ILLINOIS POLLUTION CONTROL BOARD

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

REPORT OF PROCEEDINGS held in the above-entitled cause before Hearing Officer Marie Tipsord, called by the Illinois Pollution Control Board, taken before Laura Mukahirn, CSR, a notary public within and for the County of Cook and state of Illinois, at the James R. Thompson Center, 100 West Randolph, Chicago, Illinois, on the 30th day of January, 2008, commencing at the hour of 9:00 a.m.

A P P E A R A N C E S

MS. MARIE TIPSORD, Hearing Officer
MR. ANAND RAO, Senior Environmental Scientist
MR. TANNER GIRARD, Acting Chairmn
MR. NICHOLS MELAS
Appearing on behalf of the Illinois Pollution Control Board

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BY: MS. DEBORAH WILLIAMS
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MR. ROY SMOGOR

HEARING OFFICER TIPSORD: Good morning, everyone. Welcome to Chicago on this blustery winter day. My name is Marie Tipsord. I've been appointed by the Board to be the hearing officer in the matter of Water Quality Standards and Effluent Limitations For the Chicago Area Waterway System and Lower Des Plaines River Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303 and 304, Docket No. R08-9. To my immediate right is Dr. Tanner Girard, the acting chairman and presiding board member on this rule making. To his right is Nicholas J. Melas, also board member. To my immediate left is Anand Rao of our technical staff. This morning, as you all know, we're going to skip around a little bit due to the limited availability of Mr. Chris Yoder. So instead of continuing with our general topic area, we are going to go directly to questions for Mr. Yoder. The order of those questions is Midwest Generation. Does Flint Hills have any specific for Mr. Yoder.

AUDIENCE MEMBER: I'll have to check.

HEARING OFFICER TIPSORD: If so then Flint Hill, then Citgo Petroleum Corporation and PDE Midwest, Corn Products International, Chemical Industry Council of Illinois, Metropolitan Water Reclamation District of Greater Chicago, Stepan Company, Environmental Law and Policy Center, Prairie Rivers Network and Sierra Club, and Exxon Mobil Oil Corporation.

With that, I think we will get started. I remind those of you who have been sworn, you are still sworn. And, Miss Williams or Miss Diers, would you like to introduce your witness and we'll have him sworn in.

MS. WILLIAMS: We have Mr. Chris Yoder with us today sitting at the end of the table from MBI, and he'll be testifying for us for the next three days.

(Witness sworn.)

C H R I S Y O D E R,

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

HEARING OFFICER TIPSORD: And we'll have to enter Mr. Yoder's testimony.

MS. WILLIAMS: I think, Madam Hearing Officer, would it make sense to have a separate exhibit for the testimony and there's three attachments to the testimony. Do you want them to be separate exhibits?

HEARING OFFICER TIPSORD: It's probably easier. Two things: The acoustics are horrible. So those are you who are all the way in the back of the room, you're probably not going to hear no matter how much you yell. So please come forward. I will keep reminding everyone. Please let me know if you can't hear, but the minute anything goes by on the road out on LaSalle Street, you will not be able to hear anything.

If there's no objection, I will mark the prefiled testimony of Chris O. Yoder as Exhibit No. 13. Seeing none, it's Exhibit 13.

I've been handed the CV for Mr. Chris Yoder, and we'll mark that as Exhibit No. 14, if there's no objection. And

this was Attachment 1 to his testimony, correct?

MS. WILLIAMS: Correct.

HEARING OFFICER TIPSORD: And what was attachment two, Temperature Criteria Options For the Lower Des Plaines River Final Report, dated November 23, 2005, we'll mark as Exhibit 15 if there's no objection. Seeing none, it's Exhibit 15.

Attachment 3 to his testimony, Reevaluation of the Technical Justification For Existing Ohio River Mainstream Temperature Criteria dated January 27, 2006, will be Exhibit 16, if there's no objection. Seeing none, it's Exhibit 16.

With that, then let's begin with the prefiled questions of Midwest Generation for Mr. Yoder. And just for record purposes and so the court reporter knows where to look when she's using these to work from, can you tell us what page you're starting on.

MS. FRANZETTI: There's a whole separate set of questions by Midwest Generation for Chris Yoder, and I'm starting

with the questions that begin on Page 2 with question Roman one capital A one.

Madam hearing officer, I think maybe it would be at least polite to allow Mr. Yoder to introduce yourself and tell -- give us what your current position is with your current place of employment?

MR. YODER: My name is Chris Yoder. I'm the research director.

HEARING OFFICER TIPSORD: You're going to have to speak up, Mr. Yoder.

MS. FRANZETTI: I'm sorry. Did I miss the answer while I was closing the door?

HEARING OFFICER TIPSORD: Go ahead.

MR. YODER: My name is Chris Yoder. I'm the research director for the Center for Applied Bioassessment and Biocriteria at the Midwest Biodiversity Institute. It's located in Columbus, Ohio.

Examination

By Mr. Franzetti

Q. Mr. Yoder, would it be okay if I refer to your current employer as MBI?

A. Yes.

Q. What is the primary source or sources of MBI's funding?

A. Well, there's multiple sources of funding, primarily to various clients that we are asked to do work for that includes U.S. EPA, state agencies, municipalities, and nonprofit corporations and other private organizations. There's about, I'd say, about 30 clients at present.

Q. Any one or two of those that represent a significant portion of the work that MBI performs?

A. U.S. EPA probably provides the plurality of funding.

Q. Do you do any projects for industrial clients?

A. Not at present, no.

Q. Other than your employment with the Indiana Department of Health, the Ohio EPA, and MBI, have you been employed anywhere else?

A. Between February 2001 and December of 2006 I was an employee of Ohio University at the Center For Leadership and Public Affairs, and that's it.

Q. Can you just briefly state what the nature of your work was for in that role as an

employee of Ohio University?

A. Well, it was basically doing the work of MBI, but I was technically an employee of the Ohio University at the time.

Q. So same kind of work, just a different employer?

A. Yes.

Q. Okay. Moving on to Question 3. When you have provided expert witness testimony in proceedings, and this is as described in Page 2 of your prefiled testimony, on whose behalf have you provided such testimony?

A. When I was employed with what was then the Indiana Department of Health, I testified on behalf of EPA Region 5 in a hearing, and then on other occasions for Ohio EPA.

Q. And if I can be indulged, and I think this is a question that a number of other people had but I didn't, this seems to be the appropriate time to ask it, so I'm going to sneak it in. Mr. Yoder, do you consider yourself an expert in any field?

A. Yes.

Q. What field or fields do you consider yourself an expert in?

A. Aquatic ecology, fisheries biology, ichthyology, the effect of environmental stressors on aquatic communities.

Q. And I'm sorry. I couldn't keep up with all of that. Maybe I should just ask the court reporter if she can try and read that back. Mr. Yoder will help you since I know some of the words were a little tough.

(Record read as requested.)

MS. FRANZETTI: That was excellent.

BY MS. FRANZETTI:

Q. Mr. Yoder, could you briefly explain to us what is -- what is encompassed in the field of aquatic ecology? What are you referring to when you say I believe I'm an expert in aquatic ecology?

A. Well, it's basically dealing with aquatic echoe systems and the organisms that reside in the systems and the effect of the environment on those organisms.

Q. And next would you do the same for the field of fisheries biology?

A. Yeah. I kind of look at that as sort of a subset of aquatic ecology.

Q. Okay. So we covered that under --
A. My expertise with fish primarily.
Q. Specific to fish the things that you described for aquatic ecology would be what you were referring to for fisheries biology?
A. Yes.
Q. Okay. Ichthyology?
A. Well, ichthyology, again, is a subset of fisheries, and that's the basically the taxonomy and life history of individual species, populations.
Q. And, finally, the fourth area you mentioned was the effect of biological stressors on aquatic communities. Please describe what that entails.
A. Well, simply it's the understanding, the response of the aquatic organisms and their assemblages to various both natural and progenic processes that affect them and determine their wellbeing status.
Q. Moving on to Question 4, and maybe I need to actually back up to be clear in terms of what I'm talking about. With respect -- You prepared what has already been marked in this proceeding as Exhibit 15, temperature criteria

options for the lower Des Plaines river, final report, correct, Mr. Yoder?

A. Yes.

Q. My next question applies to the same type of work you did that's reflected in Exhibit 15. For what other states have you prepared similar reports and recommendations with respect to thermal water quality standards?

A. In addition to this work, I developed a temperature criteria that are in the Ohio water quality standards. And also the work we did for ORSANCO. Do I need to spell that?

HEARING OFFICER TIPSORD: Yes, please.

THE WITNESS: It's the Ohio River Valley Water Sanitation Commission which is the compact of multiple states in the Ohio river basin.

MS. FRANZETTI:

Q. And, for the court reporter, would you just spell out the acronym that makes up the word ORSANCO?

A. O-R-S-A-N-C-O.

Q. Thank you. So you developed the temperature water quality standards for Ohio,

correct?

A. Yes.

Q. And were those adopted basically as you developed them?

A. Yes.

Q. No changes were made?

A. No.

Q. Okay. And approximately when was that? I know you make some reference to it in your report, but just to give us a time frame.

A. 1978.

Q. Are the 1978 Ohio Thermal Water Quality Standards still in effect today?

A. Yes.

Q. No changes have been made?

A. No.

Q. Moving on to Question 5, Mr. Yoder. Have you conducted any fish studies on the Chicago Sanitary and Ship Canal or on water bodies that are similar to the Chicago Sanitary and Ship Canal?

MS. WILLIAMS: I think this is compound. Can we break it down into first the sanitary and ship canal.

BY MS. FRANZETTI:

Q. Sure. Mr. Yoder, let me ask it again. Have you conducted any fish studies on the Chicago Sanitary and Ship Canal?

A. Yes. I've -- Our organization has conducted --

Q. By your organization, we're referring to MBI?

A. MBI.

Q. Have you personally been out in the fields conducting any studies?

A. No, I haven't personally done that.

Q. I believe one of your colleagues is Mr. Rankin?

A. Yes.

Q. Do you know whether Mr. Rankin has conducted any fish studies for MBI on the Chicago sanitary and ship canal?

A. No.

Q. You don't know or he hasn't?

A. No. He hasn't conducted fish studies, no.

Q. Have you conducted any fish studies on water bodies that you believe are similar to the

Chicago Sanitary and Ship Canal?

A. Yes.

Q. How many studies?

A. Well, one stands out in my mind.

Q. And what water body was that?

A. The Kayahoga River.

Q. And could you briefly, for those who are not familiar with the Kayahoga River, could you briefly describe what the similarities are of the Kayahoga to the Chicago Sanitary and Ship Canal?

A. It would be the, what's known as the Kayahoga River Navigation Channel which is a modified water body with basically constrained to an navigation channel or great lakes shipping. It encompasses about the lower five and a half miles of the main stem of the Kayahoga River.

Q. Were you doing that work -- Let me just ask it generally. What was the purpose of your fish study on the Kayahoga River?

A. Well, it was part of Ohio EPA's state-wide biological and water quality monitoring program.

Q. Was a written study report prepared on that Kayahoga River navigational channel work?

A. Yes.
Q. And is that a published study?
A. Yeah. I believe they're all listed on Ohio EPA's website.
Q. Do you recall offhand what year it would have been?
A. There's been several reports.
Q. The one you did, you worked on?
A. Probably 1984, I believe, something in that era.
Q. So your work was done on the Kayahoga River Navigational Channel in the early 1980s?
A. Yes. It actually -- through the 1980s.
Q. Through the 1980s?
A. Into the early 1990s.
HEARING OFFICER TIPSORD: Yes? You need to --
MR. DIMOND: This is Tom Dimond on behalf of the Stepan Company. Mr. Yoder, did you say that the report was available on the Ohio EPA website?
THE WITNESS: Yes, it should be.

BY MS. FRANZETTI:

Q. I think I've adequately covered five. Moving on to No. 6.

MR. FORT: Jeff Fort on behalf of Citgo. Mr. Yoder, you said something about that you had done a fish study on the Chicago Sanitary and Ship Canal, or did I mishear that?

THE WITNESS: Well, I directed people who did the work. I wasn't personally present.

MR. FORT: And you're talking about the ship canal is what the body of work that's in, I think it's Attachment S, and the other reports that we've had in here?

MR. YODER: I'm not sure --

MS. WILLIAMS: Excuse me? Could you repeat that.

MR. SULSKI: He wants to know if it's in Attachment S.

MR. FORT: I'm trying to identify where the body of work is that he's referring to that refers to the ship canal. Because I'm not sure what we're calling the ship

canal is the same as what he's calling the ship canal.

MS. WILLIAMS: Do you want to say when that was done?

MR. YODER: It was in 2005, and it was based on a regional comparability study that we were conducting in region 5, EPA Region 5. And Metropolitan Water Reclamation District was one of the cooperators in that study?

HEARING OFFICER TIPSORD: You're really going to have to try -- I mean the court reporter is having difficulty hearing you.

MR. YODER: I'm sorry.

MF. FORT: I guess maybe the question to the agency is you're familiar with his work. Is this work part of what you've included as Attachment S or the exhibits that we had yesterday?

MR. SMOGOR: It's not part of the record at this point, that study that he's referring to.

MR. FORT: Oh, it's not?

MR. SMOGOR: No, no.

MR. FORT: Is it reduced to documentation someplace?

MR. SMOGOR: Yes. We can --

MS. WILLIAMS: Can I just ask -- I'd like to ask the Agency if they've ever seen the study, the results? Have you ever seen the results of the study? Have you reviewed them?

MR. SMOGOR: I have not.

MS. WILLIAMS: Do you know if anyone at the agency has?

MR. SMOGOR: I don't know if anyone has, but I wouldn't guess that they have.

MR. FORT: Mr. Yoder, you did this for U.S. EPA?

MR. YODER: Yes.

MR. FORT: And you don't know if it has been given to Illinois EPA or not?

MR. YODER: I'm pretty certain all of the states in Region 5 received that report.

MR. FORT: But it's not part of this regard is what I hear, right?

MS. WILLIAMS: Correct.

HEARING OFFICER TIPSORD: Let's just

go that next step, and it needs to be a part of this record, I think.

MS. WILLIAMS: Right. I mean do we know the title of the report?

MR. SMOGOR: The word comparability is in it, right?

MR. YODER: I'd have to --

MS. WILLIAMS: We'll look into it and make sure.

BY MS. FRANZETTI:

Q. Mr. Yoder, do you know if it's available on any internet site?

A. I'm not sure.

Q. Okay. Do you -- Can you explain to us what the purpose was of that work?

A. The purpose of the study, actually it was a grant from Region 5 to ORSANCO, and we were a cooperator with ORSANCO. We actually were contracted by them to do the work. And it was a study comparing the results of both electrofishing at various river insites around the region. And I believe there were nine different cooperators consisting of states, municipalities, and one private organization.

Q. Was the main purpose of the study trying to determine the reliability or accuracy of electrofishing methods for doing fish studies?

A. It was more just how do different organizations that may have slightly different methods and equipment, how do the results compare.

Q. Okay. Among the slightly differing ways in which the organizations or entities use electrofishing to collect fish samples?

A. Yes.

Q. Okay. So it's not going to tell us much more than the good and the bad of electrofishing methods, or does it -- or does it contain -- comment on the type of fish found and any other attributes with regard to the fish found?

A. Well, the same basic data that we have provided for other water bodies in this particular hearing. It's the same basic type of data.

Q. Okay. I'm going to ask you to elaborate on that. We're all trying to get a sense of what the relevance is of this report we're talking about. And in that regard when you said same basic data, what are you referring to?

A. Well, the data collected -- the study

was structured where MBI sampled at sites that were already being sampled by these other cooperators. So we applied MBI's protocols to those sampling locations.

Q. Okay.

A. And so we generated the basic, you know, fish counts, species enumerations, et cetera, that -- that's what I referred to as baseline data.

Q. You mentioned one of the cooperators was the district, correct?

A. Yes.

Q. Any other cooperators in the Chicago Sanitary and Ship Canal portion of this study?

A. No.

Q. Was anyone else asked to cooperate?

A. No.

Q. And I don't know -- Before I started asking the questions, I'm not sure we established, are we going to try to get a copy of the report?

HEARING OFFICER TIPSORD: Yes.

MS. FRANZETTI: So I don't need to, okay, go into that.

HEARING OFFICER TIPSORD: Mr. Harley has a follow-up.

MR. HARLEY: Before we move on to make sure we're -- Keith Harley on behalf of the Southeast Environmental Task Force. Beyond what's referenced in your prefiled testimony and in your attached CV, have you done any specific studies relating to the Calumet River, the Little Calumet River, Lake Calumet, or the Cal-Sag Channel?

MR. YODER: I believe we had at least two sites on the Cal-Sag Channel in the study, but not on the other water bodies that you mentioned.

MR. HARLEY: And approximately when were those Cal-Sag Channel studies completed?

MR. YODER: Well, that was all 2005.

MR. HARLEY: And is that part of the record in this case?

MR. YODER: Not presently until the report is entered.

HEARING OFFICER TIPSORD: I believe his answer was that that's all part of the report he's getting ready to prepare, is that correct, or getting ready to provide us?

MR. YODER: Yes.

MR. HARLEY: Thank you.

BY MS. FRANZETTI:

Q. Moving on to Question 6. Mr. Yoder, have you conducted any fish studies on the lower Des Plaines River or on water -- I'll stop there, just on the lower Des Plaines River.

A. Well, again, it's similar to my previous answer. MBI had a field group that did some sampling on the lower Des Plaines in 2006.

Q. 2006. Now, is that also part of that same comparative fish electrofishing study that you previously described for us?

A. No, it's not.

Q. This is a separate project, correct?

A. Yes.

Q. And with respect to this project which, can I refer to it as the Lower Des Plaines River 2006 Project?

A. Yes.

Q. Okay. You, I believe, have just told me you were not personally out there in the field doing the fish study work, correct?

A. Correct.

Q. Were you out in the field directly

overseeing people who were doing the fish study work?

A. Yes.

Q. You were. What -- Explain what your role was.

A. Well, my role in these projects is to oversee their completion and execution in accordance with the grant or contract that supported them.

Q. All right. With respect to the field work, I should use that term to be clear, what did you do out in the field to supervise the people performing the Lower Des Plaines River 2006 Project?

A. I guess my role as the research director is to ensure that the field crew leaders who actually conduct the work are properly trained and qualified. So there's part of that training is done in the field, not necessarily on the lower Des Plaines, but -- and I do, I guess we have sort of an internal audit procedure that we use during the field season, and I will make visits to the field crews while they're doing their work.

Q. So for the lower Des Plaines River 2006 project, did you make any visits to the field crew?

A. No, I did not on the lower Des Plaines.

Q. Okay. So on that project, none of your work was performed out in the field, correct?

A. Correct.

Q. Okay. But there are field crew leaders that are out in the field?

A. Yes.

Q. Okay.

A. That I --

Q. And they oversee the people who are actually collecting the fish data?

A. Yeah. Field crew is a full-time employee of MBI, the crew leader who's then assisted by two or three field technicians.

Q. Okay. So we have the field crew leader, and he oversees two or three technicians. The field crew leader is a full-time employee of MBI. What about the two or three technicians. Are they full-time employees of MBI?

A. They're what we call seasonal employees.

Q. Does MBI train those people?

A. Yes.

Q. What kind of training do they receive?
A. Everyone receives training just prior to the field season in field safety, first aid. They're also instructed in the execution of the sampling protocols.
Q. I'm going to hold up there and come back to my question. So you have -- We've established you've performed one fish study or part of the performance of the fish study on the lower Des Plaines River in 2006. Any other fish studies you have been involved in for the lower Des Plaines River?
A. No.
Q. Now, with respect to rivers that you would consider similar to the lower Des Plaines River -- Let me strike that for a moment, because that incorporates different types of habitat and fish.
If I use the term Upper Dresden Pool, do you know what I'm referring to?
A. Yes.
Q. Okay.
MS. WILLIAMS: Can you describe, because I'm not --

MS. FRANZETTI: That's my next question, Counsel.

BY MS. FRANZETTI:

Q. What area do you incorporate within the term Upper Dresden Pool?

A. Well, my understanding is it would be from the -- It would be the effect of the impalement by the Dresden Dam on the Des Plaines River, and could include all the way up to the Brandon Dam tailwater. That's my understanding.

Q. All right. For purposes of this proceeding, could I ask you to use the, as the southern boundary of the Upper Dresden Pool, the I55 bridge? Are you familiar with where that is?

A. Yes.

Q. Okay. So with respect to the Upper Dresden Pool defined with I55 bridge as its southern boundary, have you performed fish studies on any other waters that you consider to be similar?

A. Yeah. I would consider, I think you could start with any river of a similar size in terms of drainage area that is modified, flow modified by dams. I've been on a lot of those throughout the Midwest and New England, tens if not

hundreds in my career. We're conducting a regional large river study in Region 5. So we've been on a number of different rivers that are impounded both for navigation and nonnavigation purposes.

Q. Mr. Yoder, are you familiar with the fact that the Upper Dresden Pool, as we're -- as we've defined it is a channelized water body?

A. If I understand the term channelization.

Q. Tell me what your understanding is of that term.

A. When I refer to channelization, it's a water body that's been physically dredged out, the channel has been altered by physical dredging.

Q. Right. Maintenance dredging, primarily usually navigational purposes?

A. And usually bank to bank that you see in agricultural landscapes to permit drainage.

Q. Are you aware that there's any channelization in the Upper Dresden Pool?

A. Well, yeah, for the, you know, for the navigation channel purposes.

Q. And with respect to both an impounded and a channelized area like the Upper Dresden Pool,

is your answer also the same, that you've worked on tens upon hundreds of those?

A. Yes, some of those were the subject of the same types of maintenance.

Q. Some of those?

A. Yes, some, not all.

Q. Roughly 10 percent?

A. Probably a smaller fraction, because most do not support that type of navigation.

Q. Okay. So one percent?

A. It's hard to say.

Q. Okay. Something less than five?

A. That's probably close.

Q. Okay. Moving on to Question No. 7.

HEARING OFFICER TIPSORD: Before you get there, I would just like to double-check. We were talking about the Lower Des Plaines River 2006 Study. Miss Franzetti was asking you about that. Is that Attachment S to the --

MR. SMOGOR: Yes.

HEARING OFFICER TIPSORD: Attachment S to the petition is the word I'm trying to come out with. I wanted to clarify that that

one is in the record.

MS. FRANZETTI: Yeah, we got one.

Thank you, Madam Hearing Officer.

BY MS. FRANZETTI:

Q. Question No. 7, have -- How many peer-reviewed scientific journal papers have you published on the subject of the development of thermal water quality standards?

A. Well, in terms of peer-reviewed paper?

Q. First I want you to answer as to peer-reviewed papers.

A. I believe there are at least two in my resume, but I --

HEARING OFFICER TIPSORD: I didn't hear the last part of that.

THE WITNESS: Two publications in my resume that deal with thermal issues directly or peer review.

BY MS. FRANZETTI:

Q. And this is with respect to the development of thermal water quality standards, correct?

A. Yes. One deals directly with that. The other one is thermal effects study that I did

for my graduate research.

Q. Okay. Can you find it on your resume. Because we all have your resume as Exhibit 14, so if you could just tell us where those two are listed.

A. Yes. Under publications and technical reports. This doesn't have page numbers.

Q. I just realized that, too. Well, let's do it this way. We've got the first page that does have the caption publications and technical reports. It's not on that one or is it on that one?

A. Yes. These are listed chronologically from most recent to --

Q. Where is the first one?

A. On the first page the next to the bottom reference.

Q. Yoder and Emery, 2004?

A. Yes. I believe that was --

Q. Updating a temperature criteria methodology for the Ohio River main stem?

A. Yes.

Q. Correct? Okay. So that's the one that directly relates to the development of thermal water quality standards, correct?

A. Yes.

Q. And that was peer reviewed?
A. I believe it was, yes.
Q. Are you -- You're not sure?
A. I'm fairly certain it was, but I am not 100 percent.
Q. Okay. And now the other one that you were saying is relevant, I guess, you think, to the development of thermal water quality standards. Which one is that?
A. That would be the Yoder and Gammon, 1976 paper. It is -- it will be five pages back. It has a 1976 publication date.
Q. Okay. I think I found it. Is the title Seasonal Distributions and Abundance of Ohio River fishes at the JM Stuart Electric Generating Station?
A. Yes.
Q. Okay. Now, I think you mentioned you did that when you were a graduate student?
A. Yes.
Q. So the peer review of that was by who?
A. Well, I don't -- it was anonymous.
Q. I'm sorry. That was an anonymous?
A. Peer reviewers are anonymous.

Q. In graduate school?

A. I don't know who they were. No, this was a publication as part of a symposium proceedings.

Q. I'm sorry. I thought you were doing it for graduate course work in a course.

A. It was based on my master's thesis research.

Q. I see. Okay. And that one really, though, is not talking about the actual development of thermal water quality standards, is it?

MS. WILLIAMS: I don't -- Object is a little harsh, I guess, but we didn't ask the question what has the Agency proffered him as an expert for. You did ask the question what he's offered himself -- what he is an expert in. I wouldn't describe what we're offering him as an expert in to be that. I would describe it as the impact of temperature on aquatic life. So to that extent, I think, actually, the second study is maybe more relevant or at least as relevant as the first.

MS. FRANZETTI: Okay, Miss Williams.

So you're offering Mr. Yoder solely for the purpose of what the impact of temperature is on aquatic life, correct?

MS. WILLIAMS: Can we go off the record for a second?

HEARING OFFICER TIPSORD: Sure.

(Off the record.)

HEARING OFFICER TIPSORD: Go back on the record. Miss Williams, please explain what you feel his expertise is, what you're offering him as an expert in.

MS. WILLIAMS: The Agency is proffering Mr. Yoder as an expert on the impacts of thermal stressors on aquatic life, and we've brought him here primarily to explain his methodology for looking at those stressors. But we have not specifically proffered him as an expert on establishing numeric criteria for temperature standards, especially not as that relates to Illinois.

MS. FRANZETTI: For the record, this is another problem, quite frankly, caused by the order in which Mr. Yoder has been put forward in this hearing. Because I am

confused by that description based on what I have read in Mr. Yoder's report that was attached to the statement of reasons. I'm also hindered in my understanding because I've not been able to question the Agency witnesses. And I think it is particularly whoever at the agency took Mr. Yoder's report and what did they use it for. Quite frankly, Miss Williams, not to be difficult, I thought his report was the starting point for deriving the thermal water quality standards that have been proposed in this proceeding. And, admittedly, changes were made to what was in his report, but his methodology, I thought, formed the basis of the proposed thermal water quality standards. And I think -- I don't know. That's why I'm confused. I think you're telling me I'm wrong in my understanding.

MS. WILLIAMS: All I'd like to say on this point for the record is I believe that when we had phone conferences prior to these hearings, I explained to you on two occasions my view that Mr. Yoder's testimony was on a

very limited subject matter, and that the agency witnesses; namely, Mr. Twait, would be testifying about the actual numeric criteria for temperature.

HEARING OFFICER TIPSORD: But you didn't answer Miss Franzetti's question, and I'm curious as to the answer to Miss Franzetti's question. Because I think it's a good point. We have a report, we have Attachment S, which I believe the testimony was yesterday that there were changes made to the proposal with --

MS. WILLIAMS: That's not what she's talking about. This is not related to thermal. Attachment S is not related to thermal.

HEARING OFFICER TIPSORD: All right. I'm sorry.

MS. WILLIAMS: Which is why I wanted to go off the record and discuss that he probably would have to talk about Attachment S unrelated to thermal. I think Mr. Twait's testimony is quite clear on this point that I'm raising, that he interpreted

Mr. Yoder's methodology in recommending what -- So to the extent that understanding his methodology is necessary, absolutely, that's what we're here to discuss. But I don't think we've been secretive at all about the relationship.

HEARING OFFICER TIPSORD: Oh, I don't mean to imply that you've been secretive. I'm just -- I think we're all a little confused because Mr. Twait's testimony is quite clearly that he interpreted the methodology and Mr. Yoder's work to develop the standards. And I think we need to get to the methodology. And so for that I think we're going to continue. And, Miss Franzetti -- If you want to object on a question-by-question basis, we'll deal with them then. But I'm still, given, again, the limited availability of Mr. Yoder and the fact that we've been told he's not coming back, I'm really looking to give them a lot of leeway.

MS. WILLIAMS: Absolutely. I don't have any objection to any line of

questioning. My objection was merely to the characterization of the nature of his expertise.

MS. FRANZETTI: And I think maybe a light bulb just went off in my head. What you're trying to say to me is, Miss Franzetti, I am not bringing him forward as an expert on how you derive thermal water quality standards. So quit asking questions about his lack of experience in doing that. Is that what you're trying to tell me?

MS. WILLIAMS: That's all I'm trying to tell you.

MS. FRANZETTI: I understand that. And what you're also trying to tell me is, yes, he has a methodology, and that methodology is for looking at thermal stresses on aquatic life, correct?

MS. WILLIAMS: He's better to answer that.

BY MS. FRANZETTI:

Q. Fine. Mr. Yoder, tell us how you describe or explain what this methodology of yours is that we're all here to hear about. And I hope

you can do it.

A. Well, I'm referring to the report.

Q. If that would be easier for you to do, tell us what -- you're referring to your report or your testimony?

A. The report.

Q. Okay. So we want to be looking at Exhibit 15. Can you give us page reference.

A. Page 1.

Q. Page 1, okay.

A. And it describes the purpose of the project.

Q. All right. But my question really was asking you how would you describe the methodology that you used for the work you did here for the Illinois EPA?

MS. WILLIAMS: Are we referring to what's been called the fish temperature model in his testimony?

MS. FRANZETTI: If that's the methodology we're talking about Mr. Twait relying on.

MS. DIERS: Exhibit 15. Exhibit 15, is that what -- that's the report. Okay.

MS. FRANZETTI: We're on Exhibit 15. Let me try and help. I'm not trying to prolong this. I'm really trying to just clarify Mr. Yoder's role here.

BY MS. FRANZETTI:

Q. Mr. Yoder, you have something you call a fish temperature model, correct?

A. Yes.

Q. All right. And you used that fish temperature model as the basis for your report that is Exhibit 15, correct?

A. Yes.

Q. Do you refer to your fish temperature model as a methodology?

A. Yes.

Q. Okay. And I think that, for current purposes probably clarifies enough what your role is here. So let me keep going. And I will skip 7 and 8 of my questions because it's -- I think Counsel has agreed it's been established he's not being proffered as an expert or was not used for the development of thermal water quality standards.

Moving on to B, participation in the lower Des Plaines UAA. With reference to Page 3

of the prefiled -- of your prefiled testimony, Mr. Yoder, could you explain how you came to be retained by the United States Environmental Protection Agency Region 5 to provide technical assistance related to the lower Des Plaines UAA and what kind of technical assistance you were asked to provide?

MS. DIERS: Can we break it down into two questions? Sorry. It's just easier on the record.

BY MS. FRANZETTI:

Q. Sure. How did you come to be retained by Region 5, Mr. Yoder, for the lower Des Plaines UAA?

A. Well, we received a grant from EPA for their term cooperative agreements which we had to -- there's a request for proposals, so we -- there was open competition for these grants, and the particular grant that this work was done under was -- I don't recall the exact title of the grant, but it had to do with the kind of the broad development of matters relating to aquatic life use, designations, and sort of the technical underpinnings of the deriving those, measuring

attainment with, and so on. So as part of that grant, I was asked by Region 5 to attend, I believe it's the -- It was the biological subcommittee, I believe, was the right term. When that process was going on, I believe in 2002, 2003.

Q. 2002, 2003?

A. Something in there.

Q. And, Mr. Yoder --

A. Prior to the report that was written by --

Q. Mr. Yoder, I hope that you won't find it annoying, but I know you're having trouble keeping your voice up. And I don't have that same problem. So what I'm going to try to do, which I think has been now established, what I'm going to try and do a little bit when I hear you dropping your voice, just for everybody's benefit, I'll try and kind of reiterate what you said trying to use your exact words in my louder voice so everybody can hear and follow along. Because the other thing we're doing is letting people ask follow-up questions, Mr. Yoder. So if you find it distracting or annoying, tell me and then I will stop. But that's why I'm trying to repeat some of the things

you say, okay?

A. I'll try to speak up.

Q. Okay. With respect to this cooperative agreement, you mentioned an open proposal, but you also spoke about a broad development of aquatic issues. I kind of lost track of was this a subset, the -- was your work for the lower Des Plaines UAA project a subpart of a broader cooperative agreement granted to MBI?

A. Yes.

Q. Okay. And when you say that there was -- It was an open proposal, it was an open proposal for the overall project?

A. Yes, for the grant. It's open competition.

Q. Okay. All right. Not a separate bidding or proposal for just this work for the lower Des Plaines UAA, correct?

A. That's correct.

Q. So let's move to the second part -- Excuse me. Let me step back.

You were mentioning the biological subcommittee of the lower Des Plaines UAA, and just for the Board's benefit, and I'm not trying to

testify, but I don't know if Mr. Yoder knows, do you know that that was a subgroup or subcommittee of what's called the Lower Des Plaines UAA Stakeholders' Group?

A. Yes.

Q. Okay. Do you recall what year, whether it was 2002 or 2003, when you were first retained to provide that -- provide assistance to the lower Des Plaines UAA biological subgroup?

A. I believe it was 2002, I believe.

Q. Okay. Do you recall for what period of time you proceeded to provide that assistance?

A. I mean the cooperative agreement extended for five years, for a five-year period. So as far as my availability for technical assistance on these matters, it spanned that entire period.

Q. Let me go on to my next question, and I think I can get to where I want to be better that way. Next question, B2, how many meetings of the lower Des Plaines UAA, let's start with the biological subgroup, did you attend?

A. I don't recall an exact number, but it was somewhere in the range of maybe four, four meetings.

Q. Do you -- Was that in 2002?
A. I believe so.
Q. Did you attend any meetings of the UAA stakeholders' group for the lower Des Plaines?
A. No.
Q. All right. So although I recognize you said the cooperative agreement spanned a five-year period, with respect to your direct dealings with the biological -- and I'm sorry. I think it's subcommittee. I've been saying subgroup. Subcommittee of the lower Des Plaines UAA, you -- that encompassed attending about four meetings of the group, correct?
A. Yes.
Q. What was -- What did you do, what assistance did you provide or what did you talk about at those four meetings?
A. Well, I recall at those meetings that there were discussions and presentations of primarily the biological inhabitant data and that I listened to those and participate in discussions about those analyses.
Q. What did you -- Did you draw any conclusions about the biological inhabitant data

that was being discussed in 2002?

A. No, not formally, no.

Q. Now, I think I skipped over -- Let me go back. With respect to the lower Des Plaines UAA project and -- which included your attendance at meetings of the biological subcommittee, what were you -- when you were asked to go to those meetings, what were you told was your purpose of -- sent to those meetings. What were you supposed to do?

A. Just provide my technical expertise.

Q. And who told you -- Who asked you to do that?

A. Region 5.

Q. Did they explain why they wanted you to do that?

A. I mean they informed me what the meetings were about and it was pretty clear what my, from knowing what the subjects of the meetings were, and I was given some of the inner work products that was taking place at that time. So it was pretty clear to me what my role was was to give them advice about.

Q. About what?

A. About the work that was being done at

the time and some of the data analyses that were being accomplished.

Q. Now, this would be by the -- the work that was being done at the time, wouldn't that have been by the Illinois EPA's UAA contractor Hea & Associates and Vladimir Navotny?

A. Yes.

Q. So U.S. EPA wanted you to help the IEPA and the UAA contractor. Is that what you're telling me?

A. Well, to sort of participate in the meetings. And if issues came up that they had questions about, that I could provide advice during the meeting.

Q. So you were sent as a resource. Would that be an accurate description?

A. Yes.

Q. Okay. Did you, in the course of attending any of the biological subcommittee meetings, did you find anything you felt was wrong about or inappropriate about the way in which the lower Des Plaines UAA contractor, Hea & Associates with Dr. Navotny, were addressing any of the biological inhabitant data you mentioned as being

prepared?

A. No.

HEARING OFFICER TIPSORD: Mr. Dimond?

MR. DIMOND: Mr. Dimond again. Mr. Yoder, did you review drafts of the UAA report by Navotny and Hea?

MR. YODER: I'm trying to -- I believe I did at the time, yes.

MR. DIMOND: Did you provide any written advice to U.S. EPA regarding the Navotny and Hea report?

MR. YODER: I really don't recall if I provided written comments. I could well have done that. I did not -- I don't recollect that at the time.

MR. DIMOND: Did you draw any conclusions as to whether or not you thought the conclusions of the Navotny and Hea report were accurate and appropriate?

MR. YODER: No.

MR. DIMOND: That's all I have at this time.

BY MS. FRANZETTI:

Q. With respect to your report to the U.S. EPA Region 5 and Illinois EPA that's been marked as Exhibit 15 in this proceeding, did you ever attend a lower Des Plaines UAA stakeholder work group meeting to present and answer questions about this report?

A. No.

Q. Do you know why not?

A. No.

Q. Did anyone ever ask you to attend such a meeting?

A. No.

Q. Okay. Did you attend any of the two public meetings that were held by the Illinois EPA in 2007 to talk about their proposed rules regarding the lower Des Plaines UAA?

A. No.

Q. Have you, before today, appeared at any meeting where potentially affected parties, like my client, Midwest Generation, were able to discuss with you your findings in Exhibit 15 and your recommendations?

A. No.

Q. Moving on to Roman II, fish temperature model, general background.

HEARING OFFICER TIPSORD: Miss Franzetti before you get going, I just want to note that thanks to the Agency, they've contacted CMS and will have a PA system here about 11:00 o'clock, so that will help.

MR. DIMOND: Just a brief follow-up question, Mr. Yoder. Regarding the 2006 study that you did that's been referred to as Attachment S, was that done as part of the same cooperative agreement with Region 5?

MR. YODER: Yes.

MR. DIMOND: Was it ever presented to the lower Des Plaines river stakeholders' group?

MR. YODER: Not to my knowledge.

MR. DIMOND: And I take it from your prior testimony that it wasn't presented -- or you didn't present it at the 2007 Illinois EPA public meeting either.

MR. YODER: No.

MR. DIMOND: Thank you.

MS. WILLIAMS: Can I redirect? Well, do you know one way or the other whether your report was distributed to that group?

MR. YODER: No. I don't know that.

MS. WILLIAMS: Can we redirect that question to an agency witness to answer?

HEARING OFFICER TIPSORD: You need to speak up. I'm not sure they heard the question at all.

MS. WILLIAMS: The question was whether the report was distributed to the work crew.

MR. DIMOND: Which report are we talking about?

MS. FRANZETTI: Are you on Exhibit 15?

MS. WILLIAMS: Yes, Exhibit 15.

MS. FRANZETTI: I can answer that question. It was.

MS. WILLIAMS: Okay.

MS. DIERS: Are you sworn in?

MS. FRANZETTI: Mr. Harley probably will insist. Actually, let's just go one more point to close up that subject area.

BY MS. FRANZETTI:

Q. Mr. Yoder, your report was distributed, Exhibit 15, to members of the lower Des Plaines UAA work group. There also were parties that commented on your report, Exhibit 15. One of those parties was my client, Midwest Generation. Did you ever see any of the written comments that Midwest Generation submitted to the Illinois EPA regarding your report, Exhibit 15?

A. I did receive it.

Q. You did. Did you review them?

A. No.

Q. You didn't. Why not?

A. I was not asked to, and I was busy doing other things.

Q. And you weren't even curious what we said?

A. Well, naturally, yes. But I, again, I wasn't asked to do it and it wasn't something that I was being tasked with under one of our client agreements.

MS. WILLIAMS: Not billable hours.

MS. FRANZETTI: I wasn't going to go there. I'm no fool.

BY MS. FRANZETTI:

Q. Mr. Yoder, let me just bring that to the present. Up until today, although you have them, have you reviewed the Midwest Gen's comments on your report, Exhibit 15?

A. No.

Q. Okay. Have you reviewed anybody else's comments that may have been submitted and you were given on your report, Exhibit 15?

A. No.

Q. Okay. With respect to then -- any -- okay.

Moving on, fish temperature model, Roman II A general background, No. 1. And I'm sorry. I'm going to ask just a general question. Sometimes when you write these questions, you're reading your testimony, Mr. Yoder, and they seem to be a natural beginning. But why don't I just at least have you explain, as briefly as you can, but with doing justice to, what is your fish temperature model?

A. Well, it was initially developed when I was employed at Ohio EPA in support of the development of their current temperature water

quality standards. And what it -- how it works is it uses thermal effects data on specific fish species that can be found in the published literature on thermal effects I. It consists of both laboratory and field derived thermal effects end points. It gathers data, I believe, on a variety of different both chronic and acute, what we call chronic and accrued end points. Chronic being things that affect the organisms in ways that don't kill it, affect it behaviorally or physiologically; and acute end points, end points that where the organism is in jeopardy of dying.

So it's a systematic process of compiling data in that manner. It -- So it relies very heavily on literature review.

Q. Okay.

A. It also incorporates a procedure where, to be applied to a specific water body, we generate something called a representative aquatic species list that is a subset of the actual species that might inhabit that water body. The reason for the subset is that there is not sufficient data on every organism or every species that inhabits these water bodies. So you take a subset that is

representative of the entire assemblage.

So, really, there's two sort of categories of input variables. One is the thermal end points that are selected for individual species, and then there are the representative species themselves. Then this basically just ranks species according to their thermal tolerance values which are expressed as temperature. And it ranks from the most sensitive to the most tolerant in accordance with four different categories: An optimum, a growth, a calculated growth temperature, an upper avoidance temperature, and a what we call an upper survival temperature.

Q. Thank you. Now, has your temperature model ever been field validated?

A. Is it okay for me to ask? I'm not sure what that means.

Q. Okay. You -- and let me use this situation as an example. The question, though, is not limited to what you did here. You, as you've just explained, you take your representative aquatic species, you collect your literature values to the extent they exist, you then rank them from most sensitive to least sensitive, and based on your four

categories. If you don't have literature data, I believe you also extrapolate to create some numbers where you have gaps with respect to those four categories. Isn't that correct, Mr. Yoder?

A. Yes.

Q. Okay. Have you ever, and you come up with ultimately, you take the number for the most sensitive species, correct, as your end conclusion of what should be the thermal standard -- well, hang on. I'm going to step back.

Where I want to start with is, so you come up with values for each of those representative species across four categories, correct? Do you go out into the field and collect data from other people and compare what you're saying should be the thermal temperature for a particular factor to what actually happens out in a stream to see how it compares?

A. Well, I guess, as I understand it, I'd have to say yes. There's been at least one occasion where I think that happened. The other thing I'd like to say is there is field derived data that can be put into the model; some of the species end points include field-derived information.

Q. Actual stream data?
A. Yes.
Q. Can be put into your model?
A. Well, tolerance values based on observations of species distributions by temperature in the field. Those are included in the database, along with laboratory derived end points.
Q. With respect to the end points that you rank in your model, for which end points did you, in doing the -- in applying your model here, did you use field-derived data?
A. Well, field-derived data would have to do mostly with upper -- the upper avoidance temperature.
Q. Okay. Not -- you said mostly. Is that the only end point for which --
A. No. The other one --
Q. -- your model here used field-derived data?
A. The other one would be something called a preferred temperature, which we also merge with the optimum temperature in the model. So those two end points can be field derived.
Q. I understand that -- I understand can

be. Would you now answer it for were they in this application of your model for the lower Des Plaines?

A. Yes. It includes some field-derived data.

Q. Do you know whether any of your -- Let me strike that.

I need to ask you how you refer to the end numbers, the values that you came up with here for the Upper Dresden Pool application of your model. How do you refer to those numbers? I want to use terminology that you'll understand.

MS. WILLIAMS: I'm confused. What do you mean by for the Upper Dresden Island pool. I'm not sure I understand. Is there a --

MS. FRANZETTI: You know what, let me hold off. I think -- let me come back to this after we go through more of the basics of how he does his model.

BY MS. FRANZETTI:

Q. But let me go to the -- to your answer, Mr. Yoder, with respect to you think there's been one instance where your fish temperature model has perhaps been compared to actual field data. You

recall that answer that you gave me, you thought there might have been one instance.

A. Yes.

Q. Okay. Where and when?

A. The one I had in mind would be the Muskegon River in Ohio where the water quality criteria for temperature were derived by this model and they were applied to evaluate and develop a management plan for a particular power plant to discharge the Ohio River or the Muskegon River. And there were biological field studies conducted in the river that, in my view, corroborated the end points that we had set for that main stem of the river.

Q. Okay. So that was the Muskegon River in Ohio. And water quality criteria were being derived for a portion of the Muskegon river?

A. They had already been derived and adopted in 1978.

Q. Oh, okay. I'm sorry. I misunderstood that. And this project -- this project you're talking about is in what year approximately?

A. The one I'm thinking about happened in 1988 when we conducted a biological and water quality study of the Muskegon River main stem. When

I say we, when I was with Ohio EPA.

Q. Okay. And so are you telling me because the Ohio -- can I call them thermal water quality standards?

A. Yes.

Q. Okay. Thank you. Because the Ohio thermal water quality standards were based on your fish temperature model, is that your basis for saying that this work in 1988 to do this biological water quality study of that river was, in effect, a comparative study to the application of your fish temperature model?

A. Well, I think what I'm saying is that we -- There were observed exceedances of those temperature criteria in the river in 1988, and we saw the adverse biological effects in the field work.

Q. What adverse effects did that biological study identify? What do you mean by we saw adverse effects?

A. Well, the basis for judging impairment would be the numeric biocriteria that Ohio EPA adopted or had in operation at that time. And those indicated an impairment to the biological assemblage

and corresponded to temperature exceedances measured in the river.

Q. Temperature exceedances of the existing Ohio thermal water quality standards?

A. Yes.

Q. I'm not following, though -- Well, strike that.

And I'm sorry if I'm repeating myself, but I'm not quite following how this validates your model. Was your model used, were the numbers derived by your model incorporated into the 1978 Ohio water quality criteria for the Muskegon River?

A. Yes.

Q. Okay. So you -- So because when those numbers were exceeded, you saw adverse effects, that's what you're saying is the validation of the --

A. In the field data.

Q. In the field data?

A. Yes.

Q. Okay. Do you know how much above the criteria the ambient temperatures were in the Muskegon River that produce these adverse effects?

A. Yeah. The criteria for that river is a daily max of 89 degrees, and seasonal average of 85. And I believe both those were exceeded. The maximum is a little easier to compare to the sampling data, and that was exceeded by three or four degrees, I believe, maybe more.

Q. So the ambient temperatures were at least 92 to 93 degrees?

A. Yes.

Q. On a daily max basis?

A. That's what I recall, yes.

Q. Okay. That's what I'm asking you. You can't really say as to how much the average of 85 degrees was exceeded?

A. No.

Q. Okay. And so it was at daily maximum temperatures in the 92 to 93 degree range where you're telling us the study identified some adverse effects to the fish?

A. Yes.

Q. Okay. Do you have any knowledge as to whether or not there were any other impairments in the Muskegon River at that time such as low DO?

A. No.

Q. You don't know?
A. Well, I do know. There weren't.
Q. There weren't?
A. No.
Q. So there was high temperatures of 92 to 93 degrees and there wasn't low DO?
A. Correct.
Q. Those two don't always go hand in hand, do they, Mr. Yoder?
A. Not always.
Q. Thank you. Any other impairments at that time that could have also caused the adverse effects on the fish in your opinion?
A. Not that I recall, no.
Q. Might have been. You just don't recall them?
A. I'm fairly certain that that's -- it was predominantly a temperature issue.
CHAIRMAN GIRARD: May I ask a quick question?
MS. FRANZETTI: Absolutely, Mr. Chairman. I'm not that arrogant.
CHAIRMAN GIRARD: What were some examples of these adverse effects?

MR. YODER: Well, the -- They were expressed in the biological sampling results by a fish index of body integrity. And Ohio has numeric thresholds for that index. And the river was not meeting those thresholds, and it was -- and it also corresponded -- the nonattainment of these thresholds corresponded to places where you measure temperatures were exceeding the current temperature criteria that were derived by this model.

CHAIRMAN GIRARD: So what you're saying, it was presence or abundance of certain species, not fish kills or some other example?

MR. YODER: Right. The IPI is -- I don't know if anyone has talked about that yet at the hearing, but it's a multimetric index that takes into account the whole host of things by the quality and attributes of the fish assemblage. It's basically a health index measurement, if you put health in quotes maybe, so. And Ohio has benchmarks for its various rivers and streams in

accordance with this index, so that's how biological condition is ascertained, whether it's meeting those goals or if it's not meeting those standards.

CHAIRMAN GIRARD: Thank you.

MS. WILLIAMS: Can we, for the record, clarify if we're addressing these questions on Page 22 and 23 at this point then? You have some questions on this topic that seems like we're -- we can maybe cross off? The last two questions.

HEARING OFFICER TIPSORD: Rather than jump ahead, why don't, if we get there and they've been asked and answered --

MS. FRANZETTI: I agree. Were we done?

CHAIRMAN GIRARD: Yes.

MS. FRANZETTI: Actually, I was wondering if we can take a break?

HEARING OFFICER TIPSORD: Yes. We can. We'll take about ten minutes.

(Short break taken.)

MS. FRANZETTI: Back on the record. Mr. Yoder, can I go back for a moment to your

testimony about the Muskegon River. And with respect to those depression or decrease in the biological scores that you were talking about. Do you know what I'm referring to?

A. Yes.

Q. Okay. Do you know whether or not that decline in the biological scores was temporary or permanent?

A. It was during that field season, and subsequent follow-up was not done by a highway PA until, I believe, almost more than ten years later.

Q. Okay. Well, what was it like then?

A. In 1988?

Q. In the follow-up ten years later.

A. In the follow-up I'm not completely certain, although I do -- I understood things have recovered.

Q. And how did they recover? Do you know?

A. Well, most of the main stem now is meeting the biological standards.

Q. Okay. With -- So you don't know what went on -- basically what you're telling me is you don't know what went on in that ten-year period from

1988 until the follow-up?

A. Well, I know what went on, yes, in response to the 1988 event.

Q. In terms of whether or not the next season there was an increase in the IPI scores, for example. You don't know because there wasn't any sampling?

A. Again, what I recall is that the entity that operated the power plant did conduct sampling, but there were also some changes in operation at the power plant in response to the thermal issues. And, again, my recollection is that there's -- management responses have positive impact.

Q. So what you're telling me is from -- the temperature of the discharges from the power plant in or about 1988 were higher than they were later on in the 1990s, correct?

A. Yes.

Q. And as a result of the lowering of the effluent temperatures, that resulted in the IBI scores increasing. Is that what you know?

A. Yeah. I wouldn't exactly characterize it as lowering of the effluent temperatures, but it

was managing the generation output to match compliance with targeting the water quality criteria for temperature.

Q. And is that managing doesn't result in lower effluent temperatures?

A. It can result in a lower heat load.

Q. Okay.

A. Or quantity of heat discharged by the plant.

Q. I think I need you to explain that just a little bit more. Quantity of heat load meaning -- can you explain what you mean by that phrase?

A. Well, without oversimplifying, it's generally the amount of heat that the water holds with respect to the volume of water that's discharged. So it's more like -- It's a mass loading of heat that's coming out of that plant and that can be used to manage the water temperature in the receiving stream.

Q. How do I determine -- How do I measure the quantity of heat load?

A. It's in terms of BTUs per hour. It's called the heat rejectory.

Q. So what you're saying is that the operator of that general -- electrical generating station lowered the BTUs per hour of its discharge?

A. Yes. In other words, it basically managed the heat load so that assured compliance with the temperature standards. And that's the way the subsequent permit for that facility was written and its terms.

Q. Okay.

HEARING OFFICER TIPSORD: Mr. Welch, is it? Could you state your name and who you represent.

MR. WELCH: Lyman Welch, alliance with the Great Lakes. You said that the IBI scores when -- declined when the heat increased to the Muskegon River. Can you explain, when you say the scores changed, is that -- Does that mean that there were less fish in the river or less baby fish or different types of species of fish? What does that mean?

MR. YODER: Well, a change in an index like that doesn't -- it means there was a shift in the composition of the fauna, and

generally what happens is that you lose -- the most intolerant representatives will either decline in abundance or move out, and that will subsequently lower the index, so it can be -- It isn't necessarily a reduction in the numbers of fish. It can just be a rearrangement of the fauna, favoring tolerant species and hurting intolerant species. It can also reflect a change in species diversity in all of the above. It's just that in a given place you need to be aware of why the index is changing. And that's part of the analysis of what the associated stressors might be contributing to that.

MR. WELCH: Thank you.

HEARING OFFICER TIPSORD: Miss Dexter, please identify yourself.

MS. DEXTER: I'm Jessica Dexter at ELPC.

An IBI is an ecological health index, right?

MR. YODER: Yes.

MS. DEXTER: So a lower IBI essentially indicates a change in the species

assemblage?

MR. YODER: Yes.

MS. DEXTER: If fish are avoiding an area because of heat, would that impact the species assemblages?

MR. YODER: Yes.

MS. DEXTER: So because of the tendency of fish to avoid high temperatures, would you expect certain species or classes of species to disappear from an area as temperatures in that area increase?

MR. YODER: Yes. It would also be a function of how long those temperatures persist and over what length of river segment that occurred and so on.

MS. DEXTER: Would you say that high temperatures will not necessarily lead to fish kills because the fish won't be there to begin with?

MS. FRANZETTI: Objection at this point. I don't consider this follow-up, and I'm objecting because there's a limited time period with Mr. Yoder, and I would like to get back to my prefiled questions.

MS. DEXTER: I'm trying to clarify what we're talking about -- This is my last question. We're talking about the IBI.

HEARING OFFICER TIPSORD: You need to speak up and go ahead and answer.

MS. DEXTER: Would you say that high temperatures will not necessarily lead to fish kills because the fish won't be there to begin with?

MR. YODER: I think it's pretty rare, especially in an open system like a river, to see fish kills because fish are very sensitive to detecting very small changes in temperature and they can avoid. I think in my entire career I've only seen what can be termed an actual thermal kill in one situation. Most of the time it doesn't occur.

MS. DEXTER: Thank you.

HEARING OFFICER TIPSORD: And I had a follow-up in the back.

MR. HOWE: My name is Peter Howe. I'm here just for myself. And, Mr. Yoder, can you give us specifics in exactly what species

were avoiding that temperature?

MR. YODER: It was primarily a group of fish from the family Catostomidae or suckers, and it was the sort of a subgroup that we call red horse species which are thermally sensitive species and also very important components of Midwest river fish assemblages, and that's primarily the group of fish that that were avoiding this area.

MR. HOWE: Thank you.

HEARING OFFICER TIPSORD: Could you spell your last name.

MR. HOWE: Howe, H-O-W-E.

BY MS. FRANZETTI:

Q. Mr. Yoder, just because now we've opened up this new topic, are you saying there were no fish in this area?

A. No.

Q. Okay. So not everybody moved out and avoided the area, correct?

A. Correct.

Q. And of those that did, they were able to live in a 92/93 degree water, didn't need to avoid it, correct?

A. The species that were left obviously, yes, they were there, yes.

Q. Okay. But the red horse were more sensitive to the thermal levels and they left, correct?

A. Yes.

Q. Did they leave forever?

A. No.

Q. Okay. Can I go back to my questions?

HEARING OFFICER TIPSORD: Absolutely.

BY MS. FRANZETTI:

Q. I think we are on II A2. In the Illinois EPA statement of reasons at Page 81, it is noted that the approach to deriving thermal standards -- I'm sorry. It is noted that the approach to deriving thermal standards was used by the Ohio EPA in 1978 and by the Ohio River Valley Water Sanitation Commission in 1984, and the approach is referring to your fish temperature ranking methodology. I think we established this earlier, but I just want to make sure we were talking about the same thing. Am I right that your approach has not been used again to set thermal water quality standards in the 23 years since?

A. No. The highway EPA hasn't changed the original standards that were inducted in 1978, but ORSANCO did commission the study that we did to update the methodology and any subsequent changes that might have to their temperature criteria.

Q. Okay. But outside of Ohio, has your fish temperature ranking approach been used to establish any thermal water quality standards?

A. Not to my knowledge.

Q. Okay. Now, when your approach has been used, and I'm on Question 3, in '78, '84, and however you're referring to it as being updated and used by ORSANCO, were there extensive stream data such as those existing here for the lower Des Plaines river available for use instead of the published literature data approach that you use?

A. If I understand your question correctly, I would say that for the Ohio River -- well, you know, I'd say yes, in the Ohio River extent. I mean ORSANCO has a fairly extensive biological monitoring program.

Q. So in 1984 that --

A. Oh, in 1984. No. That predated their program. So other than what was available in the

main stem around the -- probably the most of the studies that were conducted were done by various power companies and intended to be around in the vicinity of power plants.

Q. So there wasn't extensive stream data?

A. I did my Master's thesis on the Ohio River, and we covered at least 200 miles of the main stem with that type of data.

Q. I'm just asking you whether in those two instances when your fish temperature ranking model, you're saying, was used to derive the thermal standards, was there extensive stream data available?

A. I would say yes, there was, for the Ohio River.

Q. Okay. Was it used at all to compare your fish temperature ranking numbers to --

A. If I understand what you're getting at, I would say no, it wasn't. I mean we didn't have a study like the one I reference on the Muskegon, but there were a number of power plant studies on the Ohio River done for the 316 variances.

Q. Okay.

MS. WILLIAMS: Can I ask a redirect at this point? So as far as your -- I guess I want to make sure I understand your understanding of her question. When she's referring to extensive stream data, do you interpret that as being biological data or ambient temperature data or both?

MR. YODER: Well, I interpret it as being at least the biological data, and then also a lot of those studies also collected temperature data at the same time.

MS. WILLIAMS: And are you aware of a method for using that data to establish water quality standards?

MR. YODER: Other than what I referred to before when we decided the use of field-derived upper avoidance in preferred temperature end points, some of those came from field studies conducted in the Ohio River.

MS. WILLIAMS: Thank you.

BY MS. FRANZETTI:

Q. Mr. Yoder, did I understand your answer correctly, you're not aware of any other

methodology for establishing thermal water quality standards other than your fish ranking approach?

A. Oh, no.

MS. WILLIAMS: That wasn't my question.

MR. YODER: I didn't mean that at all.

MS. FRANZETTI: What were you referring to when you said you weren't aware of any other methodology?

MS. WILLIAMS: My question was whether he was aware of methodology for using extensive data for setting standards as the term was used in your question.

MS. FRANZETTI: Thank you. All right.

BY MS. FRANZETTI:

Q. So the answer is no, you're not aware of any methodology that utilizes actual stream survey data to derive thermal water quality standards?

A. I'm not sure that's what I said. I'm getting very confused.

Q. Please clarify what you said. I'm not understanding.

A. Well, when I hear the use of field,

you know, using field observations to set temperature criteria, I'm trying to best explain what I'm familiar with, and if those studies existed in 1984 in the Ohio River. And, to my knowledge, they did exist.

Q. Okay. But I'm now referring to your answer to Miss Williams' question. What were you referring to in terms of methodologies not existing? Mr. Yoder, let me try to rephrase my question.

Are you aware of any methodology which can take the field stream data, biological end temperature, and derive a thermal water quality criteria based on that information?

MS. WILLIAMS: Can you clarify for the record what you mean. You said our methodology. Is that what you called it?

MS. FRANZETTI: No. Any.

MS. WILLIAM: Are you aware of any?

MS. FRANZETTI: Any.

MR. YODER: I would have to say yes, I am. And we've been very involved with U.S. EPA and trying to develop methods for deriving any water quality criterion with field observations, and that would include

temperature.

BY MS. FRANZETTI:

Q. Okay. That's what I was -- That's what I was trying to clarify. Your fish ranking approach using literature data is not the only methodology available to be used to derive thermal water quality standards, correct?

A. That's correct.

Q. Okay. With respect to the U.S. EPA work you were just referring to in that prior answer, is the U.S. EPA trying to establish a methodology based on stream survey data for deriving thermal water quality standards? Is that part of the work you're working on?

A. Yeah. It's not aimed specifically at temperature. It's aimed at really any stressor variable we might want to manage. But it is a methodology for relying primarily on the biological responses measured in the field to assist in developing water quality in other types of management criteria.

Q. Okay. That work is not complete, I take it, for thermal. You can't tell us what that's coming up with?

A. No. It's ongoing. I'm aware of some work going on, it's centered around some of the climate change research. It's just getting underway.

Q. Okay. Question No. 4: In retaining the services of the MBI/CABB for the development of temperature criteria, did the Illinois EPA discuss -- Strike that.

MS. FRANZETTI: I'm sorry, Debbie. I think you probably would object to that opening phrase, so.

MS. WILLIAMS: I was going to say that must be a question for someone else.

MS. FRANZETTI: Well, let me just chop off the prefatory phrase.

BY MS. FRANZETTI:

Q. Did the Illinois EPA discuss and/or review with you, Mr. Yoder, or your colleagues at MBI/CABB the alternative approach of using and relying on extensive available stream habitat and biological data for the lower Des Plaines river to derive thermal water quality standards?

A. I would have to say no to that.

Q. There was no discussion whatsoever of,

Mr. Yoder, we have these annual stream studies that are submitted to us every year by one of the dischargers out there that survey the fish, the temperature data. Can we utilize that to help derive thermal water quality standards?

A. Well, in a very broad sense, yes, I was provided that information and we had to have it to develop the representative species list that were applied in the fish temperature model.

Q. What information were you provided? Do you know? Can you describe it?

A. The compilation of fish species that have been collected in this part of the lower Des Plaines River. I think it was one of the appendix tables that ended up in the UAA report.

Q. Other than that, that's just a list of fish, right?

A. Right.

Q. Other than being given that, were you given any other stream survey data related to fish studies, thermal levels in the Upper Dresden Pool?

A. No. I'd have to say no.

Q. So you didn't see 20 years of data that had been collected like that for the Upper

Dresden Pool?

A. No, not that I factored into this analysis.

Q. I'm not talking about what you factored in. I know you didn't factor it in. Did you even get it and look at it?

A. I -- no. Other than the summary I mentioned.

Q. Right. Of the -- and that's just -- that's the list of fish, correct?

A. Correct.

Q. Can you tell me why -- Well, let me strike that.

Were you aware that such data existed?

A. Well, I was aware that there had been field sampling taking place, so I was generally aware, yes.

Q. Okay. Can you explain to me why you felt it wasn't at all useful or relevant to ask for that data, to see that data and review it as part of the work you were doing for the agency?

A. Well, it wasn't so much that why I feel it would have been useful. It was just outside

of the scope of my task.

Q. Oh, okay. So I should not at all infer from the fact that you didn't even look at that data that you think it was irrelevant? You think it didn't have any use. It was outside the scope of what you were asked to do, correct?

A. Well, again, I mean I would not agree that it's irrelevant.

Q. I understand.

A. That it was -- I have to operate within the constraints of my project task.

Q. I understand. You're going to save me a bunch of questions, but --

A. Which is more than technical considerations.

Q. Right. Okay. So it was not within the scope of what you were asked to do to look at any of that stream survey data, correct?

A. Right.

Q. Okay. I think I can skip No. 5 that asks if the fish studies that were collected have been provided, and it's been answered. Well, let me ask this one. It might have come to him through another way. No. 6, Mr. Yoder, have you reviewed

the August 2007 EA engineering report entitled, Development of biologically based thermal limits for the lower Des Plaines River that was prepared for Midwest Generation and submitted to the Illinois EPA?

A. No.

Q. Did anybody tell you that existed?

A. I was aware of it.

Q. How did you become aware of it?

A. I saw a poster at the EPRI symposium in October.

MS. WILLIAMS: Tell them what EPRI is.

MR. YODER: EPRI is the Electric Power Research Institute.

BY MS. FRANZETTI:

Q. Was somebody speaking about it?

A. I believe Mr. Siegert was the author.

Q. Okay. Did you listen to Mr. Siegert?

MS. WILLIAMS: Excuse me. Can we let the record reflect that Mr. Seigert is your technical expert sitting with you at the witness table.

MS. FRANZETTI: I'd love the record to reflect he's an expert. Absolutely.

BY MS. FRANZETTI:

Q. Mr. Yoder, did you listen to Mr. Siegert's presentation at the conference?

A. Yes.

Q. Okay. I have to ask. What did you think about it?

A. I don't have an opinion. I haven't had enough time to look at it thoroughly enough to have an opinion.

Q. All right. One more question. Did anyone from U.S. EPA discuss with you at all the Midwest Generation alternative thermal water quality standards proposals, any of them, that have been submitted to the UAA stakeholders' group over the time of that group's efforts?

A. Not in any detail, just other than the fact that some of these alternatives existed.

Q. Did they characterize them at all in terms of what they thought about them?

A. No.

Q. Moving on to Question 7. Referring to the Ohio EPA stream assessment program that is used to designate use classifications for Ohio water bodies, is it correct that the Ohio program

emphasizes the use of field biology?

A. Yes.

Q. Is the field-based approach the foundation of Ohio's biological criteria?

A. Yeah. It's all field based.

Q. So moving on to Question 8, is it correct to say that in the Ohio stream assessment system, attainment of a use is achieved only when certain biological end points are met rather than just relying on attainment of chemical water quality criteria?

A. Yes.

MS. DEXTER: Can I ask a clarifying question? Does attainment in this situation mean attainment as we've been discussing under the U.S. EPA use attainability --

MR. YODER: Yes.

BY MS. FRANZETTI:

Q. Okay. Moving on to Question 9. In Attachment R -- and, Mr. Yoder, I'm sorry. That may be asking you something you don't even know what I'm talking about. Do you know what Attachment R is to the Illinois EPA statement of reasons? I see Illinois counsel I think has provided you with a

copy of Attachment R.

A. Yes.

Q. You can look at it. Do you recognize it?

A. Yes.

Q. What is Attachment R?

A. It's titled analysis of physical habitat quality in limitations to waterways in the Chicago area authored by Edward T. Rankin.

Q. Is Mr. Rankin one of your colleagues?

A. Yes.

Q. Okay. He works for which organization?

A. He is an Ohio University employee, but he does -- he works on our projects.

Q. Okay. And then by our, you're talking about the CABB, MBI?

A. Yes.

Q. Okay. In Attachment R, Mr. Rankin wrote, and I'm quoting, the ultimate arbiter used in the designation of aquatic life uses under the Ohio system is biological data?

MS. WILLIAMS: Excuse me, Susan. Do you have a page reference for that?

MS. FRANZETTI: I should, but I'm not sure I do. Can you give us a moment.

MS. WILLIAMS: Sure.

BY MS. FRANZETTI:

Q. Page 2, Mr. Yoder. And if you go immediately to the right of the box towards the bottom of Page 2 that says figure 1. It's the first sentence under decision-making process for assigning aquatic life uses. And it says, the ultimate arbiter used in the designation of aquatic life uses under the Ohio system is the biological data. Do you see that? Are you with me?

A. Yes.

Q. Okay. My question is do you agree that it makes sense to use a similar approach to assessing thermal conditions in situations where sufficient field data are available?

A. Yeah. I think it makes sense.

Q. Since you do, the rest of my question in No. 9 was what would you view as sufficient field data to warrant the use of the approach that your colleague, Mr. Rankin, is describing in that report? And I'm just simply trying -- not a trick question, Mr. Yoder, is what -- What do you think the meaning

is of sufficient field data in your -- in your opinion? How much do you need?

A. Well, I think it's multi-dimensional. And I think the important thing is you have to have the realistic response range of the aquatic assemblage that you're interested in across several different representatives of that water body type which, in this case, would be large rivers. It has to have geographic relevance, it -- I don't think it can be from just one river. It's stronger when you have data from several rivers. It also represented a gradient of stressor effects from least impacted to highly impacted. So those are kind of the parameters that I would set, you know, in terms of the scope of such studies.

The additional thing is, especially with things like measurement of temperature, that the actual measurements that are being taken in the field are representative of where the organisms actually came from. So there's a number of considerations here that have to be looked at.

Q. Okay. Are you a proponent -- I'm moving on to Question 10. Are you a proponent of

using field collected biological data to assess aquatic community impairment?

A. Yes.

Q. Why is that?

A. Well, to put it in context, you know, from the historical alternative that using chemical and physical criteria as surrogates for biological health, that the measurement of the assemblages itself is a more direct measurement; and, hence, if done properly, more accurate and more representative.

Q. Moving on to No. 11. Do many variables, EG, habitat, sentiment quality, water quality, flow, collectively determine the nature and quality of aquatic communities?

A. Yes.

Q. Is it -- No. 12. Is it true that the aquatic community integrates, and by that I mean responds, to these collective inputs?

A. Yes.

Q. How does one reliably separate the effects of the various inputs that affect aquatic communities? Can you do that?

A. Yes. There's -- I think it's best

done when you have reliable information on the stressors. You also know how those stressors affect the response variables that you're measuring in the bio -- again, over the sort of parameters that I stated before, that it has geographic relevance, is that it has relevance along the continuum of biological response, and it also has relevance against a gradient of stressor effects. And if all that is in place, then you can, I believe, at least get indications as to what the major categorical stressors are that are affecting an aquatic assemblage over space and time.

Q. I think I understand what you're saying. So you can get some levels of degree of impact, not -- you can't necessarily get precision, like a particular stress is 10 percent of the cause or 40 percent of the cause of the effects on the aquatic community; is that right? When you say categories, you're kind of saying these are the big guys, these --

A. Well, by categorical I was referring more to classes of stressors like habitat versus nutrients versus toxicity, separating those kinds of things out rather than saying, well, it's copper

versus (inaudible).

Q. Or it's sediments versus flow?

A. I think --

Q. See, that's what I'm asking in one --

A. That would fit the categorical class of stressors.

Q. Okay.

A. The problem is in some situations, some stressors will mask other stressors, and so you have to have data over time as well. I think it helps in certain situations to have that, and especially where some management process is in place that is alleviating one stressor so you can -- and that's how we learn is through basically a lot of different case studies.

Q. Right. So I mean what -- I think what you're saying to me is in a particular water body, if you have multiple stressors operating at the same time, it can be difficult to figure out which of those multiple simultaneous stressors are causing the worst impacts on the aquatic community, correct?

A. Some more difficult than others, but difficult doesn't mean impossible.

Q. I understand. I understand. What I'm

trying to get to is your point about if you can remove them. So, in other words, what you're saying is if you can isolate a stressor or get rid of it and then see what the effect is, that can also help you when you made your point about masking, things masking the stress. That's what you were referring to?

A. Yes.

Q. Okay. Moving on to No. 14, and let me preface this with, Mr. Yoder, are you familiar with the 1985 U.S. EPA quote, "Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses"?

A. Yes. I know what it is.

Q. And tell me if -- I'm going to now ask the question as it was written, and if you're not familiar enough with the 1985 document to answer it just tell me that and I'll move on. But if you are, then I would appreciate an answer. Is the report you prepared for U.S. EPA and the Illinois EPA, and that is Exhibit 15, consistent with the 1985 U.S. EPA, quote, guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses?

A. I'm not entirely sure. I know it has some elements in common, but I'm not sure if it's consistent with every detail.

Q. Can you tell me what elements you think it does have in common with that guidance?

A. Well, the use of specific end points of harm and the concept of representative species it has in common.

Q. Okay. So the use of specific end points, we are referring to what you earlier described as those four categories that are used in your fish ranking approach?

A. Yes.

Q. Okay. And with respect to the concept of representativeness, you're referring to your use of the concept of representative aquatic species, correct?

A. Yes.

Q. Any other respects in which you think your approach is consistent with the 1985 U.S. EPA guidelines?

A. Nothing that I'm familiar with.

Q. Do you know whether in that guidance or guidelines the U.S. EPA advocates the use of high

quality field data where such data are available?

A. Not specifically, no.

Q. Mr. Yoder, on a related point, do you recall just this past October you gave a presentation at a conference in Denver, the title of which was, quote, "Ohio EPA Methodology Fish Temperature Modeling System." And did you, in that presentation, support the inclusion of field data in developing thermal water quality standards?

A. Yes.

Q. Actually, I think I may have referred to it as being essential, isn't that right?

A. Well, I can't recall my exact words, but.

Q. Do you think it's pretty important?

A. I think it's important.

Q. Thank you.

MS. WILLIAMS: May I ask a redirect at this point?

MS. FRANZETTI: Sure.

MS. WILLIAMS: Mr. Yoder, in your opinion, would biological and temperature field data from only the Upper Dresden Island Pool, even if it was many, many years' worth,

be sufficient to derive thermal water quality standards in the Upper Dresden Island Pool?

MR. YODER: I apologize. Can you restate that? I'm sorry.

(Record read back.)

MR. YODER: I think, based on my knowledge of that area, I would say no, it's not sufficient.

BY MS. FRANZETTI:

Q. Why not?

A. Well, as I said before, I think you need -- one, to me it's too geographically constrained, and I don't believe it represents the full range of possible biological quality that exists in Midwest rivers from least impacted to highly degraded, and it may get closer to the representing the low end of the stressor gradient. And I think it lacks the -- when I say low end, the most -- the highest degree of stress. I think it lacks some other aspects of what we would like to see in a field derivation of any environmental stressor variable.

Q. What else does it lack?

A. That's what comes to mind. I think

that's what I said is sufficient.

Q. Okay. I just want to have a full understanding of your opinion.

HEARING OFFICER TIPSORD: Excuse me, if I may. I just want to ask a redirect myself. Because I'm, frankly, quite confused. Mr. Yoder, you're basing what this would lack on sort of our conjecture and hypothetical that if this existed. Because you haven't actually seen any data, I believe you testified earlier, specific temperature data that was collected over the last 20 years, right?

MR. YODER: No. I'm speaking generally about more the, you know, the environmental setting, what does that represent. I am aware of some of the data. I mean I sat in on the biological subcommittee and heard some of the results expressed, and I mean it -- based on my, you know, 30 plus years of experience of looking at a lot of different rivers and streams of varying quality, I was able to form a picture of what this area is like. And part of it

would fit then in the context of what I described as what we like to have for deriving fields -- field-derived stressor variables which is another way of saying, you know, environmental criterion.

HEARING OFFICER TIPSORD: But, again, and excuse me for interrupting you. But I want to be clear, because Miss Williams' question was in the hypothetical, that if you had seen data collected from one source -- Am I misstating the question?

MS. WILLIAMS: Go ahead and finish.

HEARING OFFICER TIPSORD: If you had seen data, that it would not have impacted your --

MS. WILLIAM: Yeah. I think you are misstating it.

HEARING OFFICER TIPSORD: Maybe I misunderstood your question.

MS. WILLIAM: No, no. It's okay. And I think this will definitely go over into the testimony line, but since I'm still sworn. My understanding of this line of questioning is Miss Franzetti is trying to get at other

possible ways, methods beyond his method. Are there different methods, not the method that he used in his report. So I was getting at -- and so she's asking him about if he agrees that there could be other methods. My redirect was directed at this hypothetical other method, would you have what you needed here to do that?

HEARING OFFICER TIPSORD: Okay. Right. Your question was would you have what you needed if you had data from one source.

Okay. Mr. Howe?

MR. HOWE: Peter Howe. Mr. Yoder, I would characterize this, and I don't want to put words in your mouth, as a recovering ecosystems from a long history of impact --

HEARING OFFICER TIPSORD: Mr. Howe, you have to form this as a question, please.

MR. HOWE: Okay. Would part of your response be based upon the condition of that waterway as it exists today and as it existed historically? I mean it has been impacted. The question about could you entirely -- could you derive water quality standards for

that river today based upon the existing fishing community. I think that's what you're getting at. Is that right?

MS. WILLIAMS: I'm not sure. But if you understand, go ahead.

MR. YODER: I think I understand, and it gets back to my -- one of the sort of criteria for what's a good data set and what does that data set represent. That if it only represents a system that's in a state of recovery, it's hard to get any -- it's hard to get much dimension out of that response against something like an environmental variable, physical, chemical, whatever. It doesn't allow enough vectoring, so to speak, along the entirety of the realistic biological condition gradient that actually exists across, say, the Midwest. And I think that's correct.

MR. HOWE: Thank you, Mr. Yoder.

BY MS. FRANZETTI:

Q. Mr. Yoder, just so I understand, in contrast do you believe that the use of solely literature data is a sufficient basis on which to

derive thermal water quality standards for the Upper Dresden Pool?

A. Well, it can be a basis.

Q. Not it can be. Are you -- You've just said --

A. Do I think it's sufficient?

Q. You just gave an answer about the 20 years of stream study data that you haven't seen. But hypothetically that you don't think that's a sufficient basis. I'm asking is purely literature data a sufficient basis on which to derive thermal water quality standards?

A. In the sense that the current system that we operate under, and you did refer to EPA's 1985 guidelines. If I read that correctly, yes, that would be acceptable.

Q. Just using literature data?

A. Yes.

Q. Okay. I just want to establish what your opinion is. Moving on to B1. Use designation decisions. On Page 4 of your prefiled testimony, it is stated that the temperature criteria options report was developed prior to and independent of the use designation determinations proposed in this

rulemaking, and that you did not participate in the use designation process. Is it correct then that the thermal criteria you developed in your report were not developed based on the proposed uses described in the Illinois EPA's proposed rules?

A. Yeah. I'd say so. I mean I did not know what those were going to be when this report was written.

Q. Moving on to No. 2. Is it correct that you were not asked to determine whether your proposed thermal criteria were protective of the aquatic life use designation proposed for the Upper Dresden Pool and the CAWS?

A. No, not directly, no.

Q. Were you ever asked whether your proposed thermal criteria were overly stringent?

MS. WILLIAMS: Can I stop for a second. I think it was a yes or no question, but I want to make sure I understood because she asked -- it's kind of a -- is it correct that you were not asked. So by saying no you're not saying no, it's not correct?

A. Right. You're saying no you were not asked. Do you understand.

MR. YODER: Yeah. It's kind of -- I mean because I did this before that was said, it's like was impossible.

Q. Of course not, right. You weren't asked. Mr. Yoder, it may seem obvious to you but the other thing that -- well, I'm not going to testify. I'm not going to testify.

So you were also -- you were also never asked whether your proposed thermal criteria were overly stringent to protect the proposed Upper Dresden Pool aquatic life use, correct?

A. Yes.

Q. Moving on to Question 3. On Page 4 of your prefiled testimony it's stated, quote, "I was not asked to propose specific thermal criteria for either the lower Des Plaines river or the Chicago area waterway system." So I know we talked a little bit about this this morning, but for your report that is Exhibit 15, what were you asked to do?

A. I was asked to provide temperature criteria options for -- I'm trying to put this in the right words -- for three potential use designation options for the lower Des Plaines river.

MS. WILLIAMS: To keep the record

consistent, can we ask Mr. Yoder who he was asked by to do that. Who asked you?

MR. YODER: U.S. EPA.

BY MS. FRANZETTI:

Q. Thank you. I may have been saying -- was I saying IEPA?

MS. WILLIAMS: No. It was unclear.

BY MS. FRANZETTI:

Q. All right. So U.S. EPA brings you in and says, Mr. Yoder, we need you to provide us with temperature criteria options for three potential use designations for the lower Des Plaines, correct?

A. I apologize. Can I hear that question again.

Q. Were you not paying attention to me?

A. I'm sorry.

Q. I'm partly doing it because that's an important point. And, again, my voice carries better than yours, so I know you're -- I thought you were looking at me like, lady, that's just what I said.

So basically you were asked by the U.S. EPA to provide temperature criteria options for three potential use designations for the lower Des

Plaines, correct?

A. Yes.

Q. That's what this report was responding to?

A. Yes.

Q. And that is Exhibit 15?

A. Yes.

Q. Now, how did you decide -- Wait a second. Back up. I just realized I'm assuming something. Did you decide on the 3 potential use designations for -- that you used -- that were coming up with the temperature criteria options for or did U.S. EPA give you three proposed use designations?

A. Well, we discussed what those options should be.

Q. You did. Okay.

A. Yes. And they --

Q. Who did you discuss it with at U.S. EPA?

A. Ed Hammer.

Q. Anybody else?

A. No. Ed is the primary technical manager.

Q. All right. And about when, just to give this some context? Do you remember would this have been in 2005 you and Mr. Hammer have this discussion?

A. No. This was before. This was kind of a spin-off of my involvement with biological subcommittee. So I was aware of what the options realistically might be out of the UAA. But it did precede the publication of the UAA.

Q. I see. Okay. And so give us as best you can recall the summary of how did you and Mr. Hammer come up with what -- I believe is general use was one of the three, right? Modified use, and then secondary contact indigenous aquatic life use. Are those the three potential use designations that you based your work on?

A. Yes.

Q. Okay. Give us some understanding of why those three were chosen to for you to use for your basis for coming up with temperature criteria options?

A. Well, the general use in the secondary contact use already exists as designated uses in the Illinois standards and then this modified use was

something that was being discussed as part of the UAA process.

Q. Okay. That one was being discussed in connection with the Upper Dresden Pool, correct?

A. Yes.

Q. Just to clarify, any discussion of maybe a fourth use? I mean how come it's three? How come it's general use, secondary contact indigenous aquatic life and modified use? Is that -- Because that's generally enough, you think, to cover the board. I'm just trying to -- Did you guys maybe start with five, get down to three?

A. No. I mean there are other options, but these were viewed as the most realistic outcomes of the UAA.

Q. Now, I think you've answered this, but just to be clear, moving on to Question 5, your -- when you use general use in your report, that proposed use designation, that was intended to be the same conceptually as the existing Illinois general use classification, correct?

A. Yes.

Q. Okay. Now, what -- Moving on to 6. What would be the habitat requirements for the

species that comprise the aquatic community you have identified as representative of general use -- of the general use category you considered for the lower Des Plaines river?

I'm sorry. Mr. Yoder, are you waiting for me? Go right ahead.

A. Well, it's a very broad issue, but generally those species require a certain habitat to support their population. So it's sort of what's typical of what we look at it as it's typical of what corresponds to the sort of the Clean Water Act Gold Minimum that is required for waters of the U.S.

Q. The Clean Water Act Gold Minimum?

A. Mm-hmm.

Q. The minimum requirements to achieve aquatic life use?

A. Yes.

Q. Full aquatic life use?

A. Right. And I equate Illinois's general use with that minimum requirement as it is in a lot of states where it's just stated as a general aquatic life. That's sort of the presumption you have to make, because these uses aren't very specific beyond that.

Q. Right. But I'm trying to, and tell me if you don't know, you know, if it's not something you can answer, you can just tell me that. I'm trying to get an understanding of what are the habitat characteristics, I'm calling them requirements in this question, that are needed that go along with achieving general use?

MS. WILLIAMS: If you don't mind, for Mr. Yoder's benefit, I guess I would just point out to him we have discussed terms already like QH, EI index, and that -- I mean if he -- I want him to know that our level of understanding has included those terms already, if he wants to use them.

MS. FRANZETTI: Thank you, Counsel.

BY MS. FRANZETTI:

Q. Mr. Yoder, do you remember the question? What kind of habitat should I find in a general use stream?

A. I'm trying to give a good answer here. It's a very general question. Let me start out by saying what it maybe isn't.

Q. Well, I'd kind of rather you tell me what it is. But all right, if that's the way you've

got to approach it. Go ahead.

A. Well, it doesn't have to be a pristine unmodified water body. I think this notion that the Clean Water Act Gold Minimum recognizes that there have been changes to the natural state of the environment, and yet we can still expect to have some kind of a sustainable aquatic fauna as a minimum so, therefore, it doesn't have to be natural riverine habitat. But there are certain minimum things that it needs to have: The fish need to have sufficient substream covered, flow, water, that type of thing. I mean we've developed some rules of thumb centered around certain indices of habitat that I think come into play. And one is the QHEI. And so generally the rule of thumb is that anything -- an index score above 60 is a no doubter. But anything below 60 doesn't necessarily disqualify them.

Q. And also doesn't necessarily qualify it. I think we heard it was gray area yesterday.

A. Right. And you have to look at some other things like the preponderance of what we call modified attributes versus good quality attributes. And there is a threshold below which generally

there's not a correspondence to achieving these standards. But in this situation it's made a little bit more difficult by just the generality of the use, and that's part of the issue we're dealing with nationally with EPA is trying to get these uses to be more specific so you can be more definitive with questions like this. It's just very difficult when there's no specificity other than general aquatic life.

Q. I see. So part of the difficulty in answering my question is the breadth of use that the general use category covers is very broad. That's what you're telling me?

A. It is. And it's not so much that it's broad, that it's just not very well defined.

Q. Okay. Moving on to No. 7. In your 2005 report to the U.S. EPA and Illinois EPA which is Exhibit 15, within the general use category, is it correct that you provided several thermal criteria options depending upon which species, which fish species were included or excluded, correct?

A. That's correct.

Q. Can you help us in terms of where do you address that in your report? Just so we can

give people a reference where in your report they would find that information.

A. The section starting on Page 12 under the subheading summer, average, and maximum criteria.

Q. And the heading below that general use. Is that where that begins?

A. Yes.

Q. Okay. Thank you. Moving on to 7A. Can you explain for us in doing that work, why did you add or remove certain fish species within these various options?

A. Well, it's kind of the equivalent to what I would say is a sensitivity analysis, but it also pertains to some of the degrees of certainty that you might have including certain species, are they really part of the RAS or is there perhaps some uncertainty in a historically degraded water body, it's very difficult to get a historical sense of what its true potential is. Because a lot of times there are not -- there are not good records in these water bodies because of the legacy effects that occur for many, many years. So there may be species at the fringes of this area that may well

potentially get there if the conditions would ever permit it. And so that's just part of the analysis is to deal with this by adding and removing those that might be viewed as being some uncertainty as to whether they're really part of the system or not or could they be. And just to see what's the effect of adding or removing those to the eventual end point. And there's also, as we explained in the ORSANCO document, that's one of the things about the model is that you can -- there's two input variables that you can -- that you can vary with good reason: One is the RAS membership, and the other one is the specific thermal end points that are plugged into the model for a particular species. And we set it up that way knowing that not all data for all species is necessarily equal, and that if someone came in with a new study or some compelling reason that one of the end points we have in there is maybe not valid for that area, then it could be -- fine, let's remove it and see what the effect is.

Q. But what we're talking about here in terms of why did you add or remove certain species within these various options, that really has to do with the RAS membership issue, correct?

A. Some, some. But I think one species we removed was -- I recall it was because it was the most sensitive species, and the next most sensitive species was not very close behind it. So, you know, we were looking at, again, the sensitivity and the outputs and how did that affect.

Q. Well, I think I can help you towards the -- in this paragraph at the bottom of Page 12 it says in about the third sentence, we analyze two subsets of the general use RAS list. One adding yellow perch, walleye, and sauger, and another removing stonecat madtom from the original RAS list. Were you the one making those decisions, what to add, you know, take away, what to add?

A. Well, I was -- Yeah. I eventually made the decision to do that, but I was getting input from primarily from my EPA counterparts.

Q. So that was from Mr. Hammer again?

A. Yes.

Q. Anyone else?

A. Well, I believe indirectly that when Mr. Howe was an employee that he had some input through Ed.

Q. Is that the same Mr. Howe that's been

asking questions today as just a member of the public?

A. Yes, yes.

Q. Okay. You two worked together on this; is that right?

A. Well, I wouldn't say we worked together, but I mean he did have input through Ed on some of these topics.

Q. I see. And you accepted his input at times?

A. At times.

Q. At times you didn't, correct?

A. Yes.

Q. With respect to the sentence I just read, does that answer the next question of what species did you add?

A. Yes, well, add or remove.

Q. Okay.

A. There is one other variation in here, too, that we -- on Table 2, the first is there's a 2004 draft that we had developed prior to updating a lot of input variables as a result of the ORSANCO study.

HEARING OFFICER TIPSORD: Excuse me.

Just for the record, that's Table 2 on Page 13.

MR. YODER: Yes.

BY MS. FRANZETTI:

Q. Okay. So --

A. So that's really another kind of variant in this process that we were looking at.

Q. That's the first grouping in Table 2, and the next grouping is with the expanded ORSANCO data added, correct?

A. Yes.

Q. But those two used the same RAS list?

A. I believe they do.

Q. And --

A. The only difference is that the original RAS from the 2004 draft relies on the thermal end point data that was prior to the ORSANCO update.

Q. And then the third -- the third group of entries here of thermal criteria are entitled general use RAS 2, and that's where yellow perch, sauger, and walleye get in?

A. Yes.

Q. To the list of species on which you're

doing your ranking, correct?

A. Correct.

Q. And then in the last one, general use, RAS 3, it removes stonecat madtom from that prior list, but otherwise yellow perch, sauger, and walleye are still in there, correct?

A. Yes.

Q. Mr. Yoder, could I ask you to double-check on something there, and if we may be close to breaking for lunch, you may be able to do it over lunch. Would you please check, I think that perhaps your general use RAS 1 that was the expanded list 2005 with the ORSANCO data already included stonecat madtom when it was not included in the original 2004 list. But if you need some time to check that, that there is, in fact, a difference potentially in those two?

A. That's probably true. Because what happened as a result of the ORSANCO study is we found data for a lot of new species, and, therefore, that would expand -- that could expand the RAS list.

Q. Okay. So a difference between that general use RAS 1 expanded 2005 list and the bottom list of criteria is the first I mentioned includes

stonecat, the last one I mentioned excludes it, correct?

A. Yes. I think that's right.

Q. And so the difference between those groups of thermal criteria would be based on -- solely on the inclusion or exclusion of the one species stonecat, correct?

A. Yeah. The difference between the general use RAS 1 and the general use RAS 3 is essentially due to the removal of stonecat madtom. But RAS 3 also includes yellow perch, walleye, and Sauger, whereas RAS 1 does not.

Q. So you can't tell what the effect is of stonecat on these numbers?

A. Yes. You can tell the effect by comparing RAS 3 and RAS 1. That's the effect of removing stonecat madtom. The addition of yellow perch.

Q. Yes. I'm sorry.

A. -- sauger and walleye really had no impact on the --

Q. I see. Okay.

A. -- actual variables that we use for the summer, average, and maximum.

Q. Okay. Excuse me.

Mr. Yoder, would you look at, under the first category here in Table 2, general use original RAS 2004 draft. And the survival short-term criteria, which is 88.7 degrees Farenheit. Is that correct?

A. Yes.

Q. And then in the next grouping, the expanded list that did include stonecat, the survival, again, same criteria, survival short term is only 84.2 degrees Farenheit. That's a drop of four and a half degrees. Do you know whether that's -- that significantly lower short-term survival thermal criteria was due to the addition of stonecat?

A. Yeah. That was primarily the impact of that species.

Q. So that, just to underscore how your ranking approach can work, the addition of just that one species dropped the short-term survival which is basically the equivalent of a daily max thermal water quality standard, correct?

A. Yeah. The short term survival is the --

Q. Right.
A. -- benchmark for the maximum.
Q. So if I'm trying to derive thermal water quality criteria using your approach, if I don't include stonecat, I would recommend a daily max thermal water quality standard of 88.7 degrees, correct?
A. That's right.
Q. And if I do include stonecat, instead I'm going to recommend a thermal water quality standard of 84.2 degrees, correct?
A. That's correct.
Q. Thank you. Question C of Question 7, would the differences between the daily maximum values calculated with and without those additional species suggest -- and let me limit it to stonecat that we just used as an example. But doesn't that suggest that the fish temperature models you use, that the results are fairly sensitive to the choice of representative aquatic species?
A. In terms of the sur capita (sic.), yes, it can be.
Q. And I would think then that you would agree with the next part of this question, would

this indicate that it is important to ensure that the representative aquatic species selected are, in fact, appropriate for the water body in question, correct?

A. Yeah. I think that's part of the RAS process.

Q. And moving on to D, given the significant effect the data for a single species can make, would you agree that it is important to ensure that the data, and especially data for species that appear to be more sensitive, are adequate and reliable; the data that is used in your fish ranking approach?

A. Yeah. I think that's fair to say.

Q. Do you know for stonecat what data is in your model that you used to come up with this 84.2 degrees Farenheit short-term survival, or I'm calling it the daily max number? Do you?

A. Yes.

Q. Okay. Can you describe?

A. It's a -- You mean the specific study that it came from?

Q. Yes.

A. It's from a work done by the Center

For Lake Erie Area Research, and it was a laboratory-based study.

Q. Single test?

A. I'd have to go back and look at the -- I don't know how many fish were involved, but it --

Q. Well, before you tell me how many fish were involved, I'll ask that, too. But you're talking about one test, right, one lab?

A. Well, one study, and this wasn't the only species that they tested. They tested a number of species.

Q. I understand. But it's just this one lab doing this study, and they used stonecat, correct?

A. Right.

Q. Okay. And you don't know how many stonecat organisms were even in the study?

A. I'd have to go back and look at the methods they used.

Q. Okay. Well, I would appreciate you doing that. Because we think, although -- well, let me ask you this: Is the stonecat value coming from a study by Reutter and Hurdendorf?

A. Hurdendorf.

Q. Hurdendorf. Okay. And I have -- so I have the right study; is that correct?

A. What's the date?

Q. '85 or '86. I'm not sure.

A. Published in?

Q. Well, actually, you need to help us. We're -- that's one of the hard things that we confronted with your report is we can't tell where you're getting your data.

A. Well, it's a reference in the ORSANCO study. That's the base line for this.

Q. Can we go off record?

MS. WILLIAMS: Can we clarify something for the record. Because he referred to the ORSANCO study. And I want to make clear for the record that by the ORSANCO study he's referring to Exhibit 16.

MS. FRANZETTI: Can we go off the record?

HEARING OFFICER TIPSORD: Off the record.

(Off the record.)

BY MS. FRANZETTI:

Q. Mr. Yoder, having now looked at -- I

put in front of you two different studies, and you identified for me that the study that the stonecat data comes from is entitled thermal discharge from a nuclear power plant predicted effects on lake Erie fish. It's the Ohio Journal of Science January 1976. Is that correct?

A. Yes.

Q. Okay. Do you recall now, and let me hand this back to you and see -- can you tell me how many stonecat organisms were in that 1976 test?

Mr. Yoder, I've been told that this might be helpful to you. I'm handing you also the -- what may be laboratory data that backs up this test, this study that you've just identified as the source of your stonecat data. And this document is entitled Federal Aid and Sport Fish Restoration Annual Performance Report, July 31, 1975. And it's at the bottom Center for Lake Erie Area Research, the Ohio State University, also dated July 1975.

Since it's taking a little bit, why don't I try to help in terms of just saying, Mr. Yoder, we believe from our review of those documents which, as you've said, are the correct tests, that is the source of your data that you used

in your ranking approach, that it was a single test using only two organisms. So I'm going to suggest we break for lunch, and if you can take a few minutes you can -- can he hold on to those two documents over the lunch hour and see if you agree that it was a single test using two organisms?

HEARING OFFICER TIPSORD: Before we break for lunch, we're going to mark those as Exhibit 17 and 18.

MS. FRANZETTI: Madam Hearing Officer, those are my consultant's only copies. So can we -- can we get them copies over the lunch hour?

HEARING OFFICER TIPSORD: Then we'll mark them as Exhibit 17 and 18. All right. We'll mark them after lunch. Let's break for lunch. One hour, please.

(Lunch break taken.)

HEARING OFFICER TIPSORD: Let's go back on the record. And when we left for lunch, we were looking at some reports Miss Franzetti had shown to the witness, Mr. Yoder. I want to note for the record that those reports aren't currently available

but will be available later if not by the end of this week before March.

MS. FRANZETTI: Correct.

HEARING OFFICER TIPSORD: And we'll just hold off in giving them an exhibit number until that time. Miss Franzetti, if you want to continue.

BY MS. FRANZETTI:

Q. Mr. Yoder, actually, I don't think we were on the record right at the end of the session when you and I spoke about whether or not you agreed that a single test using two organisms is the basis for the stonecat thermal criteria that is shown in the general use RAS 1 expanded list 2005 survival short-term value of 84.2 degrees Farenheit at Page 13 of your report, Exhibit 15; is that correct?

A. Yes.

Q. Okay. And as the hearing officer stated, we will provide copies of the test report on that test and get them into the record at a later date. I know I'm technically at Question 8 of my questions, but it was brought to my attention during the lunch break that a number of people would appreciate, first, obtaining from Mr. Yoder an

explanation of the basics of how your model works, Mr. Yoder; and by that I think -- well, I don't think. Would you please explain how your model, as you've termed it, is implemented, the selection of these end points, you know, what each one of them -- what its significance is. And then what is the process? How do you go about getting these values that are shown in, for example, Table 2 of your report for a general use designated stream; and, similarly, although I believe the process is the same for --

MS. DIERS: I'll object right there, Susan. I know it's a compound question. I know you're trying to lay it all out, but --

MS. FRANZETTI: I'm just trying to be clear.

MS. DIERS: So I think if we do it one at a time.

MS. FRANZETTI: No. I don't think his process changes. I don't want him to --

MS. DIERS: I meant I want you to ask one question at a time. It seemed to me you were asking a compound question. I thought I heard two questions already.

HEARING OFFICER TIPSORD: If I may. I believe that what she's wanting to know is how his methodology works, and she's trying to explain what she means by that. So I'm not sure it's a compound question.

MS. WILLIAMS: Can I ask then -- I mean we left off on Question 8 on Page 6. It would seem to me that on the very next page, Page 7, we start with Subtitle C, Characteristics of Fish Temperature Model. Is that the type of questions we're talking about now? I mean in the interest of wanting to be sure we get through all these questions, if we're that close, can we just start there? Is that the same thing?

MS. FRANZETTI: I'm just going to ask the same question then. If you'd rather me wait and go through 8 through 13, that's fine. I really wasn't -- This wasn't for my purposes. It was more to help people in the audience understand what Mr. Yoder did before I keep asking what are somewhat more specific questions that assume that understanding, Miss Williams. So I was simply trying to do

something that had been brought to my attention during the break that might be helpful to people out there, but I can hold off for another 20 minutes. I don't have a strong feeling one way or the other. So if you object to me posing this question right now, I'll wait and wait and pose it when I get to the beginning of Subpart C of my questions.

HEARING OFFICER TIPSORD: It might make more sense, because then if anybody has any follow-up leading to what you have there.

BY MS. FRANZETTI:

Q. Fine. Turning then to Question 8, referring to Page 9, Mr. Yoder, of your prefiled testimony, it is stated that, quote, "The modified use designation in my report is designed to represent impounded portions of rivers, similar to the Des Plaines River, and included 27 species." Please explain the meaning of the term, quote, impounded portions of rivers.

A. It would include the part of the river that's affected by the raising the height of the water by the particular dam that's creating the

impoundment.

Q. Do you remember earlier this morning we created a geographical definition of Upper Dresden Pool?

A. Yes.

Q. With the southern boundary being the I55 bridge, correct?

A. Yes.

Q. Is that what you mean -- Does that fall within your phrase, "impounded portions of rivers"?

A. Parts of it I believe do, yes.

Q. Which parts?

A. Well, I'm not certain of the upstream extent of the impoundment directly, but my understanding is that it includes the section from I55 up the stream to -- not all the way because there's a tailwater that's not part of that impoundment.

Q. All right. So other than the Brandon tailwater, is all the rest of Upper Dresden Pool --

A. That's my understanding.

Q. I'm sorry. I didn't finish. Is all the rest of Upper Dresden Pool included within your

intended meaning of the term impounded portion of rivers?

A. Yeah. I'm -- Again, I'm not familiar with the exact boundaries of how far the impoundment goes upstream. It's my understanding it goes almost to the Brandon tailwater.

Q. All right. Do you know, moving on to C, do you know whether any other portions of the lower Des Plaines River that are at issue in this rulemaking, in your opinion, fall within the intended meaning of an impounded portion of a river?

A. Well, does that include the Brandon pool?

Q. Yes. That is in this rulemaking.

A. Yeah. That's an impoundment.

Q. Okay. How does this -- I'm sorry. I need to come back to the -- How does your modified use designation, in your report, compare to Ohio's use classification known as, quote, modified, comma, impounded, end quote, waters?

A. It would be the same as.

Q. They're the same?

A. Mm-hmm.

Q. Okay.

A. Yes.

Q. So can you describe for us the Ohio category of use designation known as modified impounded, basically what it's application is and rationale?

A. In Ohio it is -- It's a codified use designation tier, and it is intended to reflect riverine habitats that are modified by the -- by what we call run of river low end dams. And so it -- That's the first step. And if we find that those sections are not attaining warm water habitat biological criteria, then it becomes something that needs to be evaluated as the impoundment itself contributing to that such that it might be redesignated through UAA. That's the way it works in Ohio.

Q. I'm not sure I fully understood your answer. In terms of what waters go into Ohio's modified impounded use designation or classification, is it only those waters for which a UAA finds that they meet one or more of the six factors in the UAA regulation?

A. Yes.

Q. Your colleague, Mr. Rankin, in his

report that is Attachment R to the Illinois EPA Statement of Reasons. He states in Attachment R that if the Upper Dresden Pool were located in Ohio, the appropriate classification for the river, for this part of the river, would be modified impounded. Do you agree with your colleague's finding in that regard?

A. What page does that appear on?

Q. Hang on.

MR. SULSKI: Is this a follow-up question or a question?

MS. FRANZETTI: It's a follow-up, that's why I don't have a page.

BY MS. FRANZETTI:

Q. Mr. Yoder, I don't think there are page numbers on Attachment R, but if you could go to -- on mine it's the fifth page in from the back, and it's the page that contains the heading conclusions. And if you want to read the section from the top of that page, Des Plaines River Recommended Category MWH-I other is the heading I'm referring to. And, again, towards the end of that section it says based on the preliminary data we collected, we suggest that the Ohio modified warm

water habitat use for impounded rivers, MWH-I or Roman I, would be most appropriate -- would be most appropriate category. The uppermost site at habitat quality generally associated with a MWH river; however, the isolation of this site among impounded reaches could influence the potential of that site. And you may not have an opinion. I thought you would be familiar with your colleague's work on the Upper Dresden Pool. So that's why I'm asking the question as to whether you agree, since we're on this topic of modified use, you used modified use, you referred to it as applicable to the Upper Dresden Pool. So I'm really just asking the last question of then you also -- you agree with your colleague, Mr. Rankin, that if the Upper Dresden Pool were located in Ohio?

A. I really haven't had enough time to form an opinion.

Q. Okay. I recognize -- I'm moving to Question No. 9. And I recognize that you were -- You've stated you were not asked to propose specific thermal criteria for the lower Des Plaines River, but hypothetically if you had been asked to do so, would your approach differ from the approach used in

your report, and, if so, how?

MS. WILLIAMS: So you're not asking if his approach would be different than the one the Agency took, but if it would be different than the one in his report?

MS. FRANZETTI: I'm basically asking him is this the approach he would use to set, if he were --

MS. WILLIAMS: His report.

MS. FRANZETTI: If he was deriving thermal criteria for the lower Des Plaines, is this the approach he would use.

MR. YODER: Yes.

BY MS. FRANZETTI:

Q. And with -- Moving on to No. 10. In Ohio, do intolerant fish species typically thrive, and by that we mean reproduce, in modified impounded use waterways?

A. I would say not typically, but there are exceptions.

Q. Moving on to No. 11. What would be the habitat requirements for the species that comprise the aquatic community you have identified in your report as representative of the modified use

you considered for the lower Des Plaines River?

A. Well, it's -- The list of these species are what we would call intermediate to moderately tolerant to tolerant of a wide range of habitat conditions.

Q. And I'm sorry. Most of these are species that you'd characterize as intermediately tolerant and --

A. Moderately tolerant and highly tolerant of a wide range of habitat conditions.

Q. Okay.

HEARING OFFICER TIPSORD: Even with the microphone you need to maybe turn it towards you a little bit more. Thank you.

BY MS. FRANZETTI:

Q. And, just to finish up, on the third type of use designation that you used in your report, could you describe the type of water body to which your secondary contact use category was intended to apply?

A. Yes. Only to water bodies that have been, I would say, severely modified and which really lack really any type of habitat availability, only the most highly tolerant species.

Q. Do you have any opinion as to what portions of the lower Des Plaines or the Chicago area waterway system, the CAWS, fit your category of secondary contact waters? I know you've never been out there, but do you have any opinion?

A. No. I haven't really looked at it.

Q. Are you familiar, though, have you -- I guess the question on the Chicago Sanitary Ship Canal. Have you seen it at all? I know you didn't go out and do field studies, but have you seen that portion of this UAA?

A. I've seen portions of it. I've actually been on the river and I have --

Q. Okay. So you've been on some sort of boat on the Chicago Sanitary and Ship Canal, correct?

A. Yes.

Q. All right. From observing it, can you tell me whether or not you think it falls within the secondary contact use designation?

A. No.

Q. Why not? What more do you need to know?

A. It just needs to be a lot more careful

analysis.

Q. Looking at?

A. Data.

Q. Data about?

A. Habitat, biological quality, water quality.

Q. Okay. So if I tell you --

A. Over the -- a sufficient area of the system.

Q. So if I tell you that it's basically cement wall for most of its part, steep slopes, you need more information than that to have an opinion?

A. I think anything I'd render based on that would be what I would call anecdotal.

Q. Okay. Now we're at characteristics of the fish temperature model, Mr. Yoder, and maybe I'll help instead of asking just the big broad question about how does this ranking approach work. Let me try to break it down. With respect to you already mentioned you take representative aquatic species, and depending upon the use designation you are trying to derive your thermal criteria for, you select certain species, correct?

A. Okay. I'm sorry. I was reading the

first question.

Q. We're not doing that question.

A. I'm sorry. I apologize.

Q. I'm trying -- I'm going back to the part that I got my hand slapped on.

MS. WILLIAMS: I'm fine to be flexible now that we're in that section. I feel much better now that we've made it there.

MS. FRANZETTI: That's what I want.

BY MS. FRANZETTI:

Q. With respect to the resident aquatic species -- what I'm trying to -- Let me say it another way.

Is that Step 1 in your approach? Define what fish are going to be on your RAS list for the particular use that you're trying to derive thermal criteria for, correct?

A. Yes. The selection of the RAS membership, yes, that's one of the first steps.

Q. Right. So Mr. Yoder -- And for this you may want your report handy. In your report, if I go to Table 1, Page 9, and it carries over to Page 10. This was the universe of fish species from which you selected your RAS list for the three

designated use options for which you were deriving thermal criteria, correct?

A. Yes.

Q. Okay. So now let's -- And if -- Let me stop. It really doesn't make any difference if I'm going to have you explain how your approach works which one of the three uses I use or you select as an example to use, correct? The approach works the same way within each of the uses?

A. Yes.

Q. Okay. So let's take modified use, okay? For modified use, you now, from Table 1, select some of the species listed on Table 1, correct?

A. For the modified use, yes.

Q. Okay. And if we go to -- If we all want to know which species from that list did you use to derive your thermal criteria for modified use category, where do I find the list of those species, the names, the names?

A. It's in this table.

Q. In Table --

A. All 27 species were plugged into the fish temperature model.

Q. I'm sorry. Yes. So you look at the column in Table 1 that's entitled modified use, and if there's an X under that, in that column, that species was used to derive your thermal criteria for modified use?

A. Yes.

Q. Okay. Same applies then for general use. There's an X there. That was one of the RAS species for general use?

A. Yes.

Q. And same obviously for secondary contact. And would it be correct then just to finish up on step one, obviously as we go down, as we're decreasing the level of the use designation, and that would be from general to modified, to secondary contact, the number of species that you used to derive your thermal criteria declines?

A. Yes.

Q. With respect to modified use, you use a total of 27 species, and that number is found at the bottom of the column entitled modified use, right?

A. Yes.

Q. And, by contrast, for the secondary

contact, thermal criteria, you only used eight species, right?

A. Yes.

Q. All right. So now we have, staying with modified use as our example in those 27 species, you then start gathering, looking for literature data for certain what are termed thermal end points, correct?

A. Well, that's already been done at this point.

Q. Is that your data base?

A. Yes.

Q. Okay. So all -- So all that literature data has already been entered into a data base?

A. Yes.

Q. And that's your data base? In other words, is that proprietary? Like you're the only one who's got it?

A. No. It's the same database that we developed for ORSANCO.

Q. So it's ORSANCO's data base?

A. Yeah. We did it for that project. We also consider it --

Q. I'm just trying to establish on the record, can I go into the data base?

A. You could get a copy of it and do that, sure.

Q. Okay. For free?

A. We are a nonprofit organization.

Q. Okay. So that's an electronic data base. You accessed that. To collect data for the particular thermal end points that you use in your ranking approach for these species, for these 27?

A. The thermal end points are already plugged into the data base, the electronic data base. I think the electronic data base right now contains -- It's almost 100 species.

Q. Okay.

A. That we have plugged in those four end points. And then it's simply a matter of selecting those species that you consider to be represented. So we select those 27 species and ask the model to run, and it would produce the tables or the values that you see in table two. It produces a report --

Q. Well, does it really produce Table 2? I mean isn't there a step before -- And, actually, not to confuse everybody, it's Table 3, isn't it,

that's modified use?

A. Oh, yeah. Okay. But -- I apologize. Yes. It would produce the same numbers in Table 3.

Q. Okay. I think I miss -- I thought there was a step before Table 3 where you would see the list of all the species, the 27, and across it would be the end points so I could see what all the individual values were for each species underneath each of the four thermal end points. No? Doesn't that exist?

A. Yeah. These are the -- The appendix tables to this report contain those.

Q. Okay. Point us -- Can you point us to either an example -- I mean you guide us as to can you cite an appendix to show us what I'm talking about?

A. Let's look at Page 66. I'm sorry. Page 64. We're going to have to necessarily jump around a little bit here.

Q. Absolutely.

A. Let's start with Page 64. What that is is a -- Those are the species that were selected as RAS for this particular trial.

Q. Yes.

A. We call them trials. And we read up here that these are thermal thresholds for modified use RAS 2 list. Okay. So that would correspond to --

Q. Table 3?

A. Well, part of Table 3.

Q. Okay.

A. It would be one of the options.

Q. Right.

A. In Table 3. So that's just a summary of the species that were selected. If you flip to Page 65, the table you see that has the percentiles, that is what goes into Table 3, but that's produced by the model by selecting these species.

Q. And would you give -- use -- well, let's -- Can we stop right there?

On this appendix Table 1F, there are the three headings -- I'm sorry -- the four column headings for the thermal end points. Why don't we take a moment, I know it's in your testimony and report, Mr. Yoder, but just for the benefit of those who are kind of learning this for the first time or hearing it for the first time, would you explain first what is the significance or

what is captured by the thermal end point called optimum?

A. Optimum would include, well, experimental end points that would regard that as either a physiological or behavioral optimum temperature that that species would like to have.

Q. For all purposes, you know, for growing, for spawning, for --

A. Not necessarily for -- it could be -- It's usually growth, reproduction, or something called a final preferendum, which is, given the opportunity, it's the temperature that the majority of the test population will congregate.

Q. Next column heading, the thermal end point MWAT, all caps, growth?

A. That is -- MWAT stands for mean weekly average temperature for growth. This is a calculated end point that's based on the U.S. EPA methodology, and it's developed in 1976. And it is -- It's not directly a measured growth end point. It's a, based on what they knew about the relationship where growth could tolerably occur somewhere between the legal temperature and the optimum temperature that there's an equation that

you could use that will calculate that. And what it's thought is this is a reasonable temperature which the species would still be able to grow and thrive. It's not necessarily the optimum growth, but it's more of a tolerable growth. That's the assumption. So it is a calculated value.

Q. Fish might not get to six feet tall but might get to five foot eight?

A. Or five eleven and a half.

Q. Oh, okay. All right. Upper avoidance thermal end point. What is that measuring?

A. That's a behavioral end point, and that's the temperature at which fish exhibit an avoidance. That's where they start to, if you plot distributions of the current, either, you know, in the lab environment or in the field, if it's properly conducted, that's the point where their abundance just really starts to precipitously drop off. And, again, given the opportunity to select a whole host of temperatures, a wide range of temperatures. So that's what that is. It's important to know that because of the tendency for fish to avoid temperatures below those that kill them.

Q. Okay. Moving to the next column for the last thermal end point UILT. Please explain that thermal end point.

A. That is an acute end point. It is -- It's derived in the laboratory. It's called the upper incipient lethal temperature, and that's a laboratory derived end point of -- There's also another term called an ultimate upper incipient lethal temperature. We chose -- it's based on what the organism is acclimated to before it's subjected to the lethal temperature.

Q. Okay. Now, I think that was the first time in explaining the end point that you used the phrase laboratory derived end point. Could you just explain what you mean by that? Is this end point a little different in that regard from the other three?

A. Potentially. Although the others, the upper avoidance and the optimum can also be defined in laboratory, but they can also be defined in the field.

Q. Okay.

A. It's --

Q. It's not unique to the --

A. It's a little difficult to get an upper incipient lethal temperature via field observations because fish will avoid -- unless you've got them in a highly constrained artificial environment. So it's almost inherently a laboratory technique to find out at what temperature does a fish die.

Q. Okay. And that's basically what that's telling us, at what temperature does a fish die, the UILT?

A. Yes. At a given what's called an acclimation temperature.

Q. Why don't you explain acclimation temperature.

A. Well, being what's collectively termed as a cold-blooded organism, they are subject to the ambient environment, and they can acclimate to temperatures either going up or going down. And if you acclimate fish to higher and higher temperatures, their lethal end point will go up, but only to a certain point. And that's what's called an ultimate upper incipient lethal is where you cannot acclimate the fish to any higher temperature. It dies regardless of its acclimation at this higher

temperature.

Q. And that's what's in this column?

A. Yes. That's pretty much what's in that column.

Q. Okay. Now go back to where you were referring to flipping over to page, part of this table that's -- well, no, it's actually a separate table. I'm sorry. On Page 65, Appendix Table 2F. And let's use the very first thermal criteria value there under optimum category at 100 percent, and I'm going to get to it in a minute to explain what the percentages are. There's a value of 21.8 or 80. How -- Where did us that value come from out of the -- how to we wind up with 21.8 optimum from the values under the optimum column on the prior appendix Table 1F we were just describing?

A. What those percentages mean is what percent of the RAS fall with -- entirely within that category. So --

Q. Another way would be are protected by that value?

A. I guess you could say that, yes.

Q. Okay.

A. So for 100 percent of the, in this

case, the 26 RAS, because we're excluding one of them from the original list, it's one of the options.

Q. We're excluding the golden red horse, right? I think it's right up there.

A. Right. Otherwise it would be 27.

Q. Okay.

A. So what we're saying is that for 100 percent of this 26 species, for the temperature to be at or below the optimum, it has to be 21.8 degrees.

Q. Right. But you get that -- Let me try and be more specific. You get the 21.8 by going down the optimum column of Appendix Table 1F to find the lowest number, correct?

A. Right.

Q. And the lowest number in that column was 21.8, and it happened to be for northern pike, correct?

A. Correct.

Q. Okay. And you do the same thing then as you go down. At least under the 100 percent column, you do the same thing for each of those end points: Growth, now growth we get that from the

MWAT growth column?

A. Yes.

Q. All right. With respect to avoidance, paren, UAT, that's from the column on Table 1F entitled upper avoidance?

A. Correct.

Q. Now, the next one you're probably going to have to explain a little bit further because we have two more categories, but we only have one column left on Table 1F, the UILT. So can you explain how staying still with the 100 percent column, where did you get -- how did you derive the survival, and I think LT is long term?

A. Yes.

Q. How do you derive that 29.5?

A. Well, the short-term survival is the UILT. The long-term survival is simply the short-term survival minus the 2 degree centigrade safety factor.

Q. Okay. So I should have started with survival short term. You take survival short term, we go to that same exercise we did for the other three end points. I just look down the column on Table 1F to find the lowest number, and that's when

I put in here for short-term survival, that's where I get 931.5, correct?

A. Yes.

Q. And then to get the long-term survival, I just deduct 2 degrees off that number?

A. Yes.

Q. Okay.

HEARING OFFICER TIPSORD: Mr. Safley, you have a follow-up?

MR. SAFLEY: If you don't mind, I want to ask a question. Tom Safley on behalf of the Illinois Environmental Regulatory Group. Mr. Yoder, I wanted to ask you a question about the optimum growth or the optimum category or column. In looking at these tables, we have the optimum listed as 21.8 degrees; is that correct?

HEARING OFFICER TIPSORD: That's Table 2F?

MR. SAFLEY: Yes. On Table 2F. In the 100 percent column, pardon me. The optimum is 21.8 degrees?

MR. YODER: Yes.

MR. SAFLEY: And that is if I'm right

looking at Table 3F, that is because northern pike's optimum centigrade temperature is 21.8 degrees.

MR. YODER: Yes.

MR. SAFLEY: And you stated that optimum is meant to represent the temperature at which that species of fish would most prefer to congregate.

MR. YODER: Yes. That's one of the measures that we relied on.

MR. SAFLEY: One of the measures you relied on to determine optimum temperatures for these fish?

MR. YODER: Yes.

MR. SAFLEY: What other measures did you rely on?

MR. YODER: For some species, because the -- all of these end points are not available for every species. It's very patchy, what's out there. So for something like optimum, I believe, and I'd have to refer to my baseline document, but I believe we included things like optimum for growth or other physiological processes, that type of

thing. But a lot of the data does include a sort of a what's called the final preferendum which is where given the choice where the fish would like to be.

MS. WILLIAMS: Mr. Yoder -- I'm sorry, Tom. I just wanted to clarify for the record. When you say your baseline document, are you referring to what's been entered into the record as Exhibit 16, the ORSANCO report.

MR. YODER: Yes.

MR. SAFLEY: So when you say is that preferendum where the -- that species would prefer to congregate, do you mean both the species would prefer that the water not be warmer than that and the species would prefer that the water not be cooler than that temperature?

MR. YODER: Well, it just happens to be where they go, and the assumption is that where most of them go is where most of them like to be.

MR. SAFLEY: Right, right. And so if they were in an area where the water was five degrees warmer than that and they would be --

and they could get to another area that was at that 21.8 degrees, that's what you would expect them to do is move from the higher temperature water to the lower temperature?

MR. YODER: That's what the data suggest.

MR. SAFLEY: I want to make sure I understand how this works. Conversely, if they were in water that was a temperature instead of five degrees warmer five degrees cooler, you would expect them to come from that five degree cooler water to the water that, in that instance, would be at a higher temperature of 21.8 degrees. It works both from --

MR. YODER: It can work both ways.

MR. SAFLEY: That's what I was trying to understand. So if you look then at the entire universe of fish, which is included on Appendix Table 3F, that optimum temperature for northern pike would be 21.8 degrees, but if you go all the way down Appendix Table 3F, the optimum temperature for common carp which was on Page 66 would be 31.5 degrees; is that

correct?

MR. YODER: That's right.

MR. SAFLEY: So for the group of fish you have almost a ten degree range that covers all of -- the optimum temperatures for all of those different species?

MR. YODER: That's correct.

MR. SAFLEY: Is there -- Is there a step in the process or is there an exercise that's done with this information to try to figure out what the optimum temperature is for the majority of the species? I don't know if average is the right way to say it, or is that something that would be possible to do or is there any usefulness to that?

MR. YODER: I'm not sure what that is without giving it more thought. But I mean you can look at the 50th percentile and, that's where half the fish congregate. So that's 28.2 degrees in this case.

MR. SAFLEY: So 21.8 just, is my last question, is not that number. That's the fish with the lowest temperature at optimum, that's when you plug that number in and the

rest of the fish in this group have a higher optimum temperature?

MR. YODER: That's correct.

MR. SAFLEY: Thank you.

HEARING OFFICER TIPSORD: Miss Dexter has a follow-up.

MS. DEXTER: You said that you use a few different end points for -- to call optimum. Do you have a preference of like -- or not -- preference is hard to use here. Do you sort of prioritize or do you -- if you have a final preferendum do you use the final preferendum and then if you don't you look to something else, or is it --

MR. YODER: As I recall that, I think that's the way we did it was to use that first, and then if that was lacking to use something else like a physiological end point which really there aren't that many of.

MS. DEXTER: Thanks.

HEARING OFFICER TIPSORD: Miss Franzetti?

BY MS. FRANZETTI:

Q. Mr. Yoder, then just to complete it, if we go back to Table 3 at Page 14 on your report, Exhibit 15 for the modified use category. And if we, I think we were, because we were using Appendix Table 1F that excludes golden red horse, we'd be in your modified use RAS 2 excludes golden red horse portion of that Table 3. So if we look at under, staying again under 100 percent protection where we're protecting the most sensitive of all the species, 100 percent of them, the optimum value there is, in Celsius, the 21.8. And we know if we go back to 1F we got that value from northern pike being the most sensitive of your 26 RAS species for the optimum end point, correct?

A. Correct.

Q. But that's what we have to do to understand what species is driving these numbers under the 100 percent column, is we really have to go back to your underlying appendix. You can't tell from looking at this table what species determined that value, correct?

A. That's correct.

Q. Okay. And then, again, just moving across, of those 26 species, if I move across to the 90 percent, if I'm going to use a 90 percent, what do you call it? Is it a --

A. Percentile.

Q. But what's it -- it's 90 percent of the 26 fish species?

A. Yes.

Q. Okay. At the 90 percent level, that value goes up to 23.9 degrees Celsius, 75 degrees Farenheit, correct?

A. I'm sorry. Which value again?

Q. I just want to make, I'm staying with optimum, but now I just want to go over to the 90 percent column?

HEARING OFFICER TIPSORD: Still on Table 3 Page 4.

MR. YODER: Yes. It goes --

BY MS. FRANZETTI:

Q. So I'm protecting 90 percent of the 26 species, so to speak?

A. Yes.

Q. Is that what that means?

A. Yes.

Q. Okay. Now, just briefly back on your UILT end point, do you know are the fish used in the UILT studies that you have in your data base and you get these values from, are they wild caught or are they cultured in the lab?

A. Again, I'd have to look at the study. Some are brought in from the field and some are cultured.

Q. All right. That's -- You don't screen out studies that are accepted into the data base based on whether they're wild caught or they're cultured in the lab?

A. No.

Q. All right.

A. We do make a notation as to what the source -- we categorize the studies, but we don't use that as a means test, I guess.

Q. Now, staying with either Table 3, or if it -- if it's applicable, Appendix Table 1F, for the most stringent UILT value that protects 100 percent at the short-term basis, which is 31.5 degrees Celsius, how do I figure out whether that's based on a fish that was cultured in the lab or was caught out in nature?

A. You first have to know which species it was.

Q. Well, I can figure that out, right, from just going up and looking at who had 31.5 and that was the common -- common carp, wasn't it? Oh, white sucker. Sorry. Oh, I'm in the wrong table. White sucker.

So first I do that, all right. I have to know where the 31.5 came from. It came from white sucker. Now, how do I figure out what literature study, what lab study generated that 31.5?

A. Besides asking me to help you with that, I would have to go look at the compendium of all the thermal data that is part of the Exhibit 16 and determine which study or studies that that particular input variable was based on.

Q. And there's no cross-referencing in here. I mean, well, let me ask you this: You go to there, that compendium you just referenced, and how do you find it in there?

A. I go to the --

Q. What are you looking for to identify it as the one where you got -- where this value came

from?

A. I look for that species, and then I look for the compilation of the different end points that we derive from the literature search, and then I can roughly determine which study or set of studies that that particular end point that got put in the model was derived from.

Q. So if I asked you to identify for me which species -- what lab report or study is the basis for the values in Table 3 for each of these end points under the 100 percent column, that would take you -- that would take you a while to do, correct? You couldn't -- you could not give me that information as you sit here?

A. Not with 100 percent confidence. I'd have to go back and look at actually how that was done.

Q. One more question on the UILT test results that are included in your data base. Do they only use fish of a certain age or size?

A. This is generally speaking, lab studies are almost necessarily based on using, especially for larger species, based on using juvenile life stages or younger.

Q. Juvenile or younger. I forget the term for the first year born.

A. Larva or young of year.

Q. Young of year. Okay. So it's at least no longer than juveniles typically, and it can be even younger that are used?

A. It can be larval survivors.

Q. All right. Okay. Back to the numbered, prefiled questions here under characteristics of fish temperature model.

Question No. 1, explain how the approach you use to derive thermal standards constitutes a quote, unquote, model as it is termed given that it does not appear to employ any modeling mathematical equations, and other characteristics typical of the usual meaning of a technical model?

A. Well, there's a lot of definitions that what a model is. And seeing that this is taking a part of the whole and simulating it, then it definitely fits what a model is, and that's what this is doing. This is taking information from a part of a whole system and applying what we know about that part and then assuming that it represents the whole system. And that's the essence of

modeling.

Q. All right. Oh, I'm sorry. Did you want to finish?

A. Well, and the mathematical manipulations doesn't include a computer program that does this. We had to write a program to make this work.

Q. So that your program could rank the thermal values from --

A. Yes.

Q. -- highest to lowest, that you needed to do a computer model to accomplish that? I'm sorry. Is that what you meant?

A. A computer program.

Q. A computer program to do that, okay. I'm sorry. I kind of thought Excel basically did that. With respect to referring to it as a model is my Question No. 2, would it be more accurate to describe it as a ranking of fish species from most to least sensitive based on basic thermal end points?

A. Well, I agree with you that's what it does. It does rank species, organizes them from most sensitive to most tolerant. But in the sense

of what it is attempting to do, it is a model.

Q. And the attempting to do part is to use this data to predict, to project out into the real world what's going to happen; is that right?

A. Yes. It's the essence of a model.

Q. Okay. No. 3 under this ranking approach, is it correct that once the fish species have been ranked for a particular end point such as upper lethal temperature, the proposed thermal standard is taken from the temperature that the literature data predict will be protective of the fish species deemed the most sensitive; i.e., that is at the top of your ranking list?

A. That's true for part, especially for the short-term survival part.

Q. I'm sorry. Did you want to add more or can I go on?

A. Go ahead.

Q. Okay. No. 4, under this ranking approach, is it only the literature -- I'm sorry. Is it only the literature data for the top-ranked species that are used to determine the numerical temperature limit that becomes the proposed water quality standard?

A. I'm assuming what you mean by top-ranked species is, again, the most sensitive species.

Q. Right.

A. Yes. That's what's, and that is, again, based on which option RAS and other option that you're looking at.

Q. Now, can you tell me -- Can you explain whether, and if so how, this approach is consistent with the 1985 U.S. EPA guidelines we're talking about earlier today?

A. I'm not sure I can really comment on that. My understanding is that the most sensitive species, it has that in common.

Q. What does it have in common?

A. That the '85 guidelines for deriving water credit criteria in general will target the most sensitive RAS for that particular parameter based on literature values.

Q. One hundred percent of the time?

A. Well, that's an interesting concept, because in terms of the RAS I believe it's 100 percent, but EPA claims it really represents, at best, 95 percent of what's really there.

Q. EPA's claim -- do you mean EPA's claim of what your data represents?

A. No, what their method represents.

Q. Their method. You mean --

A. The '85 guidelines.

Q. The '85 guidelines in that regard are not consistent with your approach, correct?

A. Well, I'm not entirely sure.

Q. Oh, all right. Well, you don't know. That's fine. But it's correct that the U.S. EPA guidelines say you are shooting for a 95 percent protection level, correct? If you know?

A. Well, that's my understanding of it.

Q. That's mine, too. And your approach is basically advocating 100 percent protection of the most sensitive species 100 percent of the time, correct?

A. I need to qualify my answer for a minute.

Q. All right.

A. Because what is happening is we're saying 100 percent of the RAS. What we are never certain of, does it protect 100 percent of what's really there?

Q. I understand. But based on your approach to deriving standards, which is also what the 1985 U.S. EPA guidelines are doing, your approach is you set the standard based on 100 percent protection 100 percent of the time for the most sensitive species.

A. One hundred percent of the RAS.

Q. Right. Okay.

MS. WILLIAMS: Can we just clarify? So we're talking about the 1985 U.S. EPA guidance. Does that guidance cover temperature in particular or is that designed to --

MR. YODER: Not that I'm aware of.

MS. WILLIAMS: It's a general guidance for --

MR. YODER: It's mostly dealing with toxic parameters.

HEARING OFFICER TIPSORD: Mr. Howe?

MR. HOWE: Mr. Yoder, do you know if that guidance document also emphasizes that you should protect recreationally important species.

MR. YODER: I'm not sure, Pete. I'm

just not that familiar with it. I mean I know it's a concept that's imbedded and it's Water Quality Criteria 101 you protect those.

MR. HOWE: Thank you.

BY MS. FRANZETTI:

Q. Moving on, Question 5. Is it fair to say that for purposes of calculating the daily maximum and period average thermal water quality standard, none of the literature values collected for species other than the top-ranked species, in other words, the most sensitive on your list, is taken into account?

A. No. It's not fair to say that.

Q. Okay. Tell me how that's not fair.

A. Can I point to Exhibit 15, Page 12, methodology also specifies what the average and what the daily max should be consistent with. It's averages should be consistent with 100 percent long-term survival of all representative subspecies.

No. 2, growth of commercially or recreationally important fish species.

No. 3, growth of at least 50 percent of the nongame fish species.

No. 4, 100 percent long-term

survival of all endangered fish species.

And, No. 5, the observed historic ambient temperature record. Daily maximum should be consistent with, No. 1, 100 percent short-term survival of all representative fish species and the observed historical ambient temperature record.

Q. All right. Stay with daily maximum there for a moment from what you were reading on Page 12. So, No. 1 there, the 100 percent short-term survival of all representative fish species. That part is consistent with what my question asked, that none -- for that, none of the literature values collected for species other than the top-ranked species is going to be taken into account, correct?

A. No. That's correct.

Q. Then I don't understand what that means. I thought that that was your 100 percent.

A. I did say you're correct.

Q. Oh, I'm sorry. I thought you said no.

Okay. What's the second factor there for what you're -- what the daily maximum standard, thermal standard, should be

consistent with? The observed historical ambient temperature record. What's that mean?

A. Well, you have to be aware of for that water body what the historical ambient temperature is in that water body to avoid the conundrum of setting criterion that's going to be frequently exceeded naturally by natural conditions.

Q. Are you -- can you tell me for the Upper Dresden Pool how I would apply this factor, how -- where would I -- what am I -- what data am I looking for here, the -- when you refer to the observed historical ambient temperature record?

A. It's difficult construct in modified water bodies.

Q. Why?

A. Because it should be -- Because the modifications could influence measured temperatures in that water body, and they might be unnatural temperature occurrences. So what it means is you need to be mindful of when you recommend daily maxes, that they have some semblance in what naturally occurs or what could naturally occur in that water body. And, again, it's just to avoid the very simple issue of setting a criterion that's

going to be too frequently exceeded and trigger other regulatory implications perhaps.

Q. I didn't appreciate that when I read your report. So I want to follow up on that and make sure I understand it now.

So you do take into account in setting the standard what's going on out there in the stream, correct, in this factor? That's what you're doing.

A. In terms of the ambient temperature regime, yes, we do.

Q. Okay. So your literature value; that is, this 100 percent short-term survival of all representative fish species, you're telling me that's got to be balanced out. That has to be potentially modified based on the observed historical ambient temperature record, correct? I'm understanding correctly?

A. Yeah. It's an option that's available to you, and we recommend the users carefully consider that.

HEARING OFFICER TIPSORD: Excuse me.

Mr. Dimond has a follow-up.

MR. DIMOND: Mr. Yoder, were you asked

to consider the observed historical ambient temperature record for any segment of the lower Des Plaines River?

MR. YODER: Well, not directly, but doing that is an inherent part of this methodology, and it's part of the report that we produced. It's particularly important for the nonsummer season recommendations. Those are really based on the maintaining the seasonal cycles so that it has been observed to naturally occur.

BY MS. FRANZETTI:

Q. Moving back to how you explained or how you recommend the period average, thermal standard should be derived. You have -- as you -- and you read them off. There are five factors listed here. Now, one is instead of the short-term survival, the RAS that we were just talking about for purposes of setting the daily maximum standard. For the period average, we look instead at the 100 percent long-term survival of all RAS. So that's the one difference there. But that's the value that's coming from your ranking approach, correct?

A. Yes.

Q. Now, moving to No. 2. Is the source of that information going to also come from your ranking approach?

A. Yes. But you'd have to go to the -- I believe in the example we discussed previously it would be Appendix Table 3F on Page 66.

Q. Be careful. I think it's 1F. Although you're not the first person who's --

A. We were talking about the option that excluded golden red horse. So it's Table 3F.

Q. It is 3F?

A. Yes.

Q. Okay. So that -- So the factor of growth of commercially or recreationally imported fish species that also comes from that table, the growth value, the growth end point?

A. Yes. There's a -- On Page 66, there's a column --

HEARING OFFICER TIPSORD: Mr. Yoder, you need to turn the microphone or -- when you turn your head --

MR. YODER: Sorry. It would be the second column where it says girth exceeded. Whenever the growth -- and that's that mean

weekly average temperature for growth term. Whenever that's exceeded, that species is listed. And if that happens to be a commercially or recreationally important species, that then can become a consideration in setting the average.

BY MS. FRANZETTI:

Q. If one of the species listed there is commercially or recreationally important, what do I do? How do I factor that in here?

All right. So I see one of them is. What do I do with that information?

A. Well, you note it and then you consider it in line with all the other five or whatever criteria for the average. It doesn't necessarily stop you and say go no further, but it's consideration you need to make.

Q. In order to consider it, do I then go back and look for -- Do I look at what their thermal value is for growth for that particular --

A. Yeah, well, that's a calculated value, okay?

Q. So I don't --

A. Experimentally derived value.

Q. I don't do that?

A. There's no other choice. But one thing you could do if that species did have growth experiments done, you could go look at those and say are those in agreement or is there enough evidence that this species is actually growing at higher temperatures. That could be a factor in saying I'm going to take this more seriously or I'm going to let it go and go to the next species.

Q. But for this factor, I'm not going to find a specific thermal value in your report to use to address --

A. You're going to find it in the model. You're going to find an end point. That's where these exceedances come from.

Q. All right. So I can find some sort of values for what the -- this growth factor is what I should consider?

A. Yeah. It's on Page 64, it's the MWAT for growth numbers.

Q. I thought I asked that and I thought you said no. So okay. I understand.

Now, No. 3 is growth of at least 50 percent of the nongame fish species where?

A. Well, again, I would have to go to this column and I would have to count up to the point where I lose, where I exceed the growth for 50 percent of the nongame fish species.

HEARING OFFICER TIPSORD: For the record, this column is the column, the second -- third column on Table 3F, correct?

MR. YODER: The second column, the growth exceeded column in Appendix Table 3F.

BY MS. FRANZETTI:

Q. And, again, well -- How will I put a thermal value to that factor?

A. Well, just for illustration purposes, let's assume that it's half of the 26 species, okay? So I count up to No. 13 and that is exceeded at 86.7 degrees.

Q. Now, No. 4 is 100 percent long-term survival of all endangered fish species, so I would just look at my -- well, I'd look on the endangered -- I'd make sure that any endangered species that are present in the water body. I've looked at your literature value to see what is the most sensitive of them, what's the 100 percent long-term survival data say, correct?

A. Yes.
Q. Okay. No. 5, we're back to the observed historical ambient temperature record. So, once again, even with taking into account these four other factors that are based on literature value, you're also advocating for the period average that the observed historical ambient temperature record needs to be considered in setting the standard, correct?
A. Yes.
Q. Can you give us any -- Can you quantify for us at all in that weighting process of the four literature value factors and the fifth, the observed historical ambient temperature record, what -- how much weight do you give to the historical ambient temperature record versus the other four factors?
A. Well, that's a standard setting issue that we don't -- that we did not take part in here.
Q. Oh, I understand.
A. We're just laying out the options for the main issue of the Agency to take it into consideration.
Q. These are your recommendations,

correct, to the standard setting agency?

A. Recommendations is maybe a strong term. They're options --

Q. Okay.

A. That they can choose from.

Q. Guidance? I guess what I'm saying is isn't this what you recommend as the way to approach setting thermal water quality standards?

A. Right. But the Agency could make the choice to --

Q. To dis --

A. -- to consider growth being more important than maintaining the ambient. That's up to them.

Q. I understand. I'm asking whether you have an opinion of how you would weight it. If you don't, you don't.

A. I -- It's going to vary by the situation.

Q. It's somewhat --

A. It's also going to vary by how the Agency handles criteria exceedances, and what their policies are. Different states handle it different ways, and it's going to be affected by that.

Q. I understand you're saying it's a site-specific type decision, depends on the water body, depends -- correct?

A. It can depend on the water body, but it can also depend on sort of the management study that you're dealing with, what kind of, you know, if you're dealing with a point source thermal discharge. Two of the choices that we seem to come down to, do I manipulate the standards or do I deal with it in the permit. And I'm not sure there's a clear consensus on one way or the other. I have an opinion, but that's not at issue here.

MS. WILLIAMS: Do you want to go ahead and give your opinion: That's fine.

MR. YODER: Well, in cases like this, I think it works better if you handle things through a permit, manage it.

BY MS. FRANZETTI:

Q. Why?

A. Because it's probably not possible to write a temperature criterion that satisfies every management need out there and doesn't jeopardize either setting them too high or too low.

MS. WILLIAMS: And as a follow-up,

Mr. Yoder, would it be your opinion that you won't recommend allowing for exceedances or excursions within the standard?

MR. YODER: I would try to minimize those kinds of clauses and exceptions, because these criteria have to function for all of the management applications that standards to support including those that were more accustomed doing like point source permitting as compared to those we aren't very accustomed to like writing TMBLs. And those standards have to support all of that, so I think we have to appreciate when we write a standard what does it have to do.

BY MS. FRANZETTI:

Q. But Mr. Yoder, would you agree, though that one thing that is a little atypical here for the upper Dresden is that we are talking about setting a thermal water quality standard for a specific pool, just the Upper Dresden Pool; not a river, not all general use waters in Illinois, in this proceeding we are solely and specifically looking to set a standard, a water quality standard, for one pool. Do you still say you don't address

this in the standard what the appropriate thermal level should be?

A. It wasn't my mission to address the standards issue surrounding that example. That's Illinois EPA's --

Q. I understand. But you just gave an opinion that it ought to be addressed in the permit. And I'm suggesting you gave that answer based on the more typical situation where you're looking to create a thermal water quality standard that's going to apply to various water segments. It's going to be via use designation. Isn't that the more typical standard setting process?

A. Yes.

Q. Okay. And wouldn't you agree here we are talking about in comparison a very small area known as Upper Dresden Pool. And in that situation, might your answer be different in terms of deal with it in the permit but set the standard without considering the factors like ambient, record, et cetera?

MS. WILLIAMS: Are we really just talking about the --

MS. FRANZETTI: Counsel, either object

or I want an answer.

MS. WILLIAMS: I object. I don't think we're just talking about the upper Dresden. It affects all of the lower Des Plaines River, so I just found it confusing. I thought --

MS. FRANZETTI: Are we going below I55 bridge with what you've proposed in your Upper Dresden Island Pool use?

MS. WILLIAMS: No, but the report also addresses the Brandon pool is all I'm saying.

MS. FRANZETTI: But that's not your use designation.

MS. WILLIAMS: We have a use designation.

HEARING OFFICER TIPSORD: Let Mr. Yoder answer the question if he can.

MR. YODER: I don't think my answer would change for this site versus a more global application.

HEARING OFFICER TIPSORD: If you're moving on to question six, let's take a break.

(Short break taken.)

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

MS. FRANZETTI: Madam Hearing Officer, I would like to introduce and have marked as an exhibit in evidence in this proceeding the Ohio Journal of Science, January 1976 report Thermal Discharge From a Nuclear Power Plant Predicted Effects on Lake Erie Fish that I mentioned earlier in my questioning of Mr. Yoder.

HEARING OFFICER TIPSORD: Thank you. If there's no objection, we'll mark that as Exhibit 17. Seeing none, we'll mark that as Exhibit 17.

MS. FRANZETTI: I want to thank the Agency for making copies during the break, and here are some additional ones.

HEARING OFFICER TIPSORD: The Ohio River report from Mr. Guiters' (ph.) testimony is 16.

BY MS. FRANZETTI:

Q. I'll start with question subset C6. How does the, Mr. Yoder, how does the species-specific ranking of temperature tolerance

under your model address, if it does, other factors such as population, community, and/or food-web interactions?

A. It doesn't directly address those factors.

Q. All right. Do you think those factors are relevant in terms of the thermal water quality criteria derivation process?

A. Well, I think almost categorically they're important to any criterion setting process, whether it be temperature or some other parameter. The problem is we just don't have much information, much expiremental data on those things.

Q. Moving on to Question 7, in the MBI/CABB 2005 report at Page 7, you describe your approach to developing thermal standards as being, quote, "naturally limited by the extant thermal tolerance data base," end quote. And you note that the model output will, quote "propagate a degree of uncertainty", end quote. Your report goes on to state that this uncertainty in the recommended thermal criteria, quote, "can be considered in the eventual derivation and application of the temperature criteria," end quote.

Is it correct that you left it to the Illinois EPA to determine how those uncertainties in the application of the model output predictions in the literature-based rankings should be addressed in its review and any revisions to your recommended thermal criterion?

MS. WILLIAMS: Susan, do you know which paragraph? I'm having trouble finding those quotes.

MR. TWAIT: It's under representative acquatic species.

MR. YODER: That's not a direct quote.

BY MS. FRANZETTI:

Q. Mr. Yoder, do you have a problem with how the question is?

A. I haven't found the quote, but.

MS. WILLIAMS: I haven't found the quote yet either.

MR. SULSKI: I haven't either.

MS. FRANZETTI: Ladies and gentlemen, are you talking about both quoted sections? I made a quote about three phrases in that question. Can you not find -- Are you saying you can't find any of them?

MR. YODER: I can't find the naturally limited by extant thermal tolerance data bases in the quote. If you can help me find that.

MS. FRANZETTI: If you go all the way to the third line from the bottom of Page 7 to about the middle of the beginning of the new sentence. Our approach is simply a best attempt to represent the entirety of the potential assemblage and, quote, "It is naturally limited by the extant thermal tolerance data base." Do you agree my quote --

MR. YODER: Thank you. Well, it was --

MS. WILLIAMS: So the quote begins at the bottom of Page 7 and then continues on to Page 8, correct?

MR. YODER: I was looking for the whole sentence.

MS. FRANZETTI: The next sentence does contain the phrase, "The model output will propagate a degree of uncertainty which can be considered in the eventual derivation and

application of the temperature criteria."
Yes. Part of that goes over to Page 8.
MS. WILLIAMS: And there's a typo here. In the -- you say in the eventual in the eventual in your question twice. I think there's a --
MS. FRANZETTI: I tried not to read it twice. I don't think I did.
MR. YODER: The answer to your question is yes.

BY MS. FRANZETTI:

Q. Thank you. Did you in any way guide or discuss with the Illinois EPA how it should address these uncertainties?

A. Nothing directly that I can recall. I think the extent of our conversations after this study were mostly clarification issues.

Q. Okay. What do you mean by clarification issues?

A. Oh, you know, if there were just understanding what I was saying more. I did not get into, you know, how they should use it.

Q. All right. Okay. Moving to D updated fish model data base Question 1. At Page 6 of your

prefiled testimony, you state that MBI updated the thermal effects data for ORSANCO and included over 200 new and suitable thermal effect studies, mostly produced after 1978. What do you mean by, quote, suitable thermal effect studies. When is a study suitable to be included in your data base?

A. If it provides the type of data and information that we need to use the fish temperature modeling system.

Q. And by that do you mean information values for the types of thermal end points that are put into your data base?

A. Yes.

Q. So if it doesn't have one or more of those thermal end points then it's not a suitable study for purposes of your data base, correct?

A. That's right.

Q. Okay. So that's the criteria, turning to next question, that's the criteria that you use to determine suitability?

A. Well, it's one of. I would have to refer to the report. I think we covered what we considered in our literature review.

Q. Well, you know, let me maybe move on

to Question C. Because really what I want to know is for these over 200 new studies, what QA/QC procedures were employed in those studies to determine -- I'm sorry. What QA/QC procedures were employed by either you or others who control your data base and what new study results get into it? What QA/QC procedures were used to determine whether the study results were reliable and credible?

HEARING OFFICER TIPSORD: QA quality insurance, QC quality control?

MS. FRANZETTI: Thank you. Yes.

MR. YODER: Well, we, one, had to -- it had to contain -- It had to be designed such that it yielded one of the end points covered in the appendices to the ORSANCO document, and we also made -- It had to be clear whether it was a field or laboratory study. It had to state what kind of laboratory study it was. It also had to state what kind of end point it was producing. And we denoted all of these by a series of footnotes. And we ended up compiling a list of, I believe I would say, about 75 different footnotes which would

denote how many different variants on these different studies there actually were. So that was really kind of our QA/QC aspect of the study. I'm not sure how else to -- what else to add to that. It was also viewed were these in a credible publication venue.

BY MS. FRANZETTI:

Q. What were your -- What was your criteria -- What do you mean by a credible publication venue?

A. I didn't want to -- We didn't want to use the very restrictive sense that it could only be from a refereed journal because a lot of the way the thermal literature is developed over the past 40 years, that there's been a lot of compendia developed that aren't necessarily amenable to getting it published in a journal due to their size. But they do refer to a lot of journal-based studies. So we included those as well. But we attempted to minimize the amount of what we call gray literature involved, but that didn't necessarily disqualify it if we knew the sources of those studies because inherently a lot of this is -- not a lot, but some is what some people might call gray literature.

HEARING OFFICER TIPSORD: Did you say gray literature?

MR. YODER: Gray literature is the term. That's -- It can be a very nonconstructive term sometimes. But a lot of the, I guess, the bigger compendia out there published by reputable sources, but not necessarily in a refereed situation where you have anonymous reviewers and that sort of thing. So individual studies of individual species, for this we tried to adhere to some type of journal publication for that. And, again, the bottom line was it had to have a good experimental study design whether it was a lab or a field study. So I think for field studies we insisted there, I think our bar was set pretty high, that we accepted field studies where there were temperatures available that were above ambient. And we rejected some studies that only looked at fish distributions in an ambient temperature regime and not an artificially elevated temperature regime. So we did -- We did disqualify those studies. So that's kind of

all part of the QA/QC process, in my view.

BY MS. FRANZETTI:

Q. Why do you disqualify the studies, the field studies that don't use an artificially elevated temperature?

A. Because you can't -- The fish were never offered the opportunity to inhabit temperatures above ambient. And some species will do that. Others won't. It doesn't give you any basis for saying that the species avoided that temperature.

Q. Understand. Of the over 200 new studies that you have added to the data base, do you know whether any of those produced or were the basis for the thermal values that you have in your tables, of thermal end point criteria in your report, Exhibit 15, that we were talking about, Table 2, Table 3 for example. Is there any way for us to tell whether those newer studies are the source of the values that wind up being in your thermal end points criteria for the respective uses you looked at?

A. Okay. The 200 studies came -- They're the studies that came out of our review as having

sufficient information to list in the appendices to the ORSANCO report which is really the baseline data gathering step. We screen more than 500 titles. And from that screening came these 200 new studies that we selected.

Q. What I'm trying to -- Let me rephrase my question. I'm not sure you actually are understanding it. I'm just trying to figure out whether any of those newer studies are the -- produced any of these numbers. When I look at Table 2, general use, when I look at Table 3, any way for me to tell if these numbers came from these newer studies?

A. Not by just looking at the Des Plaines report, no. You would have to go to the appendices of the ORSANCO report, and a rough rule of thumb would be any study that had a date after 1978 would be new studies that we found. Because the -- the previous compilation was limited to the time period up until 1978.

Q. Right. But don't I have to actually do more than that? I've got to go back to Appendix 3F that we were talking about earlier, I have to figure out what species is the source of

these values, then I got to go hunt through your references on that species and look for and then see whether or not any of the literature listed is one of the newer studies?

A. Yes. You could tell for some by -- if it was a species that was a brand new species added since then. It would be very easy to tell that. You can tell that versus summary table in the ORSANCO in Exhibit 16 in Table 9.

Q. Did you, by any chance, keep track when you were putting together Tables 2 and 3 of your report, whether any of them are based on, for example, one of the newer species so it would be the new data?

A. No, I didn't.

Q. Okay.

A. We also, as part of the ORSANCO study, actually went back and reexamined some of the previous studies at the same time.

Q. Moving on to thermal end points, lethality, Section E of my questions. E1, on Page 5 of the 2005 lower Des Plaines report, which is Exhibit 15, it is stated that, quote, "When upper thermal end points were available for more than one

method, the MBI, paren, 2005 study, selected lethal end points based on the following, paren, most preferred first, dot dot dot, end quote," after which the report lists the ChTM, UILT, and CTM methods in that order. So this statement suggests that where multiple studies using different methods were available, some were selected to use their lethal end point values, and some were not; is that correct?

A. Well, they were all recorded in the data appendix, so they were gathered. They weren't ignored. But the -- If I can cut to the quick, we tried to convert everything to something compatible or equivalent to the incipient lethal temperature end point. So that was the goal.

Q. How about we cut to -- I'll finish reading the rest of that question, but I'm going to go to Subpart A, Mr. Yoder, because I want to make sure I understand what you do when there are these multiple studies, although using different study methods in terms of either what makes it into your data base and then what -- or if they all make it into your data base. Maybe we can start there.

Do all of those, whether they're

using the ChTM or the UILT or the CTM method, do they all get to come into your database, their laboratory values that result from the application of those methods?

A. Yes. If the studies fit the --

Q. Suitability?

A. Previous criteria set before, they will all be recorded in the appendices. They were all recorded in the appendices to the ORSANCO report. So that's the first step is gathering all of the data.

Q. And when you say gathering the data, that's the equivalent of when I say goes into the data base or no?

A. Okay. I'm also thinking what goes into the database is what gets into the fish temperature model, underlying database for all the RAS. And so I see that as two different things. It's one to get into the appendices, and then you go from there to the fish temperature model end point.

Q. Okay. So let me use this. If like -- This isn't going to be a great example, because Great America, once you pay you get on all the rides. But let's assume if I'm just going into the

park and I'm not going on the ride, that's getting on the appendices, and of these get into the park, correct?

A. Okay.

Q. Now I want to go on the Batman ride. To get on the Batman ride, which is the equivalent of your data base, how do I get on Batman? How -- Is everything that got in the park, everything that got on the appendices, also wind up in the data base, gets to go on Batman?

A. In the FDM --

MS. WILLIAMS: By the database --

MR. YODER: Talking about the input data. I understand what you're saying now about database.

BY MS. FRANZETTI:

Q. It all goes into the database?

A. Once it gets into the appendix, then it is a candidate to be selected to be in the FTM input data, okay, one of those four thermal end points which --

Q. Yes. But when you say candidate, it's like is there another screening? You can get on the appendices, but you may not make it into the data

base?

A. Right. And for some species you're going to find there's going to be one value in appendix in the ORSANCO appendix to Exhibit 16. And so that's your only choice. But say you have a species that has six different UILT values from different parts of North America. Which one are you going to use, you know, and that's where the choices about what you take -- we might, in some cases, we might average some of those together, we might look at them geographically if we're setting standards for the Midwest. We'd like to have studies that correspond to this region for setting them for the Great Lakes. We would obviously like to have Great Lakes data, experimental data go into that. So those are the choices that are made, and that's where the -- what you choose to put in the input part of the model can vary. That's a choice. That's why we call it an input variable. It can vary depending on the situation.

So what you saw for the Des Plaines is just an example manifestation of that. Somebody else could take it and say, well, I don't agree with your end point for stonecat madtom.

We're either going to generate a new one or we're going to drop it out. That's part of the use model.

Q. I don't think I realized this. I don't think I realized that there were -- effectively there are judgments that have to be made as to which literature values from that appendices go into the data base to be used to wind up with the values in Tables 2 and 3 of your report, correct?

A. That's essentially correct. And that's what, just keep to -- to try to simplify this. There are two key input variables to the fish temperature model. There are the -- There are the values, the four key values for each species that's listed in the model, and then there's the representative species list, both of which can be varied.

Q. Oh, yes. I understand. I understood the representative species list could be varied, and this one you --

A. Right. But the model is set up to provide the opportunity for a user to look at the effect of different end points that might be generated by multiple studies.

Q. Yes. But the end points don't change,

do they? You always are looking at the four or five -- five that are listed in Tables 2 and 3 that we went through earlier: Optimum, growth, avoidance, survival long term, survival short term, or is that not what you mean by end points?

A. Well, let's back up a minute. Let's go back to the Appendix Table 3F or 1F that we were looking at as our previous example. And if we look at Page 64 again.

Q. Yes.

A. Those -- Again, it's the optimum, the mean weekly average temps per growth, the upper avoidance, and the UILT, those are the four key input variables for each species that go into the model. And what I'm saying is that a user could vary those based on --

Q. What do you mean vary those? Vary --

A. Well, they --

Q. Not use those four?

A. But there has to be some justification for substituting another value.

Q. I understand. But it would be -- It would be a different end point. Somebody might get rid of optimum. Is that what you mean when you say

vary?

A. No, no. Some -- For instance, let's take the first species on the list which is gizzard shad, and it listed UILT of 35.8. And someone says, well, I have a study that says the UILT now is 34 degrees. They can, if they have that study and it meets the specifications, they can plug that in and say that's the value I'm going to use for this particular situation.

Q. Okay. That's -- all right. That's -- I understand that now?

MEMBER RAO: So you're saying --

MS. FRANZETTI: Go right ahead.

MEMBER RAO: You're saying any one of these can be picked from different studies if there are marketable studies on the same species?

MR. YODER: Yes. You have that option with this procedure to do that. Obviously it needs to be justified why that particular value is picked and another one that's available was not picked. And there's also the option to take three or four studies and develop an average and use that as a means

for --

BY MS. FRANZETTI:

Q. So when you've been using the term data base, let me explain what I was thinking, and I -- or understanding that term to mean, which I think now is not quite right. I assumed the data base was the universal data base where everything that met or MBI/CABB suitability criteria was entered in. And if you were doing this when you were doing this lower Des Plaines work, you went into that data base and you, once you made your RAS decisions; i.e., the 49 for the general use, you just asked the data base give me, for these thermal end points, optimum, UILT, for these 49 species, give me your numbers from the studies that have been inputted into the data base. But are you saying that instead -- well, yes, that may exist as a universal data base. When I'm going to do a specific project to come up with temperature criteria for a given water body, I will actually take a subset of that data base based on some of the things you've just been saying. Maybe I think this one gizzard shad study is more reliable than what you've got in the data base already. So that's

going to go into that one is going into my data base. And I may think that of several studies, all of which utilize the ChTM method for determining the lethal end point, I like -- I want to do an average of those six studies' values. That's what's going into my data base. Is that what you mean? Am I kind of creating a -- I'm customizing the database using those kinds of judgments?

A. Yeah. And I don't mean to be too picky here, but I look at the database as the compilation of all the literature data that's in --

Q. That's how I was looking at it.

A. -- Appendix Z1 of the ORSANCO report.

Q. Right.

A. What I can customize are the input variables to the fish temperature model.

Q. Okay.

A. Yes. That in itself becomes a sort of a sub database. And what you can do with the electronic version, you can save each one of those, okay? So if you create Version 1.01 for the Des Plaines River or wherever, and you can then say, well, I'll either -- and I have some values, I want to see what the sensitivity is. Because I've got

these multiple studies, that kind of doesn't all say the same thing. Then I can create version 1.02 and 03 and see what the effect of that is.

Q. Okay. Now, you know where I'm going next is in your report, do you lay out those kinds of input decisions that you apply for purposes of derriving temperature criteria for the three uses in your report?

A. Not directly because of the scope of the work. I took -- we have kind of a baseline set of data that we use for Midwestern warm water rivers that we developed. And it's generally going into the ORSANCO appendix and getting geographically relevant studies. And where there's multiple studies, I believe we took the mean of some of those studies and plugged that in for a particular species. And I did not manipulate that for this particular report. What I ended up using as the key changing variable was the RAS membership. That was the first thing we really looked at. Because that's where most of the questions were. But it's possible to also, with justification, to modify the input variables on Page 64.

Q. I understand that now that it is

possible. You don't think you did a lot of that, though, for purposes of your --

A. For this report I didn't do any of that.

Q. None of that, okay. Well, then can you answer my question 1A. You know, where more than one study for a given end point existed, do you know, using what I will call your kind of more generic approach to the input values, did MBI use all of the studies or only some when there was more than one study for a given end point?

A. It varied depending on the species -- well, it's really almost a species-by-species decision based on what information is really out there and available.

Q. No. But, wait, let me ask you. See, that's what I don't understand, is my question presumes that for a given species, there's more than one study. You've got data, you've got more than one study. What do you do or does -- or are you telling me that even where you have more than one study it's going to depend on the species, how you deal with the values in that study for purposes of your data base?

A. It's going to potentially vary by the species depending on what studies are available for that species. Obviously for a species that only has one study --

Q. No. But see, that's not -- my question isn't -- one study I understand. You only have one value. What are you going to do? You've got to use it or nothing?

A. If you have multiple values, the -- I can't say there were any hard and fast rules to this, but we tried to adhere to geographic relevance, wherever the test fish is from, what part of the, of North America were they from or where was, if it was a field study, where was that field study conducted.

Q. And are those choices documented?

A. I am -- To be totally certain, I'm not sure now that they are. I'd have to go in and look at the electronic database to verify that.

Q. Would you agree then it's going to be hard for someone like me to turn to someone else who I think is an expert with regard to the derivation of thermal criteria and ask them to review what you did here and whether they agree with those decisions

on those inputs, right? I mean that's going to be hard for me to do, if not impossible?

A. Yeah. I'm not sure.

Q. Okay.

MS. WILLIAMS: Excuse me. Just to redirect for a minute. If someone, though, was to come forward with a study they thought was better than one you had relied on, they would be able to manipulate the fish temperature model to utilize that study?

MR. YODER: Yeah. They should be able to.

BY MS. FRANZETTI:

Q. Just a little problem with that assumption. The person would need to know what you did with your inputs to know whether or not they were doing something differently, correct, Mr. Yoder?

A. Can I hear the question again, please.

Q. Let me ask -- Actually, let me ask it a different way.

If someone else runs your model, would they come up with the same numbers you did here in your report?

A. Yeah. If they had the same input variables, if they had the same knowledge of input. But I mean if they're starting from scratch.

Q. Yes.

A. Without any knowledge of the decisions I made, they could potentially come out with a different answer.

Q. Right. Okay. So you have to -- to come out with the same numbers you did, you've got to know the inputs you made.

A. Right.

Q. All right. And those aren't documented in this report -- in anything that's been produced here?

A. Other than what's in the appendix tables. I mean that is documented in this report. So the key, the variables that are put in, those numbers are reported in the appendices.

MS. WILLIAMS: So you're saying that someone can find what you did use, but it might be difficult to find what you didn't use? Is that what you're saying?

MR. YODER: It's possible they'd have to have the ORSANCO report and almost go by

process of elimination and deal with that.

BY MS. FRANZETTI:

Q. It would be pretty tedious, if it is possible?

A. It would be.

Q. Okay. So now, if I just go back to asking you what you did, and, again, talking about these instances where there are multiple reports or studies for the same lethal end point, can you tell me whether or how many studies you may have excluded from the inputs that you used for your work here?

A. When you say excluded, you mean the ones that we listed in sort of our raw data compilation?

Q. Right, but didn't make it into the inputs.

A. You could not read the Des Plaines report and figure that out for yourself.

Q. I understand. I think we already established that. I'm moving on to can you just tell me -- I mean were you excluding some reports and their values when you were doing this work?

A. Yeah. There's some I can recall that I did that with.

Q. Can you give us examples just so we have some understanding of your --

A. Let's take --

Q. -- process here.

A. Large mouth bass is a good example. There's quite a bit of information and there's also quite a latitudinal variation. There are studies from Florida that's actually a subspecies that we don't have, so obviously I did not use that data. You'll find it in Appendix Z1, but that was excluded.

Q. And large mouth bass is on your RAS list obviously, so we're only -- We're talking about decisions you made?

A. I believe so.

Q. It is. It is. I just wanted to make that clear or everyone whose listening is we're talking about decisions you made within the parameters of your RAS list as to what study results you used?

A. Right.

Q. So that was a geographic decision?

A. Yes.

Q. Okay. Other examples?

A. Well, the reverse might be true of some species that also occur in northern latitudes that we felt might not have been representative and where there were studies that were more geographically relevant.

Q. Okay. Do you recall if you did, where you had multiple studies, did you use a mean value? Did you average them?

A. I know for some we used means.

Q. Mr. Yoder, if you can look at Question E1. I had stopped in the middle of it, and I want to focus on the last part of it that begins in contrast on Page 7 of your prefiled testimony. It is stated that, quote, "The combined lethality input parameter, paren, relying on ChTM, UILT, and CTM with a safety factor, closed paren, was used in calculating the short-term and long-term survival outputs of the fish temperature model."

That seemed kind of important to me because it relates to the short-term and the long-term survival outputs which can be used for derriving a daily maximum and a period average thermal water quality standard. So what does that mean? Were you combining literature values? What

were you doing?

A. Now, what we were doing was that these are really the three common lethality experimental inputs that aren't reported in the literature. And they're not -- They're not all equivalent, okay, in what their implication is for environmental effects. The ChTM, what we call the chronic thermal maximum, it's lately been viewed as being the most environmentally realistic end point. But the problem is there are so few studies out there. So the next best end point is the upper incipient lethal temperature that was, for many years, viewed as being more environmentally realistic. And there's quite a bit of information with that end point. The CTM, let's call it the chronic thermal maximum, I would say that most of the acute lethality end point studies, just the volume of studies out there, rely on that method. The problem with it is it's not viewed as being environmentally realistic because of the way that test is conducted. So there's a sort of a rule of thumb safety factor that's used to adjust that to make it more like the upper incipient lethal temperature, at least in equivalency. And a lot of these rules of thumb go

back to what I call the Zenith of thermal research in the 1970s, when there were just many more people looking at these concepts. And some of those eminate from that time period.

Q. I didn't realize that. The 1970s are considered kind of a Zenith for thermal studies?

A. You come up to -- I think once you get up to around 1980, temperature kind of falls off the face of the earth as a parameter of concern.

Q. I see. Thank you. So if I understand your answer correctly, the chronic thermal maximum, the ChTM method, is -- sorry. Is it critical thermal maximum, the ChTM stands for critical, not chronic?

A. CH is shorthand for chronic. It's a term when -- admittably we invented it. I think there's another term, I'd have to look it up, it's the ACE is what it's really called.

I'm sorry. I made a mistake.

Q. Oh, did you?

A. ChTM, we're calling it chronic thermal maximum. CTM is called the critical thermal maximum.

Q. You made Mr. Seigert very happy by

that clarification. That's exactly what he was trying to point out.

A. The ChTM has another more official term. It's in our ORSANCO report, and I just don't -- it's an ACE, but I don't --

Q. That's okay. That's all right.

A. -- recall it right offhand.

Q. Just so I understand correctly, the ChTM newer method. Would that be a fair term to use?

A. Yes.

Q. And considered better because it's a better reflection of what's really going on out in the stream when you use the ChTM method?

A. Well, its proponents claim that. I'm not sure I --

Q. Oh, you disagree?

A. Well, I'm not sure where I fall on it yet.

Q. Okay. All right.

A. What it does is it -- the test temperature is increased very slowly, like point five degrees per day until the organism dies basically. And which really it kind of simulates

what we call an upper incipient lethal temperature, whereas the critical thermal maximum --

Q. Before you get to that.

A. I'm sorry.

Q. And the reason, at least some people, may not include you, think that that more -- is more reflective of real life conditions is that more typically thermal temperatures are rising along those -- at that type of pace.

A. Well, you have to understand what the other two end points are before you can understand why people think it's --

Q. Okay. Go ahead.

A. So the critical thermal maximum, the CTM, is a much older method, and it ironically was called the slow heating method when it first originated, but it's actually a rapid heating method or the test temperature is increased anywhere from a half a degree to a degree, sometimes on the order of minutes, or it might go up by five degrees an hour. And what happens is by the time the organism dies, it's past the point of where it was really in trouble to the point of no return. So you get a falsely high reading.

MS. WILLIAMS: Are you picturing the frog in the boiling water? That's what I'm thinking of.

MS. FRANZETTI: Can you tell what type of child I was as I'm laughing.

BY MS. FRANZETTI:

Q. The CTM method that you just talked about, so the safety factor that you make reference to, that is applied to a CTM produced value is to deduct a couple of degrees from that value?

A. Yes. And to make it more in line with what the incipient lethal temperature test would include, because trying to equate the two end points.

Q. Because the thinking is that because of the more rapid temperature rise and the CTM method, that the fish maybe died at 93 degrees, but we got to 95 in the test so quickly, we can't really be sure?

A. Yeah. Before the organism lost.

Q. Right.

A. But it was really in the -- at the point of no return at some lower temperature and the rule of thumb is 92 degrees.

Q. Right. We don't really know. It's a bit of a guestimate. We don't know if it was 94, we don't know if it was 94 and a half, we don't know if it was 93 and a half. But for ease of use purposes, two degrees, rule of thumb, subtract it off the end laboratory test result?

A. Right.

Q. Okay. Now, with respect to -- You've now explained these different laboratory methods for generating a lethality input value. Can you explain now what did you do here when you had two or three different test methods being used generating different lethaltiy values for given species. Did you use them all, did you average them, did you take the mean -- What did you do?

A. Well, the first thing we did was adjust and -- You don't have to do anything to the CHDM or the UILT. Those were used -- the CTM subtract the two degrees. I believe -- sort of the rank order selection was use the ChTM first, the UILT next and the CTM as a -- if that was all that was available with the two degree safety factor.

Q. But my question assumes all three of them are available. So then would you just use the

value from the ChTM study?

A. That would be the first choice, yes.

Q. Okay. And you wouldn't use the UILT or CTM values?

A. Right.

Q. You'd ignore those?

A. Right.

Q. Okay. If you didn't have ChTM but you had UILT and CTM, would you just use the UILT value?

A. Yeah. But provision there is if the ambient -- if the acclimation temperature was realistic at which the test was being -- that is -- that test is acclimation. So you acclimate organisms to a particular temperature and then you expose them to a higher temperature. It's what's called the rapid transfer method. And so if it's at a realistic acclimation temperature that would be comparable to ambient, summertime ambient conditions in warm water systems. Yeah, we'd use that first. But there could be an instance where, you know, there wasn't a complete set of -- usually they'll test the acclimation temperatures starting at 5 degrees C and going every five degrees up to 25 or 30 degrees C. So you usually have that range of

test done. But some, you know, maybe they didn't get all the way up to 25 or something for some reason.

Q. For -- does what you -- Does your opinion of what is a reasonable acclimation temperature change based on the work you're doing? In other words, for this work in Upper Dresden Pool, do you have a certain acclimation temperature in mind that you want to see in the studies, the UILT studies that you're going to use, or do you always just have one acclimation temperature range that you consider suitable?

A. Well, again, it would -- It's for what we regard as the class of warm water system, so we look for acclimation temperatures of at least 25 degrees C up to 30 degrees C.

Q. Okay. So here you wanted to see acclimation temperatures of at least 25 degrees C up to about 30 degrees Celcius?

A. Correct.

Q. And if you only had the CTM type data, would you then just use it after you applied the -- I'm sorry. You had only CTM, but multiple studies using it generating different values? I recognize

you'd apply your safety factor 2 degrees, would you average those values or take the lowest, the most stringent?

A. Not necessarily the most stringent. It would, again, be sort of a choice based on how many studies are there and what's their geographic relevance. And assuming the acclimation temperatures were -- that's also acclimation dependent. I should have mentioned.

Q. Oh, all right.

A. And sort of the same train of thought that I talked about with large mouth bass, so -- and if there were multiple studies available.

Q. Right. Well, if you only have one study, you've got to use that value, correct?

A. Well, that's, if you're going to use that, include that species, yes, that's --

Q. Actually, though, let me ask you this question: You only have one study value for one of your RAS species for this lethal end point. But the acclimation temperature is not at least 25 degrees to 32 degrees Celcius. What do you do? Do you use it or do you leave it out?

A. Well, it's a judgment call. And there

was an occasion where I did that, and I did not use the two degree safety factor because the test was at a lower acclimation temperature.

Q. I think you have to explain to me why that creates an exception to the rule that you deduct 2 degrees from those test results.

A. A test done at a lower acclimation temperature may produce a lower lethal temperature than a test done at a higher acclimation temperature. And so to try to kind of translate that to the summer season effects, there was one study which I did not apply the two degree safety factor in recognition of the fact that it probably wasn't producing a summertime type of end point. And if I didn't use two degree safety factor, that would at least make up for some of that, I guess if you want to call it a short coming in the study or incompleteness in the study. And it really gets down to a choice. This is where the RAS gets to be so important and your knowledge about how biased is the data base towards a certain tolerance of species.

Q. Well, I understand. But it also concerns me a bit that you are taking one study,

you're not crazy about it because of the acclimation temperature it's using, but you've only got it. So if you want to use, you want to have a value, so you make this judgment call, all right, as you said, to reduce the shortcoming of it, I'm not going to do my two degree rule of thumb safety factor. But what if that's the guy, that's the study result that comes up being the lowest on -- I'm not going to go through it again, but, you know, you're top-ranked most sensitive, that can really drive the selection of the thermal water quality standard, wouldn't it?

A. It can, and then when you -- when something like that is noted, we can eliminate that uncertainty by also writing an option that doesn't include that species as an RAS. And then we can see what the effect is and a risk manager can make a decision.

Q. Okay. I think we've answered a lot of these, so bear with me.

MS. WILLIAMS: Which ones are we skipping?

MS. FRANZETTI: I'm reading to see where I think I need to pick back up.

BY MS. FRANZETTI:

Q. Moving over to Question 2, and I think we covered this in part, Mr. Yoder, with our discussion now of the UILT, the ChTM, the chronic thermal maximum, and the critical thermal maximum, CTM. You've already described, I believe, the chronic thermal maximum method of a slow -- that's the one that uses the slow heating method and is most environmentally representative. So unless you have something to add about explaining the meaning of the phrase slow heating method, I think we've covered it.

A. I would like to clarify the -- when I say that's the most realistic method, that's what the proponents of the method claim.

Q. Now, you already said you're not sure you agree?

A. I'm not sure I agree.

Q. The jury is still out?

A. That's correct.

Q. Okay. But in terms of explaining what that method is, would you agree we've covered that satisfactorily?

A. Yes, we have.

Q. All right. When you're talking about, and I'm moving now to 2B, when you're talking about conditions that are deemed more natural conditions, I think I've used the term realistic. But when you were first saying that with respect to the ChTM method, can you explain for all of us what do you mean by it's more representative or it's more realistic or it reflects better natural conditions, this slow heating method?

A. Well, again, this is -- I can only say what the proponents claim.

Q. Oh, all right. I'm sorry. You're not saying it. They are?

A. Yes. They are.

Q. And what -- Why are they saying that it's the most representative of natural conditions?

A. Well, if I understand their logic, they're saying that this very slow increase, it allows the organism to adapt to this very slow increases; in other words, acclimate to it. And when you do get to the eventual expression of lethality, that the organism has already acclimated to the highest possible temperature, therefore, it is a truer representation as opposed to the

incipient lethal temperature which is transferring fish from one temperature to a higher temperature immediately and subjecting them to that rapid transfer into a different temperature. So they're saying compared to that this slow heating is more environmentally realistic.

Q. Right. Do you know whether the ChTM slow heating method has been field validated in terms of seeing whether or not it does simulate better natural conditions? Only if you know?

A. No, I don't.

Q. Okay. I'm moving on to Question 4, and I think we may have covered it. Give me just a moment to look at it. I think you have said your approach does give preference, that if you have ChTM data as well as CTM or UILT, you would use the ChTM data instead of using the CTM or UILT data?

A. Yes.

Q. Okay. Can you tell us, I'm looking at Question 4A, as you noted previously, the methodology is new, there are very few studies available using the ChTM method. Can you identify, if any of the data end points on which your thermal criteria for the lower Des Plaines, better shown in

Tables 2 and 3 of your report, whether any of those are based on the ChTM method?

A. Actually, in this case I don't believe -- the only one that could possibly include that would be walleye, and, of course, we were in trials with that.

Q. Okay. So the only one that could possibly be a ChTM method derived value would be for walleye, and so we'd have to look and see whether walleye drove any of the survival long- or short-term values in Tables 2 and 3, okay. I won't ask you to do that, try to do that right now. I know it takes a little time.

Moving on to Question 5. I think we've already covered 5A. Moving on to Question 6, I think you've already done 6A, the rapid heating method used in a CTM. Let me ask you, though, 6B. If the CTM laboratory method, quote, does not approximate natural conditions and produces unrealistically high lethality end points, end quote, as stated as Page 7 of the prefiled testimony, why are such laboratory results included in the data base used to derive thermal water quality standards?

A. Well, we can -- We do have an adjustment factor that can, as best you can equate it, as to the more preferred end points, first of all. The second issue is we really -- we get into an issue where if we want data on as many species as we possibly can have, then we have to use those studies. Otherwise we start cutting into the available species database.

Q. We'd have zeros in place of where it says we have values in your Table 2 and 3 for survival, long-term survival, short term?

A. Well, you'd have fewer RAS to base this on.

Q. Oh, okay. All right. Now, given that -- Well, strike that.

Today do you think the majority of your survival long-term and short-term values that are in your Des Plaines River report, Exhibit 15, are based on the CTM derived data values?

A. I'm not sure. I'd have to do some homework to determine that.

Q. I think we covered C. Yes. You did. If this was a CTM derived value it was lowered by a two degree safety factor.

Moving on to D. I think you've answered D in part, but can you provide any scientific citations supporting the application of this rule of thumb two degree safety factor? Who else besides you guys does this or thinks this is a good idea?

A. I don't have it off the top of my head. It is a practice we adhered to 30 years ago, and I know it comes from -- it has a basis in the literature. I don't want to guess at who that is.

Q. When you say it's a practice we adhered to 30 years ago, who is the "we"?

A. At Ohio EPA. This is where the methodology eminated from.

Q. Moving on to Question Subpart E, Mr. Yoder. Do you understand the reference to the published conversion methods for relating CTM values to UILT values? Do you understand what I mean by that in that question? Let me start with that so I make sure you understand the question. Are there published conversion methods for translating CTM values into UILT value s?

A. I can't say yes or no to that. That may be where that 20 degree safety factor came from.

Like I side, I'd have to go back and resurrect my memory on that.

Q. Okay. And I think you've really already told me on F you really can't identify specific thermal criteria for the LDP, whether they're based on the CTM studies or the UIT, UILT, so I'll skip that. I mean I'll -- I think you've already answered F. Can you provide any scientific citations supporting your positions on the relative merits of the UILT and CTM laboratory methods?

A. Well, the reference we cite for the UILT being preferred is a publication, a compendium produced by Brown in 1974.

HEARING OFFICER TIPSORD: For clarification, the we, are you talking about the Exhibit 16?

MR. YODER: Yes.

BY MS. FRANZETTI:

Q. Anything else that you can cite us to, or is that it?

A. No. That's pretty much it, I think.

Q. Okay. Moving on thermal end points, sublethal or chronic effects. Referring to the bottom of Page 7 of your prefiled testimony,

describe -- I'm sorry. I think you have described what is being measured in the following four end points. Does anybody disagree with me on that? We went through those four columns on his chart. Okay.

So moving on to 1A, is the MWAT for growth a calculated value based on the optimum temperature and the upper lethal temperature?

A. Yes.

Q. Okay. So does that mean really that there are only three input parameters? In other words, that's a calculated value. That's not putting in study result values, correct?

A. No. But it's an input parameter in the model.

Q. I understand it's an input parameter. Okay. But in terms of it being an actual value resulting from a laboratory method, it is not. It's a calculated value?

A. Right. We've indicated that.

Q. Okay. Now, in B -- I'm sorry -- 1B, Question: What do you mean when you state, quote, "These four end points were condensed into three input parameters for the fish temperature model by combining optimum temperature and final preferendum

into a single input parameter"?

MS. WILLIAMS: Is this also on Page 7 do you think?

MS. FRANZETTI: I believe so, Counsel.

HEARING OFFICER TIPSORD: It's the very first full paragraph on Page 7.

MS. WILLIAMS: I had the bottom of 7 on to 8.

HEARING OFFICER TIPSORD: I'm sorry.

MR. YODER: So what this says is we did combine optimum temperature and final preferendum, and I think we discussed this earlier.

BY MS. FRANZETTI:

Q. I'm sorry. Would you indulge me, because I really don't remember that part of your testimony.

A. Yeah. When we explained the make-up of the four columns in appendix table -- when we were talking about the modified RAS options.

Q. Okay.

A. And we were talking about the outputs of the model for that option, that it outputs an optimum then after growth the UAT and the UILT and

we described the optimum then as a -- where we collapse final preferendum data and physiological optimum data measured by experimental tests.

Q. All right. Thank you. I'm sorry. I forgot that. Moving on to C. Do we -- Excuse me just a second. Perhaps your prior testimony satisfactorily answered that question, too, or not. We feel that's been responded to by the prior testimony.

Moving on to G, fish temperature model database. And give me just a moment because we haven't been just staying with the script, and I want to read these questions to myself and then determine whether they need to be asked.

MS. DEXTER: Meanwhile, could I ask how it's condensed so we have that.

MS. FRANZETTI: Oh, you don't think that was answered?

MS. DEXTER: It's not fully clear to me.

MR. YODER: Can you repeat that?

MS. DEXTER: I asked the question that Susan was going to ask about how the condensing happened in the optimum -- how did

you condense the values that you had within the optimum category? Is it a ranking like you did with the lethal temperatures, or is it some sort of synthesizing those?

MR. YODER: Yeah. They're actually -- They're -- condensing might be a poor choice. They're considered to be the same thing in the model, okay? You can experimentally produce an end point called the final preferendum, you can also produce physiological optimum as an experimental end point. We just, we considered them to be the same thing. We considered them all to be under the optimum category in the model.

MS. DEXTER: And so you would go through a process similar to the one we were just discussing with the lethal temperatures, where one is sort of preferred as another, or you take the -- if you have multiple values then perhaps there --

MR. YODER: We talked about this morning, and what I recall is that we had a -- I believe we preferred the final preferendum. And if it was lacking, then we

went to some other.

MS. DEXTER: I know I'm the one that asked that question before, and I just wanted to make sure that I --

MR. YODER: I thought I remembered.

MS. DEXTER: I just didn't want to -- I didn't know if the condensed was different than what we were talking about.

MS. FRANZETTI: I agreed with you. She didn't.

BY MS. FRANZETTI:

Q. We'll jump to G3. I believe you've answered questions 1 and 2 already. No. 3, referring to Page 8 of your prefiled testimony, explain the basis for your finding, quote, "That join tolerant species are underrepresented in the thermal data base which is dominated by tolerant and intermediately tolerant species. Do you need my help in finding this, anyone over there?

MS. DIERS: I have it. I just didn't think he was looking at the right document.

MR. YODER: Well, the basis of my knowledge of what species we have that we were able to find any kind of thermal effects

data in those that went into the raw database and knowing what the tolerance guilds those species belong to. And it's also, I think, something that's become very apparent to me in 30 years of being involved in quality management is a lot of the highly intolerant species that exist in our rivers and streams are, I'll say the word, grossly underrepresented in these experimental data bases. And there's -- I don't think anybody did it on purpose. They're just extremely difficult to culture and keep in the lab. Some are hard to find, and it's a lot easier to test traditional laboratory cultured species or those that are amenable and it tends to be the more tolerant organisms are more amenable to testing, and that's where the -- that part of our science hasn't really gravitated to that. And so it's not just a problem for temperature, it's a problem for really a lot of parameters. But -- So that's the basis for my conclusion.

Q. Thank you. That clarifies the statement.

So can you go on, because in that part of your testimony we're using these phrases of tolerant, intermediately tolerant or intolerant. And they actually are also boards that are used here in the proposed use designations for aquatic life. So while we have you here with your experience, what is the basis for judging species as tolerant, intermediately tolerant, or intolerant?

A. Well, my reference to that is directly to how we assign guilds for things like the index but tear right in the membership when we defined the autocology of individual species for its application for the syntheses, that is the tolerance ranking that I'm referring to.

Q. And so can you tell us where -- what the cut off is for tolerant on that indeces?

A. Well, I could tell you what species make up highly tolerant, if that's what you mean.

Q. I'm sorry. I don't think I fully understand how that indeces works. It is a listing of species by these categories: Tolerant, intermediately tolerant --

A. There are five categories that -- and there are two tol -- there's a highly intolerant

metric and there's a highly tolerant metric. And so species that are inherently assigned to one of those guilds --

Q. Are you saying guilds? Spell the word.

A. G-U-I-L-D-S.

Q. That's what I thought, okay. So they're assigned to one of the guilds?

MR. SULSKI: Fraternities.

MS. FRANZETTI: You've been hanging around me too long.

BY MS. FRANZETTI:

Q. And so that's how if, for example, if a proposed rule used the phrase intermediately tolerant species, one way I could figure out what that means is to go to these listing of the guilds and see the category called intermediately tolerant and what species are listed there?

A. Well, I need to caution you something. I don't know anything about that, what the rule says.

Q. No. I understand you. I'm asking you to assume the rule makes reference to intermediately tolerant species, as well as intolerant,

endtolerant. And I want to try to understand what that rule means. Is one way I might get some insight is to go to these same -- these are the -- those categories or titles are used to describe these guilds you're talking about in that indeces and they list, underneath those titles, all the species that are in that specific guild?

A. Yes. That's categorically the way you would do it. I would caution you, though, my definition of intolerant may not exactly match what the rule has in mind. I have no way of knowing if those are equal.

Q. I understand. I understand. I'm actually trying to figure out how does one give some clarity to the meaning of terms tolerant species, intermediately tolerant. Because I -- one person might put -- let me ask you this about the guilds. Who decides who's in what guild?

MS. WILLIAMS: They have rushes.

MR. YODER: It depends on the process, but usually this is done at the level of a state agency. And if they've developed an IBI, they have gone through that exercise.

BY MS. FRANZETTI:

Q. Oh, okay. So if a state agency has developed what we call an IBI, then they may have also -- or is it not may? They have created these guild categories? It's part of the IBI?

A. Yes.

Q. All right. And so the people at the state agency responsible for the development of the IBI create the guilds and decide who's in which guild?

A. (Nodding head.)

Q. Thank you.

A. Ideally, yes.

Q. Do you know -- given your experience working for Ohio EPA, could I ask you whether you know in Ohio EPA's IBI work, Mr. Yoder, was temperature used to establish these guilds or was it based primarily on other stressors?

A. It includes other stressors. It's more of a general tolerance. It's not specific necessarily to any one single parameter. It's more of a general tolerance environmental change in disturbance.

Q. All right. So temperature is not the

driving force for how you get into a guild?

A. Not directly, no.

Q. Okay. I think you've touched on this. I may try to rephrase Question 5 a little bit to reflect that. With respect to the intolerant species, explain what you mean by the statement on Page 8 of your testimony that available data frequently include, quote, "Single species as opposed to multiple studies for the tolerant species that -- and the single species do not always produce all of the thermal end points in the fish temperature model." This goes back to when we were talking about a bit of the bias you feel is in the database and for tolerant species and a single study may only exist for a given tolerant species. Is that correct, Mr. Yoder?

HEARING OFFICER TIPSORD: Don't you mean intolerant species, single -- single study for intolerant species?

MS. FRANZETTI: Thank you.

MR. YODER: Is this a written question?

HEARING OFFICER TIPSORD: It's Question No. 5.

MR. SULSKI: Page 12, No. 5.

MR. YODER: I'm not keeping up. Sorry. That was stated in the context of intolerant species.

BY MS. FRANZETTI:

Q. Yes. And I'm sorry. As the hearing officer corrected me, I may have misstated it as tolerant.

A. Yes. That's -- I -- yeah, that's what I said. Frequently you'll find for these intolerant species only single studies and that may not include all of the expiremental end points that might exist more frequently for some of the more tolerant species.

Q. Okay. And so for an intolerant, you may, leading to our next critical question, you more often need to extrapolate to get some of the thermal end points you want to input into your data base?

A. That's true, yes.

Q. Okay. Do you want me to keep going?

HEARING OFFICER TIPSORD: Do you think that question No. 6 in that segment has been answered?

MS. FRANZETTI: Yes.

HEARING OFFICER TIPSORD: Then, no, let's call it a day. Thank you, everyone. We're in 9040 tomorrow again.

(Which were all the proceedings had.)

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STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)

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

_____
LAURA BERNAR, CSR
CSR NO. 084-003592