BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

AMEREN ENERGY GENERATING COMPANY, Petitioner	)	
vs.	)	Cause No. PCB 2009-038
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, Respondent.	)	

THE HEARING BEFORE THE ILLINOIS POLLUTION CONTROL BOARD, taken in the above-entitled case before Ann Marie Hollo, CSR, RPR, RMR, and Notary Public for Montgomery County, State of Illinois, before HEARING OFFICER CAROL WEBB, at 9:00 o'clock A.M., on June 23, 2009, at City of Litchfield City Hall Chambers, 120 East Ryder Street, Litchfield, Illinois 62056, pursuant to notice.

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ALSO PRESENT: Susan Knowles, Esq., Ameren Services
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Roy Smogor, IEPA
Teri Holland, IEPA
Rachel Feser, intern, IEPA
Colin Clark, intern, IEPA

I N D E X

HEARING OFFICER WEBB: Good morning. My name is Carol Webb, and I'm a hearing officer with the Pollution Control Board. Joining me today are Anand Rao and Alisa Liu from the Board's technical unit. This is the hearing for PCB 09-38, Ameren Energy Generating Company versus IEPA. It is June 23rd, and we are beginning at 9:00 a.m.

I will note for the record that there are several members of the public present. At issue in this case is Ameren's petition to modify the thermal standards that apply to heated effluent discharge from its Coffeen Power Station to the artificial cooling lake known as Coffeen Lake.

The Pollution Control Board members will make the final decision in this case. My purpose is to conduct the hearing in a neutral and orderly manner so that we have a clear record of the proceedings.

If you are a member of the public who would like to speak at today's hearing, please listen carefully to the following announcements: I will call for public comment at the conclusion of the proceedings. While

your comments may include questions for the Board to consider in its final ruling, neither Ameren, the IEPA, nor the Board are required to answer your questions at this hearing. Written comments may be submitted to the clerk of the Pollution Control Board in our Chicago office. The address is 100 West Randolph Street, Suite 11-500, Chicago, Illinois 60601. And I can give you that address again at the conclusion of the proceedings. Please do not send public comments to the Springfield office. As I will further discuss at the end of this hearing, the public comment deadline will be July 13th.

This hearing was noticed pursuant to the Act and the Board's rules and will be conducted pursuant to Sections 101.600 through 101.632 of the Board's procedural rules.

At this time, I will ask the parties to please make their appearances on the record.

MS. ANTONIOLLI: Hello. My name is Amy Antoniolli, and I'm here from Schiff Hardin on behalf of Ameren Energy Generating Company.

MR. RODRIGUEZ: My name is Gabriel Rodriguez. I'm also from Schiff Hardin, and

I'm here on behalf of Ameren Energy as well.

MS. LOGAN-WILKEY: I'm Joey Logan-Wilkey, and I'm here on behalf of the Illinois Environmental Protection Agency.

MS. WILLIAMS: Deborah Williams on behalf of the Environmental Protection Agency, Illinois Environmental Protection Agency.

HEARING OFFICER WEBB: Thank you.

Are there any preliminary matters to discuss on the record? Anybody?

MS. WILLIAMS: Can I ask a procedural question from your introduction?

HEARING OFFICER WEBB: Yes.

MS. WILLIAMS: I know when you had mentioned you would take public comment that the public questions would not have to be answered today. Is this a contested case? I mean, are we treating this as a contested case proceedings or a quasi regulatory --

HEARING OFFICER WEBB: Well, it is an adjudicatory case.

MS. WILLIAMS: Yes.

MS. ANTONIOLLI: And then would the public have a certain timeframe after this hearing as to those, to submit comments? Does that end

after --

HEARING OFFICER WEBB: To submit written comments.

MS. ANTONIOLLI: Or is it up until the time --

HEARING OFFICER WEBB: Well, I'm going to set a public comment deadline of July 13th, which will be one week after the transcript is filed.

MS. ANTONIOLLI: Okay.

HEARING OFFICER WEBB: Does anybody else have any other procedural questions before we begin? Okay.

Would the petitioner like to make any opening statement?

MS. ANTONIOLLI: Yes. As I've introduced myself earlier, I'm Amy Antoniolli, and I'm here on behalf of Ameren Energy Generating Company.

Thank you, Madam Hearing Officer and the TU for being here and allowing us to present our testimony today.

We have with us today three experts who will testify to matters that we're discussing for this petition. To my right is Dr. Ann

Shortelle, a limnologist. To the right of Ann is Dr. James McLaren, a biologist. And to the right of Dr. McLaren is Mr. James Williams from Ameren, and he's the plant manager at the Coffeen Power Plant. We also have here Michael Smallwood who is an engineer in the environmental science department with Ameren. And we don't have testimony prepared for him today, but he's happy to answer questions should they arise. And Susan Knowles, who is the assistant general counsel at Ameren.

So we'd like to start by saying in this petition, Ameren seeks a modification to the specific thermal limit that was granted by the Board for Coffeen Lake in 1982. The petition for specific thermal limit is to provide a procedure that's specifically designed for discharger to artificial cooling lakes. And it allows relief from the Board's temperature limits in the way that it's adjudicatory in nature, which is the proceedings we're here at today.

The standard for review, the Board has provided specific level of justification for these types of proceedings, which is adopted in

Section 302.211 of the Board's rules. Under this level of justification, the petitioner must show that the lake is capable of providing -- provides conditions capable of supporting shellfish, fish and wildlife and recreational uses that are consistent with good management practices.

And the level of justification also requires that the petitioner demonstrate that it controls its thermal effluent in a way that's economically reasonable and technically feasible.

We've met with IEPA several times on this petition before the petition was filed and subsequently, and we thank them for taking a look at this petition so closely, and as well as the Board for having developed the substantive questions that we've already provided answers to.

And also in this specific petition that we filed with the Board, we're requesting a modification to the thermal limits that currently apply to our thermal effluent only during the months of May and October. We do not seek any changes to the limits during any

other month.

And we expect that in this proceeding, it will show that under the proposed modification, Coffeen Lake will continue to be able to support a healthy fishery and recreational uses that it currently already supports.

So with that, I will turn it over to Mr. Rodriguez to introduce the witness.

HEARING OFFICER WEBB: Before -- I just want to ask, does EPA have any opening statements?

MS. LOGAN-WILKEY: No thank you.

HEARING OFFICER WEBB: Go ahead and begin.

MR. RODRIGUEZ: Thank you, Madam Hearing Officer.

At this time, we would like to introduce each of our witnesses and have each of them summarize their testimony that will be entered into the record today. And then we'll present the entire -- all the witnesses as a panel for cross examination.

HEARING OFFICER WEBB: Okay.

MR. RODRIGUEZ: We're going to begin with Mr. Williams.

Can you swear in the witness.

HEARING OFFICER WEBB: Will the court reporter swear in the witness.

[WHEREUPON THE WITNESS WAS SWORN BY THE NOTARY PUBLIC.]

JAMES WILLIAMS, JR.,

having been first duly sworn by the Notary Public, testifies and says as follows:

DIRECT EXAMINATION

BY MR. RODRIGUEZ:

Q Mr. Williams, can you state your full name for the record please.

A James Leon Williams, Jr.

Q And can you briefly state how long you've been with Ameren and the positions you've held with the company.

A Yes. I've been with Ameren since 1986. I was a technical support superintendent at the Newton Power Station. In 2001, I transferred to Coffeen plant as a plant manager and have been there ever since.

Q You've pre-filed testimony in this proceeding; is that correct?

A Yes.

Q I am handing you a document, and I'll ask you if you can identify this document for the

record.

A Yes. This is my pre-filed testimony I submitted.

Q And that is a true and accurate statement of your testimony today?

A Yes.

MR. RODRIGUEZ: We would move for the introduction of the pre-filed testimony of James L. Williams, Jr. into the record as if read.

HEARING OFFICER WEBB: Exhibit 1 is admitted.

[WHEREBY, EXHIBIT NUMBER 1 WAS ADMITTED INTO EVIDENCE.]

BY MR. RODRIGUEZ:

Q You've also brought with you today some visual aids, have you not?

A Yes, I have.

Q Will these visual aids help you in summarizing your testimony this morning?

A Yes. They will review our current standard in our proposed standard.

Q And these exhibits are -- well, why don't you tell us what these exhibits are.

A The --

Q Feel free to stand. Oh, great.
A The first exhibit -- let me make sure everybody can see this.
This is our current standard. As you can see, in the months of June, July, August and September, we have a hundred and five degree monthly average that we must obtain, and a hundred and twelve degree max temperature with the 3 percent.
Q Let me interrupt you for a second. These are enlargements of exhibits that are attached to your pre-filed testimony; is that correct?
A Yes, these are enlargements of Exhibit 1, and the second one is Exhibit 2.
Q Okay. Very well.
Now, did you -- go ahead. I'm sorry. Go ahead and summarize your testimony for us this morning.
A Sure. As I mentioned earlier, this is the summer months that our current standard allows. And then in the winter months, we have the standard of a 89-degree average, monthly average, and a 94-degree max. And each one of these has a 2 percent or 3 percent in the summer that we can exceed those hours, but it's still part of our operating printout.

Exhibit 2 -- thanks Mike -- illustrates our proposed standard. As mentioned earlier, we're not changing our temperature limits. What we're asking for is, in the shoulder months of May and October, to have an interim limit established as we gradually go into the summer months. Still not seeing our limits, but to allow a more gradual transition into the summer months.

And in my pre-filed testimony, as I indicated back in 1997, we did seek and were awarded a variance to allow us to include the May and October time periods into a variance to allow us to operate in 1997. However, '99, there was a fish kill. There was some extreme weather in 1999. Other lakes in the state had similar issues. But that was terminated then in 1999, so we reverted back to our current standard.

Since that time, we invested $26 million in the Coffeen Station into a 70-acre cooling basin, a 48-cell cooling tower which allows us to operate more efficiently in these shoulder months. It allows to us fill the 70-acre cooling basin with water and allow it to cool at night. And then we mix it in with our mixing zone during

extreme high temperatures, as well as the cooling towers we can run 24-7 to help maintain our monthly average. However, even with that investment, during most recently, unseasonal warm temperature as well as our lake level, we were down as much as 10 feet in our lake due to the weather conditions and lack of rain. It really does not allow us to meet this standard without even derating the unit, taking the unit off, or changing my operations somehow to comply with this standard.

We have looked at other options. In the pre-filed testimony, we indicated that we can't invest around 18 million and help our cooling tower. It's a hundred and seventy-five thousand gallon permit cooling tower, but the cost is $18 million. And in the pre-filed testimony, we did an analysis on that and had about an 11 1/2 year payback. When Ameren went to deregulate it, we do analyze all of our capital expense, all of our projects. We did an EVA analysis to analyze economic benefit of such investment. Since the testimony was admitted --

MS. WILLIAMS: I think he needs to explain that.

BY MR. RODRIGUEZ:

Q Yeah. Why don't you explain for the

record what "EVA" stands for.

A Yeah. Sorry about that.

It's our economic value added. It takes into account many items to determine whether or not a project is feasible, and it makes business and economic sense.

And initially when we did the EVA, it did show 11 1/2 year payback, which meant I can invest the 18 million, and in 11 1/2 years, it would pay back on a capital -- a piece of equipment that would typically have a 15-year or capital life.

Since then, as I mentioned, we are in a deregulated environment. And we annually review all of our capital projects. And in this EVA model, it does show our forward price curves, as well as any additional environmental projects we may have. And when we reran the analysis, it does come back that it is a negative $2.7 million. So it is not economically viable.

We also did take another look at the model and wanted to look at specifically the months of May and October. The first run of the EVA, our economic analysis, we just split each month up, divided by 12. You know, what our forward price curve will be and our potential sale. And we took a

look at derates. And in May and October, around 250 megawatts is what we would be experiencing if we did have -- it's our estimate that we would see in order to comply with the current standard, what we would derate our units.

So all that was thrown back into the model and reran, which now shows a difference between what was originally submitted and in our current -- with the major factor being the forward price curves. And with the deregulated marketplace, we are driven by market conditions.

Prior to deregulation, if we wanted to invest in an $18 million cooling tower, we would present that to the Commerce Commission and hopefully be able to get that into the reg. base.

Now, in a deregulated world, we are just in -- it's the market conditions. To whatever drives the market would be how we would pay for those items.

So we reran the EVA, and it came back that it is not economically viable to install an $18 million cooling tower. Thus, we're here looking for some revisement in the standard.

We do like to consider Coffeen as a low-cost energy provider. We feel we are good

neighbors to Montgomery County. We do provide low-cost energy. So every time we would derate or take a unit off, it would require our retail customers -- we'd have to go pay the next higher price for power. So if I'm not available to run within our MISO footprint, we'd have to go back, and the next higher megawatt would be what our retail customers would be charged. So there is a benefit if Coffeen is running, and we can come up with a way to keep from derating or taking these units off.

As I mentioned, you know, Ameren is very interested in our environmental footprint in the state. We've recently installed about a hundred-million-dollar SCR, which removes -- SCR is selective catalytic reduction to remove nox. Both Coffeen units are equipped with SCRs, and they are running by design or better for nox removal. We invested over a hundred million dollars for those two SCRs. We are currently installing flue gas to desulphurization, FGD systems, which removes the SO2 over $600 million we are spending there. So Coffeen does have an environmental footprint in the state. We are proud of that, as well as we are proud of our relationship with IDNR.

We do value the lake. One of our

corporate values is stewardship. One of the things we want to do is leave the lake in a better condition than it was when we started. So all that is of value to us.

The IDNR and the lake is a great fishery. We work well as a team. And I think talking to those folks, they've had over 30 tournaments. So far, it is a great fishery. We think with this standard, what we are trying to relay is, if we can transition into these summer months, it will not be a negative impact on the lake.

And recently, it was wrote in an article that it's one of the hidden jewels in Illinois is our lake. Since that article has come out, we've had some more fishermen. So I don't know if it's hidden anymore, but it is a great fishery, and we do value that. But that is summary of my testimony.

Q Okay. Let me just ask one or two questions, Mr. Williams. You had indicated that in the new EVA that there was an assumption made about 250 megawatt hours. That would be the increase in or the maximum amount of generation you could get if you were to install this new piece of equipment; is

that correct?

A Yes, that is correct. During those shoulder months, in order to comply with the standard, I would estimate I would have to either derate, take a unit off, or change my operating methods in the equivalent of 250 megawatts in May and 250 megawatts in October, yes.

Q And the analysis assumes you would get the benefit of that entire 250 megawatts per hour for the entire month?

A Yeah. The economic value added model would assume that we would get that benefit, and that would be part of how we would help pay for these enhancements.

Q Now, in fact, do you really derate that often in May, in October?

A Yeah. We have taken units off. We have been the last unit on and the first unit off at night. We've actually taken -- derated a unit a half load, our minimum load. And, yes, I would expect to see that type of derate.

MR. RODRIGUEZ: Okay. Thank you.

MR. WILLIAMS: Thank you for your time.

HEARING OFFICER WEBB: Thank you. Oh, I'm sorry.

MR. RODRIGUEZ: Thank you, Mr. Williams.

HEARING OFFICER WEBB: Before we continue with our next witness, I just want to remind the Board that we are going to do all of the cross examinations or questions after each witness has given their summary of their testimony.

MS. WILLIAMS: Can we clarify, are these -- were these entered with Exhibit 1, these charts?

HEARING OFFICER WEBB: They're attached.

MS. WILLIAMS: So just for the record, he was referring to them as Exhibit 1 and Exhibit 2, their attachment.

MS. ANTONIOLLI: They're attachment 1 and attachment 2 to his pre-filed testimony. And if you'd like us to enter them into the record as exhibits, we're prepared to.

MS. WILLIAMS: No. The only thing I would ask at this time is whether there are extra copies of the testimony for the members of the public if they don't have any.

MS. ANTONIOLLI: Sure. Let me get all of them at once.

HEARING OFFICER WEBB: And they are also

available on our website as well if you are missing anything.

MR. RODRIGUEZ: Thank you. We'd like to present Dr. McLaren as our next witness. Would you swear in the witness.

[WHEREUPON THE WITNESS WAS SWORN BY THE NOTARY PUBLIC.]

JAMES McLAREN, PH.D.,

having been first duly sworn by the Notary Public, testifies and says as follows:

DIRECT EXAMINATION

BY MR. RODRIGUEZ:

Q Dr. McLaren, can you state your full name for the record please.

A My name is James Bernard McLaren.

Q And you are a zoologist, correct?

A A zoologist or a fisheries biologist.

Q And you've pre-filed testimony in this case?

A Yes, I have.

Q Okay. I'm going to show you a document and ask you if you can identify it for the record please.

A This document is the pre-filed testimony that I've filed.

Q And this is a true and complete statement of your testimony today; is that correct?

A Yes, it is.

MR. RODRIGUEZ: We move to admit the pre-filed testimony of James B. McLaren, Ph.D. as Exhibit 2 as if read into the record.

HEARING OFFICER WEBB: Exhibit 2 is admitted.

[WHEREBY, EXHIBIT NUMBER 2 WAS ADMITTED INTO EVIDENCE.]

BY MR. RODRIGUEZ:

Q You have also brought with you today some visual aids; is that correct?

A Yes, I have.

Q Okay. And these are enlargements from the report that you have filed and was attached to the original petition for the thermal standard?

A That's right.

Q Okay. Will these enlargements help you summarize your testimony this morning?

A They will. I've brought two enlargements. And what I would like to do is when I need them, to go up and illustrate the point that I'm trying to make.

Q Okay. Well, with that, can you now

briefly summarize your testimony this morning.

A Yes, I will.

Good morning. My name is James McLaren. I'm a fisheries biologist employed by ASA Analysis & Communication where I've worked for the past five years as a senior scientist. My office is located in Buffalo, New York. I received a Bachelor's degree in fisheries science from Cornell University in 1968. A Master's degree in science in zoology from the Pennsylvania State University in 1970, and a Ph.D. in zoology from the Pennsylvania State University in 1978.

I have over 35 years of experience serving clients in both the private and public sectors, including the Clean Water Act, Section 316(a) and (b), demonstrations for power plants and impact assessments for aquatic communities.

My firm, ASA, was retained by Ameren to analyze the potential effects of modifying the site-specific thermal standards for May and October on the aquatic community of Coffeen Lake. As has been previously explained on several instances, the proposed revisions to thermal standards are limited to the months of May and October. They are, for May

and October, a mean temperature measured at the surface monitoring location at the edge of the mixing zone in Coffeen Lake. A mean temperature of 96 degrees for the period in question and 96 degrees Fahrenheit, and a maximum temperature of a hundred and two degrees Fahrenheit not to be exceeded 2 percent of the time.

The proposed limits are intermediate between the existing summer and non-summer limits allowing the more gradual and natural transition of the lake's thermal regime from April to June and from September to November.

Now, we produced a report entitled, "Evaluation of Potential Adverse Impacts from Revised Site-Specific Thermal Standards in May and October for Coffeen Lake," dated March 2008, and it is, I believe, Exhibit Number 11.

MS. ANTONIOLLI: Attached to the original petition.

DR. McLAREN: Yes.

The approach that we used for our analysis applied the essential components of the USEPA's ecological risk assessment framework. Treating temperatures as the environmental stressor, and three game fish species -- largemouth bass,

channel catfish and bluegills as the receptors. These species were chosen to be representative of the lake's fish community.

We relied on multiple lines of evidence to asses the risk from increasing thermal limits in May and October. We performed both a retrospective and a prospective or predictive assessment of the thermal effects on the fish community.

Our investigation revealed that Coffeen Lake presently supports a balanced indigenous aquatic community and a thriving recreational fishery. The fish species populations have reproduced and thrived at temperatures that are warmer than the temperatures that are being proposed for May and October. The aquatic community has adapted to present thermal regime and would experience only marginal changes in the thermal loading during the two transition months.

Let me explain what the retrospective assessment is that I'm talking about. A retrospective assessment provides the best evidence, the strongest evidence of the long-term effects because it integrates all

aspects of the thermal environment as well as all trophic levels in the fish.

We're very fortunate, in that the basis of our analysis to have a long-term database on the fish community and the aquatic environment in Coffeen Lake data collected by the Southern Illinois University at Carbondale from 1997 to 2007, both biological and temperature and dissolved oxygen data. The data that SIU collected are the results of studies that were mandated by the Board. For the five-year thermal variance for May and October, it was granted -- issued back in July of 1997. This has been alluded to previously by Mr. Williams.

The SIU data that was collected during this time period was supplemented by data collected by the Department of Natural Resources and electrofishing Coffeen Lake during the same years.

We used the 1997 to 2004 population data to assess the fish abundance, growth, reproduction, recruitment of young and body condition of the three species in the lake. And we used water column data that came from weekly surveys through the spring and summer

and into early fall, collected by SIU at four locations within the lake. And one location, each of four segments, the recordings were made from the surface to the bottom at 1/2 meter increments.

The SIU studies focussed on the three primary recreational species that I spoke of -- the largemouth bass, channel catfish and bluegill, and thus this was the basis of information for our analysis. And we're very fortunate to have this long-term database of hard data. It's a very unusual -- for hard evidence, it's very unusual to have this kind of evidence and this amount of data collected, and the expensive program to be able to assess what the current effects are of the thermal regime on the fish.

We found that the three fish species that produced abundant, viable population through natural reproduction in the lake. From our retrospective assessment, we found in our conclusion that the lake, in its deepest portions, within the main cooling loop between the discharge and the intake is stratified nearly continually from about May or June through October and November, and is

frequently stratified in the remaining months because of the discharge of -- the thermal discharge from the plant.

There is a diversity of habitat available at any time. Thermal refuge is available outside the cooling loop and the upper part of the western arm of the lake and the large embayments on the western arm and at depths beneath the surface oriented thermal plume. The epilimnion remains oxygenated with geoconcentrations usually well in excess of 5 milligrams per liter.

MS. ANTONIOLLI: Dr. McLaren, can you give an explanation about the epilimnion for the record.

DR. McLAREN: In stratified lakes, because of the difference in the density of the water, usually because of the temperature, you have layers called epilimnion, which is above a layer called a metalimnion where there's a thermocline. There's a rapid decrease in temperature. And then the densest water remains at the bottom in a layer that's called hypolimnion.

So the epilimnion is the region where fish and possibly the metalimnion where fish would

generally remain during periods of stratification within the lake.

MS. ANTONIOLLI: Thank you.

DR. McLAREN: The resident or representative important species, the three that we're speaking about, we found exhibited abundance, growth and body condition that was comparable to or better than those in other regional or national water bodies for which data are available. We found that the survival and growth of the early life stages, the eggs and the larvae, particularly for largemouth bass, apparently are improved by the stable warmer temperatures that occur in the late winter and early spring, and are improved by the prolonged growth season that results from the thermal discharge to the lake. We found that there was no evidence of a carryover of warmer temperatures occurring during May into the summer months as was demonstrated by an analysis that we did, a correlation analysis, between degree days measured in May and degree days in June and October.

"Degree days" is not a household term, and I need to explain what that is. The degree

days is an index of heat exposure. It's commonly used in the ecological investigations and is computed as the difference between a mean water temperature for the period in question and a biologically meaningful threshold summed over a period of time. We use the daily mean temperature measured at the surface of mixing zone boundary as the index to the heat input to the lake. And we chose 60 degrees Fahrenheit as a threshold temperature because it's commonly used as a lower limit for largemouth bass spawning and for growth.

This is the very first exhibit that I would like to show. This is the regression analysis that we had done. Hopefully you have an understanding of the degree days after that. In May versus the degree days occurring in June through September. And these are the actual --

BY MR. RODRIGUEZ:

Q Jim, let me interrupt you for a second. This is figure 2-17 of your report, which is Exhibit 11 in the petition?

A It is. It's figure 2-17 of our report, and it's also an attachment to the direct testimony that was pre-filed.

Q Pre-filed testimony. All right.

A This is a plot of the degree days occurring in May against June through October. There was not a significant relationship. 2007 was a particularly warm year, and it was a particularly warm May. So there was a relationship in that year, but there are several years where we had more warm Mays, such as 1998, 2000 and 2001 where the summer degree days, the heat built up through that time was less than usual.

The reason for this to occur, we believe, is that through time, the meteorological conditions are the controlling factors of the temperature, and the temperature that occurs within May can easily be raised by the summertime temperature, the effects of the meteorological conditions.

The lake dissipates heat through surface exchange with the atmosphere. That's influenced by ambient air temperatures, relative humidity, wind and wave reaction and solar radiation.

The other part of our assessment, the prospective assessment, predicted how the thermal environment during May and October might be altered

by the revised thermal standards and how fish might react to this. It consisted of two lines of evidence. The species specific thermal tolerance and mathematical modeling of surface temperatures under conditions of high ambient air and water temperatures and full generation or heat loading.

We relied upon a model run by Sargent & Lundy. It's the Lake-T model, which is used in lakes such as Coffeen Lake. It models temperature under varying operation conditions, and it's also a model that was used for the design and operation of Coffeen Lake.

It estimated the near-surface temperatures from the plant discharge to the intake under maximum sustainable generation. That's greater than 90 percent generation capacity. And for the year that we used as the primary year -- 1987 -- the actual operation for that model was 97 percent capacity.

It also uses ambient temperatures that were derived from the national -- or ambient weather conditions derived from the National Weather Service data from Springfield, Illinois. We use meteorological data collected by the National Weather Service for 1987, and that was used to

model, to simulate the warmer than normal spring ambient temperatures. The surface temperatures were analyzed because they would represent the highest temperatures to which fish would be exposed. In other words, worst case.

From our prospective assessment, we reached the following conclusions: That warmer winter temperatures and early spring temperatures promoted earlier spawning and development of the young, especially for largemouth bass and channel catfish. This would result in the completion of the early life stages of eggs and larvae before May so that the more heat-tolerant juvenile and adult life stages would predominate during May and subsequent months under the new proposed thermal limits.

As for bluegills, they'd been reproducing successfully in the summertime at temperatures well in excess of the proposed May limits, and thus their reproduction should not be adversely affected.

Juvenile and adult fish will avoid temperatures exceeding those species-specific preferences, and this has been demonstrated by past studies of fish movements and distribution in Coffeen Lake. And this is referenced in our report.

Temperatures much cooler than at the surface of the discharge zone are present at depths and in the remainder of the lake. For example, temperatures at depth in May can be as much as 18 degrees Fahrenheit cooler than at the surface, and in October, 13 to 14 degrees Fahrenheit at depth cooler than at the surface. And typically the temperatures at the intake on the western arm of the lake can be as much as 10 or 15 degrees cooler than in the discharge zone. So there's a progressive cooling, obviously, of the water as it moves from the discharge to the opposite end of the lake in the 4.1 meter -- or 4.1 mile loop.

A fish can take advantage of natural and power station related diol (phonetic) cycles and lake temperatures that can be on the order of 3 or 4 degrees Fahrenheit. If necessary, they can take advantage of being able to recover from short-term stresses at the warmest temperatures during the time period when daily temperatures are lower.

And studies that were conducted in 1998 and 1999 by SIU have shown that largemouth bass can temporarily occupy suboptimal or temperature or DO water as necessary, and are physiologically adapted to do so to optimize their environment.

These studies also have shown, demonstrated or at least indicated that these largemouth bass in Coffeen Lake may have evolved a higher heat tolerance than in other populations. And this is being demonstrated by the preferred temperature that these fish, sonic tagged fish were found within the lake during the summer.

Modeling has shown that the revised limits allow a more gradual increase in temperatures and are rapid within days convergence with predicted June and November temperatures.

Now, this is the Sargent & Lundy model that I was speaking of. And it is -- I don't have a pen, my pointer.

This is the Sargent & Lundy Lake-T model that I was talking about, which we used to be able to -- under the absolute worst conditions during the months of May and October, what temperatures would be experienced within the lake. And this is a plot of the temperatures under the current, which is the dotted line and the proposed thermal limits for May and October. And, again, this is Figure 4.4 of our report and also an attachment to our pre-filed -- my pre-filed testimony.

Q That's 4-4, figure 4-4 to your pre-filed testimony.

A Yes, that's right.

And as illustrated here, under the current limit, there's a rapid -- there's -- with the model, it demonstrates with using full capacity, these are the worst-case conditions. There can be a very rapid increase in the water temperature at the end of May when you transition from the non-summer to the summer limits. And this can be a very stressful thing, and it certainly is not a natural situation.

Under the proposed limits, you can see that it is a more gradual -- albeit, it does jump up and down on the basis of the meteorological conditions on the data from 1987, the date that that occurred. And this, again, is for October where there can be a rapid decrease, but this is the increase that would occur in the worst conditions in October. When I say that, the evidence, that there is not a carryover of temperatures and a rapid convergence from the model ran under from June throughout the summer under the existing conditions. So you can see that the temperatures converge very closely, even though the temperatures are warmer in

May, within a matter of days. The time that the water is required to circulate from the discharge to the intake, the traveling time, within a matter of days, there's a convergence of temperatures under what would be existing or will exist in the existing thermal limits. And the same is rapid conversion here in October.

So this, the evidence that we get from the model corroborates the evidence that we were looking at in terms of the regression of degree days in May versus October, June through October, and that there would not be a carryover of the warmer May temperatures.

Now, fish kills have been a special concern in Coffeen Lake in the past. Fish kills in the past have occurred on occasion during times of abnormally warm summer temperatures or unusual meteorological conditions. But from the years of data from 1997 to 2004, the data collected by Southern Illinois University, they've been able to find no detectable long-term effects that these fish kills have had on the fish population. And, in fact, that the fish losses during these events would represent a very small fraction of the affected populations. We are convinced that the fish kills

are unlikely to occur in May and October since the conditions that have caused previous fish kills in terms of temperature or dissolved oxygen concentrations would not occur during the months of May or October.

Also the station has adopted several measures to avoid conditions that might have been responsible in the past for fish kills. As Mr. Williams had explained, since the year 2000, there's been an installation of a 70-acre supplemental cooling pond, installation of a 48-cell helper cooling towers, and there's been intensive monitoring of water temperatures in the cooling loop. These measures should eliminate or greatly reduce the occurrence of fish kills.

In conclusion, from multiple lines of evidence in our investigation, it indicates that the proposed limits for May and October do not present an appreciable risk to the fish community, lake community and the fish populations. Also there are areas in the lake that provide temperature and dissolved oxygen concentrations that can serve as refuges, if needed, but we don't expect this to be needed because the changes in temperature would be marginal in May and October.

MR. RODRIGUEZ: Thank you, Dr. McLaren.

We would now like to introduce Dr. Shortelle.

Would you please swear the witness.

[WHEREUPON THE WITNESS WAS SWORN BY THE NOTARY PUBLIC.]

MR. RODRIGUEZ: And I'm keeping a list here of words for the court reporter that we may need to, at the next break, help her with some of the spellings.

HEARING OFFICER WEBB: Good idea.

ANN B. SHORTELLE, Ph.D.,

having been first duly sworn by the Notary Public, deposeth and saith as follows:

DIRECT EXAMINATION

BY MR. RODRIGUEZ:

Q Dr. Shortelle, can you state your full name for the record please.

A Ann Burquist (sp) Shortelle.

Q And you are a limnologist; is that correct?

A That's correct.

MR. RODRIGUEZ: We'll add that one to the list.

Q Can you briefly summarize your

educational and professional background for me.

A Yes. I have a Bachelor's of Science in Biology from Mercer University, and I have my Ph.D. in limnology from the University of Notre Dame. I have worked in consulting for about 24 years, 20 of those years with MACTEC Engineering and Consulting. I'm currently a chief scientist with MACTEC.

Q And you've pre-filed testimony in this case, have you not?

A I have.

Q I'm showing you a document, and asking you if you can identify it for the record please.

A Yes.

Q And what is this document?

A This is my pre-filed testimony with its attachment.

Q Is this a true and complete and correct statement of your testimony today?

A Yes, it is.

MR. RODRIGUEZ: I'd like to introduce for the record the pre-filed testimony of Ann B. Shortelle, Ph.D. as fully read.

HEARING OFFICER WEBB: Exhibit 3 is admitted.

[WHEREBY, EXHIBIT NUMBER 3 WAS ADMITTED INTO EVIDENCE.]

BY MR. RODRIGUEZ:

Q Dr. Shortelle, you've also brought some visual aids with you today as well, have you not?

A Yes, I have.

Q And these are enlargements of exhibits that are contained in your report?

A Yes.

Q And your report was attached to your pre-filed testimony; is that correct?

A Yes, that's correct.

Q And I would like to ask you now if you could summarize your testimony this morning using your visual aid.

A Yes, I will.

MACTEC was engaged by Ameren to evaluate the effects of the proposed modifications to the current site-specific thermal standards on phosphorous and mercury. The issue is whether the proposed change would result in significant increases in internal or within lake phosphorous cycling or in lake mercury methylation.

And this is the report which is an attachment to my testimony that we produced that

includes all of our analyses with regard to that question.

And as a result of our analyses, we concluded that the proposed modifications to thermal limits in May and October will not result in significant increases in internal phosphorous loading or in lake mercury methylation over current lake conditions.

I'd like to start by discussing phosphorous. Phosphorous in sediments may be rereleased to lake water and can serve as a source of nutrients. This potential release is dependent upon conditions at the sediment water interface. So right where the sediment and the water meet.

The mere presence of thermal stratification, which is normally present in lakes and reservoirs that are similar to Coffeen lake and which includes Coffeen Lake, does not indicate that significant internal phosphorous loading will occur. And, in fact, our analysis showed that phosphorous and chlorophyll data from Coffeen Lake do not indicate significant internal phosphorous loading to Coffeen Lake at this time. Our report discusses this in detail, but basically in the review of the data, there are no season trends with regard to

phosphorous and Chlorophyll-a. This is a classic limnological pattern that you would observe in a lake that had significant internal phosphorous loading. There's no seasonal spike in concentration following fall turnover. Internal phosphorous loading thus is not a dominant process in Coffeen Lake.

MS. ANTONIOLLI: Dr. Shortelle, can I stop for you a minute? And would you explain what fall turnover is for the record? And also maybe a little explanation about why you use Chlorophyll-a in your analysis.

DR. SHORTELLE: Sure. I would be happy to. I'll take the latter first.

Chlorophyll-a is produced by green plants. These may be large plants that we're sort of normally used to seeing, but also very small plants in the water called phytoplankton or algae. And they respond to nutrients and grow better with more nutrients just like when we fertilize our yard and the grass grows. So if you fertilize the lake with nutrients like nitrogen or phosphorous -- and in this case, we're talking about phosphorous -- you would expect more phytoplankton to grow, and we can

use Chlorophyll-a as one of the indications of how much phytoplankton there are in the lake. And, in fact, that's one of the reasons why Coffeen Lake has been listed as impaired because it's been found by the Illinois EPA to be limited by phosphorous. And it's impaired for aesthetics and a variety of uses, all of which are related to too much nutrients, too many nutrients, too much phosphorous.

MS. ANTONIOLLI: Fall turnover.

DR. SHORTELLE: Fall turnover.

When a lake is stratified that Dr. McLaren had described to you previously, you find that the epilimnion, that upper layer of water and the hypolimnion are separated by a density gradient that persists doing the summer months when it's quite warm out. It's much cooler at the bottom of the lake. And this happens in most temperate lakes of any depth. It's very normal for mesotrophic and eutrophic lakes, productive lakes, of which Coffeen is one.

When the weather begins to cool off, the epilimnion, the upper waters of the lake, begin to cool because the weather is getting cooler, and they're losing heat. The waters are losing

heat. And eventually the temperatures in the upper portion of the lake and the bottom portion of the lake get very similar. You get a brisk windstorm or something of that nature, and the whole lake mixes in the fall. It's very classic temperate lake in its occurrence, and it's called fall turnover.

If you had significant release of phosphorous from the sediments into the hypolimnion during those summer periods of stratification, when the lake turns over, you will classically see a big boost of phosphorous that's evident when you compare, you know, immediately the phosphorous or chlorophyll levels after turnover to the stratified levels. That is not seen in Coffeen Lake.

So from that, I conclude that internal phosphorous loading is not now a dominant factor in the loading to Coffeen Lake in terms of phosphorous. It's occurring. It occurs in any lake, but not a dominant factor at this time.

In fact, review of the TMDL documents that are available suggest that external phosphorous loading; in other words, phosphorous that's

coming in from the watershed -- this watershed is dominated by agriculture. Agricultural, where they're likely doing the same sorts of things we're doing with our lawns -- fertilizing them. Then you get rain, rain washes sediments into the water body, Coffeen Lake, and with that, comes phosphorous as well.

We know that this is occurring because we can see in the areas of the lake that are closest and out of the influence of the cooling water loop, we see that phosphorous and Chlorophyll-a are highest there. And we see that that area of the lake is filling in with sediments, soils that are washing in from the watershed.

Okay. So in reviewing the TMDL that was issued in 2007, I was a little bit confused as to why there was such an emphasis on internal phosphorous loading for this lake, because it appears that it's a misconception that this is a current significant problem. And the issue, I believe, stems from an error that occurred in the modeling that was completed in the 2007 TMDL report for the lake. Some of these errors

were addressed in the recent 2009 addendum.

So the original TMDL document has put emphasis on internal loading of phosphorous that's really not supported by the data, and in fact, stems from an error in the modeling, the BATHTUB modeling. And that was lessened somewhat, partially corrected in the 2009 addendum.

I think I'd like to talk to you for a couple of minutes about what MACTEC did. We used five years of the data that Dr. McLaren referred to. The depth profiles -- that included temperature in oxygen to quantitatively evaluate the extent and consequences of anoxia or the lack of oxygen. And we did this on a spatial -- with GIS to look at it spatially to see, you know, where in the lake are we getting sediment anoxia that would be giving us conditions that would promote phosphorous flux from the sediments to the water column.

This analysis produced a series of maps. This is one of them.

BY MR. RODRIGUEZ:

Q For the record we're referring to Figure

2-18, 2-18 of your report?

A And that's on Page 2-23 if you're looking at a copy of the report specifically.

The analysis produced maps that showed the area of the lake bottom in kind of an orangey color that is anoxic right at the bottom of the water column. It is not showing areas where the entire water column is devoid of oxygen. In fact, we found no such cases at all. There's anoxia right down hugging the bottom. And this is, again, very typical and normal for productive lakes in temperate zones like Coffeen.

And there's always, regardless of month, and including the most thermally heated months of the summer, there's always oxygenating water not only in the upper hypolimnion, but in the epilimnetic waters of the lake. So there's no sense that in this lake, we have large dead zones where, you know, nothing can survive.

So for this figure, this is a representation of our analysis for May. It shows the current condition in orange. This is the area of anoxia at the sediment water interface that would be producing a higher than oxygenated flux of phosphorous into the water column of the

hypolimnion. And this sort of pinkish-red color, which you can see just in a few areas, is our modeled results if the modification in permit limits is granted. So a small change here. And in this one, this is the same lake. The same lake. Only for October.

Q Just for the record, this is Figure 2-19 of your report, which is attached to your pre-filed testimony; is that correct?

A That is correct. And it's on Page 2-24.

So, again, just enlarged today so that people can see it a little bit more readily. And this shows the conditions we're predicting. Well, current prediction for October, and then the slight additional amount of bed sediment that would be present in October if the permit change were to occur.

So let's look at this another way. This is Figure 2-20 of my report on Page 2-25. And this graph shows three different analyses of loading. The blue bars are predicted loadings of phosphorous to Coffeen Lake, annual loading, okay? The first two columns are the total loadings predicted in the 2009 TMDL recently issued. And I applied two different estimates of internal loading

based upon our analysis. One is the one that was used actually in the 2009 report, the flux rate. And the other one, a higher flux rate that I thought was more appropriate for the lake.

Using those two analyses, the incremental increase from the May and October phosphorous flux into the lake just for May and just for October, if the permit criteria are changed, is from a half a percent to 1.1 percent increase in phosphorous. I think it would be difficult to even measure this in the field. It's a very, very small amount. It's not a significant amount.

We also did our own analysis, a BATHTUB modeling, an analysis of loading, which we think is more reasonable for the lake. It is less than presented in the 2009 TMDL, because that TMDL document still includes, I think, more internal loading than is warranted. But under our analysis, the increase is still only 1.5 percent annual phosphorous loading.

Okay. I'm going to sit down for a minute. I'll be back.

Okay. I'm going to move on to mercury. Coffeen Lake is on the 303(d) list impaired for mercury. Mercury cycling is very

complicated, but mercury methylation is of particular interest in this situation because it's methylmercury that tends to accumulate in the food web and is the dominant form of mercury that's found in fish because of that.

Methylation of mercury is affected by multiple parameters, and it's not based solely on thermal stratification. So one of the things I would ask you to do first is to look at Table 3-1 in my report, which is on Page 3-4. This is a summary of mercury in fish data from state and federal studies. And in Coffeen Lake, largemouth bass were measured, and they are among the very lowest in mercury concentration, below the average for the county, for Montgomery County, and below virtually all the rest of the data available for the surrounding counties. There are only three other lakes on that table that have concentrations that are the same or below those that were observed for fish tissue mercury concentrations in those studies.

Turning now to Figure 2-3 in my report, which is on Page 3-5.

Q For the record, is that Figure 2-3 or Figure 3-2?

A 3-2.

Q 3-2 of your report. Thank you.

A This is entitled, "Illinois Largemouth Bass Mercury Concentration." So now we're looking only at mercury in largemouth bass.

In Montgomery County, that's the green bar, quite low amongst the counties shown here. And the star shows that Lake Coffeen is even lower than the average found in Montgomery County overall. There are many counties with much higher averages. And also of note, the national average for largemouth bass mercury concentration in fish filet tissue is just over half a milligram per liter. So up at this point, that's the national average. So these counties in Illinois, a lot of them are doing a lot better than that.

So the question might be why are Coffeen fish comparatively low in mercury? Well, one major factor is that one of the primary drivers, if you will, for mercury concentration in fish tissue, regardless of the cycling dynamics, is how much mercury you have in that system to begin with. You can have slightly higher and slightly lower dynamics of whether, you know, mercury cycling is going up or down, but you start with a particular amount of mercury. And that mercury is associated

with the entire watershed that feeds into that water body. That is driven in the agricultural areas of Coffeen Lake and the surrounding Illinois counties by atmospheric deposition. So if you have a larger watershed, basically you have a larger basket or capture zone for mercury to get into the lake.

We note that the ratio of watershed to lake area, which is a common metric that's used in limnology and in environmental sciences to help people understand the size of the water body relative to the size of the watershed; for Coffeen, it's a relatively modest ratio. In other words, the watershed is not large compared to the size of the water body. But we note in looking at a number of the other lakes that have TMDL, so that I could review the data, that their ratios tend to be much higher. In other words, their watersheds are larger on average than, you know, when put in a ratio sense with their water body. So they're gathering more mercury. Their initial conditions, if you will, from which to put mercury into fish is larger because of that. Obviously, the watershed size and the lake size are not changing as a result of the proposed thermal limits change.

So we find that mercury is quite low

in Coffeen Lake, and changes to the thermal standard during May and October will not increase the overall mass of mercury in the lake. The incremental effects that might occur for mercury in terms of, you know, minor changes in methylation would be similar to the sorts of magnitude we've assessed for phosphorous cycling. And, regionally, mercury loading reductions will have a significant effect. Basically about a 33 percent reduction in fish is necessary to remove the impairment. And proportional reductions are expected from decreased atmospheric loads of mercury.

So we would conclude from that, that although a change in thermal limits in May and October may have some theoretical changes in mercury cycling, they're likely not going to be measurable. And the mercury in the lake itself is low, as demonstrated by national and state surveys, and expected to remain low because the watershed that feeds the lake is of modest size compared to the size of Coffeen Lake.

So in conclusion, the proposed modifications to current site-specific thermal standards in Coffeen Lake will not result in significant increases in phosphorous loading

internally or in mercury methylation over current lake levels.

Q Dr. Shortelle, you may have done this, and it may not be necessary, but for the avoidance of all doubt, can you take just a moment to state what a TMDL is, what TMDL stands for?

A Total maximum daily load is a TMDL. Basically, water bodies that are determined to be impaired for one or more factors could be -- you know, it could be mercury, it could be phosphorous, it could be any number of water quality related standards and their uses are considered to be impaired.

Under the Clean Water Act, EPA or state-designated authorities must evaluate that impairment and develop the total maximum daily load of that constituent that the lake can actually handle, if you will. And it's composed of point source loads, nonpoint source loads, margin of safety, and you come up with a total maximum daily load. Those are published. People can comment on them. Typically if they're put out by the State, the Federal USEPA will review them and countersign them, and then they become approved. And these plans have -- or these reports have suggested plans

in them or a path forward to reduce that constituent that's causing the impairment over time. So that at the end of the day, water quality hopefully would be improved, and eventually that lake or river or stream would be off the impaired list.

Q Thank you.

Madam Hearing Officer, that concludes the presentation of the summary of the testimony on Direct. We would at this time make our witnesses available for questioning from other parties.

HEARING OFFICER WEBB: Okay. I would suggest we maybe take a five-minute break to give our witnesses a chance to perhaps find a water fountain. So we'll go off the record.

[WHEREUPON THERE WAS A SHORT DISCUSSION OFF THE RECORD.]

HEARING OFFICER WEBB: We will go back on the record.

We will now have an opportunity for the Illinois Environmental Protection Agency to cross-examine or question the three witnesses that just testified. We're going to be doing this somewhat more informally than we normally do. Questions may be directed to a particular witness or to the entire panel of the three

witnesses. Ms. Williams has also agreed that the Board's technical unit may ask follow-up questions to her questions if it's relevant at the time. So we'll just sort of play it by ear.

Ms. Williams, I'll let you go ahead and start your questioning.

JAMES WILLIAMS, JR.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q Good morning, Mr. Williams.

A Good morning.

HEARING OFFICER WEBB: Excuse me for the interruption. I'll just remind everybody that they are still under oath. Go ahead.

BY MS. WILLIAMS:

Q I'd like to start off talking a little bit about this concept of derating. Can you just sort of define for us how you're using that term, "derate."

A Absolutely. We monitor the conditions of the lake routinely. And in order to comply, we will actually take a unit from full load. Our total megawatt output net from Coffeen is 900 megawatts. So I would derate it. I would take the unit down to

700 megawatts. Thus puts less heat load into the lake, and we could comply with those standards by derating a unit.

Q So I mean, the way I'm understanding it from your testimony is, it's a pretty simple concept. It just means operating at less than something less than full capacity?

A That is correct.

Q So it could be anywhere from slightly less to zero, I suppose? And it would be considered derating? Or do you call it something different if you took it off, took a unit off line?

A If we took a unit off line, we would call that an outage, take the unit completely off. I am restricted on minimum load. I cannot go down to zero; I cannot go down to 10. On each unit, I do have a specific minimum load, again, with the technology that we have available at the station.

Q Can you explain the minimum load for each unit.

A Yeah. The minimum load for unit one -- we have two generating units. One is a 360 megawatt gross. Unit two is a 590 megawatt gross. Unit one, I can go down to 240 minimum load. Unit two, I can go down to 450 minimum load.

Q Does the Coffeen Station typically derate in June through September?
A No other reason than lake thermal. There may be specific equipment that may have issues, but typically not.
Q Do you ever have to derate in the winter months to meet thermal limits?
A None that I recall outside those shoulder months, October.
Q So sometimes you would derate in June through September, and at this time, also in May and October, but from November through April, you never derate?
A Due to thermal.
Q That you're aware of?
A That I'm aware of.
Q Just if there would be a outage or maintenance issue?
A That is correct.
MR. RAO: Can I ask a follow-up?
MS. WILLIAMS: Yes.

EXAMINATION

BY MR. RAO:

Q You said that you don't derate between during the winter months or summer months for any

reason other than the lake issues. Do you derate for any other -- related to any other, like the power demand?

A This spring was the first time, due to deregulation and the grid. There had been some maintenance on transmission lines in the state. We were derated in spring due to what we call congestion, how much voltage we can put across lines. This was the first time I've seen that type of derate. Other than fan failures or equipment failures, we would not derate.

Q So other than lake-related issues, both the units will operate at full capacity or whatever the normal capacity is?

A That is correct.

MR. RAO: Thank you.

BY MS. WILLIAMS:

Q Let's talk about that. Full capacity. I mean, you said full capacity, normal capacity. I think you've identified 950 megawatts.

A I will --

Q That's not what you're always operating at, is it?

A Yeah. The 950 is a gross, what we call 950 gross. We take some of that electricity for

auxilliary power, and we say 900 net. So the difference in those two numbers, one is a gross generation number; one is a net generation number, and the number I referred to is 900 net. It takes all our auxiliaries off of that. And the other numbers I quoted as capacity, 590 and 360, are gross megawatt numbers.

Q Now, I believe I read in the documentation that Ameren had been operating at 66 percent capacity from 2002 to 2006; is that correct?

DR. McLAREN: That is correct.

MR. WILLIAMS: Okay.

DR. McLAREN: That's from the ASA report.

BY MS. WILLIAMS:

Q Is it also correct that Ameren plans to operate at 90 percent capacity by 2011?

A (By Mr. Williams) That is correct.

Q What would you say that the capacity is today?

A I believe we are slightly under 80 percent to date.

Q And when you say "to date," you mean before 2009, right?

A Yeah, 2009, yes.

Q What was the capacity, percent capacity

before Ameren came to the Board in 1997 for variance? Do you know?

A No. I'd have to review the data. That's easily obtained. I just don't know off the top of my head.

Q Do you think it was less than 66 percent?

A I would say it was not less than 66 percent.

Q Can you explain the reason that Ameren is planning to go from, I guess, you say slightly less than 80 percent today to 90 percent in 2011?

A The capacity factors are calculated with major outages. We go in and maintain the units. Some of those years, we do have four- or five-, six-week outages. As we move forward, all of our maintenance outages should be completed, and we should be at the 90 percent capacity.

Q So you're not going to have maintenance issues that would require a shutdown after 2011?

A There's a new maintenance -- not upgrades, but, you know, we go in and repair the equipment, and we hope to gain operating capacity with those repairs. With the scrubber going in -- unit one scrubber will go in operation this fall; unit two early next year. With those, we have new ID fans

and items like that, that we would not expect to have maintenance on.

Q Would you agree that most Ameren facilities probably derate to meet thermal limits?

A I'm just aware of Coffeen. Other Ameren facilities are either on rivers. Newton is on a lake, and I'm not aware of their derating.

Q You don't believe they do, or you're not aware one way or another?

A The time period I was there, we did not.

Q And does that mean you operated at a hundred percent capacity factor?

A No. I would estimate in the 90s, but not at a hundred.

Q Okay.

A Some of that would be driven by market conditions and the ability to sell the power.

Q So by 2011 -- well, and even today, I guess, would you consider within your definition of derating to go from 80 percent capacity down to 66 percent capacity where those stations were operating in the early 2000s? That would be considered a derate?

MR. RODRIGUEZ: I'm sorry. Could you read the question back.

[WHEREBY THE REQUESTED PORTION OF THE RECORD WAS READ BY THE COURT REPORTER.]

MS. WILLIAMS: Do you understand? Do you want me to try to rephrase? Does the witness understand?

MR. RODRIGUEZ: I'm not sure I understood the time period that you're asking.

BY MS. WILLIAMS:

Q What I was trying to ask -- because I think I changed in the middle. In 2002 to 2006, according to the petition, the station was operating at 66 percent capacity, 66 percent capacity. Today we're around 80 percent-ish, right? And then in 2011, it would be 90. Let's say today, if you had to go from 80 percent to 66 percent, would you define that as a derate?

A In the deregulated environment, yes, that would be a derate. In order to be profitable, I would want to be in that 90 percent to be able to sell my power at the lowest cost to our customers. And if I was at 66, I would consider that a derate.

Q Okay. In the Sargent & Lundy report that was Exhibit 15 to the petition, they had a fact I just wanted to verify with you. They stated that

the original limits for this station were based on a thousand megawatt station at 60 percent capacity factor. Do you agree with that? Did I say 60? At a 70 percent capacity.

A I believe early S & L designed criteria did use 70 percent capacity.

MS. ANTONIOLLI: Also to note, we don't have the other Sargent & Lundy report here with us today. If there's specific questions regarding this report, we can try to have a follow-up.

MS. WILLIAMS: Okay.

Q They also state that the plan is to go to 1,026 megawatts; is that correct?

A I'm not sure of the thousand twenty-six megawatts, but, yes, there is an increase in megawatts, yes, for that study.

Q For the study?

A We looked at what upgrade could be done to enhance the throughput and primarily in the turbines. But that number today, I would not agree with.

Q Let me read to you what it says and see if you agree with this statement that they make. I'm looking at Exhibit 15 now to the petition. And the

pages are not numbered. Well, sort of numbered. There's a -- oh, okay. They are numbered up here. 5 of 13.

And the second paragraph of text, it states, quote, "Future growth electrical output of the plant, including burning a higher percentage of Illinois coal, and steam turbine and induced draft fan upgrades is expected to be 1,026 megawatts."

A Yes, I agree with that statement.

Q Can you explain these upgrades that he's referring to?

A Yes. At the time of the study, there are some turbine higher efficiency. Without additional steam flow, you can obtain the additional megawatt output. And it would include those upgrades in order to get to the thousand twenty-six.

Q So I'm not sure I'm understanding your answer. Do you mean these were upgrades that were considered, but are not being done right now?

A All of those upgrades have not been completed at this time.

Q Okay. Are they still planned?

A Yes.

Q Okay. Thank you.

Were you involved at all in the 1997

variance petition before the Board?

A No, I was not.

Q Have you reviewed the Board's opinion in that?

A Yes, I have.

Q Is it your understanding that Ameren argued in that case that installation of supplemental cooling was economically unreasonable at that time?

A I don't recall that statement.

Q Do you agree that Ameren installed supplemental cooling subsequent to that proceeding?

A Yes.

Q How often is supplemental cooling used at the Coffeen Station?

A It's used daily during the summer months and shoulder months.

Q Daily meaning every day?

A Yes, ma'am.

Q And for how many hours a day?

A We have two operating models. To protect the upper limit, we will fill the basin during the day, shut those pumps off and allow it to cool overnight, and then use the basin then during the peak time of the day to go into the mix zone. If

our average is what we're trying to work with, then we will use it around the clock. Both methods, the basin is in use around the clock. The pumps would not be running, and one would, but we are still using the basin as residence time to allow additional cooling before we open up the pump or turn the pumps on and put it into the lake.

Q Okay. Let's talk about the helper towers now. Is it one tower?

A We have 48 cells. It's basically three towers or three chains of towers.

Q And how often is that tower used?

A During those same periods, shoulder months and summer months, with the exception of maintenance, they'll be running daily.

Q For the entire day?

A Yes.

MR. RAO: Can I ask a follow-up question?

MS. WILLIAMS: Yes.

EXAMINATION

BY MR. RAO:

Q In your testimony when you talk about this 48-cell cooling tower, how does this cooling tower compare with the helper towers evaluated by Sargent & Lundy as compliance alternatives in terms of flow

capacity?

A I know the additional towers, the new proposed is a hundred seventy-five thousand gallon per min tower. Without looking, I don't know the capacity of the three, of the 48-cell tower we have.

Q Okay. Do you think it's higher than the output towers or maybe lower?

A I really don't know. I'd have to look.

MR. RAO: Thank you.

BY MS. WILLIAMS:

Q On Page 2 of your testimony, you state that, quote, "The need for relief is greater now than it has been in the past due to more frequent high summer temperatures especially in periods of low lake levels." What do you mean by more frequent high summer temperatures, and what data do you have to support that?

A As I think the testimony has indicated, the past few summers have been extremely high. Lack of rain -- that our lake was 10-foot low until late last fall that we started actually getting lake level. Today, we are overflowing, or we were last week. It stopped today or yesterday. But so the data we have is the meteorological data as well as the lake level indications we would have.

Q So you're using lake level as an indicator of ambient temperatures?

A We were using lake level as heat dissipation. Heat dissipation is your surface area of the lake, and as the lake level goes down, you lose surface area and that affects our cooling ability as well as throughput through the lake.

Q But what causes these periods of low lake levels?

A No rain.

Q Is that the only causes as far as you know?

A We do have internal losses. You have losses, seepage, just internal, but the capacity is not that great. So mainly it's primarily due to lack of rainfall.

Q Next I'd like you to explain the last sentence on Page 3 of your pre-filed testimony, and I'll read it to you.

Quote, "Incurring substantial additional costs for enhanced cooling technologies investigated beyond those investments already made by the company is not economically reasonable, as none of these alternatives would provide a substantial environmental benefit." Can you explain

the economic reasonable analysis here?

A Yes. As I mentioned in my testimony, we use the Economic Value Added model. It reviews the assumed megawatt gain. It looks at the future price curve. It looks at our cost for electricity to make. We look at all of our depreciation. It runs the whole economic model of the investment.

And when I mentioned it's not economically feasible, it shows a net present value of a minus $2.7 million to do this project. And that's with the $18 million cash outflow, outlay, and that is put into the model. So all those assumptions are run and looked at economically whether or not it would be feasible to do the project.

Q So it will cost $18 million to build the towers, the cooling towers?

A The hundred seventy-five thousand GPM unit, yes, ma'am.

Q Which is the largest of the three considered? Or was I correct?

A I'm not familiar with the capacity of the existing towers.

Q There are a few areas where I've noticed kind of documents or models or concepts that are

referred to that I don't know that I can find in the record, and this is one of those. So there was some economic information provided with the petition, but I don't believe I could find anything in the record regarding your updated analysis. Am I correct in that?

MR. RODRIGUEZ: You mean the written analysis? Are you asking about a written analysis?

MS. WILLIAMS: I'm asking about -- there was a change in Ameren's position between the filing of the petition and the filing of the pre-filed testimony. So I didn't find any documentation of the basis for that change of opinion. I mean, you've explained it, but I didn't find any numbers, any runs of the model, any report.

Q Is that correct? It's just your narrative?

A No, that is correct.

MS. ANTONIOLLI: Right. We provided an explanation. No charts to contain the numbers.

MR. RAO: We had the same question, too. We didn't find that information, and I have this question here about whether there is an

analysis updated that's not part of the record. If so, would it be possible to provide it?

MR. RODRIGUEZ: We can do that.

EXAMINATION

BY MS. LIU:

Q But to put it into context, you threw out the number negative 2.7 million. That means it's not economically viable. At zero, does it become economically viable, or does it have to be a positive number?

A I'd have to review that, but you'd want it to be a payback period before you'd make an investment and lose $2.7 million through the life of a cooling tower is what that analysis would show. Before the life of that cooling tower, I'd have to -- I'd lose money there, and plus the cooling tower would be at the end of its life. You'd make -- that's what this analysis would take into account, the full life expectancy of the cooling towers. So, yes, that's correct.

MS. LIU: Thank you.

BY MS. WILLIAMS:

Q Just to follow up on the Board's question. Do you believe that's the economic reasonableness test that the Board should consider

whether or not Ameren can make a profit off of the installation of the treatment technology?

A No, I don't believe the profit. It needs to be a payback to be economically viable.

Q So it needs to be zero before it's considered economically reasonable by the Board?

A Yes, and it would be considered, correct.

MR. RAO: Ms. Williams, before you move on, outages and this derating, are we still on that?

MS. WILLIAMS: I think I'm done with derating. I have more economic questions.

MR. RAO: I have one question.

EXAMINATION

BY MR. RAO:

Q Mr. Williams, on Page 3 of your pre-filed testimony, you note that one of the ways Ameren complies with the thermal standards is also by, you know, scheduling plant outages or extending forced outages during those shoulder months. Could you explain for the record how many times Ameren has relied on planned outages or forced outages to comply with the standards since 1999?

A The specific number of times, I couldn't accurately tell you since '99. I do know frequently

we have to take a spring outage, and more frequently in the October period, we would take those outages. I know for the past three or four years, we have taken outage in those months. Early in 2000, I'd have to go back and review. By knowing the past few years, we've done that, taken those outages.

Q With these planned outages, is it something that you do every year with both the units?

A No, it's not. If we have known issues, you know, we'll get -- we're tying the scrubber in, we'll have a short outage, we will do maintenance. Sometimes that may be one week, two weeks, or we can tie it into a forced outage. When we have capital improvements that would require a unit to be off, it would have a scheduled outage, but it's not routine. I would say every four or five years, a unit would be expected to be off for four to five weeks. Other than that, it would be short planned outages in the spring and fall. Unless there's large capital projects or the turbine upgrades, we would not have a scheduled outage in those periods. And as well, you know, it is market driven. When the weather gets hot, we're expected to produce. So the timing is tough as well.

Q So if you do have these planned scheduled outages, if you want to schedule it during the shoulder months, are there any operational concerns? Or is it purely that financial concerns about meeting the demand during those months?

A There are -- depending on summer versus winter, I mean there are some operational issues with temperature. I wouldn't want both units down in February and freeze up plant water systems. Typically in the spring, there would not be a problem operationally to be off, other than the market conditions.

MR. RAO: Okay. Thank you.

BY MS. WILLIAMS:

Q You state in your testimony -- I think it's on Page 5 -- that you call Coffeen a lower cost generator of electricity. Can you explain who you are lower cost than, or how you are determining that you are a lower cost generator?

A Absolutely. Ameren Energy Generating is part of MISO, the Midwest Independent Supply Organization. Each day we bid in our price by 9:00 o'clock this morning for tomorrow, and I'm not aware of their prices. I do know if I'm picked up and running, I am cheaper than other units that are

off. So it's real imperative that when I bid in those days, I am bid in such that I will be running. Coffeen is pretty much ran as a baseload unit, which therefore would surmise that I am at a cheaper cost than our competition. I do not know their prices.

Q Why don't you explain that term, "baseload generator."

A We're running all the time. With the exception of the congestion issue that we discussed a few minutes ago, Coffeen had been expected to be running all the time. Unless there was a forced outage, tube leak, we would be expected to run, turn the unit around and come right back up and supply the grid with power, which would tell us we are one of the lowest cost providers. And when we're not running, the Midwest Independent Supply Organization, they would go pick up the next higher cost unit. Therefore the price retail would be higher.

Q So do you think this increase in capacity, is that a reflection of you being a lower cost generator, the ability to operate at higher capacity?

A The plant has always been -- has been at the ability to run with the higher capacity without

the exception of these maintenance outages. There are times when we have ran at higher capacities during the summer. We will run 90 plus capacity. When we schedule these large outages, it does take away your hours, and your capacity is lower. So we would have been able to run at those capacities prior as well, and now it is market driven.

Q And the way you've described the MISO process, you can't, as you sit here today, tell us you charge less per kilowatt hour than the another, quote, "power plant" in Illinois per se?

A Just internal to my organization. I do not know what external companies prices are.

Q So would you say you're a lower cost generator than other Ameren facilities --

A Yes.

Q Than all other Ameren facilities in Illinois?

A No.

Q Who would be lower?

A The Newton plant would be lower.

Q Are Coffeen and Newton the lowest?

A Yes. And that's really driven by fuel price and transportation costs, not operating ability, is the difference between Coffeen and

Newton. Our transportation costs for fuel is higher than it would be to get to Newton. Operating wise, we're real close.

Q And how many plants does Ameren own in Illinois?

A We have Hutsonville, Meredosia, Grand Tower, Newton, Coffeen. And then we have two, the former Soko (sp) plants, Edwards and Duck Creek, coal-fired plants. So how many was that?

Q I don't know, but that's quite a few.

Does Ameren believe that the cost of them installing the flue gas desulphurization and selective catalytic reduction technology is economically reasonable?

A I do not think so.

Q Because?

A We're over $600 million for SO2 removal, mandated we put these in.

Q But it was an investment that the company made to comply with Board requirements?

A Yes.

Q Is that correct? Can you tell us -- well, I think I'm going to move off of that.

MR. RAO: I have a question about the cost.

EXAMINATION

BY MR. RAO:

Q On Page 4 of your testimony, you note that since the analysis made by Sargent & Lundy in 2007, the market prices for capacity and energy had fallen considerably. Can you speculate why that's happened? Or if you can answer more definitively, that's fine, too.

A Well, if I knew the real reason, I'd be other places right now. Typically, what I look at -- and this is just myself, you know -- gas prices, natural gas price, a lot of things that drive power prices, and we go out and look -- it's almost a commodity where you can track and trade. And it is shown that the power prices have continually dropped, and I think it's driven more by the prices of energy.

Q Do you think this trend is going to continue in the foreseeable future?

A I think in the near future, yes. I hope it does pick back up as the economy picks up. I think that's a driving factor as well. But, yeah, our models do indicate that we hope it does pick back up, yes.

Q So does the model kind of account for any,

you know, change in terms of the costs, or you know, the prices are increasing all the time? Or when you read it, this analysis, was it just reflecting that the prices are going to go down in the future?

A No. The data that I reviewed of the model does show increase in future price curves. It does take that into consideration, as well as some allowances for CO2 in future environmental prices. So it does take that into account.

Q Okay. And in this report that you would be submitting in the future, it will explain all this information that was put into the model and explains the analysis?

A It will have the data in the model that shows what those prices would be, yes.

MR. RAO: Okay. Thanks.

BY MS. WILLIAMS:

Q As you sit here today, can you tell us the difference in price that resulted in the change, in your opinion, in your testimony? So what was the price that the original report was based on versus what you looked at and submitted your pre-filed testimony?

A Not without looking at the analysis. I do not have that off the top of my head.

Q Can you tell us why Ameren chose not to raise the level of Coffeen Lake by 3 feet as indicated in the 2007 TMDL?

A The part that I'm aware of is, it was pulled due to the fact that we are reviewing the dam at Coffeen. Does it make it a higher class dam? And we're reviewing the engineering behind that, what modifications need to be done. So it's pulled to continue engineering on that. It just has not been resubmitted right now.

Q Are there plans to resubmit that in the future when that's completed?

A Potentially. I'm not aware of when that would be.

Q Or "if"?

A Or "if," that's correct.

Q Can you explain why Ameren is seeking to pump water from Shoal Creek and how much additional water will be pumped?

A Briefly, we are looking to be able to pump from Shoal Creek the FGD, the flue gas desulfurization, scrubbers that we are putting in, utilize water from our lake. It's estimated, full load, around 2 million gallons a day draw on the lake. Therefore we need to be able to pump capacity

out of Shoal Creek in the high-flow periods.

Q Do you know how much do you plan to pump?

A It would be an estimate. I'm not for sure what the total capacity is. What we're looking at is being able to pump in the spring. And when you have flow in the East Fork Shoal Creek, I'm not sure what those capacities would be or estimated at. You know, the studies we've looked at during normal weather conditions, it would be sufficient to support the 2 million gallon drawdown annually. The 2 million gallons is daily.

Q Okay.

A But we have to look at the East Fork Shoal Creek on an annual basis just because it does not flow all the time. So we are looking at annual flow through that creek.

Q What impact will the need for 2 million gallons a day have on the lake levels and temperatures?

A Okay. Can you repeat that question please?

Q So we have described the need for -- if I am paraphrasing your testimony correctly, the need for an additional 2 million gallons per day?

A That's correct.

Q And that 2 million gallons per day would be needed for what? Let's go through that again.

A Okay, yeah. I understand your question now.

Yeah, the 2 million drawdown, we will need to maintain lake level to cool the plant, as well as -- you know, it depends on meteorological events. Are we going to have a hot summer? Are we going to have a drought? So I can't really give you an answer on what our expected temperature losses would be. You know, are we going to have a lot of sun one summer and no rain? But, no, the lake and the level would be needed for capacity to cool the plant as it is designed and intended to do.

Q I guess is your answer there would be no impact on lake levels from today? I mean, is that the answer?

A I can't say that. I don't know how much rain we're going to get in the month of May, October.

We are going to take an additional 2 million gallons a day from Coffeen Lake for the scrubber operation. Now, if we have enough rain to cover that, and what we can get from potentially from East Fork Shoal Creek, we would not expect a

negative impact on the lake level barring normal weather conditions.

Q And then so you're going to take 2 million gallons per day from the lake? And annually from Shoal Creek, you plan to take 2 million? You didn't say 2 million gallons annually?

A No, no. I do not know that. I don't know what the capacity in a given period would be from the lake.

What I'm trying to say is, the study we've done and looked at for East Fork Shoal Creek under normal weather conditions, normal rainfall amounts, the amount of capacity we can gain from East Fork Shoal Creek during its periods where it does have flow, and our normal 2 million gallons a day use for the scrubber, will maintain our lake level. Now, once we get into a higher drought period, we may lower lake level.

MS. LIU: May I follow up?

EXAMINATION

BY MS. LIU:

Q What happens to the 2 million gallons? Do you treat it and put it back into the lake? Or does it go to a sewage treatment plant? Or does it

evaporate?

A Most of it is evaporated. Once -- and real quick, our FGD is a Hitachi design, what I call a shower versus the BATHTUB scrubbers. It is a shower. We spray this limestone slurry on the gas as it comes up. The slurry then is collected at the bottom of the absorber, and then we will pump it across the road and dewater. So we will dewater some of that and bring it back in. Most of the losses will be during evaporation. We're applying this slurry into our gas treatment and will be evaporated, correct.

BY MS. WILLIAMS:

Q And the water that is returned in the plant will go?

A That will go back into the lime slurry into the absorber.

Q So it's a closed loop?

A Yes, ma'am.

Q Do you agree in the 2007 SIUC study, there was a reference that stated that the mean monthly temperatures in 2003 to 2006 in Coffeen Lake were higher than in 1999. Do you agree?

A I'd have to go with what the data said. I would agree with the data.

Q Could this be due to an increased production we've just talked about?

A It could be due to a number of factors, including weather conditions, lack of rainfall. It could be one of the conditions, yes.

Q Do you agree that the maximum hourly temperatures at the edge of Ameren's mixing zone in the summer months have actually been cooler since 1999? Now I'm talking about maximum hourly temperatures. So the first question was about the mean monthly temperatures. This question is about maximum. Are you aware one way or another?

A I think we've taken operational control and managed those temperatures very well.

Q Do you think that maximum temperatures can be more lethal to fish than averages?

A My personal belief is "yes."

Q What do you mean in your testimony when you say in paragraph 10 -- or when you use the phrase in paragraph 10, "environmentally acceptable"? Can you explain that term in your testimony?

A What I was referring to in that case was an acceptable method of cooling, additional cooling capacity.

Q So when you say that the study concluded that modifying the limits in May and October is proposed by Ameren is expected to be environmentally acceptable, that's what you mean when you just testified?

MR. RODRIGUEZ: I think you're misstating it. I mean, paragraph 10 is reciting a statement out of her conclusions drawn by ASA. He's not making a judgment on his own in paragraph 10.

MS. WILLIAMS: He's just quoting?

MR. RODRIGUEZ: The ASA study concluded something.

MR. WILLIAMS: That would be Jim.

JAMES McLAREN, Ph.D.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q Can you go ahead and define -- do you think that's a quote in your report?

A I'd like you to repeat the question please.

Q Mr. Williams' testimony states that the ASA study concluded that modifying the limits in May and October, as proposed by Ameren, is expected to be environmentally acceptable. He's not citing to a

page or a quote, but he's summarizing your report?

A Yes, I would agree with that.

Q And how did you define that term "environmentally acceptable"?

A Environmentally acceptable, in many senses, but mostly relying upon the historic information that we have on what the lake regime, the thermal regime has been, and the fact that we're dealing with temperatures that are lower than experienced for the full summer period, we see no reason why it shouldn't be environmentally acceptable. Historic data has shown that the lake has adapted and is functioning at these temperatures.

MS. WILLIAMS: I think I have quite a few more questions in this area for Dr. McLaren, but I'll move on until we get to his questions.

JAMES WILLIAMS, JR.,

CROSS EXAMINATION

BY MS. WILLIAMS:

Q In paragraph 11, Mr. Williams, I'm going to read you another quote here. It says, "If adopted, these limits would more realistically reflect the natural thermal environment where temperatures fluctuate daily or weekly while

increasing in the spring or decreasing in the fall."

Would you say that 89 degrees Fahrenheit reflects background winter water temperatures anywhere in Illinois?

A I wouldn't know what other lakes are. I mean --

DR. McLAREN: That sounds like a question that I should probably answer. Should I restate that? Or would you please?

MS. ANTONIOLLI: I would object on the ground of relevancy. I think we're talking about Coffeen Lake here.

BY MS. WILLIAMS:

Q What I'm trying to get at -- and that's fine. We can move on, but the statement is that it will realistically reflect a natural thermal environment. So I think my question is getting at, do you think that even the winter limits that Coffeen is subject to in any way attempted to reflect a -- realistically reflect a natural winter environment?

A My statement reflects that if I have a gradual increase in May versus a sharp increase June 1, it would be a natural progression of temperature of the lake.

MS. WILLIAMS: I think that's a good transition to a few questions that I have about your permit limits. Why don't we move on to that topic unless you have anything.

MR. RAO: No.

BY MS. WILLIAMS:

Q Okay. I'll start -- I'm going to kind of walk through the thermal limits, which are contained in your NPDES permit, which is Exhibit 1, to the petition. And the first question that I have about that is that -- well, these limits are contained in special condition 5, correct?

A Correct.

Q And one of the requirements is that Ameren take measurements at the outside edge of the mixing zone; is that correct?

A That is correct.

Q Can you describe to us where those thermal measurements are taken.

A Yeah. We have a mixing zone acreage right outside the discharge that's measured at that point, 26-acre mix zone.

Q And I believe you provided a map to the Board in your response to their questions. I think it was Attachment A that drew a little line --

MR. RODRIGUEZ: I don't think he did, but Ameren did.

BY MS. WILLIAMS:

Q Oh, Ameren did. Have you seen the map that I'm talking about?

A I don't believe so. I've seen maps, but I have not, the one you're referencing.

MS. WILLIAMS: Do you mind if I show him this?

MS. ANTONIOLLI: Go ahead.

MS. WILLIAMS: I'm showing the witness a document marked attachment A, revised Coffeen site diagram.

MR. WILLIAMS: Okay.

BY MS. WILLIAMS:

Q And I believe that there are three white lines marked on that map that are identifying mixing zone edge; is that correct?

A That is correct.

Q Can you explain why there's three lines?

A I think -- I would refer -- this must have been used for the study to raise the elevation 3 feet. If you raise the elevation, you will have more capacity. So the closest to the discharge would be the 593 level, and then our normal pool of

590 and then a pool of 588. And that was there to be able to run models. And if we were at 2 foot below, where would our mix zone acreage be?

Q So I think my question for you on this point is, how do you determine where the temperature loggers are placed at any given time? How do you determine where this line is?

A You do a mathematical calculation based on the slopes and the capacity and make that determination where the 26 acres of water would be. And we don't move that based on lake level being low. It would be based on our normal pool. So when we're at lake levels down 10 feet, I don't go out and move my temperature monitor. It's the site-specific per our permit. And we might be able to ask Mr. Smallwood the specifics, but that's my reference.

Q And I believe it states in the permit -- this is just sort of a clarification I want to clear up between Dr. McLaren's and Mr. Williams' testimony.

I believe that your testimony, Mr. Williams, indicates that the measurements are taken at a depth of 18 inches? Does that sound correct? Or maybe I'm just reading from the

language of the permit that says a depth of 18 inches.

A I believe that's in the permit, but I'd have to reference the permit for the exact -- I believe it's more than that, but I don't know the exact number unless someone else does.

JAMES McLAREN, Ph.D.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q Dr. McLaren, do you have an opinion on how deep the measurements are taken?

A My understanding is it's at 28 inches.

Q And can you tell me what you're basing that on, your understanding? I mean, what you think you looked at to find that?

A I believe I'm basing that on information that was in the SIUC reports.

MR. RODRIGUEZ: I'm sorry. Could you read that question.

[WHEREBY THE REQUESTED PORTION OF THE RECORD WAS READ BY THE COURT REPORTER.]

MR. RODRIGUEZ: Thank you.

JAMES WILLIAMS, JR.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q Are you familiar with the NPDES permit, Mr. Williams?

A Yes.

Q Do you have a copy of it in front of you?

A No.

MS. WILLIAMS: Would counsel agree to stipulate that the permits measurements should be taken at 18 inches? Or would you rather that I ask him questions from the permit itself?

MR. RODRIGUEZ: Well, the permit -- I think the permit speaks for itself.

MS. WILLIAMS: Okay. I don't want to waste a lot of time on this. There just definitely is some inconsistencies in the record that Ameren submitted about whether temperature is taken at 18 inches or 28 inches. So I would like maybe that to be cleared up in THE post-hearing comments from Ameren.

MS. ANTONIOLLI: We'll agree to that.

MS. WILLIAMS: I mean, it's not that significant. I just think it's an

inconsistency I'd like to see cleared up.

Q Mr. Williams, do you have any information or data about what the temperatures are within the mixing zone, what the actual effluent discharge temperatures are?

A I would have a discharge out of the main condenser temperature as it goes into the discharge flume prior to the mixing zone so I know what temperature is leaving each of the condensers.

Q And what would be a maximum for that temperature?

A Again, depending on weather conditions, we typically will have a Delta T across our condensers 20 degrees. So we would pick up 20 degrees from our intake.

Q And so you take intake measurements as well then?

A Yes.

Q And are those in the record? I don't know if I saw any intake temperature measurements in the record.

A I'm not aware of any, no, unless it's in the data. I'm not aware of it.

DR. McLAREN: It's in -- the data intake temperatures are -- we do present some intake

temperatures in our data.

MR. RODRIGUEZ: But let's clarify. Are we talking intake temperatures at the intake? Or were you asking Jim about intake coming off the condensers?

MS. WILLIAMS: He was saying that it's a 20 Delta T from intake. So I was asking about intake temperatures because I could use that to determine the effluent temperatures. I was just going to --

MR. WILLIAMS: Yeah. We will have a temperature exiting the plant prior to the mix zone.

MS. ANTONIOLLI: Also this map that we were referring to before as Attachment A to the Hearing Officer's answers -- or answers to the Hearing Officer's questions, also shows the monitoring locations on there. So if that would help, you can see where we monitor.

MS. WILLIAMS: It's up to the Board, but I would think some of that data would be helpful to be submitted as part of the record.

Q So going back to the permit itself, special condition 5 states that the thermal discharge shall not result in the temperature

which exceeds 105 degrees Fahrenheit as a monthly average, June through September, a hundred and twelve degrees Fahrenheit as the maximum for more than 3 percent of the hours during that same period. Mr. Williams, is there any limit on the absolute maximum? Do you understand what I mean by using that term?

A Any time we're over the 112, we record that. I'm not aware of a max over that.

Q You're not aware of any required absolute maximum, correct?

A No, that's correct.

Q Do you know what the highest maximum ever measured has been?

A No, I don't.

Q Do you think it would be safe to recreate in water that was 112 degrees?

A Define "recreate." Boat, fish? Yeah, there would be areas on the lake where you could recreate at, yes.

Q Areas? Other areas? Or it would be okay to be within the 112-degree areas?

A We don't allow folks in the discharge flume or in that area of the lake or toward the intake of the plant.

Q Okay. Maybe I should have asked that question first. Where is the public restricted on this map here? Where?

A On which map?

Q I'm looking at attachment --

A On the intake side -- I'm just estimating -- it's probably a hundred yards from the intake. And on the discharge side, I'm not familiar with how far that would be.

Q Would you be familiar with whether it's farther from the discharge point than the 26-acre mixing zone?

A Yes.

Q So somewhere outside the mixing zone you'll also prohibit recreation?

A That's correct.

Q I believe Ameren has referred to the eastern arm of Coffeen Lake as segment 1? Does that make sense? I'm sorry. I'll show you the map again.

Are you aware of whether public access is allowed within Segment 1 on the map of Attachment A to the answers to the Board's questions?

A I'm not for sure where on the discharge

side public access is. If it is at the mix zone, in the mix zone or outside. I'm aware of the intake, but I'm not confident on the discharge arm.

Q Okay. Thank you.

What is the limiting factor that requires Ameren to derate? The average temperatures or the 3 percent excursion hours? Do you understand my question?

A Yeah. I try to operate as to maintain that monthly average.

Q Okay. So when you're forced to derate, it's generally because you're in danger of violating those average limits?

A That is correct.

Q Either for May or for the summer months?

A And as I mentioned, we do have the cooling basin. I do operate to protect the max. You know, how I operate the basin. I do protect those max temperatures. And I can cool the water at night, and then put it in. So I do operate in the summer to protect both. I utilize the -- it's kind of tough, because we do have two operating type models. But, you know, I do use the cooling towers to protect that average. I run those all the time. And I do utilize in the summer months to protect

that max. I do utilize the basin in operating mode to protect that max. But when I'm going through my monthly average, it is typically the hardest thing for me to comply with, and that's why we operate and derate because it's tougher to bring that monthly average down toward the end of those months --

Q Right.

A -- just mathematically.

So to really answer your question, I operate both. I'm running the basin to protect the max temperature in the towers to keep my average down.

Q And, you know, typically -- and I think that the Agency typically sees these facilities have issues with excursion hours. We'll say you can only have 3 percent hours over your max, 2 percent hours over your max, and that will be a limiting factor.

Can you explain, though, in this case why if the average is primarily your limiting factor, you are asking the Board for an increase in the max as well? Would Ameren be able to operate as requested under the relief with just the average temperature changing for May in October?

MS. ANTONIOLLI: Can you provide an example of how that relief might look, be

worded?

MS. WILLIAMS: I think it would be easier for the witness if I did that.

Q And what I'm referring to is if, like, currently in the winter, it says 94 degrees Fahrenheit is a maximum for more than 2 percent of the hours, right, if that's the winter maximum?

A Yes.

Q And is that what you're asking for, is the average? I don't know. Can we put -- you know what? Would it help me to put your exhibits back up here?

A That's fine.

It would be the proposed one, Mike.

MS. WILLIAMS: You're right, Amy. It's hard to envision how that would look. I guess --

MR. WILLIAMS: I guess what you're saying on that max, you know, if my 94 max stayed the same, the proposed monthly average would be below. It would be 94.

BY MS. WILLIAMS:

Q Exactly. Well, I guess more what I'm getting at is, do you really need this hundred and

two degree max, and could something less than that be maintained and still allow the operational conditions you're looking for? Or is this the minimum level of relief that Ameren thinks they need to get the operation they want to get out of the plant?

A I believe that was the model, and that was the min. I couldn't make that a hundred and four or a hundred and three, but I believe the model has indicated that to be the min number.

Q But if you made it a hundred and one, you would still have to derate more frequently?

A There would be some operational change, correct.

Q Can you tell us about how many excursion hours Ameren takes advantage of over the course of a year?

A I don't know specifically each year. I know the past since 2002, we have not reached the 3 percent or the 2 percent.

Q Since 2002? Is that what you're saying?

A Yes. I know of -- and I don't think we did prior to that, but I'm not for sure.

You know, from an operational standpoint, whenever you get to those high

temperatures, that goes into your monthly average. So it's beneficial to keep those high temperatures down to keep your monthly. The higher I get on those excursion temperatures, the harder it is to maintain the monthly average. Therefore I try to operate the best I can to keep that, as I mentioned earlier, the monthly average down. The higher excursion temperatures you get, it drives your monthly average up, so.

Q Are you familiar with the thermal limits at Newton or any of the other plants?

A Not current, no.

Q On Page 2 of the document that was titled, "Ameren's Response to the Agency's Recommendation," Ameren states, quote, "Under anticipated operating conditions, Ameren only expects to see current temperature limits during unusually warm May or October months."

MR. RODRIGUEZ: Could you read the question back.

MS. WILLIAMS: Actually, I haven't asked the question yet. I just read from the report. So do you want me to read the quote again?

MR. RODRIGUEZ: I just hadn't caught up to you yet.

BY MS. WILLIAMS:

Q I think what I'm sort of looking -- and asking is the converse, and I think you sort of already answered it. If the Board was to increase the number of excursion hours under your current standard -- so right now you have 89-degree monthly average and 94-degree max in May and October with only 2 percent excursion hours. Would 3 percent excursion hours make a difference, or some additional number of excursion hours allow Ameren to increase production without having to ask for additional relief?

A You'd have to have Dr. McLaren explain the effects on fish, but the higher the excursion temperatures allowed would make them much tougher to maintain the monthly average. If I'm allowed to run at hotter temperatures for shorter periods of time, I've got to compensate at lower temperatures to take into account that excursion. So --

Q Right.

A -- operationally wise, it would not, in my opinion, be of benefit.

Q So your general answer about that is no different for May and October? Because May and October, as you've described, are a little bit

transitional. So there's going to be cooler nights and what have you. But you think it's still the same concept? You're going to be --

A Yes.

Q Okay. Do you know what the expected maximums will be under the proposed relief? Do you understand my question? I'm not sure I --

A No, I don't.

Q So we have -- the relief is requesting a monthly average of 96, and a max of a hundred and two, and then 2 percent, hours you could go over a hundred and two. So because the average is a limiting factor -- well, do you know what the average is expected to be at the edge of the mixing zone? Would it be right at 96?

A No, I don't know what that number would be.

Q You don't know what it would be? Okay.

Do you know what the max would be able to have and maintain that average?

A No. All I know is based on the modeling, those would be the min temperatures that we would expect under normal operating conditions and weather conditions.

Q So the modeling -- because I mean, doesn't

the modeling have some predicted numbers? So you're saying the modeling may predict what the average will be, but that is under predicted weather conditions as well, correct?

A Predicted weather and capacity factors and operating concerns, yes.

Q So that could change? That could increase the actual temperatures?

A Operationally not, but then again, if you go long periods without rain, extremely long warm periods that would be unseasonable, it would affect that temperature.

Q Do you have more issues with May or more issues with October under the current standard?

A Recently it's been more the October period.

Q And when you said recently it's been more October, does that mean prior to that it was more May, or prior to that it was more equal?

A Prior to that, it was more equal. We had issues, both.

Q And were you involved in the 2007 provisional areas --

A Yes.

Q -- request? And what led to that

situation?

A Pretty much the same issues. We had low lake levels, high temperatures, exceedingly long periods of time with high temperatures.

Q And do you recall what relief was granted to Ameren in that provisional variance?

A Not for 2007.

Q You don't recall? Is that what you mean by "no"?

A Yes.

Q Okay.

MS. ANTONIOLLI: That provisional hearing is attached as Exhibit 2.

MS. WILLIAMS: And I mean, just for the record, the variance that's attached as Exhibit 2 is unsigned by the petitioner. Is there a copy that was signed and accepted that you know of?

MS. ANTONIOLLI: I think we can provide that. We'll check that.

MR. RODRIGUEZ: If there is one, we will.

MS. KNOWLES: If there is.

BY MS. WILLIAMS:

Q If Ameren were to have an absolute max in its relief, would you be able to comply with that

operationally? So if your relief said something more along the lines of what I'm familiar with, which is shall not exceed "X" for more than 2 percent of the hours and at no time shall it exceed "Y," would you be able to fit that into your operational?

A Again, it would be dependent on weather. If I was told to comply, I would shut both units down.

Q But there must be an absolute max where you have to shut them down anyway, right, at some point to maintain your averages?

A Absolutely.

Q Okay.

A And we look at that daily, what our monthly average is and what our max temperatures are. And if we can't comply to meet our existing standards, then we either bring the units off, derate them, do whatever it takes to make sure the standard is met.

Q So that's something you can determine on a daily basis by following your monitoring over the previous days of the month?

A That's correct.

EXAMINATION

BY MR. LIU:

Q So basically the max would change depending on the history?

A That, and what our average is. If we are running real close to the 96 monthly average, and we're in October, and maybe that max is a hundred and two, maybe less than that, then we'd have to start taking action.

And that's really why the 2 percent or the 3 percent -- you know, it's a moving target for us because we must comply. So if I'm already high on -- toward the end of the month, high on my average, that hundred and two would put me over. So I can't run at that temperature. So I'd have to take action then. Even though I've got that max, and I have hours available, I still can't do it to comply with my monthly average. So I will start taking action. Bringing units off, derating them to maintain that monthly average, so.

And it gets -- you know, like I said, a couple times a day we're watching that towards the end of the second week of October. We may already be up high on toward our average. And that max, we just can't maintain that, or go over. And it really

would hurt our average. So we take proactive measures and start early in October. We rarely wait until the last week of October to do anything. We're doing things the second week of October to comply.

And you asked, you know, previously about the May. You know, we've had outages in May. So, yeah, more recently, it's been all of October has been our issue.

BY MS. WILLIAMS:

Q I believe you mentioned earlier that Coffeen Lake has been discharging recently. I don't know. Did you say it stopped? Into the creek? So normally -- is it correct that normally it does not -- the lake itself does not overflow back into Shoal Creek; is that correct?

A It hasn't in the near future very often, but it has -- since late last fall, we've had significant rainfall in the area. And we had been overflowing most of the spring into East Fork Shoal Creek from the lake.

Q Most of this past spring you're saying?

A That is correct.

Q Is there any process to monitor the temperature at that overflow point?

A I don't believe so.
Q Is there any modeling that's done that would tell you what the temperature would be at that point?
A I'm not familiar with those models.
Q All I'm trying to get at is, that part of the condition of Ameren's relief is that the temperature, when the lake does flow over, comply with the generalized standards. Now I'm assuming in most cases then, those are periods of high flow, cooler temperatures, but I was just trying to determine whether there's any way of documenting that that condition is being met.
MR. RODRIGUEZ: Wait. We don't have that condition correct.
MS. ANTONIOLLI: It's not in the NPDES. Are you referring to the NPDES permit?
MS. WILLIAMS: No, the relief. It's a condition of the relief.
MR. RODRIGUEZ: Of the relief. We don't have the relief.
MS. WILLIAMS: No, no, right. I'm not suggesting that the permits says you have to monitor there. I'm just asking the question of whether there's any way to determine.

MR. RODRIGUEZ: If the relief were correct.

MS. WILLIAMS: No. Under the current relief. Whether the condition to meet general use standards at the point the lake discharges. So anybody who gets relief under this provision must also comply with general use standards at the point their lake discharges into.

MS. ANTONIOLLI: Are you looking at the Board order granting relief?

MS. WILLIAMS: Can you hand me the -- I think it is in the Board order, but I was looking more at the requirements for -- I mean, do you disagree with that, that that's one of the requirements for an artificial cooling lake?

MR. RODRIGUEZ: If the relief were granted as the provision, and it provides that the Board as part of the relief granted, which included the condition --

MS. WILLIAMS: And then you're suggesting that the Board did not actually include such a condition?

MR. RODRIGUEZ: Are we talking -- I'm not sure. Which board are you talking about?

BY MS. WILLIAMS:

Q So when it says -- and I mean, I don't want to get it off of that.

But 302.211 (j) is very clear that all discharges from the artificial cooling lake to other waters of the State comply with applicable provisions of Subsections B through E of 302.211.

So I didn't look specifically at whether that was in the Board order or not, but I was just trying to get at whether we know through measured data whether that is accurate or not. And your answer is "no," correct?

A Yeah. There wouldn't be any relevant indication.

MR. RODRIGUEZ: And for the record, 302.211 (j) says what it says, so.

HEARING OFFICER WEBB: Ms. Williams, can I just ask you, do you still have quite a bit more for this witness?

MS. WILLIAMS: I actually just think I have a few more, but I think should be able to finish for a reasonable lunch break.

HEARING OFFICER WEBB: Okay.

BY MS. WILLIAMS:

Q I believe -- okay. Ameren states probably

in a couple places, but the one I'm referencing here is Page 7 of their response to the Agency's recommendation. That they have installed the 70-acre supplemental cooling basin and helper cooling tower. And this has helped prevent fish kills. Can you explain why? Or do you agree that that has helped prevent fish kills?

A Since we've installed and operated those two devices, I'm not aware of any fish kills.

Q And can you explain how that works? Not how the clean tower works.

MR. RODRIGUEZ: I'm going to object because I don't think that's what this paragraph says. So you may want to show it to him.

MS. WILLIAMS: Oh, okay. You don't think that's the position?

MR. RODRIGUEZ: Yeah. I don't think it says that.

MS. WILLIAMS: Yeah, because I did not quote this.

MR. RODRIGUEZ: I mean, for the record, I think the sentence you're referring to is since the installation of these enhancements? The SIUC report? Is that the sentence you're

referring to?

MS. WILLIAMS: Let's move on then. That's fine. I mean, I think the witness said he agreed that there haven't been any. So that's a little different than saying that the cooling tower has resulted in that, right?

MR. RODRIGUEZ: Right.

MS. WILLIAMS: And I think I was sort of trying to get at the same point of -- well, anyway, we'll just move on. That's fine.

I don't think I have much more. I guess I'd like to look over when we take a break and see if there might be one or two that I want to ask, but I think I'm pretty much done. Or if you can give me a five-minute break, I can look.

HEARING OFFICER WEBB: Well, let's go off the record and discuss what we want to do so you don't have to type all this.

[WHEREUPON THERE WAS A SHORT DISCUSSION OFF THE RECORD.]

[LUNCH BREAK.]

HEARING OFFICER WEBB: Ms. Williams, you may call -- you may continue with your next witness.

MS. WILLIAMS: Good afternoon. I'm going to move on to questions for Dr. McLaren.

HEARING OFFICER WEBB: I just want to remind the witnesses again you are still under oath.

JAMES McLAREN, Ph.D.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q The first question, Dr. McLaren, is have you ever been involved in any 316(a) or 316(b) demonstrations in Illinois?

A I have not. And not 316(a). I have been involved with several 316(b) studies that Ameren is conducting in the State of Illinois.

Q And at which facilities are those?

A At Meredosia, Grand Tower, Coffeen, Newton, Hutsonville.

Q Have you been involved in 316(a) demonstrations in other states?

A Yes, I have.

Q Can you tell us which states?

A Most recently in New York and New Jersey.

Q And were the studies that you reference in your CV regarding the Finger Lakes, were those entrainment type studies, or were they thermal studies?

A They were 316(b). They were entrainment impingement type studies. There was a -- I should correct that. There was a 316(a) related study in one of the -- at one of the power plants.

Q Do you know which one?

A It was the Gowdy Plant and the New York State Electric & Gas in the southern interior of New York.

Q Have you written or published any papers on thermal tolerance of fish?

A No, I have not.

Q And what areas do you consider yourself an expert?

A In fisheries science, fish ecology, fish behavior, aquatic ecology, and related -- there could be a long list, but they're all interrelated.

Q Would you consider yourself an expert in thermal tolerance of fish?

A Yes.

Q You state on Page 1 of your testimony that you are hired to conduct, quote, "an evaluation of

the potential for adverse ecological impacts from a proposed modification to the current site-specific thermal standards applicable to Coffeen Lake." Can you tell us specifically what proposed -- what impacts you looked for?

A The impact I looked for was to the biological -- the population parameters for the three key species that we've got our database for -- largemouth bass, channel catfish and bluegill. And relied upon the existing database and the literature background as to other sources of information for thermal inputs to cooling lakes.

But specifically the data themselves were what were collected by SIUC, IDNR and involved growth rates, mortality rates, recruitment indices of abundance, relative abundance, and in some cases, absolute abundance, condition factors and species composition, that sort of information.

Q When you talk about literature, did you do a literature review or a literature search? Or how did you go about researching the literature?

A I have, and my company has an extensive literature library on information like this. And when I found lead to other information, I would follow it up. I have not done a computerized

literature search, but I haven't found that necessary.

Q Can you explain why it wasn't necessary? Just because you were able to find enough in your library or what? Explain to me why.

A I did it the hard way. I did searches through journals and also the Internet searches. So if you are able to accept a literature search through the Internet, certainly I've done quite a bit of that.

Q On Page 2 of your testimony, I believe that you testified that the 316(a) technical guidance manual is merely a guide in this case because the Coffeen Station is not changing any design parameters of its generating equipment that would affect its thermal effluent discharge. Would you -- and this is not a quote. So I first will ask you if you agree that's a correct paraphrase of your testimony?

A I'd like to actually see it.

Q Sure.

A The testimony.

MS. WILLIAMS: Do you want me to show it to him?

MR. RODRIGUEZ: Which paragraph are you

talking about?

MS. WILLIAMS: Three. The first couple of sentences in three.

DR. McLAREN: That's correct. That was a proper statement.

BY MS. WILLIAMS:

Q Will the thermal effluent temperatures go up if the relief is granted?

A They may, depending on the station's need and the weather conditions.

Q What operationally will cause temperature to go up?

MS. ANTONIOLLI: Temperatures where?

BY MS. WILLIAMS:

Q The effluent.

A What we're requesting is relief for the situations when weather conditions, warm weather conditions and the requirement of additional generation would have the effect of ending up with a derating of -- a derating situation for the plant generation, so.

Q So I guess what I'm getting at here, and I'm not sure I stated my question very clear, but what I'm hearing you say is that increase in power generation would not be considered a major change in

operational mode as you're using that phrase in your testimony, correct?

A What we're asking for is a relief for the situations where -- because of situations the thermal limits could be exceeded.

Q Right.

A That's where the relief is. I'm not aware that the generation -- this is not an intent for increased generation alone.

Q Are you suggesting that the limits are being violated now?

A In the past, there have been times -- no, they're not violated, but the company, the plant has had to derate in order to not violate, and they've not violated.

Q Correct. And they've done that for many years, correct?

A Most recently it's been more important because during, let's say, within the past three years, warm spring temperatures have created the situation, and electric demand, electric generation demand have created the situation where they could be in violation if they had not taken measures to stay within their limits.

Q Do you recall our discussion in

Mr. Williams' testimony about the Sargent & Lundy report discussing the increase, the changes that are going to be made that will allow for an increase in the maximum capacity to 1,000 megawatts?

A I'm aware that that's a possibility, but I think I'm really not the person to be able to testify as to what that really entails.

Q I just want to be clear that I understand. Knowing that that's there, knowing that they will be able to operate at a higher capacity, if the relief is granted, what you mean when you say that there will not be a change to the operational mode in this case. Or actually what you say is, is not changing any design parameters of its generating equipment, I guess. So the upgrades described in the Sargent & Lundy report, you do not consider them a change to any design parameters? Is that correct or incorrect?

A My understanding is that it's not a change in the design parameters. It's a change, a potential change in the operational needs. And I'm aware that there is a requirement for additional power because of the scrubbers that are being installed for compliance with their equality.

Q On Page 2 of your testimony, you state

that Coffeen Lake supports a thriving fishery.

MR. RAO: If you don't mind, I think Mr. Williams wanted to add more to that point.

MR. WILLIAMS: The study concerning the operating of the units does not provide additional heat input into the lake, if that's your question. It's an upgrade in the efficiency of the turbines, and it allows the additional upgrade. We're not putting more heat into the lake, if that was the question you were asking.

MS. WILLIAMS: Well, that helps answer my question I think, yeah.

MR. WILLIAMS: Okay. Thank you.

MS. WILLIAMS: I don't know if I understand why.

MR. WILLIAMS: It's to do with the rotor size, the blading design. You get more use out of the work of the energy. It's the newer turbine designs. But your steam -- no more steam input is going through the unit; therefore, no additional heat load into the condenser. It's just an efficiency upgrade.

MS. WILLIAMS: Thank you.

Do you want me to repeat the question I

asked, Dr. McLaren?

MR. RODRIGUEZ: You probably need to, yes.

BY MS. WILLIAMS:

Q At the bottom of Page 2 of your testimony you state that Coffeen Lake supports a thriving fishery. And can you tell us what you mean by a thriving fishery?

A (By Dr. McLaren) The lake is supporting a great number of fishing tournaments that are in -- specifically largemouth bass, but also there's an active fishery for several other species, including the channel catfish, white crappie. I understand there are flathead catfish, white bass. So there's several recreational species.

And the fishing -- there's surveys that have been conducted by the Department of Natural Resources that actually quantify the amount of fishing pressure in the harvest. And all those show to me that it is a very active fishery. There's apparently an increasing demand, too, for the support fishery that's there, including the involvement of interscholastic teams from high schools getting the experience on Coffeen Lake.

Q Is the concept of a thriving fishery different than the concept of a balanced indigenous

community?

A Fisheries are managed, and this is a particularly well-managed fishery. They're managed for particular sport fish, more often than not. So you would look at it in terms of the importance of a particular game species that are being fished for and exploited, but also for the overall community composition. So the fish themselves that are being managed are only a component of the overall balanced community. And in all probability, you wouldn't have a strong recreational fishery if you didn't have a balanced community.

Q So do you believe there is a balanced indigenous community in Coffeen Lake?

A I think it is balanced, yes.

Q I think it's in paragraph -- yes. Paragraph 4 of your testimony, you state that recent 316(a) assessments have shown that the decision criteria from the USEPA draft 316(a) guidance is congruent with the 1998 guidelines for ecological risk assessment. Are you following --

A Yes.

Q -- the section I'm talking about?

Do you have any citations to 316(a) assessments that have shown this?

A We have conducted several 316(a) demonstrations and in the process of doing so with the general framework of the ecological risk assessment. These are what might be called gray literature because they're being prepared for our clients. And we do have published literature on the application of the ecological risk assessment guidelines for 316(b) demonstrations that our firm has published for Electric Power Research Institute. And those references could be -- well, actually they are cited here. They're 2002.

Q These are for 316(b)?

A The principles are very much the same. It's the detail that changes.

The important thing is the fact that you are looking at multiple lines of evidence and that you are identifying the stressors and the receptors and so forth. So it's a systematic framework that is designed for not only chemical, but also physical or whatever types of stressors that can be adapted.

So our efforts that we've had in the past -- well, actually, over 10 to 12 years have been in that direction, that we have adopted since the framework has come out, kinds of investigations

that would be patterned after the basic structure and basic approaches of the ecological risk assessment.

Q And I mean, what I'm getting at here, I understand that you feel that the 316(a) and the 316(b) scenarios are similar or comparable, but in this particular statement in your testimony, you say recent 316(a) assessments have shown, and then at the end when you provide a citation, it's to 316(b) document. So I'm just wondering which 316(a) assessments you're referring to in that statement.

A We have done 316(a) assessments for power plants in the New York Metropolitan Area for Key Span, now National Grid; for Public Service Electric & Gas, and several others that follow the kinds of structure that I'm talking about using the ecological risk assessment type investigation.

The ecological risk assessment was designed specifically for chemical stressors to begin with, but then the EPA has actually suggested that it could be adapted for any kinds of stressors.

Q Can you explain how you are defining the term "fish passage" in Paragraph 8 of Page 5 of your testimony? I think it says available data showed that fish passage will not be impaired by the

marginal increases in water temperature during May and October. If you could define "fish passage" for us.

A Fish passage in this case is the movements of fish within Coffeen Lake. It could be from one arm of the lake to the other. It could be from one cove of the lake to another. It could be -- it's from the surface to depths, whatever.

Q And how does the mixing zone affect this passage in this case?

A The mixing zone in my assessment is not preventing fish passage. There are studies that have been done by SIU. As I was mentioning during my verbal testimony, sonic tag studies that have shown specifically a largemouth bass and channel catfish, that fish have moved freely within the lake and commonly up to a mile or more, which is a considerable distance.

Q Do you agree that entrapment of fish has occurred in coves near the mixing zone resulting in fish kills?

A This is a phenomenon that's been described by SIU in their annual reports as a possible reason for some limited fish mortality during the few of their fish kills that they recorded. So I am

basically citing what they have said, but I would agree that this could happen on rare instances where fish are occupying a cove within the lake. And they're citing specifically within the discharge arm where they have taken refuge, but with a prolonged temperature increase, have for one reason or another, not vacated that water for temperatures in the lake better suited for their preference, their tolerance.

So on occasion, some limited numbers of fish have been killed. And I think they've cited two, and possibly three instances in the past, seven years during the periods of their study, that that might have happened. They described the fish that were in that kill as being small, less than 7 inches in length, and probably could have been or very likely could have been schooling.

Q Could have been what?

A Schooling fish.

Q Okay. Do you consider this phenomenon consistent with your definition of fish passage?

A Yes. Yes, I do. There are very few of these instances that have happened. And when they've happened, it happens once. And then after that, even though the temperatures may remain

elevated for the remainder of the summer months, there aren't any additional fish kills. So what I would interpret that as, is that it's the odd group of fish to which this is happening, and that passage has been available for the others. There's certainly a lot more fish in the lake than have been observed to be killed during these events.

Q Okay. I'm trying to understand why you consider it consistent with your definition. Because of the number? Or because of the phenomenon itself being consistent? I mean, to me, it seems that if you're describing a phenomenon where fish are trapped, and they cannot leave the cove, that would be inconsistent with protecting for fish passage. So explain to me why you don't agree.

A First of all, I don't know that they cannot, but it's evident that they did not.

Q Okay.

A And we do have our hard evidence that fish do move. Why these fish didn't move, I can't tell you. I don't know. Maybe they could have moved and they didn't. But as I was explaining, it's the rare instance, and therefore fish are -- I think there's a very ample demonstration that fish are moving to areas that they can tolerate because they do

survive, and in the long run they do very well.

Q Is it correct that SIUC concluded that the cause of these entrapments was sudden temperature rise?

A Yes, sudden and prolonged temperature rise.

Q Is it possible for a localized fish kill to occur without being detected by humans?

A Fish kills is a very ambiguous term. I'm not sure that I've ever seen a clear definition of what a fish kill is, except when it's compared to a massive kill, one of a size so as to be noticeable to onlookers.

The Coffeen Lake, during the studies that we've referred to, the SIU studies, was visited by the staff on a weekly basis. So they had a lot of time to be able to observe whether or not fish kills were occurring. They did, on occasion, find one or two fish that were floating, which could be fish that have been caught and released. Everyone knows who's ever been fishing that if you release a fish that's been caught, there's a possibility of delayed mortality of the fish. I wouldn't call that a fish kill. I would call a fish kill something that's noticeable and would be noticeable to the

public. And when such thing occurs, it is reported, and the IDNR sends a representative to investigate it. And the IDNR keeps a record in a file of fish kills on lakes within the state.

Q Is it true that the SIUC researchers concluded that at least some of the angling related fish mortalities were caused by -- were in part caused by thermal stress as well?

A I believe they did say that, but even if they didn't, I would agree with that.

Q You would agree? Okay.

A That is a situation that can occur, and whether or not the fish are kept or whatever, I would say that that would be a byproduct of fishing, whether it's commercial or recreational.

Q And you would agree, I assume, that fish mortality is not the only negative impact, potential negative impact on fish, correct?

A There are acute, and there are chronic impacts on fish. So we were looking in terms of both acute and chronic as was SIU.

Q I'd like to ask a few questions about degree days because I'm not familiar with this concept entirely. Do you know of any states that have relied on degree days in setting water quality

standards?

A I would venture to say that that would be a misapplication of degree days.

Q Okay. What would be a proper application of the concept?

A Well, obviously what we did. It's used as a heat input index when you're investigating the effects of various variables or factors on a population, whether it be fish or anything else. And you want to investigate the effects of temperature.

Degree days is a very useful index that will allow you to measure what the overall longer term heat input would be. It doesn't differentiate what the instantaneous temperature of water is, but it's a very reliable estimate as to the sustained temperature.

When -- a question had arisen on that, because it is such a familiar index to me and throughout my career. I checked on just -- I am a member of the American Fisheries Society, and I did a literature search on the AFS publications and found a hundred and eighty-five references to degree days. So I think that's a very good indication that it's a very commonly used index in scientific

investigations.

Q I think that would be good -- if we can put back up the chart with the years on the degrees days.

Can you explain for us why you conclude that years with more degree days in May do not also have more degree days in June or October? Does that make sense?

A That chart shows the scatter plot of the data points that we have available from the SIU data. And they are temperatures that were measured at the mixing zone boundary on a daily basis, the mean daily temperatures. And that as I explained the degree day, that is the difference between the mean daily temperature and the threshold that we used of 60 degrees Fahrenheit. As it turns out during the period of time, most all temperatures are greater than 60 degrees Fahrenheit. So there's no exclusion of any days or anything like that.

This is a linear correlation analysis regressing the May degree days on the remainder of the growth period from June through October. So we're looking for a statistical relationship. Is there a consistent relationship where a warm May is followed by a warm growth season or the remainder of

the year?

Q So can you -- I'm sorry. Can you go back and repeat that for me? Maybe I missed it from your testimony. What period are you saying that virtually all the days are over 60 degrees?

A From the beginning of May through the end of October, most of the days at the mixing zone boundary are going to be greater than 60 degrees at the surface.

Q Well, then how is this a useful tool?

A Because it integrates temperatures through time. It isn't the number of days that are over 60 degrees. It's the difference between the temperature itself for that day and 60 degrees. So on warm summers when, let's say, a particular day is 85 degrees in one year, and it's 60 degrees in another year, there's a difference there of 15-degree days. That's the measurement. That's the index. So sustained warmer temperatures within a particular year can be very different.

MS. WILLIAMS: Why don't you repeat what you were saying.

DR. McLAREN: What he was pointing out, I believe I said 15 degrees is the difference between 85 and 60, and it's 25.

MS. WILLIAMS: That's good. A lawyer can do correct math.

DR. McLAREN: Well, he has the calculator with him.

MR. RODRIGUEZ: That's about as far as I go.

BY MS. WILLIAMS:

Q Isn't it true that that concept is used primarily with regard to growing days; is that correct?

A It can be used -- frequently, or probably most frequently is a growth -- is related to growth. But growth is a very important parameter for us to be dealing with, and it's probably the biggest difference in what makes Coffeen Lake such a great fishery. It's a prolonged growth season and earlier growth and development.

Q Did you look at any study that has used the concept in the way that we're talking about using here today?

A Yes, yes. In fact, one is cited in the report. And it's for growth recruitment and several other parameters, which they use three days.

Q In the literature cited?

I mean, I think I already asked you

if any states use this in setting standards, and you answered that that would be an inappropriate use of it. But is it -- well, point me to which study you're talking about. Does that study look at degree days in the context of setting a thermal criteria or an individual source?

A The study itself is referenced in Section 6 of our report on Page 6-1. This particular one is authored by R.C. Beams Durford (sp) and J.A. North, published in 1995. "Growth Natural Mortality and Predicted Response to Fishing for Largemouth Bass and Smallmouth Bass in North America." I think you had two questions there. That's the answer to your first question.

Q So, okay. I'm sorry, yes. So this study, does this deal with fishing as opposed to thermal conditions?

A It's the thermal regime. It's the thermal environment. What effect does temperature have on the welfare of the fishery.

Q And was it studying a natural --

A Yes, natural.

Q -- welfare?

A Natural, meaning that it was a non-cooling lake. I believe that that was the case. I would

have to check, but I'm pretty sure it was.

Q I believe you testified -- your testimony about how you selected 60 degrees. In your testimony, I believe you referenced largemouth bass spawning, correct?

A Yes.

Q Did you say something in your narrative this morning about growth? I mean, I would expect from what little I know about the concept, that most of the studies look at the growth, the temperature for growth. Is there a trigger? Or is "trigger" a good word for the degree days?

A I think I understand what you mean, but --

Q I guess I'm asking, why did you use spawning rather than growth? Or if that's not an accurate summary of what you did, tell me what you did.

A Optimal temperatures for growth is a very commonly used thermal tolerance limit. And growth can lead to several other things that are important to the biology of the fish, including reproductive success, survival, food habits and so forth. And so these are really interrelated.

And the literature is replete with references to how temperature affects growth

positively, which in turn can help survival for largemouth bass in particular. It allows them to grow to a certain size that they can become fish eaters, what are called piscivorous, and so that their energy input is increased. So it's a positive influence on several population parameters.

Q Both is or --

A Temperature.

Q Oh, temperature.

A I think you asked specifically about spawning?

Q Is it correct you said in your testimony 6 degrees is the low level -- 60. Sorry. 60 degrees Fahrenheit is the lower end of the largemouth spawning temperature; is that correct?

A That's right.

Q And what is the lower end of the preferred growth temperature for largemouth bass; do you know?

A It's about 50 degrees.

Q Why did you select 60 instead of 50? That's the question I was trying to ask, but I didn't know the number to stick in it.

A Okay. It was a dual purpose. For one thing, it's a biologically meaningful choice using 60 degrees, and I believe they used 50 degrees for

their study, as several others have, because it's a reasonable representative of the lower growth limit. But 60 degrees measured at the mixing zone boundary would be equivalent to relief for the situations very close to 50 degrees throughout the remainder of the lake. So not only would 60 work for the temperature within the discharge arm for spawning, it would also be a good representative measure for growth in the remainder of the lake.

Q When you say remainder of the lake, I mean, you don't mean the entire remainder of the lake, do you?

A I mean, areas where elevated temperature or excess temperatures do not occur. So that's at greater depths because we know --

Q Outside the cooling loop? Is that what you're talking about?

A Not only outside the cooling loop, but at depths beneath the thermal plume and in coves and in embays.

Q You agree that largemouth bass are spawning in May at Coffeen Lake?

A Yes. I would say the great majority of spawning would be over by May. What happens in cooling lakes is that fish will react to the

temperatures that are present in the waters that they occupy, and that has been documented not only in Coffeen Lake, but in Newton Lake and Lake Sangchris and others is that there could be different spawning times based upon the temperature that's within that particular arm of the lake. So I won't say that there would be absolutely no spawning of largemouth bass in May, but the predominant amount of spawning should be well over by May, and it has been documented to occur into March and April anyway.

Q Do you think that this relief will affect the dates of spawning?

A No.

Q Why not?

A Because it would be after the peak spawning period.

Q Did you look -- this may seem silly, but I think when you pointed to your chart, you indicated if you look at 2007 --

MR. RODRIGUEZ: Which chart are we looking at?

MS. WILLIAMS: Figure 2-17.

Q One could see an example of a point where the total degree days -- well, can you

explain again what you were saying that this point in 2007 does show a correlation?

A No. In order to have a correlation, you have to have a number of data points. One data point does not a correlation make.

Q Is 2006 a data point?

A It's the overall pattern.

When you do any egression, it's a matter of predictability. How well does that particular variable predict what will happen under certain circumstances? And that's what we're dealing with here. You're using multiple data points, because obviously you don't predict on the basis of one year or two years. It's on the basis of several years.

What this relationship is showing us is that in some instances, you can have both the warm spring and a warm summer as in 2007. And we know it because that's been one of the trigger years for this whole relief effort. But that you can also have a warm May, as in 2001 or 2000, followed by a very moderate or cooled summertime. The reason being is what determines the summer temperature, June through -- or June through whatever months you want -- and this is June through October -- is not

what has occurred in May, but what are the conditions during the summer that influence the ability of Coffeen Lake to shed its heat load.

Q Is it your testimony that when there are more degree days in May through September, there is a correlation with more degree days in October?

A Yes.

Q Okay. Did you look for a correlation between maximum temperatures and impacts on fish?

A I did. I didn't run a statistical analysis of it, but I did look at the maximum temperatures within each of the years. And it was apparent to me, just looking at that, that there wasn't a relationship. So I didn't proceed any further.

Q And if there had been a relationship, would that have changed your opinion?

A I would have to see what the results were.

Q On Page 7, you state that 200 or fewer fish recovered is considered a limited fish kill.

A Yes.

Q What would you consider for a lake this size a medium or a large fish kill?

A I have been aware of fish kills that have been caused by factors other than temperature that

are greater, much greater in magnitude than that. It would have to be in the context of the population size that you're dealing with.

I think the important thing is here, if you've only got five fish, losing two of them, is that an important -- is that a fish kill? If you have a fairly large population -- if you lose 200 fish, is that a limited fish kill? And to put that into context, you'd have to put it in terms of what you believe the population size to be and how does it relate to the numbers of fish there lost.

And in the long run, when something like that happens, do you see a depressed abundance in future years of the fish or any other indicator that this fish kill has affected the population status?

So when I say limited fish kill, in many cases here -- I don't remember exactly on this one -- but 200 fish is not a difficult number of fish to get, especially when they're small. When we go out and collect fish from a cove with electrofishing, we can get well over 200 fish in five minutes. So on that basis, I would say that is limited.

Q So it's relative?

A It is relative.

Q On Page 8, Paragraph 15, the first sentence of that paragraph states, "Since 1999, the station has adopted several measures to avoid thermal conditions similar to those that might have led to the 1999 fish effect." What specifically do you believe caused the 1999 event that can be mitigated? So one factor was certainly weather. Nothing they could do to mitigate the weather. So what are you referring to in this sentence?

A At that time, the supplemental cooling towers and the cooling lake were not installed. So the only control that the station would have would be in the input of heat to the lake, derating or something like that. The station did monitor temperatures at that time, but now they've got a tool to keep temperatures at a lower level than they had in 1999 overall. The heat input to the lake through heat loss, through the cooling pond and the cooling towers would help.

Q But the average temperatures at the edge of the mixing zone has not gone down since installation of this technology, have they?

A I'm not sure. I would have to look to verify that. Temperature being what it is, I don't

recall that I looked at an average temperature for a whole season or anything like that, but I have looked specifically at temperature patterns. And in our report, we actually do show what the mean daily temperatures were for the years that fish kills occurred. I haven't looked at specifically, say -- except for degree days. We did the analysis of degree days, but not in terms of maximum temperature or average temperature. The degree days probably would be a fairly good reflection of the average temperature.

So on that basis, we do show in the report in one of our figures that the years, the most recent years, I believe from 2004 through 2007 -- in our report Figure 2-16, there's a plot of the degree days on a monthly basis. And from that, also a ranking of years and degree days, and the four most recent years were ranked higher in terms of heat exposures, so.

Q Which I think I remember which table you're referring to.

A I'm sorry. I can be more explicit. It's Table 2-2 in our report on Page 224.

So even though the temperature or the cumulative temperature -- if you want to call it

that, the degree day index -- is higher during these most recent years, the kind of fish kill that occurred in 1999 has not occurred during this time period.

Q Do you have an opinion about why?

A My opinion is, it's part of it, that it would be the use of the cooling towers.

Q But how?

A By leveling off the temperature inputs.

Q Could it be the maximum?

A It could be.

Q Okay.

A Probably a very but overriding factor is the weather. And from all indications, that what caused that one anomalous type kill that we referred to in July of 1999, was a situation -- I don't want to call it the perfect storm, but I think it's been used every once in a while, of a very prolonged period of high ambient temperatures, relative humidity, very calm weather and cloud cover. And that particular instance was reflected in fish kills that occurred outside of Coffeen Lake as well as including some non-cooling lakes.

Q Turning back to Page 8 again of your testimony. In Paragraph 16, you state that you

looked at the thermal requirements of the lake's fish populations as reported in the literature, correct?

A Mm-hmm, yes.

Q And the end of your report, I believe you provide a table with some Appendix A?

A Yes.

Q Does this table reflect the literature you're referring to?

A Yes.

Q Does it reflect all the literature you looked at or certain literature that you selected for use?

A It was literature that best represented what we are experiencing here. It's not all the literature. The main reason it's not all the literature is that these laboratory studies have relied -- which determine temperature tolerance in terms of what's known as upper incipient lethal temperature or the critical maximum temperature, are where fish are acclimated to a certain temperature and then exposed very quickly in the case of the upper incipient lethal temperature or in fairly rapid steps in the case of critical thermal maximum.

Stepping up the temperature, the

important thing being, the variable being what temperature fish have been acclimated to. So if you're looking at the literature for fish that have been acclimated to very cool temperatures, the UILT is going to be lower than the higher acclimation temperature. So these data are the available data that we have for a high acclimation temperature, something much closer to the realistic conditions that we are dealing with here.

Q Okay. So you --

A It's the chronic exposure to warmer temperatures to which they are acclimated.

Q You set aside studies that you found that have lower acclimation temperatures?

A As being inappropriate, because the fish would not have been acclimated to those temperatures when experiencing these.

Q Did you have a specific cutoff of where you decided to throw out a study? Or did you just look for studies with the highest --

A I've looked for studies that had the higher acclimation temperatures, something where there isn't such a drastic temperature change.

The reason that we relied on a limited scale on this type of data is that it gives

us an indication. I think thermal preference is a very good temperature tolerance variable. But we know what would be the temperatures that would be best for the species that we should allow that they would be present within Coffeen Lake and not necessarily at the edge of the mixing zone.

MS. WILLIAMS: Can we put the proposed standard site back up?

Q Can you tell me, Dr. McLaren, what is the -- I'm going to call it lethal end point. Is that acceptable? I assume you might have used a UILT, or you might have used a CTM study, depending on what were the data. Is that correct? Or did you only use UILT studies in your research?

A We used whatever was available.

Q So can I refer to them collectively as lethal end points for now?

A Okay.

Q What is the lethal end point for largemouth bass?

A Well, what we've provided in Appendix A for an adult largemouth bass -- let's say it's acclimated to 30 degrees centigrade. The maximum temperature in this case -- I believe it was UILT,

upper incipient lethal temperature, was 36.4 degrees centigrade.

Q Uh-oh. Can you translate for us?

A Well, I can, because I did the calculation myself once.

Q How about 97? I don't know if that's --

A It's 97, about 97.3 degrees. I'd have to get the calculator.

Q So you're saying that's the upper incipient lethal temperature for largemouth bass?

A That laboratory study tells us that. I'm not saying that that's true necessarily.

Q What about bluegill?

A It would be an appendix. As it turns out, most of those species have very similar temperatures that are derived that way in laboratory studies.

Q I still want you to point to me the one for bluegill.

A Well, a bluegill, an adult bluegill, a CTM value that was published by a fairly standard fisheries reference was 41.5 degrees centigrade. So multiply that by approximately 2, and add 32 degrees, and it's pretty darn warm.

Q But then you found another study at 38.3?

A Well, it was acclimated to a temperature

of 16 degrees Fahrenheit lower. That's quite a shot. Bluegills are a good example of very heat-tolerant species.

Q Okay. Would you say the same about largemouth bass?

A Yes.

Q What about channel catfish?

A There's not as much information, but from the looks of it, they're not very different. They are also heat-tolerant species.

Q Would you say white crappie is a heat tolerant --

A Not as heat tolerant, no, as the others.

Q Did you look at what the avoidance temperatures or the optimum temperatures were for the three species you focussed on?

A Yes, I did.

Q Okay. And can you tell us? Are they in Appendix A as well?

A We did not include that. So I don't have them readily available, but I do have a little bit. The preference temperature for, let's say, largemouth bass in the literature has been fairly wide range from the approximately -- well, from 79.7 degrees, 79.7 Fahrenheit to 89.6 degrees

Fahrenheit. That would be the final preferendum (phonetic).

Q Would you agree, Dr. McLaren, that looking at the literature, that either of the lethal end points that are used would likely be exceeded with the three species that we're looking at by the maximum temperatures for May and October?

A Yes, they would be.

Q Okay.

A The maximum temperatures outside are at the boundary of the mixing zone at the surface. The key thing to remember is that the temperature, as I had mentioned in my verbal testimony, the temperature at depth and at distance from that particular location can be very much cooler on the order of 10 to 15 degrees cooler, and that's within the cooling.

Q I mean, would you agree, though, that if the entire cooling loop uniformly was at the limits of the relief requested, that even these three fairly thermal tolerant species would not be living there?

A You're asking me to -- let me make sure I understand what you're asking.

Q I'm sorry. That's kind of complex. Go

ahead.

A You're saying if the lake were isothermal?

Q Right.

A Uniform temperature at these limits, would it be suitable habitat?

Q Right.

A No, it would not. But, of course, that's not the situation and won't be in the cooling lake. Certainly this cooling lake.

Q Right. And in your opinion, it's environmentally acceptable that fish need to leave portions of the lake, correct? I mean, is that accurate?

A Every environment has that -- every natural environment has that situation. If I go to any water body where there's -- fish are allowed to immigrate or emigrate, egress or ingress, you're going to find a difference in the species composition determined by this temperature preference for those species. And some temperatures can be very much higher than what we're dealing with, and the fish avoid them. That's what fish do.

Q Would there be a point at which too large of the lake is being used? Is no longer suitable habitat? Is there some point at which you would say

that is too much?

A Yes.

Q Do you know what that point would be?

A I don't from the kind of information that we were discussing. I do from what we have.

We have 10 years or 8 years of biological data -- and this is a rare opportunity. There aren't too many water bodies where you have eight consecutive years of detailed fishery statistics to work with like we do here. And the indicators that you would have would be if you can find a relationship between the population parameters, like growth, survival, reproduction, life-stage occurrence and so forth, and temperature, or if you find fish kills. On a massive scale, that would be significant. So we have the very best, and I propose much better, truer information from this kind of study than we do from laboratory studies. It actually says this is the way a population responds to this condition.

Q On Page 3-1 of your report -- and I think there's also a footnote on Page 9 of the petition, there's a statement that says, "The representative with RIS" -- what's the "I" stand for?

A Important.

Q Important. Sorry. "Of the representative important species should be chosen to adequately represent those not chosen." Can you explain why largemouth bass, channel catfish and bluegill adequately represent the other species not chosen, including white crappie and gizzard shad?

A I can from two aspects.

One is that these three species are the basis, the primary basis, or at least three of the bases for species for a recreational fishery. It's the fish species that are being managed for it by the DNR. One of the criteria for RIS is either commercially or recreationally important species, which they are.

Secondly, they reproduce -- self-reproducing populations within the lake. If they didn't reproduce in the lake, it wouldn't be a good representative species.

There are lots of species that are transient, or they are stocked, and they certainly wouldn't be representative.

And they are also representative because they are predatory species that will reflect the status of the lower trophic levels. In reality, too, that they are also the species for which we

have data to work with in the long-term database.

Q That doesn't hurt.

A The hard fact reality is that the decisions that were made back in the 1980s and '90s, that those were the species of interest. And the reason being that although white crappie has been a valuable sport fish in the lake at times, it's a very cyclic species. That's very poorly understood on why it's cyclic. It depends upon periodic success of your classes. And if you have a year class failure, you can have a very changing structure that wouldn't be very conducive to trying to detect changes unless you happen to know that it's temperature related influence that causes a year class failure. I haven't found anybody in my field who can tell me that.

And gizzard shad -- you did ask -- let me finish that.

Q Yes.

A Gizzard shad wasn't used primarily because gizzard shad traditionally can reproduce the heck out of a lake or any other water body. They're just a very abundant forage species, but it's more difficult to get a good clear index of their abundance using the gear that's been used by the

DNR, and that's nearshore. That's a pelagic species. So we don't have an effective pelagic fishing gear to track those. But traditionally those have not been the limiting factor. They may have limited the abundance of other species, but they, themselves, have done very well.

Q But just to be clear, in looking at representativeness in this context, representativeness of a range of thermal tolerance was not a factor that was considered; is that correct?

A It was not a direct factor. This is a lake that has been managed for these species and have survived in these species. So they are a good indicator species for the fish composition of the community that exists.

Q On Page 9, you discuss Sargent & Lundy's study, and you refer to it as near-worst case operating conditions, and it looks at mean daily temperatures. Can you just tell me is this term "mean daily temperatures" different than a daily average? I think maybe there's some different terms used.

A You have to be very careful in the wording, and I'm not sure that this is the case

here. But a mean daily average and a daily mean average could be two different things.

Q And do you know if they are two different things?

A In this case, they are daily averages.

Q Okay. And it's different obviously than the daily maximum --

A Yes.

Q -- obviously? Okay.

So the Lake-T modeling, this is the Lake-T modeling you're talking about?

A This is.

Q Is this one-dimensional modeling provided anywhere in the record?

A I'm sorry. What was the question?

Q The information -- another document that I could not find, I believe, was the modeling. I did not see anything in here except for your description and your testimony and in the petition about them of modeling.

MS. ANTONIOLLI: You're asking about the Lake-T modeling in Sargent & Lundy? And Sargent & Lundy provided a little bit of follow-up, but other than that, we don't have them here with us today. So I left them out.

MS. WILLIAMS: Okay.

Q Do you know what then the near-worst case means as to those worst cases?

A I know what I meant.

Q Okay. I'm sorry. What did you mean?

A That was actually my terminology. It's near-worst case because the model was run, as I had explained, with using 1987 as a warmer than average ambient spring temperatures. So the meteorological conditions were conducive to warmer temperatures for the base year that they used and also the operation or the heat loading.

The model was run to find what limits would be if the plant were operated under the existing thermal limits and under the proposed thermal limits. And they used at maximum generation, which nominally was called greater than 90 percent operation, but in actuality, it could be significantly higher than 90 percent.

As I said in my verbal testimony, it's my understanding that all of a sudden, the generation was 97 percent. And the model was allowed on a day-by-day basis to put in this maximum heat input until the temperature rose within 3 degrees of the limit, in which case they would kick

in the helper towers.

As background, the cooling pond loop was operating, but they managed keeping the temperatures below the maximum and the mean by operating the cooling towers. So that's what we say, a warmer than average ambient temperature with the plant running full out, while staying within the temperature limits of either proposed or existing.

In reality, for the reasons that Jim Williams delineated, the plant would not be expected to be doing this all the time. They're not going to be running maximum in the months of May.

Q Would you agree that if the fish in this lake were already stressed, that increasing the temperatures in May and October would increase their stress?

A That's a hypothetical that I would find to be unrealistic. No, I don't believe that the fish are already stressed. So this is a hypothetical that I would need to know a lot more information than that.

Q I think I'll save that for some of Joey's questions when she gets more into that.

In your report, I believe you indicated that with regard to the UILT and the CTM

lethal end points, that it is common to use a 2 degree Celsius safety factor. Would those end points in establishing --

A Yes, that's routinely used.

Q Okay. Thank you.

And I think it's on Page 4-3 of your report, you indicate that the modeling results found that the median temperature will be 95 degrees Fahrenheit in May. Is there anywhere I can look?

MR. RODRIGUEZ: I'm sorry. What page did you say?

MS. WILLIAMS: 4-3.

DR. McLAREN: That's operating under this near-worst condition.

BY MS. WILLIAMS:

Q And I just want to clarify. I mean, I think you may have already -- there's nowhere I can look in the record to find those numbers myself, right? If I want to see what's the max or what's the average going to be the first week in May versus the last week in May, there's nothing that's been provided so far for me to see that in the records; is that correct?

MR. RODRIGUEZ: I have no idea where you're even talking about right now. Where are

you? Are we talking about a particular figure?

MS. WILLIAMS: He's referencing details from the modeling that was done. And I'm asking -- and it's on Page 4-3.

MS. ANTONIOLLI: Of the ASA report.

MS. WILLIAMS: Of his report, yeah.

Q According to the model, the median temperature, 58 percentile at the edge of the mixing zone during May would be approximately 95 degrees Fahrenheit under the proposed standards compared to approximately 88 degrees Fahrenheit on existing. I would like to know, for example, what the average is? That's a median, right? That's different than a average. I don't know much math, but I know there's a difference. I would like to know what the maximum is going to be. But that information, is that in here somewhere where I can find it in the charts?

A Yes.

Q Okay.

A Yes. It is shown actually for the 1987 base year in that figure that I had up on the board, Figure 4-4. It shows the actual daily temperatures that were modeled. It actually shows the mean daily

temperatures that were modeled on a day-to-day basis with the 1987 base year. The solid line being the solid line.

And as I said, it's an artificial construct because the modeler is maximizing the potential output of the lake while keeping the temperature at the mean threat, of the mean limit of 96 degrees Fahrenheit. So it's not a coincidence that the median temperature would be 95 degrees Fahrenheit when it's artificially being run to get there.

Q Okay. I think it would be a lot more helpful to me if we had the actual data. And that may just be my inability to line up these little numbers with the lines.

A Okay. This is the figure that I'm talking about, 4-4.

Q Okay.

A The other one shows the percentiles. Figure 4-1 and 4-2 show the percentiles, and that's where the median would come from, but the actual temperatures, the actual mean daily temperatures are plotted on 4-4.

Q Okay. Thank you. That's very helpful.

A And as a reminder, those are temperatures

at the mixing zone boundary surface.

Q Right. Would you agree with regard -- because I think you testified earlier when you were using this exhibit about your conclusion, that for a period during May and October, there's going to be a difference between current and proposed, but that those differences will come together relatively quickly, right?

A Yes.

Q I would like to talk about October from this chart. I'm having a hard time -- is October 1st the little black line between September 29th and October 13th? Or is that --

A Well, I can't tell you, looking at which data is actually which date. But it looks to me like -- well, certainly we're in October well before the temperatures start to diverge there.

Q Okay. Because what I see in these two graphs is there's a precipitous drop either way prior to them then going back up under this relief; is that correct?

A Yes.

Q Are you concerned at all that this relief will alter this natural pattern at this point in the fall of increasing temperatures when they have been

going down so? So in your --

A No, I'm not, no. If you look with this rapid drop, that rapid drop is occurring regardless of what the thermal limits are. And it's a natural phenomenon because the nights get colder and the days get shorter, and that's going to occur.

Q But under the --

A But under the revised limits, the temperature will hit a bit of a plateau according to these worst-case situations, but the temperature difference is not very great and would converge by the beginning of November.

Actually, as a fisheries biologist, I clap my hands because that lengthens the growing season for the fish. It gives them a better ability to bulk up for the winter probably better over winter survival to attain larger growths. That sort of thing happens in the fish hatchery.

Q As a fisheries biologist, are you concerned at all about whether the winter temperatures are sufficiently low to allow for a natural processes?

A No. I'm only aware of one or two species that have to go through a refractory winter period to bring about spawning, and those species don't

occur in this lake.

Q Would you be able to say that most species do not need that period? Or is it just something that's not known at this time?

A I'm not aware of anything I've seen in the literature that would contradict that most species do not need.

Q So you believe most species do not?

A I don't think that's the controlling factor. It's the oddity in my experience that they have to have the cold temperature. And I think yellow perch is the one species that I recall has to have that. Certainly it's not the species that we're dealing with in this lake.

MS. WILLIAMS: I think I'm going to turn this over to my cocounsel. I've just tried to help you -- Dr. McLaren, I tried to focus on what you call the prospective study type issues. I think Ms. Logan's questions are going to look at the retrospective issue.

CROSS EXAMINATION

BY MS. LOGAN-WILKEY:

Q Good afternoon. Are you familiar with the lake management report done by IDNR done in 2007?

A Yes, I am.

Q It was attached as Exhibit 12 to the petition.

On Page 9 of your answers to the Hearing Officer order, you state that the fish have frequently demonstrated exemplary growth and condition.

A Yes.

Q Can you explain to me what you mean by exemplary growth and condition?

A Well, let's do growth first.

Growth, we have reported in our report here where we've compared mean size at age for young, at a year, and older fish. And I think we will follow by age within this population versus other populations in the Midwest and in the South, and Southeast. And we found for some species, like the largemouth bass, that Newton Lake is the only other lake that had fish growth as great as we have here. That's including some of the southern lakes, including all the southern lakes that I found in my survey. I'm not saying that there can't be another lake somewhere, but in readily available information, some species like largemouth bass are larger and remain so throughout their lifespan.

Q What about condition?

A Condition factor that's used most currently right now is a relative weight index, and that's a ratio of the weight of the fish, the mean weight of the fish for an ideal weight for that species across its range with an index of 100 representing a optimal condition and a good management target.

Q Okay. Do you have that report in front of you? Or would you like to look at it? I wanted to get into some specific questions about each species of the fish.

A I don't know if I have it here in front of me.

Q I have it if you need a copy.

MS. ANTONIOLLI: Do you guys have an extra copy?

MS. LOGAN-WILKEY: Yeah, we do. That is Attachment 12 to the petition, the lake management status report in 2007.

DR. McLAREN: Okay. Thank you.

BY MS. LOGAN-WILKEY:

Q If you look at Page 2 of the report, it states that bluegill had a catch per unit effort ranging from 60 to 89.

A Bluegill from 60 to 89, yes.

Q And the lake management program goal is greater than 100; is that correct?

A Yes.

Q What do you think the reason is maybe for that? Do you think that temperature could be having an effect on bluegill for the catch per unit effort numbers seen?

A The answer to that is, in the long-term database that I looked at, I don't think so. I think there are more controlling factors than temperature because they're undersized, and typically they're very small and in poor condition.

Q Okay.

A But I don't see that as -- I saw no evidence that it was temperature doing that.

Q Okay. So you stated that they tend to be small in the lake. What is the relative weight for bluegill if you look there on Page 2?

A Yes. The relative weight has ranged from 82 to 89.

Q And what is the lake management program goal?

A 90. 90 is the minimum, 90 to a hundred and ten.

Q Ninety to a hundred and ten. I guess what

would your thinking be as far as to why they aren't reaching the lake management program goals for relative weight and for the catch per unit effort? If you want to take those one at a time.

A Well, relative weight, I would guess to be because they're overpopulated for their food base, or they're competing with other species that are insectivorous. And that's a very common phenomenon in bluegill, particularly in almost -- in several bluegill lakes. You can have one -- not necessarily regional thing, that they're doing very well, and others that they become stunted in their growth. So we have, I think, in our analysis in our report, we show very strong evidence that they're becoming stunted.

Q Okay.

A That they're doing very well in their first or second year, but then after that, they're smaller at a particular age than in other populations. And that's typically what happens in stunted bluegills. And fisheries scientists -- fisheries managers, let me say, have made a living at it trying to get over that hump.

Q Okay. And you said that they are stunted. And in the DNR report and the narrative there states

that they're continuing to struggle. So would you say this is just typical of what we see with bluegill in lakes and not related to temperature?

A It happens in probably more than half the lakes. And it's happened from my reading of the record, from the earliest studies that have been done on Coffeen Lake and other lakes that are comparable.

Q Okay. Does feeding tend to slow down with higher temperatures in the summer in bluegill? How do they react as far as their feeding goes?

A They're adapted to fairly warm temperatures. So is there a point where they stop feeding? Yes. Have they reached that point? I don't think so.

Q Do you know what that point would be?

A No, but you'd have to think that it was close to the upper range of their preferred temperature.

Q And what did you say that temperature is, the range of their temperature?

A I don't have that in front of me, but since the lethal temperatures are fairly high, the preferred temperatures would be high, too.

Q On Page 3-7 of the ASA report, you state

that competition for food is limiting the growth of bluegill.

A That would be my reading.

Q Could the competition be caused by higher temperatures in the winter? Because there are so many of them, they're growing, and then there are too many of them for the food population that they have?

A I didn't see any evidence.

First of all, the kinds of things that we see happening here occur in non-cooling lakes. It's not specific to this particular lake or the cooling lakes in general. So there's more than adequate explanations, and I can't pinpoint which one they are, but the net result of it is that they are stunting. The growth is poor.

Q Okay. Do bluegill generally have higher food demands when temperatures are warmer?

A Yes.

Q They do? Okay.

So those demands would slow down in the winter?

A Yes. At the same time, in an unheated lake, they would slow down. In a heated lake, during the wintertime, you're probably in a good

optimal range. So what I would expect to occur in a lake that's a cooling lake is that the growth season would be -- on a species like that, certainly in the spring and in the fall -- and I wouldn't be surprised in the winter as well -- as long as food is available, and it would be typical that in warmer lakes, that the growth can slow down in the summertime at higher temperatures.

Q Okay. Now, if you could turn to the channel catfish. The report states that the catch per unit effort has met the objective greater than 10. What does it say about relative weight per catfish in 2006?

A Yes. This is the DNR status report.

Q I'm sorry, yes. The lake management.

A Okay. The lake management status report?

Q Yes.

A Channel catfish?

Q Channel catfish.

A Could you repeat that?

Q In 2006. Sure. The catch per unit effort has met the objective of greater than 10.

A Yes.

Q What does it say about relative weight per channel catfish in 2006?

A In some years -- oh, in 2006, it's just below it. It's at 85 rather than 90.

Q Okay. And what was it in 2003? Or I'm sorry. In 2000?

A In 2000, it was 93.

Q And on Page 3 in the narrative, what does DNR say about catfish, the channel catfish population?

A Do you want me to read it?

Q Yes. Could you read that for me?

A "Conversely, channel catfish abundance has risen over the past two samples. The fall 2006 catch effort was 11 fish per hour which relates to the four-year mean of seven fish per hour. This population continues in anguish."

Q I would just ask you to stop there. What do you think they mean by that, that it continues in anguish? Are they talking about the size or of the abundance?

A I have no idea.

Q Okay.

A I'm not anguished about it.

Q Okay. And then they go on to state that body condition has declined since this increase and catch per unit effort has come to fruition. What

could be the cause? Is that, again, competition for food? Or could that be an effective temperature? Or why do you think that --

A I think it's a competition for food, crippling the population size and probably maintaining the same food base.

Q Would you say that by warming the lake, we are seeing greater abundance, but lower quality fish?

A No.

Q No?

A Fish -- year to year, it's very variable in terms of reproduction particularly. You know, all the stars have to align to get an exceptional -- that's a metaphor. All the variables, particularly the abiotic, the physical variables, timing and so forth have to align to have an exceptional year class.

There's something that's happened within the past two, three years here for channel catfish and largemouth bass that has caused excellent reproduction of these species, and it's increasing the abundance of the small fish.

Now, I'd have to look again, but I think that -- I have to remember if -- the large

fish have increased in abundance for channel catfish. So in this case, I think what's happening is there's a recruitment of strong year classes from early 2000, 2001 period to the most recent years where we're having more and larger catfish in the population. You see that in terms of the index that they refer to as the RSD 20 and the RSD 18. That's relative stock density. That's the ratio of fish larger than 18 inches or larger than 20 inches compared to a stock size fish.

Q Okay. And looking at your ASA report, I believe this is Page 3-21 and Figure 3-20 -- Figure 3-10 on Page 3-21. If we look there at the size of the catfish, and we exclude the year 1997, isn't there a trend of the fish becoming smaller as we approach from 2000 -- well, actually, it looks like in all of those years, is there a negative relation if we exclude 1997, the relative weight of catfish?

A I would venture that if we exclude 2004, you'd have a flatline. I'm not sure why we'd want to exclude 1997.

Q Well, just looking at the more recent years and past few years, from 1998 forward, during the time that SIU was conducting the studies, would you see --

A I'm sorry. When I look at that, I see no relationship between degree days and the mean relative weight. Once you start pulling out gears, you can do that ad nauseam.

Q That's fine. We will move on then.

Turning to the Coffeen Lake, the report states that in 2000, the catch per unit effort was 168. And has it decreased or increased since 2000 looking at those numbers?

A It's decreased dramatically.

Q Has relative weight also decreased in those years?

A Yes, it has, in 2004 and 2006.

Q Could this be attributable to the lake temperature? Or what would you think would be causing the decline in gizzard shad?

A I have two theories. One is the introduction of threadfin shad to the lake. As you'll see THS on the bottom, threadfin shad only began appearing in the lake in the late -- I forget. 1998, 1999, something like that. Somehow it was introduced to the lake. It wasn't introduced by the DNR. Probably a bucket, a bait bucket from fishermen. Or as it happens in some places in the country, the fishermen take fish management into

their own hands, and they'll add more fish.

Anyway, the threadfin shad has become established as a competitor for gizzard shad.

Q Are threadfin shad -- excuse me. I'm sorry.

A Threadfin shad is a natural competitor of the gizzard shad.

Q Okay. Are threadfin shad more tolerant of heat than gizzard shad?

A Yes. Their natural distribution is a little bit further south than the gizzard shad.

Q So you'd be more likely to see gizzard shad in an Illinois lake and threadfin shad in a southern lake?

A Yes.

Q Is that your testimony?

A Yes.

Q On Page 9 of the DNR report, it states the gizzard shad population was large and of desirable size to support both small and large predator fishes in 2000. Would you say that based on the catch per unit effort and relative weight measured by IDNR in 2006, the gizzard shad population was large and of a size to support small and large predator fish?

A I'm sorry. I lost you. What page are we?

Q Page 9 of the DNR report.
A Oh, of the DNR report.
Q Yes. They're discussing the size of gizzard shad in 2000 compared to 2006.
A Okay. Gizzard shad population is large and of desirable size to support both small and large predator fish.
Q And then if you compare to the 2006 numbers for gizzard shad population, would you state that it is still large of the size to support the small and large predator fish? Can you tell that from looking at their numbers?
A No, I really couldn't.
Q Okay.
A I'm very -- as I said earlier, I'm very hesitant about indices of abundance for pelagic fish using a sampling gear that's used in the literal zone. I don't know how accurate that is.

It may be that the population has really changed a lot, but because it's a schooling fish, you can miss them entirely during your sampling, or you really get into them thick. It's a pretty high variability. So I don't know if these changes in abundance and relative weight are real or not. If they are real, I have some ideas on why.

As I said, a competition thing. But I also happen to know that these poor two species are trying to support a large predator base that keeps getting larger in that lake with stocking of striped bass and species like that. So it's possible that this is a temporary situation where the gizzard shad are competing and then getting eaten at a fairly rapid rate by an abundance of predator species.

Q Okay. And then if we look at the report, once again the DNR report, on what they see in the white crappie population, it shows that they're declining as well. Can you take a look? And the numbers are the catch per unit effort was 45 to 65 in 1997 to '99, 25 in 2000, 26 in 2001, 37 in 2003 and 11 in 2006.

A Yes.

Q Do you have any thoughts on what could be causing the decline in the white crappie?

A I think there's been recent failure of reproduction for the species. A weak year class or two, that might have brought that about.

What they observed was an abundance of large fish and a relative abundance of large fish and the reduction in the numbers of small fish. And as I said, this species is cyclic, and it has been

in the history of this lake, so much so that when decisions were being made about what species to study back in 1997, they excluded white crappie because they were very hard to find. So apparently they made a comeback since 1997, but they may be fading again, and that's typical of that species.

Q Okay. And then turning to what the IDNR report says on largemouth bass. The catch per unit effort has steadily increased, but IDNR notes a reduction of the larger fish; is that correct? You can look on Page 3 of the narrative.

A Yes.

Q I believe it's so stated there. And what do you think the reason may be for the decline in the larger fish and largemouth bass?

A Two possible reasons. The one that strikes me as perhaps the strongest is that fishing pressure has gotten pretty intense on this species.

Q Okay.

A So they may be exploited to a point where the larger fish are being removed by the fish.

Q Could it also be again competition for food and not enough of the forage fish?

A No.

Q No?

A I don't think so, because the relative weight is exceptional and the growth rates is exceptional. So I don't think it's a food thing. I think it's either exploitation of the large fish or pure arithmetic, because relative stocked density, as I said, is the index of the number of fish above a certain size to the stock density. If you increase the number of small fish, proportionately the larger fish are going to look less abundant. I don't know how much of that, because I don't have the data in front of me, but I'd be suspicious that there could be some of that going on, too.

Q Okay. Do the higher temperatures have an effect on the feeding of the largemouth bass?

MR. RODRIGUEZ: Which higher temperatures?

BY MS. LOGAN-WILKEY:

Q During the summer. During, say, June through September.

A Higher than what?

Q The temperatures in June through September, do they have an effect on feeding the largemouth bass?

A I have seen nothing that would indicate any negative effect. As I said, the growth rates have been very good. And by summertime, largemouth

bass have reached the size that they become piscivorous and will feed on the gizzard shad and the threadfin shad and grow very well. So I haven't seen any evidence of temperature limiting of the growth. Actually just the opposite.

Q Okay. I'm going to turn now back to the idea of entrapment of fish and specifically ask some questions from the March 2007 SIU report.

A Okay.

Q And you're familiar with this report, correct?

A Yes.

Q Okay. From 1997 to 2006, SIU measured how much of the lake was available to the fish as a percentage at a water temperature below -- I'm sorry -- within 87 to 96 degrees Fahrenheit and above dissolved oxygen levels of 1 to 4 parts per million.

In 2006, SIU found three dates where conditions appeared to be critical to a point where fish could be compelled to locate some type of a thermal refuge to avoid short-term thermal stress. Do you think that it is acceptable for fish to be stressed and need to seek refuge during those temperatures?

A Is it acceptable for them? That's what they do.

MR. RODRIGUEZ: Let me interrupt. Can you tell me what part of the fish report, SIU report you're citing?

MS. LOGAN-WILKEY: I'm looking at Page 5.

MR. RODRIGUEZ: Of?

MS. LOGAN-WILKEY: Of the SIU -- I believe it's the 2007 report. The dates were -- it's about halfway down the page, Page 5 of the 2007, on June 22nd, July 19th and August 3rd in 2006. Those three dates were dates where conditions appeared to be critical to a point where fish would be compelled to locate to seek thermal refuge to avoid short-term thermal stress. Page 5. It's the second paragraph.

DR. McLAREN: I've got the paragraph.

BY MS. LOGAN-WILKEY:

Q Okay. I guess what I'm getting at is this idea of eroded fish habitats, and whether it's appropriate for the fish to need to seek refuge from the high water temperatures and being entrapped in the cove areas.

A I couldn't pass judgment on something like that. The temperatures are periodically or perhaps

invariably going to be -- and dissolved oxygen concentration are going to be limiting. And yet the evidence shows and in the following sentence, the fact that no fish kill occurred underscores the resilience and adaptability of fishes to extreme environmental conditions over time.

Q But what may have happened if the temperatures had remained high or ambient temperatures had remained high to a point after those dates where the fish still could not leave those coves and if the habitat became basically even more critical? And then the area in the coves had too high of temperatures, and they can't escape the idea of entrapment, and then the fish kill could occur?

MS. ANTONIOLLI: That's a lot of speculation in that question.

BY MS. LOGAN-WILKEY:

Q Well, but that's what happened in 1999, correct?

MS. ANTONIOLLI: That's not the fish kill we're talking about here, the 2006 one.

MS. LOGAN-WILKEY: There wasn't one.

MR. RODRIGUEZ: I'm not sure.

DR. McLAREN: Are you asking can the

conditions that occurred in July of 1999 occur again? I don't understand what your question is.

BY MS. LOGAN-WILKEY:

Q My question is simply whether or not -- let me rephrase it.

A Okay.

Q Are eroded fish habitats consistent, from your perspective, capable of supporting fish?

MR. RODRIGUEZ: I'm going to object because they're not talking about the eroding habitat. So I'll just make that objection for the record.

HEARING OFFICER WEBB: I'm sorry, Mr. Rodriguez. I couldn't hear you.

MR. RODRIGUEZ: I'm just objecting for the record that this paragraph really doesn't deal with -- doesn't mention the concept of eroded habitat as SIU has used that term in the reports.

HEARING OFFICER WEBB: I'm not sure I followed the question myself. I'm just worried, you know, maybe if you could just, you know, make the questions a little more clear just to make sure that the Board could follow

what point you're trying to make, and the witness, more importantly, can give you the information.

MS. LOGAN-WILKEY: Sure. I'll just go ahead.

Q The bottom of that paragraph, it states, however, if conditions eroded further than were witnessed on 3 August, it is most likely that a large-scale fish kill could have occurred. So your testimony would be that that's a possibility if conditions had eroded further?

A Empathetically, what they're stating, I wouldn't disagree with them.

Q And in July of 2001, there was a fish kill that involved 546 channel catfish and 65 largemouth bass following a period of prolonged tidewater temperatures.

MR. RODRIGUEZ: Where are we now?

MS. LOGAN-WILKEY: Let me find the page number for this then.

MR. LIU: Would you mind if I asked a follow-up question to clarify the term "eroded fish habitat"?

MS. LOGAN-WILKEY: Sure. That would be

fine.

EXAMINATION

BY MR. LIU:

Q I think in the SIU study on Page 10, when it talks about eroded fish habitats, it says that forage species often inhabit water, temperatures near their thermal maximum, because their food supply is more abundant there. So is the eroded fish habitat a place where the food supply is abundant, but the fish get trapped because of this lethal hot temperature that swings by? Or does the abundant food supply die because of the lethally hot temperatures?

A Fish have to be very adaptable. As it turns out, their preferred temperatures are often very close to a point where they can become stressed. They've got to manage their lives so that they are not only in the right conditions as far as the physical conditions, but that the food supply is available, too. Fish have been known to go outside their preferred habitats to get fed, and then return back to where they're most comfortable. That happens in several species, by going -- changing the depth following a school of fish that's their prey. So they're balancing all these various needs. And I

think that's what that comes down to.

As far as being -- this "habitat erosion" is a term that SIU has used to define entrapment within coves where it's a very localized fish kill. That in that particular habitat, these fish are there and have been exposed to something that amounts to lethal conditions. And it's that particular group of fish that experience the mortality.

So that's a reference where they could have been where they were to take advantage of food, and then -- I don't want to be anthropomorphic, but made the choice between food and being comfortable, and maybe in this case they made the wrong choice.

MR. RAO: It's like the paw in the bottle.

DR. McLAREN: What's that?

MR. RAO: It's like the paw in the bottle, where a monkey puts its paw in a bottle to get the food out, but it cannot get the food out of there, but it doesn't want to get the paw out of the bottle either.

DR. McLAREN: Well, yeah. There is conflicting motivation there. I think that's what they're referring to. I didn't write

that. So that would be what I would guess.

EXAMINATION

BY MR. LIU:

Q When I hear the term erosion and water settling, I think like stream bank erosion, but that's totally different?

A Habitat erosion is reduction in the volume of water that falls within predefined limits of temperature and dissolved oxygen. Comfort zone.

CROSS EXAMINATION

BY MS. LOGAN-WILKEY:

Q On page -- I'm sorry. It's on Page 10 of the 2007 SIU study, the fish kill I was referring to in July of 2001 involving 546 channel catfish and 65 largemouth bass following a period of prolonged tidewater temperatures. Did that fish kill, to your knowledge, involve eroded fish habitats as well?

A I'm sorry. I've lost you. Where? Is this the same report?

Q Page 10, the 2007 SIU report on Page 10.

A Okay. I see it.

Q The first full paragraph there in the middle of the page.

It states that mixing zone surface water temperatures began prolonged increase and

remained at temperatures of at least a hundred degrees Fahrenheit on July 7th in 2001.

Then if you go do down further in the paragraph, it says that the prolonged nature of the high water temperatures after July 7th likely caused an eroding of co-habitat in the discharge mixing zone which resulted in the July 10th fish kill.

A Yes.

Q Okay.

A It does say that.

Q My question is, going from there, if we raise the temperatures in May and October, and we have no maximum temperature, might we see eroding fish habitats occurring during those months as well --

A No.

Q -- as what happened here? No? You don't believe we would see that?

A No.

Q What if we were to have an unseasonably high ambient temperature in May or October? Then is there a possibility that we would see an eroded fish habitat?

A No, because Mr. Williams would do what he could to drop the temperatures if that were the

case. The relief that's being asked for are temperatures that are considerably lower than the summer temperatures. So before it ever got to that, the station would have at least done what it would have to do to comply with the thermal standards. And if that still meant that the fish died, then I would say it would be a natural-cause fish kill.

Q Okay. I believe it was your testimony that there would be a more natural increase in temperature in the lake under the proposed standards.

A Yes.

Q Okay.

A A more gradual transition.

Q Okay. So when you say that by heating the lake sooner more gradually, is it true that fish would not become trapped by sudden heated discharges later in the summer because they would earlier avoid those areas of the lake?

A One could hypothesize that. That's something I'd certainly like to know if that's true. If I understand what your question is -- maybe you need to restate your question for me.

Q Maybe I should.

What I'm trying to get at is

whether -- you say that there would be -- I believe your testimony is that there would be a more gradual increase in the temperatures in those parts of the lake where fish had become trapped in previous years; is that correct? Am I understanding that?

A It could do that.

Q Okay. Is that your testimony? My understanding is that that is your testimony, that fish would have a gradual increase in the water temperatures so that fish would not become trapped in those areas later in the summer because they would already be avoiding those temperatures?

A I don't believe I've ever written in the testimony those two together. I said there is a more natural transition. And, actually, in my verbal testimony, I said that more natural transition could avoid fish being trapped and rapidly rising temperatures in the month of May.

Q Okay. Because fish would not be in those areas? Is that what you're saying?

A No, no. Primarily the more gradual is that there would give more opportunity for the fish to acclimate to the rising temperatures, and possibly hypothetically give them the opportunity to react, to leave those temperatures seeking more

suitable temperatures before the point where those temperatures could become stressed.

Q So would it be correct to say that less of the lake as a percentage would be available at that point in time where they were leaving those areas of higher temperatures?

A Less of the lake? It could be very marginally less, but if you lose some habitat, obviously there's a reduction. So --

Q Okay.

A -- I don't anticipate that to happen in the months of May or October, though.

Q So you would still expect to see fish in those areas?

A Yes, I would.

Q In May and October?

A Yes, I would.

HEARING OFFICER WEBB: Excuse me, Ms. Logan-Wilkey. Do you still have quite a few more questions for this witness?

MS. LOGAN-WILKEY: I need to go through and probably remove some of the questions that Debbie has asked so that we aren't being repetitive.

HEARING OFFICER WEBB: Well, why don't

we -- since we've been going for about two hours, why don't we take a five-minute break for our poor court reporter and anyone else who may need a short rest. And so let's go off the record.

[WHEREBY A SHORT BREAK WAS TAKEN.]

HEARING OFFICER WEBB: Let's go ahead and go back on the record. And we will continue with Ms. Logan-Wilkey.

BY MS. LOGAN-WILKEY:

Q I'm going to turn now to Chapter 14 of the 2000 SIU study. Are you familiar with that chapter as well?

A Yes.

Q Okay. On Pages 14-11 --

MR. RODRIGUEZ: Let me interrupt. It's unclear to me whether this was made a part of the record. So I have some extra copies of it, I think, and we could submit it now as part of the -- introduce it into the record. Were you planning to?

MS. LOGAN-WILKEY: I believe it's Exhibit 3 of the Agency recommendation, but we can go ahead and make it an exhibit.

MR. RODRIGUEZ: If it is, that's fine.

MS. LOGAN-WILKEY: Okay.

Q As dissolved oxygen declines at lower depths, do fish tend to move up into the warmer water resulting in higher body temperatures to obtain dissolved oxygen needed for survival? Would you agree with that?

A That's what they found.

Q And on Page 14-17 of Chapter 14 of the 2000 SIU study, it states that largemouth bass have an ability to cool faster and retain cooler temperatures longer. Would you agree with that?

A Where on Page 17 are you reading?

Q Okay.

A 14-17?

Q Let me turn to it. The second paragraph there on 14-17.

MR. RODRIGUEZ: The second full paragraph?

MS. LOGAN-WILKEY: The first full paragraph.

Q The internal body cavity of the largemouth bass has a longer initial temperature lag when warming than when cooling, and they retain their cooler temperatures for longer periods of time. This means the

largemouth bass can cool faster, retain cooler temperatures for longer time periods. Thus largemouth bass may be utilizing areas of lower dissolved oxygen as a thermal regulatory process.

A I remember reading something like that, but I don't see that on this page.

Q Are you aware --

MR. RODRIGUEZ: I think she may have a different copy. You may want to get the exhibit from her, rather than what you've got, because I don't see it in 14-17 either.

DR. McLAREN: Unfortunately these things are probably still in Word. So they are going to print out in different pages.

MS. LOGAN-WILKEY: That's possible because I did print them from a disc that Amber provided, so.

DR. McLAREN: I think it would be up here. I'll just be looking at yours.

I have a lot of difficulty with that first sentence, understanding what they're saying in the first sentence. But what they do say is that they use the lag time and in internal temperatures to their advantage.

BY MS. LOGAN-WILKEY:

Q So that they school faster and retain cooler temperatures longer? Is that -- would you agree with that? Or are you familiar with the idea that SIU is presenting here?

A I am familiar with what they were saying.

Q Do you agree with that?

A What they're saying -- well, it's not for me to agree or not to agree. They're the ones that did the study.

But my interpretation of what they were saying is that there is a lag time so that the external -- the internal temperature doesn't reflect the external temperature until after this lag time. So they can go into warmer temperatures and remain cool, and then go back to the cooler temperatures again without having felt the full impact of the warmer temperatures. So their internal temperature lag time allows them to take advantage of and optimize their habitat that they can temporarily -- they can temporarily occupy a warm temperature to get it dissolved oxygen that they want. In fact, I know that to mean no -- I know that to be what they intended to say because one of the authors told me that in a recent conversation,

so.

Q Okay. Do you know whether channel catfish are able to do this as well?

A They don't have the kind of data unfortunately on channel catfish that they do in largemouth bass. So we don't have the data. At least I'm not aware of the data that would tell us "yes" or "no."

Q Okay. And what about bluegill? Do we have data showing that?

A We don't have data on bluegill.

Q Going back to Chapter 1 of the 2000 study, on Page 3.

A 2007 study?

Q I'm sorry. The 2000 study, Chapter 1, Page 3.

A Oh, 2000. Chapter 1, Page 3.

Q Yes.

A I don't have that.

Q Okay.

A I'll trade you.

Q Okay. Actually, I may have more questions from that chapter if you want to hold on to that.

A Okay.

Q This report is Chapter 1 of the 2000 SIU

study, which is Exhibit 3 of the Agency's recommendation, I believe.

MS. ANTONIOLLI: I have Exhibit 2 as the February 2004 report.

MS. LOGAN-WILKEY: Exhibit 3.

MS. ANTONIOLLI: Exhibit 3.

MS. LOGAN-WILKEY: Of the Agency recommendation.

MR. RAO: Is that the November 2000 report?

MS. LOGAN-WILKEY: Yes, Page 3.

DR. McLAREN: This is the third page?

MS. LOGAN-WILKEY: Yes.

MR. RODRIGUEZ: You may want to refer an actual paragraph and the start of the paragraph because the pages aren't numbered.

MS. LOGAN-WILKEY: Okay. I'm sorry. I think we should just mark this as an exhibit, the Chapter 1 overview of the results from the SIU study.

HEARING OFFICER WEBB: We can mark that as Exhibit 4.

MS. LOGAN-WILKEY: It's from the SIU study from 2000.

HEARING OFFICER WEBB: Does anyone have

any exhibit labels, either party?

MS. ANTONIOLLI: Do you have a copy?

HEARING OFFICER WEBB: Do you have a copy that you can file with us?

MS. LOGAN-WILKEY: Yes.

HEARING OFFICER WEBB: Are you using it right now?

MS. LOGAN-WILKEY: I'm using it right now. I can give him another one.

HEARING OFFICER WEBB: Thanks.

MR. RODRIGUEZ: Joey, how much of this -- are you going to use this as an exhibit beginning with Chapter 1 overview?

MS. LOGAN-WILKEY: Yeah, Chapter 1 overview. I have a question from Page 3.

MR. RODRIGUEZ: Okay.

HEARING OFFICER WEBB: Did you already move to admit this, or are you going to wait until after you use it?

MS. LOGAN-WILKEY: I'll make a motion now to admit it as our Agency Exhibit 1. Would that be correct?

HEARING OFFICER WEBB: No. I'll just mark it as Exhibit 4.

MS. LOGAN-WILKEY: Exhibit 4? Okay.

HEARING OFFICER WEBB: And there's no objection?

MR. RODRIGUEZ: I just want to make sure we know what the entire exhibit consists of. How many pages is that?

MS. LOGAN-WILKEY: It's unnumbered. It's Chapter 1, the overview of results. That's the beginning of the chapter, and it ends with Figure 1.15.

MR. RODRIGUEZ: Got it.

MS. ANTONIOLLI: Okay.

MS. LOGAN-WILKEY: Okay.

HEARING OFFICER WEBB: Then Exhibit 4 will be admitted.

[WHEREBY, EXHIBIT NUMBER 4 WAS MARKED AND ADMITTED INTO EVIDENCE.]

MS. LOGAN-WILKEY: Thanks.

Q If you turn to the third page -- and I apologize that the pages apparently are not numbered, but let me find it.

SIU states that if the fish require refuge from the potentially stressful temperatures, then it is important to determine if suitable habitat is available. Fish movement is

monitored to determine habitat utilization.

And my question is, what do we use other than temperatures to determine whether or not there is suitable habitat for the fish?

A What do we -- what did they use?

Q What would you use? What would you consider to be another indicator other than temperature of a suitable habitat?

A Oh, wow. That would be a rather long list of potential variables from depth, light, currents, dissolved oxygen, pH. It's the cue that fish use for selecting their habitats. Substrate type, prey abundance.

Q Dissolved oxygen would be one?

A Dissolved oxygen would be one.

Q Okay. And what determines the effect of the stress of higher temperatures on fish? In other words, are there other factors that would come into play that may determine whether or not the temperatures will put stress on the fish?

A You could have multiple stressors. So I think what you're asking, can there be other stressors besides temperature? And I'd say "yes."

Q Okay. And if you have a lower dissolved oxygen level, would that increase the amount of

stress, the higher temperature that would be placed on the fish?

A Not simply lower. It has to be lower than their tolerance level for dissolved oxygen.

Q Okay. So if we had a lower than their tolerance level of dissolved oxygen, then the temperature may place a greater amount of stress on the fish, a higher temperature?

A There could be an interaction of the stressors.

Q Do you have any information on the level of macrophytes that are in the lake?

A That was not part of the most recent study. The answer to that is, I don't have much, no. I have an understanding -- I've been told, but I've looked at the reports that -- lake management status report makes mention of macrophyte removal. And also that at times, macrophytes are not very abundant, and other times they're very abundant. Beyond that, I'm not aware of any available data on it.

Q Okay. Does temperature have an effect on the growth of macrophytes?

A It's a species specific thing with macrophytes, just as with fish and other organisms.

So macrophytes can have tolerance limits the same as other organisms. So temperature can have an effect, but typically it's not really a terrific or well-used indicator of temperature.

Q Okay. Would the temperatures under the proposed standards affect macrophyte growth in Coffeen Lake with the species we have there? Are you aware of that?

A I wouldn't anticipate any effect of the proposed May and October standards on plants, no, the macrophytes.

Q In turning to -- this is going to be somewhat difficult because there aren't page numbers. But the conclusion in Chapter 1, which has been marked as Exhibit 4, the conclusion page, if you turn -- it's just before the first table about halfway through the packet of information. It's the last page of the narrative, and it's marked "Conclusions" towards the top there.

A Yes, I see it.

Q Okay. If you look at about the middle of the page, it states the fish appear to be sacrificing higher oxygen levels for lower temperatures.

A Yes.

Q And this is discussing around -- during the time period of the 1999 fish kill. Do you think that that is something that's acceptable for the fish to be sacrificing higher levels of oxygen for lower temperatures? Would that provide stress on the fish?

A What I would say is that the fish are reacting to the temperature levels and the DO levels as they do. They seek the conditions that give them the best opportunity for survival and reduction in stress. I couldn't begin to put any kind of a value judgment on that, but it is what fish do.

Q But would it provide additional stress on the fish? The idea of having to sacrifice the higher oxygen levels for the lower temperatures? Would that provide stress on the fish, plus cause stress on the fish?

A Theoretically it could.

Q It could lead to a fish kill as it did in 1999?

A Under extreme conditions it could. As I said, we actually have the post facto data to tell us whether it did or not.

Q Right. Would you say that there's a bit of a catch 22 in that the high surface temperatures

force fish deeper for refuge where DO levels are the lowest?

A A catch 22?

Q In other words, that they have to choose, one or the other, a comfortable temperature versus adequate dissolved oxygen levels under extreme weather temperatures? Or lake temperatures. Excuse me.

A I would say that this is part of the life history of fish, that they're always making selections to optimize their habitat. It's not uncommon that they would do that sort of thing. Whether or not those conditions are conducive to survival and the well-being of the fish is something that we have determined through the long-term database.

MS. LOGAN-WILKEY: Okay. That's all we have. That's all we have for this witness.

HEARING OFFICER WEBB: Thank you.

MR. RAO: I have some questions for Mr. McLaren.

EXAMINATION

BY MR. RAO:

Q Dr. McLaren, on Page 12 of your pre-filed testimony, you note that assuming Ameren's request

for relief is granted, the company and DNR have discussed developing study plans that investigate the ability of fish to avoid exposure to stress by seeking preferred temperatures within the lake environment. First, is this study something that Ameren is going to do only if relief is granted? Is that how it's approached?

A I'm sorry. I can't answer that question.

MR. RAO: Anyone on the panel?

MS. KNOWLES: That's correct.

MR. RODRIGUEZ: Yes. The answer is "yes."

MR. RAO: Okay. If so, what do you -- what other plans in terms of once the study is done and the results are produced, how are the results going to be evaluated in terms of the requested thermal standard? If the studies come out not supporting what's being considered in this proceeding, how is Ameren going to proceed?

MS. ANTONIOLLI: I think the study would continue to proceed in the way and to the manner in which they've been conducted over the past several years. Does that answer your question?

MR. RAO: That's right. Some of the

previous proceedings, a study like this would be part of a condition of granting a thermal standard. And is that what's Ameren intent is to add this as part of -- make it a condition of granting the requested relief?

MR. RODRIGUEZ: That's not part of the request for relief, no. We would be doing these studies and monitoring the health of the fishery, but we're not asking that that be included into some kind of condition, or that there be some kind of conditional outcome as a result. We're seeking permanent relief. And these studies will be conducted pursuant to the agreement that we have with DNR.

MR. RAO: And would the results of the studies be publicly available for the Agency to review or anyone else interested to review it, the results?

MR. RODRIGUEZ: Yes.

MR. WILLIAMS: We can make them available.

MR. LIU: Would the studies involve the three RIS that were used previously?

MR. RODRIGUEZ: I don't know that the study has been designed yet exactly, but Jim would be --

DR. McLAREN: We did only sketch out the scope of a study with the intention that if studies were to proceed, that the details would be worked out and possibly in cooperation with the Department of Natural Resources. So those kinds of decisions probably would be made at that time. I would be very surprised that it didn't include at least those three species.

MR. RAO: What's the impetus for the study? Was there some concern expressed by DNR about this petition before the Board? Or is it just Ameren decided to do this study?

MR. RODRIGUEZ: It was in the context of the conversation that we were having with them, with the petition, and they had expressed an indication. You know, an indication that the studies -- you know, we had a database, and, you know, that has now stopped, and that they wanted to see -- they were interested in seeing that collection of data get through.

MR. LIU: Are they expecting it to continue forever or a period of three years or something like that? Did they discuss a timeframe?

MS. WILLIAMS: Can I just interrupt a

second? I think it's pretty unusual at a hearing not to swear the attorneys in if they're answering the actual questions.

MR. RODRIGUEZ: We actually don't have --

MS. WILLIAMS: I just would like you to be sworn in.

MR. RODRIGUEZ: I'm not a witness. So maybe we can just have him answer, or somebody from the company may want to get sworn. You'll have to get sworn in.

HEARING OFFICER WEBB: Well, wait. Let me stop. Are these questions that --

MR. RAO: It's based on Dr. McLaren's testimony when they talk about the study.

HEARING OFFICER WEBB: But they're not questions that you could answer, Dr. McLaren? They're basically what Ameren's policy is going to be?

DR. McLAREN: I can only answer my input into concepts for the study, but I cannot determine -- make these decisions for Ameren. So that's why. I'd like to, but I can't.

MR. RAO: You can address it in your briefs, too.

MR. RODRIGUEZ: We could do that.

MS. ANTONIOLLI: We might be able to, if it's possible, to keep the -- you know, have some time period after this hearing to be able to submit more information that might help, either before our briefing period starts. I don't know if that's --

HEARING OFFICER WEBB: Maybe we could do something like that, because I, too, don't -- I would prefer not to obviously have Ameren's attorneys act as witnesses in the proceeding. So perhaps when we're off the record, we can have another perhaps hearing officer with supplemental Board questions, you know, and we can allow both parties to comment on that, if that's an acceptable solution for now.

MR. RAO: Yes. I think all the questions are on the record pretty much, yeah.

HEARING OFFICER WEBB: Okay. Did you have anything more?

MR. RAO: No.

MR. LIU: I do.

HEARING OFFICER WEBB: I'm sorry, Lisa.

EXAMINATION

BY MR. LIU:

Q In the paragraph after that, there is also

a mention of the study of three-year fish stocking pilot study. Are you aware if that's going to include the RIS species as well or just new species that might be introduced?

A (By Dr. McLaren) I'll begin to -- the discussion was that we would review -- that we could review species that would be thermally adapted to the lake that would be attractive to the managers, the lake managers of DNR. They had some ideas of species that were of interest for us to evaluate. It could be stocked, but this was all in preliminary conversations with them.

But I think in that testimony, there may also be offering of stocking for replacement of fish in the case of fish kills, which could theoretically involve the three primary species or at least one or two. I think -- I don't think we need any more bluegills.

MR. LIU: Maybe one other question you could address is what the outcome of those studies would be in terms of affecting any type of relief that might be granted if the study shows that perhaps there is a problem? Is there a way that we can craft the mechanism into the relief such that it can be addressed

through that kind of a study?

MS. ANTONIOLLI: Okay.

MR. RODRIGUEZ: Okay.

HEARING OFFICER WEBB: Do you have anything further?

MR. LIU: Along those lines, I was wondering if we could ask the Agency a question.

HEARING OFFICER WEBB: Yeah. Do you want to wait until they've asked their questions of the third witness?

MR. LIU: Just to keep the record together, I don't know.

HEARING OFFICER WEBB: Pardon me?

MR. LIU: To keep the record together, it might be a good idea just to do it now.

MS. WILLIAMS: If we have somebody that can answer. We don't on the --

HEARING OFFICER WEBB: Okay.

MR. LIU: We were just wondering if the Agency would consider attaching some sort of a condition to any relief granted, what the Agency might consider it looking like?

MS. WILLIAMS: We'll probably have to consider that --

MR. LIU: Studies or something like it has in the past? If that's something you could do either now or later.

MR. RAO: You can change your mind of course.

MS. WILLIAMS: I think we'd have to consider to address that in a post-hearing comment probably.

MR. LIU: Okay.

MR. RAO: Thank you.

HEARING OFFICER WEBB: Are we ready to go on, or did you have more? Okay. All right.

Are you ready to go on to the third witness?

MS. LOGAN-WILKEY: Yes, we are.

HEARING OFFICER WEBB: And, oh, I also still need Exhibit 4.

[DOCUMENT TENDERED.]

ANN B. SHORTELLE, Ph.D.

CROSS EXAMINATION

BY MS. LOGAN-WILKEY:

Q Good afternoon. I have a few questions obviously about phosphorous, and then we'll move into mercury from there. So to start out in your model, what phosphorous flux rate did you use to

calculate the internal loading of phosphorous?

A We used two. We used the one that Illinois EPA used in the 2009 addendum, TMD addendum document. That was 2.2 milligrams per square meter per day. And the other one that we chose coincidentally was double that amount. It's referenced as Hagard (sp) et al 2005, and it's 4.4 milligrams per square meter per day.

MR. LIU: Where is that?

DR. SHORTELLE: I'm sorry.

MR. LIU: Does that appear in your report?

DR. SHORTELLE: It should. It's referenced on 2-13, but I'm not sure if the actual numbers are present there or on another page, but those are indeed the values on Page 2-13, the last paragraph. I've got the references, but not the exact numbers.

BY MS. LOGAN-WILKEY:

Q You referred to something -- you referred to it as the 2009 Illinois EPA addendum.

A The TMDL addendum for Greenville and Coffeen Lakes.

Q Who prepared that addendum?

A Who prepared it? I'm not sure. Hansen Professional Services, I believe.

Q And was Hansen Professional Services retained by Ameren to prepare the 2009 addendum?
A I don't know.
Q You don't know? Okay.
Do you know if that's the finalized document, whether that's been approved?
A It's very new. I don't know if it's approved. It may still be draft.
MR. RODRIGUEZ: Perhaps, would you like clarification on this issue?
MS. LOGAN-WILKEY: Sure.
MR. RODRIGUEZ: Okay. Could we at this point swear in an Ameren employee who could probably shed light on this?
HEARING OFFICER WEBB: Sure.
[WHEREUPON THE WITNESS WAS SWORN BY THE NOTARY PUBLIC.]
MICHAEL SMALLWOOD,
having been first duly sworn by the Notary Public, testifies and says as follows:
DIRECT EXAMINATION
BY MR. RODRIGUEZ:
Q Can you state your name for the record.
A Yes. My name is Michael Smallwood.
Q What do you do for a living?

A I'm an environmental engineer for Ameren.
Q And do you have information to share here with respect to the TMDL that was done in Coffeen?
A Yes, I do.
MR. RODRIGUEZ: Okay.
CROSS EXAMINATION
BY MS. LOGAN-WILKEY:
Q Can you describe for me how this 2009 addendum TMDL came about?
A It was in response to an Agency request regarding our Section 41 permit for the East Fork Shoal Creek project.
Q Is it finalized?
A As of Monday, yes.
Q It was finalized this past Monday?
A That's correct.
Q Yesterday?
A Yes.
Q Do you know whether that's been approved by the United States Environmental Protection Agency?
A To my knowledge, no, not at this time.
Q Are you aware that it does need approval from the USEPA?
A No, I'm not aware.

Q You're not aware of that? Okay.

No further questions for that witness. Thank you.

HEARING OFFICER WEBB: Okay. Thank you.

ANN B. SHORTELLE, Ph.D.,

FURTHER CROSS EXAMINATION

BY MS. LOGAN-WILKEY:

Q Going back to the different flux rates that can be used to calculate internal phosphorous, why did you choose the 2009 addendum and the Hagard 2005 flux rates for the calculation for Coffeen Lake?

A Well, the one that was used in the 2009 addendum, I was trying to be consistent with as many of the assumptions that had been used for the TMDL documents in the past, anything that I thought was reasonable and that we could stay consistent with. That was a goal.

Q Do you know what flux rate was used in the 2007 TMDL?

A Not off the top of my head. Although I do know that they inappropriately invoked internal loading from the BATHTUB model, and that's just one of the issues with that BATHTUB model, but it's a different situation. They're not picking a flux

rate. Certainly one would -- because they're not fluxing from a bottom area like we did, but certainly there's a calculation within the BATHTUB model that was invoked. Basically they used the internal loading to true up their model because they couldn't get it to calibrate.

Q So would the use of different flux rates result in higher internal loading calculations for phosphorous?

A If the flux rates were higher, yes.

Q But based upon which flux rate you used, you do get a different result, correct?

A Either higher or lower.

Q Right, correct. Higher or lower just depending on what flux rate is used?

Do you know what the ranges of possible flux rates that can be used to determine the calculation?

A Well, I think the two that were used here are appropriate for, you know, central USA reservoirs, but there's a fairly wide range. It depends on the sediment types and a whole raft of variables.

Q Okay. Do you know what the range, possible range is, even though it may be very broad?

A Not off the top of my head.
Q What's the highest flux rate you've seen used for internal loading phosphorous?
A In a reservoir?
Q Yes.
A I don't know that off the top of my head either, but it probably could be in certain areas of the country maybe double this at least. You know, places that might have more year-round loading rates, that kind of thing.
Q So would you say --
A Very lucky sediments, something like that. I don't think that would be applicable here, but maybe up to something like 10. There's a range for sure.
Q Okay. So there may be a range starting at 2.2 or even lower, all the way up to 10?
A Or lower, depending on, you know, what kind of lake or reservoir or wetland system that you're dealing with.
Q Okay. Now, you predicted an increase of 329.1 to 658.1 kilograms of phosphorous per year due to the increased May and October standard; is that correct?
A I'm sorry. Could you repeat those

numbers?

Q Sure. And I can give you the page number that I'm looking at as well. It's Page 2-13 of your report.

You state that the estimate ranges from 329.1 kilograms phosphorous per year to 658.1 kilograms of phosphorous per year.

A Under existing permit conditions.

Q So that's under existing permit conditions.

And then what do we see being added from the May and October temperature increases? What increase in internal phosphorous did you find would occur due to the temperature increase? I'm looking at Page 2-25. I think that --

MS. WILLIAMS: Can you put up the exhibit that she was looking at?

MR. SMALLWOOD: Sure.

DR. SHORTELLE: The blue bar graph, but the specific numbers using those two flux rates was an additional -- in round numbers, 48 kilograms of phosphorous per year to 96 kilograms of phosphorous per year. Under the new permit conditions, that would be added to the other, and that's for the internal only.

BY MS. LOGAN-WILKEY:

Q So there would be an increase of internal phosphorous of 48 kilograms phosphorous per year to 96 kilograms phosphorous per year under the proposed standards for May and October?

A Yes.

Q Okay.

MR. LIU: May I ask a follow-up?

MS. LOGAN-WILKEY: Sure.

EXAMINATION

BY MS. LIU:

Q Dr. Shortelle, I was looking for the math, how you arrived at those numbers. Is that something that you got by running a model?

A These numbers are not from the BATHTUB model.

Q Okay.

A Although I did run the BATHTUB model with our assumption, and that's where you see the loading bar. That last bar on the -- is our estimate.

Q Okay.

A But the math we did, we used spatial analysis. So we estimated the area of the sediments to which these flux rates would be likely appropriate. And then month by month, the amount of

phosphorous that would be generated during those conditions, and tallied them up.

So the 48 kilograms and to 96 kilograms is an estimate of -- if the permit conditions were changed, what's the little bit more of phosphorous that might be fluxed into the hypolimnion during that May and October timeframe. But we used a combination of, you know, the numerical analysis and our GAS spacial analysis to get those numbers.

Q I don't remember actually seeing that in your report.

A Described or?

Q Not the numbers or your calculations or the demonstration discussing it.

A Well, I don't know that -- I mean, they're summarized here, but I could potentially provide a appendix.

MR. RODRIGUEZ: Yeah, we can do that.

MR. LIU: And the very specific numbers, 32 -- or 329.1.

DR. SHORTELLE: And I'm rounding them just now, because you know, you can calculate any specific numbers that you want, but, yeah.

MR. LIU: It would be helpful just to see

the backup calculations.

DR. SHORTELLE: Sure. We definitely have that.

MR. LIU: I appreciate that.

DR. SHORTELLE: We definitely have that.

MS. LIU: I'm sorry to interrupt.

MS. LOGAN-WILKEY: You're fine.

Q Now, in your study on Page 2-22, you state the increased temperatures in May and October will increase the stratification of the lake increasing the total number of anoxic days. Is that correct?

A I'm sorry. On this page?

Q 2-22, Table 2-5.

A Oh, the table, yeah.

Q The current and predicted days with anoxic sediment conditions.

A Yes.

Q So this increase in anoxic days goes from 18 to 23 under first segment 1 under the proposed standards, and 17 to 25 for May, and segment 2 under the proposed standards; is that correct?

A Correct.

Q And then for October, we see an increase in segment 1 from one day to a total of 13?

A Correct.
Q And one day in segment 2 in October and then a resulting 11 total days under the proposed standards for October?
A Yeah, that was our estimate, yes.
Q Okay. And then is your testimony that you also predict an increase of 8 percent sediment surface area being exposed to anoxia during May and October?
A Are you looking at Table 2-6?
Q Just a moment, and I'll give you a page number here.
A I see it here on the text on Page 2-22.
Q Yes, that's correct.
A I believe that was our estimate of the additional area. You know, in round numbers for that time period.
Q Okay. Now, can you say that the phosphorous you see that's going to increase the 48.08 to the 6.17 kilograms phosphorous per year, is it your testimony that that will or will not reach the epilimnion?
A It's my testimony that it will not.
Q So where will the phosphorous go then?
A Well, it goes into the hypolimnion, which

is where the rest of it is during that -- you know, that's fluxed from the sediments during that time period. And during the time period that there's anoxia present at the sediment surface water interface, phosphorous is fluxing out, but other phosphorous is raining down. So that there's a net -- you know, either increase or decrease in the hypolimnion over time. But that amount is still so small distributed across the hypolimnion in the lake, that when you mix that with the entire lake volume into the epilimnion, you don't see a boost in phosphorous concentration. Obviously it's incrementally a tiny bit more, but you don't see a number, an increase in phosphorous in the surface waters that would fuel an alga bloom.

Q Basically did you calculate phosphorous by averaging sites 1, 2 and 3? Or did you look at the sites separately in determining whether there would be an increase?

A Our analysis for the sediment flux you're talking about was by segments. And then we summed it all up. The graph that's up here is summed, but our analysis was done by segment.

Q Okay. Is your testimony that site 3 contains more Chlorophyll-a than sites 1 and 2?

A Okay. We have to be a little bit careful here because the segments are consistent with the Southern Illinois segments.

Q Okay.

A Okay? Independent of that, or not associated with that, there are three sampling locations for the lake, ROG 1, 2 and 3. Those are the data that they appear in the TMDL documents pulled out of the storette. ROG 3 is located in that upper northern arm of the lake. We could put up a -- and I think there might be a copy of it in here.

MR. WILLIAMS: You've got a picture of the lake.

DR. SHORTELLE: Excuse me?

MR. WILLIAMS: There's a picture of the lake.

BY MS. LOGAN-WILKEY:

Q On Page 2-23, would that be an appropriate --

A What would effectively be second segment 4, but I'm quite sure there's also a picture of it in here as well, if I could find it.

MS. ANTONIOLLI: On Page 2-20.

MR. RAO: Are you on Page 2-11?

MS. LOGAN-WILKEY: 2-7.

DR. SHORTELLE: They're on 2-9, and they're also on 2-7. Figure 2-5 shows the sampling locations and also figure 2-8 on Page 2-9. So ROG 3 has higher chlorophyll. I believe that's statistically significantly higher than the other two segments.

Phosphorous is, you know, numerically higher. I'm not sure that it was statistically significantly higher, but it's elevated up in the upper arm presumably because of external washing in from the watershed.

BY MS. LOGAN-WILKEY:

Q Is phosphorous the only factor that affects Chlorophyll-a levels in the lake?

A No.

Q No? What are the other factors that may influence the levels of Chlorophyll-a that we would see?

A Oh. I mean, that could be like the fish laundry list that we heard earlier. Light availability. Well, you know --

Q Does heat affect Chlorophyll-a levels?

A It can. I mean, chlorophyll is being produced by living organisms. So if it's warmer,

their metabolic process and enzymatic processes are accelerated up to a point. So they could be making more chlorophyll at warmer temperatures. If they're in the dark, they might die and shut down. Plants have to have light. That's by no means an exhaustive list.

Q Okay. I am going to move now to mercury. I'm sorry. I need to go back. I need to turn to the next page. I have a couple questions about phosphorous before we move on to mercury.

A Okay.

Q Are you aware that the 2007 TMDL was based on Ameren's commitment to increase the lake, the level of the dam -- excuse me -- by 3 feet?

A The 2007?

Q The TMDL, yes.

A No, I'm not aware of that.

Q You're not aware of Ameren's commitment to raise the level of the dam by 3 feet?

A I'm not aware that the 2007 --

MR. RODRIGUEZ: I'm going to object. I don't think that's in the record anywhere.

MS. WILLIAMS: Is the addendum in the record anywhere?

MR. RODRIGUEZ: Yeah.

MS. WILLIAMS: It is?

MR. RODRIGUEZ: Well, I don't know whether it is either. I don't know about this commitment either. I'm not sure about that commitment.

MS. LOGAN-WILKEY: I'll just withdraw the question and rephrase the question.

HEARING OFFICER WEBB: Thank you.

BY MS. LOGAN-WILKEY:

Q Are you aware whether the 2009 addendum has different scenarios for meeting the phosphorous?

A Yes.

Q Okay. Can you explain those to me.

A I don't have a copy of it in front of me. I can't explain all of them, but -- and we looked -- for our document, we specifically looked at the base case because that was the one that was consistent with 2007 and is based on the standard pool for the -- our normal pool for the lake at 590 feet, but it does include a series of other scenarios that were modeled with the BATHTUB model, exploring, use of water from other sources like you had heard talked about earlier here today, and potential raising of the lake level. These, I

think, are to evaluate because of the effects of the scrubbers, when the scrubbers come on line, the amount of water that they're going to consume, use.

Q Is one of those scenarios, does one of those scenarios in the 2009 addendum involve raising the level of the dam by 3 feet?

A Yes.

Q Are you aware --

A Yes.

Q It does?

A Yes.

Q And what effect does raising the dam have on the phosphorous levels on the lake?

A Oh, I think that would be positive.

Q So it would help?

A Help? I mean --

Q The phosphorous?

A Well, if you take a bowl, and it's got "X" amount of phosphorous in it, that's going to have a concentration based on the volume of the bowl. If you increase the volume, it's dilution.

Q Right. So it would be a positive benefit as far as the phosphorous?

A If you increase the volume of the lake, and you do not change the phosphorous inputs from

any sources, the concentration will go down.

Q Okay. Thank you. I'm going to move to mercury now.

MR. LIU: Could I follow up please?

EXAMINATION

BY MS. LIU:

Q Would raising the dam 3 feet and raising the level of the lake 3 feet also have other environmental issues associated with changing the contour of the stream?

A Absolutely.

MR. LIU: Okay.

BY MS. LOGAN-WILKEY:

Q Okay. As far as mercury goes, what mercury data were looked at for Coffeen Lake other than the fish tissue data to determine that mercury levels in the lake are, as you, I think, have stated in your testimony, low?

A Well, the fish tissue data, you know, available from storette which include -- I think -- I'm not sure if all these data are in storette, but there's the federal survey that was done and the state survey that was done. Those fish tissue concentrations do demonstrate that the available data for Coffeen Lake is low relative to its

neighbors, I would say.

Q So the fish tissue data would demonstrate that the fish tissue from fish in the Coffeen Lake are low possibly compared to other similar lakes?

A Yes.

Q Okay. Do we have any data that shows what actual water concentrations of mercury are on Coffeen Lake?

A I did not find any waterborne total mercury or methylmercury data.

Q Are you assuming that levels are low based on the watershed to lake area size?

A I'm assuming the levels are low based on the fish. Those are the integrators for mercury and I believe the basis of the impairment.

Q Okay. Did temperature factor in the methylation of mercury in your opinion?

A It can be.

Q Do you agree that increasing the temperatures may promote methylation?

A It may.

Q Isn't that your testimony on Page 3-12 of your report?

A It may, yes.

Q It may? Okay.

Would decreases in DO also increase the production of methylmercury, or could they?

A They could. If there's sufficient change in oxygen depletion at the sediment water interface, for example.

Q So if temperature increases, increase in sediment in the lake, that we may see an increase in mercury? Is that your testimony?

A Well, I don't think we expect to see a temperature change in the bottom at the lake, but I think we do expect to see in May and October, a small incremental change in the area that is anoxic. And if a significant amount of methylation were occurring in those bottom sediments or from those bottom sediments, that would increase by that incremental amount.

Q On Page 3-6 of your report, you state that largemouth bass in Coffeen Lake had concentrations of .08 and .09 milligrams per kilogram, and that the 33 percent reduction in mercury would be needed to reach .06 milligrams per kilogram; is that correct?

A Yes.

Q Will the proposed temperatures for May and October aid in reducing the mercury levels in the lake to .06 milligrams per kilogram in your opinion?

A The change in temperature is not going to affect the amount of mercury in the lake.

Q We would just see an incremental increase?

A Not in the amount of mercury in the lake, no.

Q In the methylation of mercury?

A Possibly, possibly, possibly. Theoretically it's possible.

Q Okay. On Page 3-6 of your report, you also state that water levels impact the mercury; is that correct?

A I'm sorry. Where are you now?

Q Page 3-6, 3.2, paragraph 3.2 there at the bottom.

A Yes, but not water levels in the sense of what if we add 3 feet of freeboard to the lake. This refers to wetland areas specifically or floodplains where you see repeated raising and lowering of water and exposing of sediments. Those kinds of events have been shown in some cases to foster mercury methylation. That's not relevant to Coffeen Lake, per se. It could occur in the watershed, I guess.

Q Okay. So would an increase in the dam by 3 feet lead to lower mercury levels? Or you

don't -- it's your testimony you don't think so?

A There is nothing about -- well, it's my testimony -- it will be my testimony that raising the level of the lake will have no effect on mercury amounts in the lake.

Q So it wouldn't have a similar effect that phosphorous would have by being diluted and be at a lower concentration?

A That would be -- that's different than the amount of mercury that's in the lake. Concentration would be diluted.

Q I'm sorry. The concentration then would decrease if we did see an increase in the dam by 3 feet?

A By the same mechanism, dilution, that we just talked about with phosphorous.

Q Okay. Thank you.

Earlier in your testimony regarding the size of the watershed was that Coffeen has a relatively small watershed; is that correct?

A I don't remember if I said small. I think I might have said modest relative to the other ones that I was looking at.

Q Okay.

A It's kind of middle of the road. There

are some that are very tiny, you know, in some places where lakes, you know, are larger than their contributing watershed around the edge. Coffeen is not like that obviously, but it's modest compared to many others.

Q Okay. I think you stated that the watershed area and the surface area is 12 to 1, the ratio is 12 to 1. Is that accurate?

A Approximately. Something like that. 13 to 1, 12 to 1.

Q Okay. In going back to phosphorous, you were comparing Coffeen Lake to Greenville Lake, correct?

A In this document?

Q Yes.

A Yes.

Q Okay. And do you know how deep Greenville Lake is compared to Coffeen Lake?

A Not off the top of my head. But there are depths reported in the TMDL document, the 2007 TMDL document.

Q Do you know whether Coffeen Lake is deeper, has the deeper maximum depth?

A It's larger in surface area. I'd have to look it up.

Q Okay. Would that make a difference in phosphorous that you would expect to see the depth of the lake?

A Can you restate your question?

Q Sure. What I'm trying to get at is, it seems there's a comparison in the report between Greenville Lake and Coffeen Lake, okay? And Coffeen Lake is a lake of approximately a thousand acres; is that correct?

A Yes.

Q And Greenville is much smaller; is that correct?

A Yes.

Q And could we also assume that it's a deeper lake? Coffeen Lake is a deeper lake?

A It may be.

Q May? Okay. Are you aware that Greenville Lake is not a heated lake?

A I'm not aware of that.

Q You're not aware whether it's heated or not? Okay.

Are you aware that the watershed area, the surface area ratio of Greenville Lake is 35 to 1? Does that approximately sound accurate?

A I mean, I don't dispute it, but I didn't

look at that.

Q Okay.

A I mean, I did not -- if I implied that I specifically was trying to compare those two lakes, I need to set the record straight about that. I used the graphs in the 2007 IEPA TMDL document and similar graphs that we updated with more recent phosphorous and chlorophyll data to illustrate what it looks like when a lake demonstrates an internal mode that is significant and when they don't.

The only reason -- I'm not picking Greenville Lake because I think it's a perfect match to Coffeen Lake. They're in the same TMDL document. So the IEPA graphs are on the same page, and I'm just using those to illustrate a point.

Q Okay. So going back to the idea that the watershed is larger for Greenville Lake; are you aware of that, whether it is larger for Greenville Lake?

A I wouldn't have been off the top of my head, but I believe you.

Q So you're not aware whether that the watershed area is compared -- comparing Coffeen Lake to Greenville Lake?

A I mean, I read the TMDL document. I don't

remember it off the top of my head.

Q Okay. That's fine. So regarding Coffeen Lake, is it your testimony that the mercury coming into the lake is limited due to the size of the watershed?

A Well, it's limited compared to some of the other -- if we go back to the graph and the comparison of other lakes in nearby counties, it seems apparent that Coffeen Lake has lower mercury in fish. One potential explanation is it has less mercury overall. And since I'm not aware of point sources or significant point sources or significant other sources of mercury in these areas, I think the primary one being atmospheric deposition. So if you take a very large watershed, you've got a much bigger area to capture external inputs into the lake. It's not the only possible factor in determining what the overall mercury amount is in a lake. The size of the lake matters, other factors matter, but it helps us to understand the data that we have. Because many of the other lakes that have higher mercury in fish have much, much, much larger watersheds.

Q Okay. So would you expect to see the same type of reasoning applied -- would you apply the

same type of reasoning to phosphorous that the size of the watershed may have a negative impact on the amount of phosphorous coming in or maybe limiting it?

A Oh, absolutely. I think these lakes, the ones that I've been looking at in the TMDL documents that I've been reviewing, their agricultural primarily -- and they have significant amounts of phosphorous coming in from the watershed. That's not the same as what's their internal load. One doesn't necessarily predict the other unless you look at a significant time series.

Q So if Coffeen Lake had a larger watershed, we have more phosphorous coming in, but there's a smaller watershed, and we're seeing the levels coming in that are coming in?

A I think that the initial estimates in the 2007 TMDL document are not accurate and demonstrably not accurate. I think there are significant phosphorous loading from the watershed. That doesn't mean internal loading is zero. It's not zero in any stratified lake. It's the normal process of the lake.

But in Coffeen Lake currently, and if we go to the permit changes that are being

requested, that picture doesn't change. The internal loading due to phosphorous in Lake Coffeen is currently a minor player that does not manifest itself into the epilimnion where it can fuel primary production. And that's where the impairment is driven from. Impairment is associated with what's going on. You know, the aesthetic value, too much chlorophyll, whatever. All it is, is looking at that epilimnetic phosphorous. That's the basis, I think, for the impairment.

Currently Coffeen Lake does not show significant internal loading fueling that problem, and the change that's being requested in thermal limits for May and October do not alter that conclusion. It's a de minimis increase. 1 percent, plus or minus a half a percent of the total loading.

MS. LOGAN-WILKEY: Okay. Thank you. That's all we have.

HEARING OFFICER WEBB: Does the Board have any further questions for anyone on the panel?

MR. RAO: No, but I have maybe a couple questions for the Agency, just clarification about that 2007 TMDL.

Earlier I think Dr. Shortelle, when she described the TMDL process, she mentioned

how -- you know, once the TMDL is published for public comments and before it's finalized. Did the Agency receive any comments regarding the errors in the TMDL when it was published for public comment?

MS. LOGAN-WILKEY: We don't know. We can get that information.

MR. RAO: If you can find that out.

Also has the 2007 TMDL been approved by the USEPA?

MS. WILLIAMS: Yes.

MR. RAO: Okay. Thanks. That's all I have.

MR. LIU: Actually, there is one more thing. Since we have so many people from the Agency, can we introduce them?

HEARING OFFICER WEBB: Sure. Well, why don't we -- do you want to do that now? I was going to give the petitioners an opportunity to Redirect.

Did you have any Redirect you wanted to do on your own witnesses?

MR. RODRIGUEZ: I think so, but could we take five minutes for me to --

HEARING OFFICER WEBB: Sure. In fact, why

don't we just go ahead. We do have several people here from IEPA. Maybe we can just -- because I think we don't know who you are.

MS. HOLLAND: I don't know who I am either half of the time. My name is Teri Holland. I work in the Bureau of Water, Surface Water Section, Lakes Unit.

HEARING OFFICER WEBB: Okay. And you are?

MR. SMOGOR: I'm Roy Smogor with the Bureau of Water. I'm in the Surface Water Section with the Streams Unit.

HEARING OFFICER WEBB: Okay.

MS. WILLIAMS: I also have two interns with me.

HEARING OFFICER WEBB: I recognize one intern. We have two interns.

MS. WILLIAMS: Identify yourselves.

MS. FESER: I'm Rachel Feser. That's F-E-S-E-R. I'm in the Bureau of Water for the next couple of months in legal enforcement.

HEARING OFFICER WEBB: Okay.

MR. CLARK: I'm Colin Clark. I'm in water registry.

HEARING OFFICER WEBB: Okay. Welcome.

Would you -- if you like, we can go ahead and take our public comment.

MR. RODRIGUEZ: Why don't we do that.

HEARING OFFICER WEBB: Let's go ahead. And which one of you ladies would like to speak first? Okay. If you'd please stand and maybe stand at the perch, and if you could give us your name as well.

MS. BATES: Yes. My name is Mary A. Bates. I'm an adversely affected person. I live at 936 Vandalia Street in Hillsboro, Illinois. My family and friends frequently visit Coffeen Lake, and I have many friends living near Coffeen Lake that participate in the tournaments.

I have concerns about the Coffeen Lake, especially if the Deer Run Mine proceeds, and it is likely that water coming into the lake will be greatly reduced. The mine will subside the area above the lake watershed with the stated average in the permit application of 5.7 feet.

My question is, has anyone looked at the combined environmental impact of what is happening in the area with Deer Run Mine and

this proposal from Ameren? Has an environmental impact study been done? And if so, by whom? Thank you.

HEARING OFFICER WEBB: All right. Ma'am, would you like to make a comment?

Oh, yeah. I'm sorry. You can't answer her question. The question is presented to the Board. The Board will review the question when they read the transcript. We've got a court reporter who will prepare a transcript for us, and they will consider that in their final opinion and order.

MS. DECLUE: Okay. I'm Mary Ellen DeClue. I live in Litchfield.

HEARING OFFICER WEBB: Could you please spell your last name.

MS. DECLUE: Mary Ellen, two words. DeClue, D-E-C-L-U-E, like I have no clue? Clue.

All right. I live in Litchfield on Lake Lou Yaeger. It's a beautiful lake. So I appreciate your concern on Coffeen Lake. We need to take care of our wonderful resources like that.

My kind of suggestion is, we've talked

about Coffeen Lake is impaired. The dissolved oxygen is extremely low. I mean, it's really hurting for the fish. And I was under the impression that as you increase the temperature of the water, metabolic rates in fish increase, which means they need more oxygen. So I can see where there's, you know, potentially a problem in actually promoting a good fishery situation. Is there any way that the oxygen level in the lake can be addressed? I mean, I know we have thermal stress, but I mean is there a way to have, like, fountains or bubbles? Or, "aeration," I guess is the word I'm looking for. Does that promote -- you can't answer it? Okay.

HEARING OFFICER WEBB: The Board will consider that question when it takes up the issue.

MS. DECLUE: And about the mercury? I was under the impression the mercury we're talking about comes from burning coal. And so if there's less water, less watershed, that means there's less coal dust around, all right?

Gillespie Lake right now, they have warned about eating fish due to high mercury. So I

don't know. Are there any other lakes around here that have that same warning about high mercury levels in fish not to eat?

HEARING OFFICER WEBB: Yeah, this really isn't a question-answering kind of proceeding. It's more like a judicial proceeding. It's not like our regulatory proceeding. So really we're not here to answer questions. Like I said, you can pose questions to the Board for their consideration.

MS. DECLUE: Who's the Board?

HEARING OFFICER WEBB: The Illinois Pollution Control Board members.

MS. DECLUE: So I need to write a letter?

HEARING OFFICER WEBB: Well, you don't need to, because they'll be reading this transcript, but you are more than welcome to write a letter.

MS. DECLUE: Then included in that, why is it 5 milligrams per liter to dissolved oxygen? What is that magic number? The 5? I mean, I'm just curious why that particular number was chosen.

HEARING OFFICER WEBB: Well, like I said, this really isn't a proceeding to answer.

MS. DECLUE: I wish we had a question and answer.

HEARING OFFICER WEBB: Yeah. In a regulatory proceeding, you may get more answers to your questions, but this is an adjudicatory proceeding.

MR. DELCUE: Thank you.

HEARING OFFICER WEBB: Thank you.

Would you still like to take a break, or would you like to --

MR. RODRIGUEZ: Could we take just five minutes?

HEARING OFFICER WEBB: Yeah.

[WHEREBY A SHORT BREAK WAS TAKEN.]

HEARING OFFICER WEBB: We're back on the record, and Petitioner's attorney is going to ask for some Redirect testimony from the witnesses.

JAMES WILLIAMS, JR.,

REDIRECT EXAMINATION

BY MR. RODRIGUEZ:

Q Mr. Williams, I just have a couple of points here I wanted to clarify and for clarification of some earlier testimony.

First, when you were talking about -- your scrubbers are going into the plant now this year; is that correct?

A That's correct. Unit one will be in service the end of this year and unit two primarily March of 2002.

Q And those scrubbers are designed to control for what pollutant?

A Mainly to remove SO2. We do have a benefit of some mercury reduction. Our overall compliance plan would have us in mercury reduction by 2015, I believe.

Q Let me ask you about the -- you talked earlier today about some -- you're going to have some increased capacity as a result of some of these efficiency projects that are going forward?

A Yeah. We talked about the increased output of the Coffeen generating station, and those are primarily due to efficiency upgrades with the turbine set. The majority of that power that will be produced will go to power the scrubbers. The scrubbers take an auxiliary load of 40 megawatts, and that was a way to increase that and be able to use the power to power the FGD systems.

Q Some of your increased power will be used

to power some of these pollution control devices?

A That is correct.

Q Okay. Finally, let me ask you; there was some discussion earlier today about 90 percent capacity factors, and I think it was in the context of Sargent & Lundy work and some projects with respect to power capacity factor for the Coffeen Station in 2014, I think. And I think the number they were using was 90 percent; is that correct?

A Yeah, that is correct. When we talked -- you know, the capacity factor, that's for the annual capacity. During the summer, we would expect to be in the high 90s. That's when the power is needed. And we would be expected to be in the 90 plus. And then the study would be 90 for the annual year, but during those summer months, we would be in the high 90 percent capacity factor.

Q In fact, is that true today?

A Yes.

Q And was that true five years ago?

A Yes.

Q Okay. So during the summer months, when these thermal limits are in play, and in May and October as well, you already are operating at capacity factors that are at or above 90?

A Yes, as long as I'm in compliance with my standards.

Q Okay. So what we're talking about then in terms of the Sargent & Lundy projections and into 2014, what we're talking about there is an annual capacity level?

A That's an annual capacity factor.

Q Which would include periods of time that were really unaffected by our relief, that the relief that we're requesting today?

A That is correct.

MR. RODRIGUEZ: Okay. I would like to ask Mr. Smallwood for some clarification.

MICHAEL SMALLWOOD

REDIRECT EXAMINATION

BY MR. RODRIGUEZ:

Q First of all, there was some discussion earlier about the TMDL and more importantly the TMDL addendum. And are you familiar with the work of -- in the TMDL project in negotiation with the Agency?

A Yes.

Q In fact, is that a project that you've been working on?

A That's correct.

Q Could you provide for the Hearing Officer and the Board an explanation of the background of the work that might and the discussions between the Agency and Ameren on the TMDL addendum.

A Certainly. For the Section 401, water quality certification, to support East Fork Shoal Creek Project, which was discussed earlier as a mechanism to provide additional water supply to Coffeen Lake, we were advised by the Agency that we would need to revise the existing TMDL to incorporate those new water flows to account for any increased phosphorous into the lake from East Fork Shoal Creek.

Q Okay. And there was some discussion also about increasing the level of the lake itself?

A That's correct. The revised TMDL, Ameren thought it in our best interests that we evaluated approximately 10 to 12 different scenarios of different water supply sources that we thought may be viable to provide water to the lake. That's not to say that we may or may not do these. And there is no prioritization based on those. Raising the dam spillway 3 feet was one of those options as well as pumping from various lakes and other streams in the nearby area.

Q And at one point, we heard a question anyway as to whether there was a commitment by Ameren to actually do a lake raise? Was that something that was committed to be done?

A No. That was neither committed than the previous 2007 TMDL document, nor was there any commitment in the current revised one dated essentially June 21, 2009. And a lot of that references back to what Mr. Williams was stating based on the economic evaluation that's done for any kind of projects.

Q Okay. Let me change topics then to one final matter. There was also a discussion earlier today -- I believe it was in the morning session -- about monitoring for temperature at the edge of the mix zone. Do you recall that testimony?

A Yes, I do.

Q You were present this morning?

A Yes.

Q There was a question asked for -- I guess there was implied in one of the questions that there was a monitoring requirement in the NPDES permits for the station, that the monitor or the monitor be set at 18 inches below the surface of the water. Do you recall that?

A Yes, I do.

Q Are you familiar with the NPDES permit for the Coffeen Station?

A I am.

Q And do you know what the current monitoring requirement is for the mixing zone?

A Quoting from special condition 5, the second sentence of the NPDES permit, it states that the edge of the mixing zone shall be a maximum area of 26 acres in compliance with the following thermal limitations determined by a fixed temperature recorder set at the edge of the mixing zone below the surface of the water.

Q And do you know where the recorder is set at Coffeen Station?

A There are two monitors. One we designate as a primary compliance monitor. The other is a secondary just purely for backup data purposes. They're both at the edge of the 26-acre mixing zone, and the monitoring probe is 1 meter below the surface of the water.

MR. RODRIGUEZ: I have no further questions.

HEARING OFFICER WEBB: Thank you.

MS. WILLIAMS: Uh-oh. Do you guys know

how many inches are in a meter?

MR. SMALLWOOD: Approximately 39.

HEARING OFFICER WEBB: Did you have any?

MS. WILLIAMS: Can I ask just a quick follow-up?

HEARING OFFICER WEBB: Yeah. Go ahead.

MS. WILLIAMS: I think it's really quick.

I would like to draw your guys' attention to your answer to question 4 to the Board's questions. I'll just read -- can I just read?

MR. RODRIGUEZ: We'll find it.

MS. WILLIAMS: Page 11, the first sentence of the answer to question 4 from the Board states in order to ensure compliance with temperature limits as set forth in the NPDES permit, Ameren measures water temperature at a depth of approximately 8 inches below surface at the location.

MR. RODRIGUEZ: Okay.

MS. WILLIAMS: Do you want me just to ask him to explain?

MR. RODRIGUEZ: I don't know, but it's not consistent with the NPDES permit. So we may be filing an errata.

MS. WILLIAMS: That would be fine. Just

so we can clear that up.

And then one other quick follow-up.

CROSS EXAMINATION

BY MS. WILLIAMS:

Q I guess is it Mr. Smallwood?

A Yes.

Q When you were referring to the June 21, 2009 addendum --

A Yes.

Q -- that was submitted to the Agency on that date; is that correct?

A That's correct.

Q Have you heard anything back? I'm assuming not yet, right?

A Not today. I've actually been out of the office the last couple of days.

MS. WILLIAMS: Thank you.

CROSS EXAMINATION

BY MS. LOGAN-WILKEY:

Q I just have one quick question.

I think my question may not have been phrased appropriately earlier regarding the issue of raising the level of the dam by 3 feet. Would you say that it's correct that the 2007 TMDL, those numbers were based upon the dam being raised by

3 feet?

A I have no knowledge of that. I have read and reviewed it. I just can't recall at this time. I do recall that there was a statement in there that it stated something to the effect that Ameren in the future was going to raise the spillway by 3 feet, but I don't think that was actually incorporated into the modeling, but once again, that's something we can verify.

MS. LOGAN-WILKEY: Okay. We will do the same. Thank you.

HEARING OFFICER WEBB: Okay. Both sides have made all the comments that they would like to make? Is anyone making a closing statement tonight?

MS. ANTONIOLLI: Sure. We have a little bit of time.

HEARING OFFICER WEBB: Okay. Sure.

MS. ANTONIOLLI: I think actually I'll do it from here.

So we provided a lot more information today and over the past couple weeks that we hope -- that we believe supports the relief that we seek in the petition for modified thermal limit for Coffeen Lake.

We've heard from Mr. Williams that Coffeen supports the thriving fishery. We're heard Dr. McLaren's analysis of historical data for Coffeen Lake that supports his observation and his prospective analysis anticipating that Coffeen will continue to provide conditions capable of supporting shellfish and wildlife.

Finally, Dr. Shortelle has provided her opinion that the requested relief will have no significant ecological impact.

And we would just like you to consider this information for the record.

HEARING OFFICER WEBB: Okay. Would the EPA care to make any closing statements?

MS. WILLIAMS: I think we'll reserve it for our briefs.

HEARING OFFICER WEBB: Okay. The transcript of these proceedings -- we've had a discussion off the record.

The petitioner would like an expedited transcript, and I have informed them that the Board is not able to pay for that. However, if Keefe Reporting would call the clerk's office, Don Brown, I have no problem with working that out. Somehow if we can somehow work it out

where the Board doesn't have to pay for an expedited transcript, as far as I'm concerned, you know, you can have it. If it doesn't work out for any reason, and I can't imagine why, we would otherwise have the transcript on July 6th.

Once we get the transcript, it will be posted on the Board's website.

MS. WILLIAMS: Whether it's expedited or not?

HEARING OFFICER WEBB: Right.

We are also taking the unusual step of not setting a briefing schedule at hearing. During the course of the proceeding, it was decided that Petitioner would file some additional supporting documentation. The parties have agreed that the supporting documentation shall be due by July 10th. And the parties have agreed to meet for a status conference on Monday, July 13th at 4:00 p.m. at which time a briefing schedule will be set.

I do not think we have any further members of the public here to make any comment. So I will just state that I find all of the witnesses testifying today to be credible. And we will now adjourn the proceedings. I thank you all for your participation.

[END OF PROCEEDING.]

NOTARIAL CERTIFICATE

I, ANN MARIE HOLLO, a Certified Shorthand Reporter for the State of Illinois, CSR# 084-003476, and a duly commissioned Notary Public within and for the State of Illinois, do hereby certify that on June 23, 2009, there came before me at the City of Litchfield City Hall Council Chambers, 120 East Ryder Street, the foregoing hearing held before the Illinois Pollution Control Board.

The Witnesses were first duly sworn to testify to the truth and nothing but the truth of all knowledge touching and concerning the matters in controversy in this cause; that the witness was thereupon examined under oath and said examination was reduced to writing. That this transcript is a true and correct record of the testimony given by the witnesses, and an accurate record of the said hearing.

I further certify that I am neither attorney nor counsel for nor related nor employed by any of the parties to the action in which this deposition is taken; further, that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in this action.

IN WITNESS WHEREOF, I have hereunto set my hand and seal on June 25, 2009.

My commission expires April 5, 2010.

_____
Notary Public