UNITED STATES OF AMERICA

BEFORE THE

NUCLEAR REGULATORY COMMISSION

In the Matter of:	X
	X
HOUSTON LIGHTING & POWER COMPANY	X
	X
	X Docket No. 50-466
Allens Creek Nuclear Generating Station, Unit 1	X
	X

Krost Hall Auditorium
Bates College of Law
University of Houston
Houston, Texas

Friday
February 6, 1981

PURSUANT TO ADJOURNMENT, the above-entitled matter came on for further hearing at 9:00 a.m.

APPEARANCES:

Board Members:

SHELDON J. WOLFE, ESQ., Chairman
Administrative Law Judge
Atomic Safety and Licensing Board Panel
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

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I N D E X

WITNESSES	DIRECT	CROSS	REDIRECT	RECROSS	BOARD EXAM.
Dr. F. S. Sanders (Resumed)					
By Intervenors: By Mr. Scott	---	4887			
By the Board: Judge Cheatum					5053
Judge Linenberger					5058
By Intervenors: By Mr. Scott				5073	
D. E. Simmons AND Dr. J. D. Guy					
By Mr. Copeland	5097				

PROCEEDINGS

9:00 a.m.

JUDGE WOLFE: All right. The hearing is resumed.

It is now a little after 9:00 a.m.

In attendance are Applicant's Counsel, Mr. Copeland and Mr. Newman, Mr. Black for the NRC Staff.

No other Counsel, party or representative of the parties is here.

We will stand in recess for five minutes.

(Recess taken.)

JUDGE WOLFE: It is now 9:05.

Mr. Scott has made his appearance.

Before beginning with Mr. Scott's cross-examination of Dr. Sanders, I note that the Board in its discussion and ruling yesterday with regard to TexPirg's motion of January 29, 1981, at transcript page 4807 at the bottom of the page.

We have ruled that -- Well, without further ado, that portion of the motion which seeks to have the Board disqualify itself is entirely inadequate and does not meet the requirements of our regulation.

Obviously, the regulation referred to was Section 2.704(c).

All right, are you ready to proceed with your cross-examination of Dr. Sanders, Mr. Scott?

MR. SCOTT: Yes.

Whereupon,

F. S. SANDERS

resumed the stand and, having been previously sworn, was examined and testified further as follows:

MR. NEWMAN: Mr. Chairman, before Mr. Scott commences his examination, yesterday, shortly before he left the room, there was discussion concerning a requirement that Mr. Scott identify the points that he intended to adduce on cross-examination; and I wonder if we could have that identification which is required by the Board's ruling at page 4854 of yesterday's transcript.

JUDGE WOLFE: Yes, Mr. Scott, pursuant to that ruling what specific points do you propose and intend to cross-examine the witness upon?

MR. SCOTT: Essentially all points relevant to the contention that have not been previously covered.

MR. NEWMAN: Could we have an identification of those points that have not been previously covered?

MR. SCOTT: All points that are not in the hearing transcript.

MR. NEWMAN: Do you have, Mr. Scott, a game

plan for this cross-examination?

Do you have a list of areas that you want to explore?

MR. SCOTT: I have a plan in my head. I've got some of it written down.

I would object strenuously to giving it to Applicant's Counsel or Staff Counsel or to the witness.

I'm willing to show the Board what I have, although I do not wish to be restricted to the literal words written on this.

I have been furiously writing since 5:00 o'clock this morning, other than the time I've been in the car. And --

JUDGE WOLFE: Well, let me ask you this way, Mr. Scott: In light of the previous cross-examination, I'm certain you could advise the Board those areas that you do not intend to cross-examine on.

MR. SCOTT: In terms of general areas, there are no areas that I don't intend to cross-examine.

JUDGE WOLFE: All right.

Let's break that down now.

What specific sub-areas, if we can call it that, do you intend not to cross-examine upon?

MR. SCOTT: Those covered by the previous cross-examiners.

JUDGE WOLFE: Th was my question. I'm getting back an answer that raises the question exactly what sub-areas are you not going to cover?

What specific sub-areas are you not going to cover, in light of there having been an exhaustive cross-examination upon them?

MR. SCOTT: Well, I wouldn't characterize any of the previous examination as exhaustive; but basically, what I have perceived so far in the cross-examination of this witness is that the previous cross-examiners have touched upon basically all areas.

They, largely because of training, have not had the ability to pursue them into the depth, even the amount of depth that's a minimum necessity necessary to determine -- make a decision on this contention.

I can understand why Applicant and Staff were very happy, for example, with Mr. Doggett's cross-examination.

JUDGE WOLFE: They were very what? I'm sorry.

MR. SCOTT: Happy. If you noticed, there were no objections. They made comments afterwards how happy they were with it, and it's understandable to me and the Board why that would be.

JUDGE WOLFE: Actually, I think the comment came from Staff, but go ahead.

MR. SCOTT: Okay.

And so I intend on pursuing in more depth, considerably more depth, those points.

I mean, examples of Mr. Doherty's problems yesterday with the effects of cadmium versus hardness of water.

There's a very valid, very important point there that hasn't ever made it into the record.

That's just an example of something that -- if you want to describe it as exhaustion -- time spent attempting.

There's perhaps a valid point that it's been exhausted.

In terms of getting something of validity into the record, my opinion is that those people have not been able to.

JUDGE WOLFE: In other words, then, you are saying that your examination, to your mind, should not be limited at all and will not be limited, because you don't think the prior cross-examination has touched upon pertinent material points; is that correct?

MR. SCOTT: That's not quite correct.

They have touched on them. The problem is that's all they've done.

JUDGE WOLFE: I see. Anything further,

Mr. --

MR. COPELAND: Yes, Mr. Chairman.

I believe that Mr. Scott has directly flaunted a specific order by this Board to provide the Board with an outline of the points that he intends to cover that have not been covered by prior cross-examination.

That was a direct order to him as he was leaving here yesterday.

He has not done that.

The Board was the one that used the term exhaustive cross-examination in this exchange; and I believe if that is the Board's view that there has been a thorough cross-examination of this witness, that is clearly within the Board's authority to decide and determine that the record is quite complete.

I think that the Board and the parties at this point are entitled to know with a great deal of specificity what matters remain to be developed.

Mr. Scott's self-effacing characterization of his capacity to cross-examine better than other Intervenors is not good cause for having flaunted the Board's order.

I believe that the appropriate remedy is to conclude that Mr. Scott should not be allowed to cross-examine further, because he has flaunted that order.

MR. SCOTT: Mr. Chairman, I've clearly not flaunted anything.

I've got something in writing. I've explained in detail.

It's clear the Board understands what I'm talking about.

(Bench conference held.)

JUDGE WOLFE: Mr. Scott, recognizing that a cross-examiner has certain subjective feelings about the adequacy of prior cross-examination, we can appreciate that.

However, sitting as the Hearing Judges here, and in using the words "exhaustive cross-examination of prior cross-examiners," I meant just that.

We feel that there has been particularly exhaustive, and I don t mean just touching upon, but exhaustive, in-depth cross-examination on the subject of mercury, on the subject of algal bloom behavior and their effects on fishing, as well as in the area and upon the subject of spawning.

We're concerned that you haven't seen fit to -- whatever your subjective feelings are about it -- you haven't seen fit to enlighten the Board that you have made any effort to specify that there are certain questions within the subject of mercury, algal bloom effects

on fishing and spawning areas that you feel should be dealt with more upon cross-examination?

Unfortunately, you have not done this.

MR. SCOTT: Mr. Chairman.

JUDGE WOLFE: Yes.

MR. SCOTT: I previously said I have two pages here of that.

I have not refused to give you that.

JUDGE WOLFE: Oh, all right.

MR. SCOTT: It's just that I don't want to be limited just to this.

JUDGE WOLFE: Well, let's see what you've done. Hand that up to the Board, will you?

MR. SCOTT: I'll be glad to, but considering my handwriting, it probably won't help much.

JUDGE WOLFE: If it's anything like mine, I'll be able to read it.

MR. BLACK: Chairman Wolfe, at some time Staff would like to indicate to the Board and parties what its position is.

JUDGE WOLFE: Yes.

MR. BLACK: As Staff indicated yesterday, we believe that reasonable probing of the witness' testimony to determine if conclusions are valid and

based on sound evidence is perfectly permissible.

We also believe that reasonable probing of Dr. Sanders' testimony has gone on, quite exhaustively, and not only in areas that you just indicated, but we also indicate that I think chlorine has been exhaustively reviewed by the parties previous to Mr. Scott.

Dr. Sanders' testimony, not only in his direct testimony, but in his cross-examination testimony, has indicated that he has done a very conservative worst-case review of the aquatic ecosystems of this lake, and the prior examiners have probed that conservative review.

Mr. Scott at the very least should indicate to the Board and the parties at this point where he would differ with that conservative review of Dr. Sanders.

I think that's the very least that he could do at this time is indicate where he disagrees with that conservative review and on what grounds he wishes to cross-examine.

I would also indicate to the Board that the Staff has made the transcripts available to the Intervenors in this case.

Dr. Sanders' cross-examination by Mr. Doggett on February 3rd, 1981, has been available to Mr. Scott for several days now -- three days, and certainly his

cross-examination should indicate where in the transcript he wishes to reference and go from there.

Mr. Baker who has been in and out of this proceeding did precisely that. The Staff had no objection to Mr. Baker's cross-examination, because he started out by referencing the transcript pages where Dr. Sanders had indicated something to Mr. Doggett.

So we're getting now to the point that if past history repeats itself, Mr. Scott will not do that.

He will go off on his own cross-examination without reference to Dr. Sanders' testimony or without reference to Dr. Sanders' cross-examination that has gone on previously.

If that is the case, we can expect to have strenuous objections by both Staff and probably by the Applicant, based on asked and answered or some other grounds.

This is precisely what I believe the Board wished to preclude by having Mr. Scott file with the Board and the parties an outline of his cross-examination.

Without that, I believe that we are going to get into tremendous amounts of exhaustive cross-examination that may lead us down fruitless trails.

At this point the Staff would strenuously object to embarking upon that trail without some outline

of his cross-examination.

JUDGE WOLFE: Mr. Scott has handed up to the Board now an outline of the areas and type of cross-examination that he wishes to engage in.

He has made that effort.

MR. NEWMAN: Your Honor, I wonder whether it might not be helpful in the Board's deliberations as to what to do with Counsel's identification of the areas in which he wants to cross-examine to determine what time period Mr. Scott believes will be occupied by the questions that would be asked in the areas that he has identified for the Board.

JUDGE WOLFE: I would also agree with you, Mr. Black, that there has been exhaustive examination also in the area of the subject of chlorine, yes.

MR. SCOTT: Mr. Chairman.

(Bench conference held.)

JUDGE WOLFE: We have reviewed Mr. Scott's outline, and for example, we see that on the outline there will be much cross-examination in the area of chlorine discharge; some in the area of spawning; quite a bit in the area of heavy metals.

It really doesn't tell us specifically, really what the objectives are of the cross-examination.

I think the only thing we can do under these

circumstances is that we have advised you of our thoughts, Mr. Scott, on what subjects have been exhaustively previously cross-examined.

You can expect, I would think, that there will be numerous objections, asked and answered objections, objections as to cumulative type cross-examination.

We can advise Applicant and Staff and any other party concerned with this hearing today that we will hear such objections.

Once again, if there is over-reaching, cumulative type cross-examination that adds nothing to the record and merely serves to string out this cross-examination, as we have done in the past, we will limit cross-examination.

That's the best we can do at this point.

I'm not certain what else can be done under these circumstances.

MR. NEWMAN: Your Honor, may I make a suggestion?

JUDGE WOLFE: Yes.

MR. NEWMAN: I think that in view of the failure to identify the major specific points that he intends to adduce, and indeed, Perry Island talks about the Board insisting on an advanced indication of what the Intervenor will attempt to demonstrate --

JUDGE WOLFE: Could you give me some background on that, Mr. Newman?

MR. NEWMAN: Surely.

JUDGE WOLFE: How much time was given that party?

MR. NEWMAN: I can't say. I really don't know the record.

I know the Appeal Board decision and nothing beyond that.

JUDGE WOLFE: Yes.

MR. NEWMAN: What the Appeal Board decision does address, however, is that latitude of discretion afforded to the Board to limit cumulative and repetitive cross-examinat on; and suggest to the Board that not only under NRC rules but under the Administrative Procedure Act, the Board has a wide-ranging discretion to impose a wide variety of reasonable limitations to curtail cross-examination.

It seems to me that the Board's order not having been complied with, that is the order to identify the specific points that the Intervenor intends to adduce on cross-examination, the alternative is to allow Mr. Scott a period of time in which to conduct that cross-examination.

I would suggest that he be allowed perhaps two

hours to conduct his cross-examination.

I would suggest that that would force Mr. Scott to probe in those areas which are of greatest importance to him and the areas in which he feels he can make the most significant contribution to the record.

That, after all, Mr. Chairman, is really the thrust of the entire Administrative Procedure Act and its rules relating to the conduct of examination.

The Attorney General's Manual says the true test of cross-examination and whether it's worthwhile is whether it is required for a true and full disclosure of the facts.

It seems to me that if the Chair imposed a reasonable limit on cross-examination, I think we could provide a greater degree of assurance that that which does come out on the record will contribute to the record.

I don't mean to suggest that two hours has to be an absolute final and complete cut-off. If at that point after two hours the Intervenor is pursuing a point which appears to be productive, then obviously he should be permitted to go on and complete that point which he believes will be productive of the record, or which the Board believes will be productive on the record.

Similarly, if at that time he can identify other specific points that he wishes to adduce which the

Board is interested in hearing further testimony on, again, it's within the Board's discretion to do so.

But I think in the past the Board has done this successfully, placed time limits on Mr. Scott's cross-examination when it's gotten out of hand, and it has done it in a very even-handed fashion.

It set an initial time limit, as I recall at one point, and extended it, as I recall, at two points during that cross-examination.

I think that it's a worthwhile experiment to get on with this hearing and this cross-examination of this witness who is a man who has been sitting here for two weeks trying to get on and off with serious responsibilities.

JUDGE WOLFE: Yes.

MR. SCOTT: Mr. Chairman, I very much want to respond to that.

JUDGE WOLFE: All right.

MR. SCOTT: Several things are important.

Number one, there's no need for me to go back and read the transcript. I've been here for 99 percent of all the testimony of this witness.

So I could have wasted four or five hours or maybe ten going back and reading the transcript and looking up page numbers.

The Staff's suggestion earlier was a way to waste time instead of conserve it in those circumstances.

Number two, these two contentions that this witness is here to testify on are TexPirg's contentions, so if anything, TexPirg should be the most familiar, most prepared.

Frankly, we've been living with this for three years.

Most of the other Intervenors have come in and looked at the transcript or looked at the direct testimony and run down through there asking questions.

It's a different type cross-examination.

Thirdly, the Perry Island case don't even come close to pertaining to this situation.

That was a case in which an Intervenor was trying to cross-examine on questions that had not even been admitted into the proceeding.

JUDGE WOLFE: Did anyone cite Perry Island? Was it Perry Island itself?

Which case was that now?

MR. NEWMAN: I referred to it. That's 8 NRC --

JUDGE WOLFE: All right, fine.

MR. SCOTT: It's the one I'm talking about, also, and its various appeals.

So there is nothing that I can think of that

allows the Board or even encourages the Board to do anything other than apply the rules that Mr. Newman has mentioned that apply to the Administrative Procedures Act and the rules of the NRC in procedure, and you have repeated those, and that's what your ruling says.

JUDGE WOLFE: All right, Mr. Scott.

We've heard the argument. We think you have made your point that certainly these are your contentions, your client's Contentions 2 and 4, although they also include Griffith 4 and McCorkle 2; that you have apparently spent more time in researching them perhaps than have other cross-examining parties.

However, as I say, the Board feels that these four areas have been exhaustively examined and we'll just have to see how we go.

What we will do is that at the end of two hours the Board will confer, at approximately 11:30 or so and decide how you are progressing.

We will take into consideration the number of sustained asked-and-answered objections there have been, and objections of other forms that we've sustained, and we may proceed to, as we have done in the past, limit your cross-examination.

This is intended only as a warning. We trust that you will take this warning to heart and trim

your questions, have them direct, and we'll just have to wait and see how you do.

I return your cross-examination outline to you, Mr. Scott.

MR. SCOTT: Yes. I would like to say one additional thing.

I find nothing improper about anything that you have said this morning.

JUDGE WOLFE: Thank you.

MR. SCOTT: I would like a clarification in that several times it has happened in this proceeding, the two hours have been spent largely listening to the opposing Counsels' arguments as to why it is asked and answered, and my spending a lot of time explaining why I was asking a different question and then being --

JUDGE WOLFE: Don't you think the Board will take that into account at the end of two hours?

MR. SCOTT: I hope so. That's what I was asking a clarification on.

The two hours means my time instead of just time passing.

JUDGE WOLFE: It's the Board's time, too.

I hand you your outline and you govern yourself accordingly by what we've said.

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MR. SCOTT: Frankly, I would estimate that I would be through with this witness by 11:30, if it's my time and his.

I'm sure that he and I could go over in a room by ourselves and get all of my questions answered that quickly.

JUDGE WOLFE: Would you like to go off the record now and take two hours off, because the requirements are that anything that is said -- testified to be on the record.

So you would be wasting two hours, wouldn't you?

MR. SCOTT: No. I could refine my questions considerably.

MR. COPELAND: Your Honor, I would be glad to give Mr. Scott a flat two hours with no objection, as to asked and answered, if he would agree that after two hours he would terminate his cross-examination.

JUDGE WOLFE: Is this agreeable?

MR. SCOTT: Not quite.

(Laughter.)

MR. COPELAND: That's what I thought.

JUDGE WOLFE: All right.

Let's proceed.

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CROSS-EXAMINATION
(Continued)

BY MR. SCOTT:

Q. Okay.

Dr. Sanders, this Board has repeatedly asked me to get --

JUDGE WOLFE: You're wasting time, Mr. Scott. Just get to it.

MR. SCOTT: Get right at things.

BY MR. SCOTT:

Q. So I'd like for you to be referring to page two of your testimony which lists -- I'm not sure if these are the exact words or not -- but in general terms lists the contentions.

And it mentions several specific areas that have been discussed in this hearing and that are parts of the contentions that TexPirg claims have an impact upon the cooling lake, such things as the north bluff, chlorine releases, algal blooms, heavy metal concentrations and cold shock.

Of those things I would like your honest, fairly explanation which of these areas is of the least concern and just go down the order. And then we'll concentrate on the ones that are of most concern to you.

A. Well, the two areas that are competing for least concern would be cold shock and the sewage discharges

in relation to excessive algal growths.

Q. Okay.

Now on that point, I'm more interested in the general problem of algal growth, not necessarily where it came from.

A. Well, again, sir, I repeat that they are of very little concern to me as an ecologist in reviewing the information available for forecasting and postulating the potential ecology of this hypothetical system.

Q. Okay.

As a clarification of that, does that include the visual impacts?

A. In the entire lake, yes, sir, we have come down to just a very small portion of the lake -- some restricted circulation areas during the late summer as having the potentially -- highest potential for having some sort of a nuisance algae occurrence.

We have also alluded to the fact that these occurrences are very rare in Texas. And that has come from direct communication with algal specialists within the universities of the state.

Q. The next least concern?

A. Well, actually in the same group is number six on page two; and that is the idea of the environmental burden. I think we've gone over the fact that it will be a

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substantial crappie fishery; and I don't consider that an environmental burden personally.

So actually I would group all three of those together. So that leaves us only with spawning habitat, chlorine and heavy metals.

Of all those, next throw out spawning habitat, again with relation to the crappie fishery. And that leaves us with heavy metals and chlorine.

I would then throw out chlorine. That would leave us with heavy metals.

Q Okay.

Let's discuss heavy metals first then. Are there any heavy metals other than mercury and cadmium and zinc that you have any concern for in this cooling lake?

A Well, actually the only one I have concern for at all is mercury, in terms of real concern. I think we have already stated that in the low parts per billion range, that the heavy metals will combine in what you would call an additive or synergistic fashion, and have the ability to cause chronic stress, which I don't believe actually in fact will be measurable in the lake. But it may be there in some fashion.

So really the only specific heavy metal of concern is mercury.

Q Would you not agree that chronic problems are

of concern, even though they may be hard to measure?

A. Not when they occur over very small areas in a large lake.

They are more of academic interest at that point.

Q. Okay.

Now as to mercury -- I believe that's what you said you have the most concern for -- do you have a data base other than the fact that there has been some 24 measurements of mercury in the Brazos River, that certain values were obtained?

A. Are you asking me what my data base is?

Q. Do you have any data base other than that, in terms of actual measurements?

A. Yes. I reviewed the USGS data base from Richmond, Texas, downstream of the cooling lake -- prospective cooling lake, which consists of bimonthly sampling between 1969 and 1977.

Q. Okay.

A. That's approximately 50 data points, roughly.

Q. Is this data that's in one of their -- I guess annual publications that records the values obtained?

A. No, sir.

I obtained this data via a computer hookup with a large scale data base -- national data base having

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to do with water quality in the U. S. We just fed in the specific sampling location, asked for data -- all data on heavy metals between -- at that time the earliest known samples and current and present day, which was 1977 at that time.

Q. Okay.

And is there some way that you can give us those values? I realize it would take a lot of time to read 50 values over the --

A. Well, I have a summary in my hand, a handwritten summary. I'll have to ask my counsel whether --

DR. SANDERS: Is it all right with you?

MR. BLACK: What exactly do you wish to do with it?

MR. SCOTT: Learn what the values are.

MR. BLACK: You can look at those, if you wish --

MR. SCOTT: I want the Board to know what the values are.

DR. SANDERS: Shall I read values for you?

MR. SCOTT: I think so, if it's all right with counsel.

MR. BLACK: What exactly are we trying to prove here? That he has values, or the values are high or low, or what?

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MR. SCOTT: Just what they are.

You know, I assume he has got them. I'm not questioning that he has got values. I mean, I know such data is recorded.

MR. BLACK: Okay. So you agree there is data? I --

MR. NEWMAN: Mr. Chairman, this is patently a fishing expedition.

If that witness did not have, by pure fortune have that handwritten summary in his hand, there would be no question worth asking here.

Mr. Scott should have data like that in his own possession and cross-examine from that data.

MR. SCOTT: Mr. Chairman, I am very happy to ignore that data. In fact, I think based on that, that's just what I'd like to do.

JUDGE WOLFE: To do what?

MR. SCOTT: To ignore the data he has got there.

MR. NEWMAN: Then let's move on.

JUDGE WOLFE: There's no point in it then. If you don't -- If you have no cause to question this data, then there's no reason for you to cross-examine, nor for the Board to look at it.

Let's just proceed. You know what the witness

has said. If you had not engaged in discovery and found out about these values and if there's no reason to dispute them ... let's get on.

We're spinning our wheels.

MR. SCOTT: The problems is -- I was trying to make a complete record. Those data are not in the record.

JUDGE WOLFE: Well, if there's no objection to them, no reason to question their accuracy, why get into them?

MR. SCOTT: Okay.

We'll ignore that data.

JUDGE WOLFE: We know it's there. If you have no reason to question it, let's get on with it.

MR. SCOTT: It's not in the record.

JUDGE WOLFE: The statement that he relies on it is.

BY MR. SCOTT:

Q Okay.

How far downstream of the cooling lake is Richmond?

MR. NEWMAN: Objection. Asked and answered.

MR. SCOTT: The exact distance downstream has never been given.

MR. NEWMAN: Yes, it has.

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MR. SCOTT: Not even within a mile.

MR. NEWMAN: We have discussed the proximity of Richmond to the Allens Creek cooling lake with this witness.

MR. SCOTT: Only that it was downstream a number of miles.

MR. NEWMAN: That's exactly what the inquiry was.

MR. SCOTT: I asked how many miles.

JUDGE WOLFE: I'll allow the question. Answer the question.

DR. SANDERS: I don't know the exact river miles to Richmond. By looking at maps, I would judge somewhere in the 25 to 30-mile range downstream.

BY MR. SCOTT:

Q Okay.

What data do you have that is within a few miles upstream of the Allens Creek cooling lake, that indicates mercury values?

A. Well, we have the information provided to the Applicant by the Dames and Moore biological report.

Q Is it fair to say that that data consisted of some -- as to mercury levels -- some 24 measurements?

A. Well, I'm not sure exactly how many measurements they reported. But you're in the right ballpark,

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yes, sir.

Q. Is it true that most -- all of those measurements were below three, except for two -- three --

A. Three what?

MR. NEWMAN: Which study are you referring to Mr. Scott? Can you identify the study?

MR. SCOTT: The two studies that have previously been mentioned here --

MR. NEWMAN: Which one are you referring to?

MR. SCOTT: Each one of them consisting of some 12 monthly measurements, one of them being the Dames and Moore study; the other one being an earlier pre-monitoring sampling done by --

MR. NEWMAN: There are two Dames and Moore studies. This record is going to get incredibly vague unless you identify which of the studies you're relying on.

MR. SCOTT: Mr. Chairman, this is an example of what I was instancing before.

(Bench conference.)

MR. SCOTT: I could specify that we're talking about the two that Dr. Tischler said he relied upon to get the 24 measurements.

(Further Bench conference.)

MR. SCOTT: Mr. Chairman, one of the studies

is shown on page S.2.9.

MR. NEWMAN: Is that the study that you're questioning on now?

MR. SCOTT: That is one of the two studies.

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BY MR. SCOTT:

Q Are you familiar with that study? Is there any confusion about that?

A No. That table was a table that I prepared.

You're talking about Table S.2.6 on page S.2-9?

I prepared the table from the data provided by the Applicant.

Q Yes, that's one of them.

Some other witness testified that in addition to that subject, there was a later one that consisted of the 12 more monthly measurements.

MR. COPELAND: Mr. Chairman, the point is here that Mr. Scott has asked this witness a specific question about specific sampling frequency in a specific study.

And all we're trying to do is to find out which study he's talking about.

If he can't answer that question, then I suggest that he has wasted all of our time here -- five minutes -- trying to figure out what study he's talking about.

We ought to move on.

JUDGE WOLFE: Can you identify the study you asked about?

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MR. SCOTT: I already have.

It's the one that Applicant's own witness has referred to in response to questions I asked him previously.

I can't refer to the page number or the date or any of that.

I mean it's something that I think is clear in everyone's minds ... this is an example of --

MR. COPELAND: No, it isn't clear.

MR. SCOTT: -- delaying tactics.

JUDGE WOLFE: No, you're putting the question to the witness and asking him about some study. You have to identify the study so that the witness will know what study you're talking about.

You can't go back and say there's something in the transcript that some witness identified a study. You have to tell the witness which study you're asking him a question about.

MR. SCOTT: Perhaps the witness can tell me what I'm asking about.

BY MR. SCOTT:

Q Dr. Sanders, are you aware of any studies other than the one mentioned on page S.2-9 that Applicant has submitted in some form into this hearing?

A Well, there is a study that the Applicant

2-14

has prepared on the heavy metal body burdens of fish in the Brazos River in the mid-winter of 1978, which was presented at least to me -- I guess docketed with the NRC and, therefore, available as a public document.

Q Okay.

Did that study, to your knowledge, measure the concentrations of mercury in the water as opposed to in the fish?

A Yes. It measured mercury in water, mercury in sediment in the Brazos River and mercury in fish.

Q Do you happen to know how many measurements were made in that particular study of mercury concentrations in the water?

A I believe they lasted only over a few months. I do not believe that was another year's -- full year's data, no, sir.

I would say three or four months of data only.

I would like to add, however, that those data points fell well below what is shown in this Table S.2.6 and --

Q Yes, I'm aware of that.

A Okay. It wasn't given the weight as this table was, and as the Richmond USGS data was.

Q Okay.

2-15

On that Table S.2.9, how many of those measurements for mercury exceeded one part per billion?

MR. COPELAND: There is no Table 2.9, counsel.

Are you referring to 2.6?

MR. SCOTT: I'm referring to Page 2-9, Table S.2.6.

MR. COPELAND: Thank you.

DR. SANDERS: Okay.

How many of the 12 measurements listed for mercury are above one part per billion? Is that your question?

MR. SCOTT: Yes.

MR. COPELAND: Asked and answered, Your Honor. The table speaks for itself.

MR. SCOTT: Mr. Chairman, it's not at all clear that this table is in the record.

MR. COPELAND: It is in the record, Your Honor. It's part of Staff's Exhibit 12.

MR. SCOTT: It's not clear to me that it's in the record for this contention.

JUDGE WOLFE: It's in the record. The entire document -- the Final Supplement to the Final Environmental Statement is in evidence as Staff Exhibit 12.

MR. SCOTT: Does that mean then that the Board

can rely upon it to determine into the various contentions?

JUDGE WOLFE: It's in evidence for all purposes.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q. Dr. Sanders, what is the standard deviation?

A. What is a standard deviation?

Q. Yes.

Do you understand what it is in the statistical sense?

A. Sure.

It's a sum of residuals given as an absolute value with respect to the mean.

Q. Okay.

Is it fair to say that it's a measure of the precision of measurement?

A. That's fair to say that, yes.

It's fair to say that in the sense of repeated analysis of the same sample.

Q. Okay.

Are you adept enough, by looking at that data just to in your head, give us an approximate standard deviation for that data?

A. Well, are we talking about data now on Table

2-17

S.2.6?

Q. Yes. And for mercury specifically. You've got some 12 measurements there.

A. No, I couldn't give you something just off the top of my head.

I could give you just the range.

Q. Range of what? Standard deviation?

A. No, the range of absolute measurements reported.

Q. Okay.

Let me ask you to do this: Assuming all measurements on there were zero, excepting the two measurements that were 36 and 12, what would the mean for those measurements be?

A. If everything else is zero and 36 and 12, so you'd have 48 divided by 12, is that what you're trying to say?

Q. Yes.

A. That would be four.

Q. Okay.

Could you, by looking at that data, select the median number? Or in this case I believe it would be the two numbers on either side of the median.

A. Well, I haven't looked at it with that regard. I couldn't -- I could just estimate very roughly right

2-18

off. They would be ... well, somewhere in the one to two range -- parts per billion range, as a median.

Q Okay.

Is it fair to say that only four of those measurements come out to be less than one?

MR. COPELAND: Objection, Your Honor. The table speaks for itself.

MR. SCOTT: That's okay. The Board will have access to it.

BY MR. SCOTT:

Q Okay.

Do you understand what the 68 percent and 95 percent confidence intervals mean in relation to standard deviations?

A As a probability distribution?

Q Yes.

A Yes.

Q Based upon that, could you make an approximation as to what value of measurement would be at the 95 percent confidence level that it would not be exceeded?

A I really don't understand your question.

Q Okay.

Do you agree that it takes two standard deviations to meet the 95 percent confidence level?

A Yes.

2-19

That's approximately.

Q. Okay.

In summary, are you willing to say that based on this data in Table S.2.6 that it is impossible to be confident that the mercury levels in the Brazos River don't exceed one part per billion?

A. The mercury levels in the Brazos River during average flow conditions? You'll have to be much more specific before I answer the question.

- - -

BY MR. SCOTT:

Q. Were these measurements taken over a period of approximately one year?

A. Yes, sir.

Q. Was there one of them taken each month during that time period?

A. Only one month is omitted on that basis.

Q. Which month is that?

A. The final measurement in November 1974. This is only eleven measurements.

Q. Is it true that in March of '74 there was one taken the very early part of March and one the last part of the month?

MR. BLACK: Objection.

The table will speak for itself.

BY MR. SCOTT:

Q. Do you know of any -- Do you have any reason to believe that this data was taken when average wouldn't represent average flow conditions for the river?

A. Sir, I'm sure that the river, being a turbulent system, is a well-mixed system; but I would like to repeat what I've said in the past about measurement frequencies in rivers.

This is a table that indicates -- gives a rough characterization of the river water quality.

3-2

It is not adequate for determining total heavy metal flow down the river. It is not adequate for that purpose.

Therefore, the answer to your question would be no.

Q. Okay, that's what I was after.

Is it your opinion that you can use this data to show that one should have confidence that the cadmium levels are not above the -- not above those that can cause adverse environmental effects?

A. Are cadmium levels where, sir?

Q. In the Brazos River right now, where they were measured.

A. Well, I see two values in that table that in reflection to the EPA recommended criteria would lead one to believe that chronic impacts are possible.

That doesn't mean by any way, shape or form that they will in fact occur in the system.

Q. But using this data, can you be assured they will not occur.

MR. NEWMAN: Objection, Mr. Chairman.

He's arguing with the witness now.

MR. SCOTT: I'm not arguing. I asked a specific question and I got a slightly different answer.

The distinction is very important.

3-3

JUDGE WOLVE: Objection overruled.

THE WITNESS: No, I can't be certain that they will not occur. No, sir.

BY MR. SCOTT:

Q. Okay.

As to zinc, the same question, if you remember it?

A. Okay.

Zinc has one high value, a very sharp pulse. Other than that, zinc is consistently below what I believe are chronic effect thresholds, which would be in the mid-parts per billion range, say 500 or so -- parts per billion; I hope I said that correctly.

Q. Okay.

Now, considering that this is Brazos River water, what -- Let's make one further clarification.

Do you happen to know whether or not this was -- Do you happen to know how these samples were taken, whether or not they were near the bottom of the stream, the side, the depth they were taken from, any of that sort of information?

MR. COPELAND: Your Honor, I'm going to object to this question on the grounds that Mr. Scott needs to be more specific when he says, "Was this data gathered on such-and-such standards?"

3-4

The problem with the last 15 minutes of this cross-examination has been that Mr. Scott has ignored all the other data that Mr. Sanders has looked at in forming his conclusions, and I'm afraid that without being specific, when he says, "this data," that the record is going to be very confused.

I would like each time that he is asking these questions a specific reference as to which data he's talking about.

JUDGE WOLFE: You're speaking about the data on Table S.2.6, Mr. Scott?

MR. SCOTT: Yes, at this time.

JUDGE WOLFE: With that in mind, Doctor, answer the question.

THE WITNESS: Could you repeat the question, please?

BY MR. SCOTT:

Q Do you happen to know how these samples were taken?

I'm trying to get whether or not they were water samples, sediment samples, or a mixture, or what?

A I'll answer your question directly.

These are totals from water and suspended material in the water. I would assume taken from something like mid-depth in the Brazos River at the

3-5

indicated sampling station.

Q Okay.

Are any of them bottom sediment samples alone?

A No, they are totals from the water, sir, the water plus suspended material.

Q Right, okay.

Do you have any specific knowledge as to the amount of suspended material in each of the measurements?

A Not on a weight by volume basis, sir. I don't have that figure in my mind.

Q Do you happen to know in a more general sense, you know, that on this day the river was muddy and on this day it was not?

Do you know that of your own personal knowledge? I don't want you to guess by looking at the data, but --

A No. I would have to say no, sir. I would be just speculating.

Q Okay.

Do you have any reason to believe that the water that is sucked into the Allens Creek cooling lake would be any different in quality than the mid-depth water of the Brazos River?

MR. BLACK: Mr. Chairman, at this point I'd

like to interject an objection.

I believe that we ought to ask at this time where this line of questioning is going, because I think it is abundantly clear, not only through Dr. Sanders' direct testimony, but through his cross-examination, particularly by Mr. Doggett, and I would refer you to TR-4327, on this question of heavy metals, whether you can accurately calculate the quantity of heavy metals which would get into the lake.

It is abundantly clear that Dr. Sanders is on record as saying that no, you probably cannot accurately calculate the amount of heavy metals that will get into the cooling lake; you cannot accurately determine what the bioaccumulation and biomagnification of those heavy metals will be.

That's exactly why the Staff has recommended and the Applicant has agreed to go on a fish monitoring program, to determine exactly what those heavy metals concentrations will be in the fish.

So at this point I'd like to find out exactly where Mr. Scott is going, because this has been gone over time and time again; and until he can hook up exactly what he wishes to prove in this line of questioning, I think we ought to terminate it.

It makes no sense to quibble about the data;

3-7

it makes no sense to try to get a statistical basis for that data, when in fact the witness has conceded you cannot accurately quantify that; and therefore, we move on from there.

MR. SCOTT: Mr. Chairman, he's making a good point except for one thing.

If the data indicates that there is a strong likelihood that the detailed sampling technique is going to indicate a problem, then the Board needs to consider that in deciding whether or not this is the right place to build this plant, this is the right design for this plant, and whether or not it is going to be a viable recreational area.

What I see Staff's position as being is that, "Well, we admit we will probably have a heavy metals problem, but we wash our hands of that and say we will measure it as it occurs and see how bad it is, and ignore it otherwise."

MR. COPELAND: Your Honor, that's a mischaracterization of Dr. Sanders' testimony and the Staff's case.

What Dr. Sanders has said is that based on all the information that is available, there is no reason to expect that there will be a problem here; but recognizing the uncertainties that may exist in some

3-8

of this measuring and sampling program, that the Staff recommends as a precaution against those uncertainties that a monitoring program be continued.

I think Mr. Scott is attempting to disprove once again that there are some uncertainties in the measuring.

I don't believe we have proven a single point in the 30 minutes now that Mr. Scott has been cross-examining on heavy metals that has not already been covered in the record.

I know the Board understands this point. I know that everybody else here understands the point.

I think that we have now reached the point where we have exhaustively examined the subject, and I think I'm going to object to any further questions at all dealing with heavy metals as being asked and answered.

(Bench conference held.)

JUDGE WOLFE: The Board has conferred.

Obviously, Mr. Scott is seeking to challenge, as he says, even what Dr. Sanders considers to be conservative evaluations or conservative data; apparently Mr. Scott wishes to establish that they are not conservative enough and that even with monitoring, the plant should not be licensed.

It would appear at least for now this is

3-9

fair cross-examination.

Objection overruled.

MR. SCOTT: Thank you, Mr. Chairman.

I do realize that there is some validity to the Staff Attorney's objection, and there has been a whole lot of evidence in the record discussing this point.

It's the bottom line that keeps escaping us as to how you can have this data and still have a viable fishery.

That's my concern here.

JUDGE WOLFE: You have prevailed, Mr. Scott, and trying to press home a point after you've prevailed is wasting your time until 11:30.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Dr. Sanders, I believe you have stated that -- In fact, I'm sure you have stated in your direct testimony that you can't calculate the total amount of heavy metals that will be coming into or staying in the cooling lake; is that correct?

A Yes, with any real degree of accuracy. Yes, sir.

Q Right.

Realizing that, I would like for you to

3-10

comment some upon approximations, even if they are fairly gross approximations.

Is it fair to say that the heavy metal concentrations in the Brazos and Allens Creek cooling lake will be higher than those in the intake water from the Brazos River, after a number of years of operation?

A. You are saying that the heavy metals will accumulate in the lake after a number of years and we will have higher over-all concentrations in the lake compared to both the Allens Creek run-off and the water in the Brazos River?

I could say this: That those heavy metals which do enter this system will probably be incorporated into sediments on a proportion basis, a percentage basis, and end up in sediments in this cooling lake.

That is typical of all systems that are undergoing deposition rather than scouring as the rivers and small streams are.

Q. Okay.

Is it in your testimony somewhere that you expect in general for heavy metals of resulting in a doubling of concentration?

A. No, I didn't say I expected that. I only said that that is the assumed concentrating factor in the reservoir given the periodicity of make-up water

pumping and Allens Creek flow and overflow from the spillway back to the Brazos River and whatnot.

That is the worst case concentrating limit.

Q. Okay.

By that, is it not true that you mean concentrating limit in Allens Creek cooling water as compared to the Brazos River water? We're discounting sediments at this point.

A. If I've understood your question correctly, yes.

Q. Do you want to explain -- I wouldn't want that answer to lose its import because you didn't understand the question.

A. The cooling reservoir at some periods of the year will not have any input. It will only have losses due to evaporation and seepage, what have you.

That is a concentrating scenario, whereas the Brazos River will have constant through-put obviously. Rivers have downstream transports.

Q. Is it fair to say that this doubling is some sort of average concentrating effect in the lake over a long period; that there could be variations, obviously, but depending on the pumping modes and stuff?

A. Well, that's the yearly averaging as provided to me by hydrologists. I just took their figure at

3-12

face value.

Q Okay.

Now, is it also true that -- Did you not just say that one would expect the degree of uptake of mercury by the sediment to be greater in the cooling lake than it was in the Brazos River?

A No, I did not say that.

These are exchange adsorption/desorption reactions which are, of course, somewhat governed by the heavy metal concentrations themselves; but given the low quantities of these metals in general, I would say that that would not be the case. You would have more or less equal adsorption in both Brazos River water and in the cooling lake water for inorganic silts; probably also the organic detritus dissolved and particulate.

Q Okay.

I thought I had earlier heard you say that the scouring action of the Brazos would tend to inhibit the getting of the mercury into the Brazos River sediment as opposed to in the Brazos River water.

A No. That's relating to a physical phenomenon of sediment deposition.

The scouring by the river keeps sediments in suspension and moving down river towards estuaries, the oceans. That's the difference in a standing and a

3-13

running water body.

That's all I was referring to.

Q. Okay.

Now, just for clarification, is it not true that the sediment, once it stands in the relative quiescent cooling lake, will settle out on the cooling lake bottom?

A. Well, there are sedimentation basins -- this is for the Brazos River now, for makeup water pumping, sedimentation basins available to precipitate the course of larger inorganic silts suspended in Brazos River water.

That sediment coming down from the Allens Creek drainage, of course, will sediment out and create a delta in the confluence area of Allens Creek with the cooling reservoir.

Other than that, those colloidal materials and those organic detritus, very light flatulent materials are liable to be kept in suspension for considerable periods of time, although I'm sure there will be a net vertical displacement down the water column over long periods of time and you will in fact have sediment accumulation occurring in the reservoir.

Q. Okay.

Now, up to this point we've been totally talking about the Brazos River contribution from heavy metals.

3-14

Is it not true that there have been measurements made of some heavy metals at least in Allens Creek itself?

A. Yes, sir.

Q. Do you know how many data points we have for mercury?

A. Should have the same 12 data points in terms of dates, with respect to dates.

I believe there are -- My information shows them to be the same.

In other words, the Dames and Moore sampling crew sampled the Brazos River and Allens Creek on the same dates.

Q. Okay.

Those are the dates that are on Table S.2.6?

A. Yes, sir.

Q. Okay.

Do you have the readings for each of those measurements for mercury?

A. Yes, sir, I do.

Q. Is it true that the maximum reading is three parts per billion?

A. My figures show that the maximum reading was 2.5 parts per billion.

Q. How many of those other readings are greater

than one, if any?

A. On only two sampling dates did mercury concentrations in the Allens Creek flow exceed the value of one part per billion.

This is in the sampling year 1974.

Q. We have one reading that 2.5. What were those other two readings that were greater than one?

A. There's only one more, and that would be a 1.3.

Q. Was there also a reading of 1.0?

A. Yes, sir.

Q. Okay.

A. There actually were three readings of 1.0.

Q. Three readings of 1.0. Okay.

As to cadmium, does your maximum reading for Allens Creek itself show to be eight?

A. My handwritten notes show it to be 8.5 parts per billion.

Q. Okay.

Any others above 5?

MR. BLACK: Mr. Chairman, I'm going to object at this point.

This is going to be the same objection that I voiced earlier, but I would like to point out one more thing.

3-16

This line of questioning is going to, as I sense it, get to the point where Dr. Sanders is again going to be asked to speculate as to the heavy metal loadings in the Allens Creek Reservoir.

He was asked that exact same question by Mr. Doggett at 4328, TR-4328, and Dr. Sanders indicated that based on the Brazos River water coming in and his not being able to accurately calculate the quantity of metals in that, based on the agricultural run-offs, based on the ungauged watershed inflow from Allens Creek, he would not care to speculate on the basis of that data as to what would be the heavy metal loading in the reservoir.

I submit that we're going exactly to that same point and certainly Mr. Scott indicated that as well.

The line of questioning that I have heard so far since my previous objection has just been going to the data going into that exact same question, heavy metal loadings into the reservoir.

I object because I ave heard nothing that would indicate that Mr. Scott s going to elicit any new evidence out of this witness that he has not considered, and I submit that any further questioning is irrelevant, and I think it will get down to the

final conclusion that he would be argumentative with the witness as to whether or not this witness can speculate as to those heavy metal loadings.

I object.

MR. SCOTT: Mr. Chairman, there's a lot of truth to that, except I'm not going to ask this witness to repeat that opinion of his.

What I'm trying to do is get in front of the Board evidence of the basis of that opinion so the Board can make its own determination of how much weight to give to the witness and to deciding what to do as far as monitoring the fish viability; and I'm awfully close to finished.

I would have been, probably, by now.

MR. BLACK: Mr. Chairman, I submit the evidence is already in the record.

MR. SCOTT: Could you tell me where that it show us the number of readings of cadmium greater than five?

It's not in that book; I can promise you that.

(Bench conference held.)

JUDGE WOLFE: Well, by your explanation of why you were continuing this line of questioning now, it's a departure from my ruling of several minutes ago and

3-18

overruling an objection since your current statement of where you are going is not in support of what you had told me earlier.

It just seems to me that we're engaging in a squirrel cage sort of cross-examination. I see no point to it now in light of your most recent support of this line of questioning.

Therefore, I think it's clear on the record by prior cross that this line of questioning will not lead us anywhere.

Objection sustained.

BY MR. SCOTT:

Q. Dr. Sanders, what was the highest zinc reading obtained in Allens Creek?

A. I don't --

MR. BLACK: Mr. Chairman, isn't this going in contravention to your latest ruling?

We're still pursuing a line of questioning that's going to lead to heavy metal loadings in the reservoir.

JUDGE WOLFE: Yes, Mr. Scott, unless there's some other purpose behind this question.

I've already ruled on this line of questioning.

Objection sustained.

BY MR. SCOTT:

Q Dr. Sanders, if I see what you're saying on page 14 of your direct testimony, is it a fair characterization to say that you can't predict -- certainly with accuracy, or I would even say, to within an order of magnitude, the mercury concentration that's going to be expected in Allens Creek -- I mean the Allens Creek cooling lake?

MR. NEWMAN: Objection. Asked and answered. Transcript 4327.

MR. SCOTT: Mr. Chairman, I'm confident that that that does not answer that specific question.

MR. NEWMAN: That was precisely the question that was put to the witness. He indicated that based on the data he had, he could not make accurate predictions with respect to the concentration of materials for the bioaccumulation factors in the lake.

MR. SCOTT: That's not the question that I asked. I knew that.

I asked if he could -- We have to decide what he means by "accurate."

Obviously, you know, if he takes the position that "accurate" meant "I can't tell the difference between one and 1.01," it's a meaningless statement.

On the other hand, it has meaning if he can't

determine it to within an order of magnitude.

JUDGE WOLFE: Then why didn't you ask that question?

MR. SCOTT: That's what I asked.

JUDGE WOLFE: No.

The question that you asked had been previously asked and answered.

Now, if you want to develop that, then you develop it. But you don't ask the same question that has been asked before.

MR. SCOTT: Not being argumentative, but I used the word "order of magnitude" in my question. So with that in mind, could you answer it?

Or shall I re-ask it?

DR. SANDERS: Let me say this: If I were to attempt to estimate the heavy metal loading to the cooling reservoir, I would take the approach used by Dr. Tischler. And he has so done a very credible job.

Our problem is that we do not have the error bounds on that data.

And we don't know whether those error bounds are one, two, three orders of magnitude or whatever. We don't know.

So all we do is -- Well, we have currently the information that we can extract from the limited data

4-3

available to us, which shows that on the basis of median concentrations, that there will be low heavy metal loading into this system.

The error bounds around the figure, we just don't know.

They could very well be greater than an order of magnitude.

MR. SCOTT: Okay.

DR. SANDERS: It would be plus or minus, however. You have to understand that.

MR. SCOTT: Sure.

BY MR. SCOTT:

Q Now that gives us some feeling for the error bounds on the concentration of mercury in the Allens Creek cooling lake.

I believe it's your testimony and common knowledge that it will be an increased concentration in the Allens Creek cooling lake sediment, as compared to that in the water. Is that correct?

A I would say under the conditions to be expected at Allens Creek, that is the high pH, the eutrophic status, the inorganic silt inflow, that there should be precipitation of hydroxides and the settling out of adsorbed mercury onto inorganic silts.

And, therefore, I would expect mercury to be

stripped from the water column.

Q. Okay.

Can you give us some feeling of the error bounds that would be around this -- I want to call it segregation ratio (I don't know if that's the correct term or not).

Let's put it this way: What's the bounds that you would put upon the increased mercury levels in the sediment as compared to that in the lake?

In other words, will it increase a factor of two, 30 percent, two orders of magnitude?

A. Are you trying to ask me what proportion of the inflowing heavy metals -- mercury specifically -- would end up in the sediment compared to remaining dissolved in the water column or at least suspended in the water column?

Q. If a person goes out after 30 years operation of this plant, they took a sample of mercury concentrations in the sediment ... average sediment in the lake versus redoing the Dames and Moore test here -- you know, at five or ten foot elevations in Allens Creek lake, what would be the ratio of their concentrations?

A. Sir, mercury has a very high vapor pressure. And in terms of the residence time in the sediment, it's going to be a dynamic process. There will be mercury

moving in and out of the sediment. There will be mercury moving in and out or across the air/water interface given this high vapor pressure.

The long-term storage rates of mercury in the sediments are beyond my ability to calculate or to estimate.

Q. Well --

A. I've already said in my testimony to you, sir, that there will be this net displacement. But that would be short-term displacement.

I would suspect some buildup for sure. But ....

Q. I understood all that.

I'm trying to get you to give me some bounds upon the increase of that buildup. I mean, I don't want you to say anything you don't know and don't believe in ... just give us a --

For example, if I said it was going to be a trillion times higher concentration in the sediment. Would you say, "No, that's probably not correct"?

A. I would say that was probably not correct, yes.

Q. If I said it was going to be double, would you say that that was not -- not at least double, but just double, would you say that's probably low?

A. Well, if we look at the concentrations of

mercury in sediment and water on a per surface area basis (and that is the entire water column -- per unit of surface area) relative to the sediment underlying that water column, then a factor of two is certainly reasonable.

Q. Okay.

Now moving on to one higher degree of -- or a different degree of concentrating the mercury, what can you say about the probable levels of mercury that could be reached in the fish that live in this lake?

And if you want to differentiate between bottom feeders and non-bottom feeders, feel free to do that ... you know, comparing their levels of mercury in the meat with that that's in either the cooling lake or the cooling lake sediment.

A. Sir, as I stated in my testimony, I have no ability to come to arrive at a figure. There are so many uncertainties that I can't -- it would be pure speculation on my part to put an order of magnitude -- bioconcentration or biomagnification factor in front of us at the moment.

And I am unwilling to do so, given again what I have stated in my direct written testimony.

I really do not know, and I would again state that the environmental conditions to be prevalent in this

lake; that is, the high pH, the eutrophic stat[illegible]omewhat lower DO in the sense that it isn't highly saturated all the time and what not, will mediate against bioaccumulation and biomagnification.

And that -- these are qualitative trend sort of analyses. And that is about as far as I can go with the information that I have available.

I would once again submit that that is about as far as the field of environmental toxicology would be willing to go in this particular instance.

I've tried to do an exhaustive search of all literature and talk to recognized experts and pose those same questions to them.

And that is my response.

Q Well, I can very much appreciate that.

The thing that is still not clear to me though is whether or not that's your response because the work that has been done, which might be exhaustive, shows wide variations due to variations in each of these three things you've mentioned (namely, pH, the eutrophic conditions and dissolved oxygen in the lake) because of wide variations depending upon those; or is it basically --

Or is it because there has just been almost no data or work done on this subject?

A Well, again, for biomagnification we have a

4-8

very poor data base in natural systems in an aggregate sense, and that is across a wide diversity of natural systems.

With respect to bioaccumulation, we have primarily literature from laboratory studies, which is a much greater literature, but it will not suffice again for this particular situation.

So --

Q. Okay.

A. -- we characterize this as -- just two aspects of the characterization. One is that all these processes in nature are very complex, and there is no known mechanistic way of going about making predictions.

And, secondly, even if we thought we had a fairly good mechanistic way of doing this -- I'm talking now about a model, some sort of an analytical model, we don't have the information available to flesh out that model.

Q. Let me ask you this concerning that answer. I have a feeling you might like this project.

If -- Do you feel that --

MR. NEWMAN: Mr. Chairman, I'm going to ask that that remark be struck. I don't think there's any basis for that statement.

"That you may like this project."

4-9

MR. SCOTT: Let me explain at least. By "this project," I certainly didn't mean the Allens Creek project. I meant a project that I'm getting ready to --

JUDGE WOLFE: The exercise that you want the witness to go through. Is that --

MR. SCOTT: Correct.

JUDGE WOLFE: All right.

MR. SCOTT: Does that eliminate your objection?

MR. NEWMAN: Go ahead.

BY MR. SCOTT:

Q Given three or four years to go out and take measurements in this area of lakes and get some bounds upon their pH values and amount of nutrient loadings and amounts of heavy metal concentrations and that sort of thing, do you feel that you could for each of those lakes and areas that you've studied, come up with a pretty accurate -- by that, I mean within an order of magnitude -- determination of these factors that I've been asking you about; namely, the ratio of the mercury in the water to the sediment and the water and sediment to the fish and that sort of thing?

MR. NEWMAN: Mr. Chairman, I'm going to object to that question.

That has no direct bearing on Allens Creek

lake or the Allens Creek stream. I think what he is talking about is improving the state of the art and the data base, in this general area of the witness' expertise.

It has no direct bearing on this case.

MR. SCOTT: Mr. Chairman, it has a very direct bearing.

I hestiate to tell the witness the bearing until he has answered the question. But I will tie it together for the Board.

JUDGE WOLFE: Well, we have to know the purpose of the question.

This has come up repeatedly. And I have no reason to believe that any expert witness appearing before this Board, in light of being advised of the direction of a line of questioning or what's the purpose behind a question, is going to misstate or shade whatever he says.

I have no evidence of this at all in this proceeding.

Therefore, I think it's proper for you to explain the purpose for your question. We're sitting here as a Board. There's no jury. We look to the witness, and we determine his credibility.

So I see nothing wrong with the question put to you.

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MR. SCOTT: Without any -- As I said earlier, this witness and Dr. Armstrong are my two favorite witnesses. But --

JUDGE WOLFE: Pardon?

MR. SCOTT: Favorite. Favorite witnesses.

JUDGE WOLFE: I don't catch the word.

MR. SCOTT: Favorite.

In a general sense, I do want to object to that the cross-examiner has to explain where he's going in front of the witness.

But, you know, given the Board's ruling, I will comply with it.

I will comply by explaining where I'm going. NEPA requires that when there is a possibility of doing surveys and gathering data and coming to a determination that might impact a decision or a project controlled by NEPA, that those works and studies should be done prior to the determination of whether or not to build the facility.

That's why I was asking this question. I'm wondering -- In fact, I guess the answer is obvious, considering the fact that there is supposed to be monitoring of the system, that the capability is here, in fact, to make these determinations now.

MR. NEWMAN: Mr. Chairman, what we have here

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is the legal argument. The status of the extent of the monitoring that will be done on the Allens Creek lake has been adequately set forth in the record.

If, on that basis, Mr. Scott wants to make the legal argument that that's insufficient for NEPA purposes, that's something to do in findings and conclusions. It's not a question the answer to which can be derived from this expert witness.

MR. SCOTT: That's not --

JUDGE WOLFE: I just don't see how the question that is objected to is explained by this argument you're making.

MR. SCOTT: You're talking about my argument?

JUDGE WOLFE: Exactly. I see no nexus -- no connection between the question and the purpose for which it was asked.

I think the record speaks for itself now.

Objection sustained.

BY MR. SCOTT:

Q Dr. Sanders, how long has this plant been under consideration for licensing?

A Well, it's my understanding that the first considerations were, for locating a plant in this general region were back in the early seventies, '71, '72, '73 -- well, I'd say prior to '73.

Q Okay.

Why is it that we couldn't have more detailed data over that some ten-year period of time than we have in this proceeding?

MR. NEWMAN: Objection, Mr. Chairman.

JUDGE WOLFE: Sustained.

Much too general a question. "Why don't we have more data?" Impossible to answer.

BY MR. SCOTT:

Q Dr. Sanders, do you think it would have been possible to -- by that, I mean within the state of technology -- to have taken enough data in the last ten years to have better pinned down the heavy metal concentrations --

MR. NEWMAN: I'm going to object to that question again, Mr. Chairman.

That's -- I see no relevance to the -- to any issue that's before the Board at this time.

MR. BLACK: And besides, I'd like to indicate that we have gone over this question regarding the uncertainties in the data many times before. It's getting repetitive.

MR. SCOTT: Mr. Chairman, before this Board is the question of whether or not NEPA has been complied with. One of those questions is whether or not an

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adequate data base has been prepared to make a NEPA -- a valid NEPA determination.

And it's for that reason that I'm asking questions as to -- We've got the admission that the data base is not valid.

Now, the only question is would it have been possible or would it be possible to get a valid data base in a reasonable period of time.

MR. BLACK: I'm not certain that there has been an admission that the data base is invalid. I think there's an admission that it may be difficult to accurately calculate, quantify the heavy metals from that data base.

And that uncertainty has been recognized. But it serves no purpose to go into whether more data could be collected, or what have you.

If Mr. Scott wants to make an ultimate NEPA conclusion, based upon the adequacy or inadequacy of the data base that has been collected, then he's free to do so.

But it doesn't serve this record any useful purpose to go into whether more data could have been collected.

MR. NEWMAN: I would just add to that, Mr. Chairman, that there has been a mischaracterization of the

record.

I don't believe Dr. Sanders ever said that the data base was invalid.

As a matter of fact, I believe he defined the term "validity" and in his terminology, I believe, indicated that it was valid.

(Bench conference.)

MR. SCOTT: Mr. Chairman --

JUDGE WOLFE: I think the question is a fair one. And I think the counsel is entitled to probe it.

Answer the question.

Objection overruled.

DR. SANDERS: Could I have the question repeated, please.

MR. SCOTT: I'm going to have to ask the court reporter to repeat it. If somebody will tickle my memory, maybe I'll remember what it was.

(Record read.)

DR. SANDERS: To better pin down the heavy metal concentrations in Brazos River water flow?

BY MR. SCOTT:

Q Yes.

A Well, I think it's a foregone conclusion that you can do anything you want to do, in terms of sampling and analysis, as long as you're willing to spend the time

and the money.

Certainly, a ten-year data base would give us a very -- well, it would be a unique data base, if we had ten years of high quality data for any natural system.

Q. Okay.

A. I would like to add in response to your comments with respect to NEPA that we do have a time trend of data available from the U. S. Geological Survey for a period now exceeding ten years, and that time trend has shown consistent drops in the concentrations of mercury in the Brazos River.

Apparently what is my opinion that happened here is that the Applicant went out and caught some pulses occurring in the early seventies, possibly as a result of agricultural runoffs or something else -- that is not any longer in any kind of great prevalence, because it is not showing up in the data.

The data tnat are available are valid -- statistically valid data points in time -- snapshots in time.

And they lead us to believe that heavy metal loading will not be excessive in any sense of the word.

On the basis of that, I cannot state -- Well, I cannot propose an exhaustive heavy metal survey

of the Brazos River.

I don't see enough information in the later years (I'd say from 1975 on) to require an exhaustive survey of mercury, cadmium, what have you, in the Brazos.

I only state that it would be fortuitous to have -- not fortuitous -- but it would be ideal to have a statistically valid data base from which to calculate exact within a fairly well defined accurate -- or error bounds heavy metal loading to a proposed system.

And from there we can maybe upgrade our ability to make some kind of forecast.

But there isn't enough information here, to my way -- or to my mind to force me to demand a much improved study of heavy metal flux down the Brazos River.

I would certainly, as any ecologist would, like to see a lot more data. I think we're always yelling for more data.

But there is the law of diminishing returns with respect to cost and time, and we ought to recognize those.

And I would say that the heavy metal study done in the early seventies by the Applicant was certainly state of the art at that time, and probably even went beyond that method. They have gone beyond what is

typically collected at other plants and other sites for the same basic needs.

The USGS data is collected by a federal agency on a frequency determined by them to adequately satisfy their needs, to characterize -- to very, very generally characterize the quality of a watershed at various points along that watershed.

And we don't have enough information to demand a greatly increased program of heavy metal sampling in the Brazos River from what I've seen in the latter seventies.

Q. Dr. Sanders, is it not true that you do not have any question about the accuracy of the techniques used in the Dames and Moore study?

A. I would like to state that analytical veracity is one of the biggest problems in reported data in the literature. All data are suspect on the basis of analytical veracity.

Now, what we've assumed is that people do their best.

Q. Well, I'm talking about the techniques used. I thought earlier you had suggested at least that the techniques used by Dames and Moore was state of the art.

A. At the time they ran their samples, they did a very credible job, yes, sir.

As a matter of fact, I believe those samples were not run by Dames and Moore; but they hired an outside consultant whose specialty is water chemistry.

Q Okay.

A And that certainly to my mind would tend to upgrade the quality of the data reported.

Q Right.

Didn't you indicate earlier in your testimony that you had some doubts about the data that the Geological Survey collected as to heavy metal concentrations?

MR. NEWMAN: Mr. Chairman, I'm going to object to that question. It has been asked and answered, asked and answered.

I've heard so much about the USGS data that I just cannot believe there's one more good question about it.

(Bench conference.)

MR. SCOTT: I will withdraw that.

BY MR. SCOTT:

Q Okay.

Now let's change the subject to spawning, and in particular to spawning areas of the lake.

JUDGE WOLFE: Mr. Scott, would you reserve that line of questioning until after the recess.

We'll have a ten-minute recess.

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(Whereupon, a short recess was had.)

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JUDGE WOLFE: All right, Mr. Scott.

MR. NEWMAN: Mr. Chairman, does the record reflect the time that we are resumed?

If not, it's 11:22 by my count.

JUDGE WOLFE: All right.

BY MR. SCOTT:

Q Dr. Sanders, what I'd like to do is pin down a little better the areas of the lake where you expect particular fishes, various species, to be able to spawn.

MR. NEWMAN: Mr. Chairman, is it a fair inquiry to ask why this line of questioning is being pursued?

Is there something about the particular part of the lake in which various species spawn that has some effect on the ultimate determination with respect to whether this is a self-sustaining fishery?

Is that the purpose of the inquiry?

I don't know why these questions are being asked, particularly with the record we have on spawning.

MR. SCOTT: Where the various species spawn, if anywhere, sets the basis for the source of the fish in this lake.

Now, we realize that there is a claim, at least, that certain fish will be stocked. There's also testimony

5-2

that other fish will not be stocked.

Certain fish are certainly going to have to be capable to spawn.

JUDGE WOLFE: Yes, that's fairly well a matter of this record.

Now what's the purpose of going into spawning any more than it's already been gone into?

What is your purpose? Where are you going? What's the ultimate goal here?

MR. SCOTT: To show that there's very limited areas, in fact insufficient areas, for spawning under ideal conditions; and considering the other impacts of the lake, even those areas, many of them at least, will not be fit for spawning.

MR. BLACK: Any particular species?

MR. SCOTT: Most of them. It shouldn't take very long to get through my series of questions.

JUDGE WOLFE: Go ahead. We'll see how you go.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q. Dr. Sanders, what -- Considering everything you know about this lake, including its turbidity and everything that's been discussed, what depth of water is the maximum depth that you can expect spawning -- in

5-3

fact, I ask you this, realizing that it's been answered.

MR. NEWMAN: Objection.

It has been asked and answered.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Since you have previously stated that ten foot is the maximum depth that you can expect spawning --

MR. NEWMAN: That's a mischaracterization of the record. It doesn't lay a foundation for the question.

The witness has never testified to that effect.

MR. SCOTT: Maybe the question has not been asked then.

JUDGE WOLFE: Or maybe it's been stated in a different way.

MR. NEWMAN: As a matter of fact, sir, the transcript reference for convenience is 4262, I believe.

BY MR. SCOTT:

Q. What areas of the Allens Creek Lake have a rocky bottom, if any?

A. Well, obviously, there's no true rocky bottom anywhere in this area.

Q. Okay.

A. These are aggregate sizes larger than pebbles we're talking about.

Q. Right.

3-4

Q Where in Allens Creek Lake would you expect a bottom consisting of pebbles?

I mean by that, anything of greater size than BB's.

MR. COPELAND: I object to the relevance, Your Honor.

It hasn't been established that that question makes any difference with respect to spawning.

MR. SCOTT: It's in the record; it makes a difference.

JUDGE WOLFE: What is in the record?

MR. SCOTT: That the substrate makes a difference to spawning; some spawn on clay; some on rocks.

MR. BLACK: I think that's a mischaracterization of the record developed so far with regard to the species that will be in this cooling lake.

I don't remember that in the record.

MR. SCOTT: Do I need to read it to you?

JUDGE WOLFE: Read what to me?

MR. SCOTT: Where in the record it shows --

JUDGE WOLFE: That's the nature of the objection, that you haven't laid a foundation by showing that rocks are essential to spawning.

MR. SCOTT: Okay. Look at Table B.8.

MR. BLACK: Of what?

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MR. SCOTT: The Final Environmental Impact Statement.

JUDGE CHEATUM: What is the page?

MR. SCOTT: It is Table B.8, page B-13, back in the Appendix.

BY MR. SCOTT:

Q. Dr. Sanders, have you found that table?

A. Yes, sir.

Q. Does not the longear sunfish -- does it not nest over gravel bars?

A. The table summarizes a Reference 27, which so states apparently.

Q. Okay, and the white crappie, does that Reference 27 not state that it nests on gravel or hard bottom?

A. You are reading directly from a table. Yes, sir, it states that in the table.

Q. Do you disagree with that?

A. Well, my information says that -- I am looking at the same information digested from Reference 27. It says that crappie will in fact spawn much deeper than eight feet.

So I will take exception to those values reported in the table.

I would say that I would -- I haven't

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looked at Reference 27, but apparently -- Well, I shouldn't say much about it until I look at it, but my information shows that they will spawn much deeper than that, that white crappie will spawn much deeper than that.

Q And what was the source of your information?

A Do you want me to give you a book title?

Q Give it to the Board.

A It's by Dr. Peter Moyle, a Professor of Fish Ecology, University of California at Davis, who has written extensively on warm water and freshwater fishes in general. I would say warm and cool water fishes in the west.

However, his data are from a diversity of lakes in the west, and he makes comparisons to those areas where the species are considered endemic rather than just introduced.

His information shows that crappie spawn as deep as six or seven meters.

Q Okay.

What was this person's name? How do you spell it?

A It would be M-o-y-l-e, Dr. Peter Moyle.

Q Has he written this in some article or book?

A I'll just give you a title of a book. This is one of the books I use for general reference on fish

ecology. It's similar to Loggler's books and whatnot on fisheries ecology, inland fisheries ecology in the U.S.

It's called Inland Fishes of California, published 1976. I happen to like his writing style and the way he presents his information.

It's very readable.

Q. Can you show me where in that book he makes that statement?

A. Just a minute.

JUDGE WOLFE: While the witness is looking at the book, there was some objection about questions relating to rocks as necessary for spawning.

You referred to this table at page B-13 of the Final Environmental Statement.

In light of the fact that there is allusion in this table to rocky bottoms in spawning grounds, the objection is overruled to any line of questioning on rocky bottoms.

MR. SCOTT: Thank you.

THE WITNESS: I'll quote you from page 310 in this book.

BY MR. SCOTT:

Q. Okay.

A. By the way, this is University of California Press as the publisher.

5-8

I quote -- Again, this is a chapter on "White Crappie."

"Nests are occasionally built in water as deep as six to seven meters."

Q. Is there any further explanation?

A. It gives an optimum depth. The optimum depth, according to Peter Moyle, is a meter, and that falls within the range indicated in the Table B.8 in the FES on page B-13.

Q. Could I look at that book that you just quoted from, the one that mentioned occasionally to the depth of six to seven meters?

MR. COPELAND: Well, Your Honor, it seems to me that we have now changed subjects; is that correct?

We have gone from the question of rocky bottom to depth of spawning.

MR. NEWMAN: And with respect to depth of spawning, that was the subject of a prior ruling by the Board that that had been asked and answered.

JUDGE WOLFE: Yes.

MR. SCOTT: Mr. Chairman, I've read the statement there and I feel it would be helpful to the decision -- in some cases not helpful to me -- to have that whole paragraph read into the record. It's a relatively short paragraph.

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MR. COPELAND: I'm going to object, Your Honor.

The question of depth for spawning has been thoroughly examined in this proceeding. I don't see any reason to read that into the record.

JUDGE LINENBERGER: Additionally, Mr. Scott, again, if it's not helpful to you, don't bother with it.

You're not making this record for our purpose; you're making it for your own in support of your contention.

If it's not helpful to you, then don't take up everybody's time with it.

MR. SCOTT: But, sir, it is helpful to me.

JUDGE LINENBERGER: I misunderstood you. I thought you said it was not.

MR. SCOTT: What I meant to say was that it is not totally helpful. There are some things in there that I wish weren't, and there are some things that I'm glad that they are.

JUDGE WOLFE: Where are we now? Once again, we're back to spawning depth.

Why are we back on that subject again?

MR. SCOTT: Let me explain how that happened.

I was making discussions and asking questions of the witness about consistency of the bottom, gravel, rocks and whatever; and he, I'm sure, accidentally, started

5-10

talking about depths.

Since he did -- I was going to talk about that later. I just let it glide off into that.

MR. BLACK: But the ultimate question is where are we going to go after this. I believe that's what the Board is inquiring and I certainly am going to inquire.

MR. SCOTT: I'm inquiring, as I originally said, about those portions of the lake that are suitable habitat for spawning for various fishes; depth and substrate are both relevant.

JUDGE WOLFE: Well, all right.

Taking it a step farther, what do you intend to establish by going back into the issue of depth insofar as it relates to spawning?

Why are we going back to it? What are you trying to establish that's not on the record already?

MR. SCOTT: Well, the same thing I mentioned earlier: namely, that there is very little of this lake suitable for spawning.

JUDGE WOLFE: By virtue of depth?

MR. SCOTT: Depth is one part of that.

I resent very much having to -- object, I guess, is the right word -- having to lay out my course of examination.

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JUDGE WOLFE: Well, we have ruled time and time again. I've had to advise you that if we don't know where you're going, you are not going to be allowed to attempt to get there, and you may object all you want, but that is our firm ruling.

So you are just taking up time away from your own cross-examination when you continually go back to the ruling.

We will make inquiry, either upon our own motion or request of Counsel or other parties, as to exactly why you are engaging in a line of questioning.

If you don't tell us and you don't make your case, you're not going to be allowed to do it.

Now that's it, Mr. Scott.

Recognize it. Don't question it. Recognize it.

MR. SCOTT: I do recognize it.

JUDGE WOLFE: All right.

MR. SCOTT: But I do want to explain --

JUDGE WOLFE: You are arguing with the Board and I --

MR. SCOTT: No, sir, I'm not.

JUDGE WOLFE: You are arguing with the Board about its past ruling and about its current ruling on the same thing.

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When we ask you where you're going with a line of questioning, you will answer and not argue that you think that this is exposing your case.

It's simply not that at all. If you don't have a good explanation of where you are going with your questions, you will not be allowed to ask the question.

MR. SCOTT: I'm very --

JUDGE WOLFE: Now let's get on with it.

MR. SCOTT: I must say that I'm very glad to explain to the Board the answer to that.

JUDGE WOLFE: And I said you will explain on the record, not only to the Board, but to everyone in this room.

We're not playing a sub rosa game here of some sort.

MR. COPELAND: By my watch, Your Honor, Mr. Scott's two hours have expired.

So I think this conversation is even more appropriate.

I think it's now time to explore exactly what it is that is left to be done that has not been done, with extreme specificity.

JUDGE WOLFE: All right.

How much more time do you need for your cross-examination on the remaining of the subjects that

5-13

you intended to explore with this witness?

MR. SCOTT: My uncertainty is about as wide as that of the witness on that.

I would project being able to finish by the end of the day.

(Bench conference held.)

JUDGE WOLFE: Would the other parties comment on whether in their mind the cross-examination has been cumulative in the past two hours.

MR. NEWMAN: Yes. I believe that we've had cumulative cross-examination.

I believe we've gone into areas previously covered with respect to mercury concentrations, and that the initiation of the second part of the inquiry concerning spawning is clearly all cumulative and, indeed, repetitious of other cross-examination.

I think that the notion of allowing the balance of this day, to take this witness' time for the balance of the day, given what we've seen thus far in the cross-examination is absolutely outrageous.

I think that with another hour or so, that ought to be the outside limit on the continuance of this cross-examination; and even then, sir, I think we'll have to see precisely where that hour is going to be spent, because this witness' time is precious.

5-14

JUDGE WOLFE: Even though he is not your witness.

MR. NEWMAN: Yes. I'm a citizen, though, and I'm one of the people that pays his salary and I know he's a good competent individual and he should be able to get back to the work that he does normally.

JUDGE WOLFE: All right.

MR. BLACK: Staff would note that cross-examination by Mr. Scott that has been conducted this morning seemingly, in our mind, has gone into the repetitive and cumulative stage.

As I indicated, I think Dr. Sanders had noted the uncertainties in his evaluation and indicated his course of action in light of those uncertainties, and Mr. Scott has done nothing to change that course of his testimony.

So when you total up the big scorecard here and mark off the number of points that have been made by Mr. Scott in his course of cross-examination, certainly, in our mind, no points have been made, and the record has not been advanced by the course of his cross-examination.

Now certainly, if we get into the areas of spawning habitat, here again I would note that this question has been explored in depth by this witness at

5-15

TR-4261 through 4267.

Certainly, this record has been advanced in this particular subject matter by witnesses that have gone before Dr. Sanders, and it just goes to emphasize my point that if we are going to conduct cross-examination in this area of spawning habitat as one area, Mr. Scott should tell us exactly where it is going and make specific reference to the transcript pages where he may choose to wander a little bit beyond what has been attested to before.

JUDGE WOLFE: Are you in a position to make reference to transcript pages?

MR. SCOTT: (Shakes head.)

MR. BLACK: This just boggles me totally because certainly Staff has let it be known that we are willing to make a transcript available to Intervenors if they will use it.

If they are not going to avail themselves of it, there is no sense in having us keep the transcript here.

It's for the purpose of allowing Intervenors to know exactly what was said, to hone in on their cross-examination; and if it's not going to be used for that purpose, then perhaps we ought to withdraw it.

But I would also note that other Intervenors

5-16

have used it; Mr. Doherty and Mr. Baker have used it extensively, and I commend them for doing it.

That's the purpose of it being here.

MR. SCOTT: Mr. Chairman, I would just gladly invite anyone in this room, including any attorney, to put on their little track shoes, line up behind me and try to keep up with me in this hearing.

I am here all day. I can't be reading transcripts when I'm here.

As quick as I'm off, I spend two hours driving home, eating supper, going to bed, getting up and rushing back down here and fight two more hours traffic.

There is no time to do what he suggests, except possibly on the weekends.

JUDGE WOLFE: Well, Mr. Scott, it is our ruling.

We have listened attentively over the past two hours to your cross-examination.

We think in the main it has been cumulative and repetitive of the questions that have been asked on the record, and they haven't been really developed beyond that.

So it is our ruling that we will permit you two more hours of cross-examination of this witness, at

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which time we will close off your right of cross-examination.

This way you will be under the gun to ask direct and precise questions and get to the meat of where you are trying to get to.

It is now a quarter of 12:00. We will proceed with your cross-examination until a quarter of 1:00.

That is one hour. We will recess and then you will be given another hour to complete your cross-examination.

With those limitations, proceed.

This is up to your determination whether you want to spend the full two hours left to you on spawning, if you want to spend it on chlorine, or whatever; but judge your time accordingly.

You've been here. While you may not have read the transcript, you know what the oral examination was all about.

So apportion your time accordingly.

MR. SCOTT: Although the Board has stated that I don't have to note my objections and whatever --

JUDGE WOLFE: That's true and, again, you are using your time.

MR. SCOTT: Mr. Chairman --

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JUDGE WOLFE: There are no requirements to make exceptions. Your rights are reserved, and I would repeat that.

MR. SCOTT: I agree with that, except it must be understood what it is I'm objecting to.

So if something is not said, it can't be clear on the record what I have objected to.

The federal rules require that.

BY MR. SCOTT:

Q. Back to spawning and those areas of the lake where we can expect the spawning

I believe you just stated that the optimum spawning depth was one meter for crappie in California?

A. That is the information presented by Dr. Peter Moyle in his book.

These are for warm water lakes in California.

Q. Was it limited to warm water lakes?

A. Well, crappie is a warm water species, sir.

Q. By warm water, then, you don't necessarily mean with power plants on them dumping effluence, do you?

A. I have no information on the exact number of lakes that Dr. Moyle surveyed.

Q. Okay.

A. And what the nature of those lakes were with respect to power plants.

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Q. Is there anything in that book that would indicate how frequently, occasionally or what percentage of the time, spawning would take place at the depths of six to seven meters?

A. Yes, sir, in the sentence I read I believe it said specifically that they occasionally build nests as deep as --

Q. That's what I meant. Do you have anything that indicates what "occasionally" means?

A. Well, what that means to me is that if forced by competition for nesting sites, they will spawn as deep as six to seven meters.

So that could be every year you'll find individuals spawning that deep, if you have a productive fisheryand a large number of adult spawners all seeking nesting sites.

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BY MR. SCOTT:

Q. Well, I'm still confused as to what the word "occasionally" means.

A. "Occasionally" can mean two things. It can mean frequency of occurrence with respect to a given time and a given population, or a given individual in successive spawning years.

And I believe it can be used both ways.

Q. Okay.

Do you have any information there that indicates in a condition where the water depth is at least seven meters what percentage of the eggs would be laid at six to seven meters versus, say, at the optimum depth of one meter?

A. No. The fractional -- or the frequency distribution of this phenomenon has not been presented by Dr. Moyle for California lakes.

Q. Has it been presented by anyone else that you know of?

A. Well, again, I have not reviewed the Texas fishery reference number 27 referred to, in again, Table B.8 of the FES.

There is a range given, obviously, in that data and presented in the table.

Q. Okay.

And that maximum range, in terms of meters, would be about how much?

A. Which data are we talking about now, sir?

Q. This two to eight-foot depth.

A. I don't take that to be a maximum range. I consider that to be as usually reported a more typical range, if you want to consider again a qualitative -- qualifier.

Q. Okay.

Once again, do you have any information to indicate whether or not the two to eight-foot is a broad average versus a range?

A. I am sure, sir, that this is considered the average spawning depth for the species in Texas reservoirs.

Well, I would have to assume that from the title of Reference 27 and from the way the data is presented in this table.

That is just looking at a frequency distribution of spawning versus depth. If you are out in the field sampling, where do you find the spawners? No, that doesn't mean anything about success of spawning with relation to depth.

Q. Okay.

Isn't an average normally one number as

opposed to a range of numbers?

A. Well, we're -- an arithmetic mean is certainly a given number, yes, sir.

Q. Okay.

JUDGE WOLFE: Mr. Doherty has just made his appearance.

BY MR. SCOTT:

Q. How --

JUDGE WOLFE: At 11:55.

BY MR. SCOTT:

Q. How much of -- Looking at the map on page S.2.8 of the Final Supplement to the FES --

A. Could you repeat the page number, please?

Q. Yes. 2.8.

MR. BLACK: 2-8.

MR. SCOTT: Correction: 2-8.

BY MR. SCOTT:

Q. Do you see that picture?

A. Yes, I have the figure in front of me.

Q. Along the cooling lake dam on the north side and on the east side --

A. Yes, sir.

Q. How far out from the edge of the lake would you have to go before you reached a depth of three foot, on some sort of average?

6-4

A. Well, along the dike area, it's a three-to-one slope, so you wouldn't have to go out very far. I imagine --

Q. Would it be about nine foot?

A. I would say that would be more than adequate, yes.

Q. Okay.

Now is the -- How far out would one have to go on the southern and western edges of the cooling lake to reach a depth of three foot?

A. Well, that's not as uniform a habitat as the dike is, so that would vary. But your first approximation would be within the same ballpark. It is a steep-slope bluff, a natural bluff environment.

Q. Okay.

Now, do you have -- Have you looked at the topography of that area enough to tell at typical lake levels how wide Allens Creek is going to be up near the entrance to the plant, where say the plant access road is?

I mean, I don't want you to guess looking at that drawing. But have you looked at -- through the maps --

A. Sometime in the past -- I forget -- Of course, I walked that entire area. So with respect to

6-5

low water levels -- Is that your question?

Q. No, just standard -- typical operating lake levels.

A. Just -- I really -- It certainly broadens out in some areas.

So I'm a little uncertain as to exactly how broad that would be. It ....

Q. Would you expect it to be approximately that of what someone going out there in dry weather before the lake is built would be seeing as the natural width of the stream?

MR. NEWMAN: Could you repeat that question, please? I didn't catch it.

BY MR. SCOTT:

Q. If anyone goes out there now and looks at Allens Creek --

A. Yes.

Q. -- an average person would know where the high banks were on each side. Would you expect the water levels to go approximately from just high bank to high bank, once the lake is built?

A. Yes. It shouldn't flow over into pastureland and whatnot on the higher banks, no, sir. It should be below that.

Q. Okay.

Now, what's your remembrance of the width of Allens Creek from high bank to high bank?

A. That was my point. Exactly where the upper edge of the cooling lake would be ... I don't have a very good recall on that. So --

Q. I realize that. I'm willing to let you answer it in a ... you know, broad terms. You know, more than and less than type numbers.

For example --

A. It's my understanding from looking at maps and again trying to recall this, that it would be something less than 100 yards wide ... its confluence. So you would have a very small bay formed there.

And then it narrows considerably as the gradient increases upstream.

Not the gradient, but the depth decreases upstream.

Q. Okay.

As a matter of clarification, when you say confluence, do you mean where it runs into the Brazos?

A. No, it's confluence with the cooling lake itself. Right where the bay would spill out into the open water ... cooling lake environment.

Q. Okay.

How could you tell that without the lake

6-7

already being built?

MR. NEWMAN: Mr. Chairman, I have foregone objections to this point. The witness has already indicated that he has only limited knowledge -- or limited recall of the dimensions of the lake.

This is about the fourth or fifth question that is addressed to the matter of the topography or the width of the lake.

I --

MR. SCOTT: The stream.

MR. NEWMAN: Excuse me. The stream.

MR. SCOTT: Well, you know, being there and seeing -- being more familiar than the witness, I can't ... I can't be happy with the answer that he has given of 100 yards wide at a point.

MR. NEWMAN: You specifically said: Give me a no-larger-than or a no-smaller-than.

The witness has done his best to respond to your very vague question. The question should be -- I object to that question.

MR. SCOTT: Well, we may just need a clarification.

Was that meant to be a maximum width or an average estimate or what?

DR. SANDERS: I assume that would be a maximum

6-8

width. It shouldn't be any greater than that for sure.

I'm taking this sort of from a mind's eye view of drawings of the lake, other than this one presented that you have referred to -- this figure on page S.2-8.

There are a number of other ones, of course, available that have not made it into print in this fashion.

There will be in fact a bay ... a small bay there.

So it won't be some narrow, three or four widths channel or something of this nature. We will have a small bay.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Do you -- Okay.

Would you expect --

JUDGE WOLFE: In any event, having secured the answer, the objection is overruled to that question.

BY MR. SCOTT:

Q Dr. Sanders, would you expect that maybe one of the prime spawning areas might be up near the reactor itself, up in that exclusion area? Or would that not be any better place than, say, down along the southern edge of the lake?

6-9

A. Now, we're talking about the western edge, along the natural bluff -- the western edge near the plant itself?

Q. Yes.

A. -- near the reactor.

Well, I believe that they're going to clear off a lot of that area during normal construction. Certainly remove trees and whatnot.

So I would consider that a degraded spawning habitat, with respect to -- only in a relative sense -- the -- the undisturbed more southern bluff area.

But you're correct in assuming that some spawning will go on there, yes, sir.

Q. In the degraded sense -- or in the relative sense -- can you -- and I understand there's a lot of estimating here.

Are you willing to make any estimate as to how much degraded, you know, would the spawning be a half, a tenth, two-thirds?

A. In my review I have assumed that there would be no spawning going on; that, in fact, it would be totally degraded.

That the area -- There's a much better figure than this. It is the lake management plan figure presented by the Applicant. I believe he has actually

6-10

presented this as a document in these proceedings.

And I have assumed that that whole upper plant area is, in fact, removed from the effect of spawning zones of the lake. It should no longer be an effective spawning zone.

Q Okay.

Could you define a little more exactly what do you mean by the upper -- you know, the limits that you excluded of that area?

A Well, that's from the -- That includes everything inside the restricted area boundaries. Okay?

Q Okay.

- - -

BY MR. SCOTT:

Q. How much spawning did you assume could occur along the north dam, if any?

A. You're talking about the exterior levee now?

Q. Yes.

A. Okay. That area in the very far north that would actually be part of the restricted area where the discharge canal flows in?

Q. Well, part of it is restricted and part of it is not.

A. Okay, right. Yes, you're correct.

Well, again, in percentages I wouldn't be able to say in terms of percentages. But there will be spawning attempted there, again by the sunfishes as indicated in my testimony.

Q. Right. I realize that.

But I didn't notice in your testimony any estimation as to the probability of success of spawning attempted in that area.

When you said -- earlier you were discussing the -- You assumed the exclusion area was not going to be a viable place to spawn, I'm trying to find out if you're essentially making that same conclusion as to the northern dam area.

A. Yes, within the exclusion area, I am, yes, sir.

Q. Okay.

But outside the exclusion area.

A. Well, I do not consider that to be optimal spawning habitat on the basis of its slope and the fact that it will be in the most approximate area to chlorine discharges -- the most closely found area to chlorine discharges.

On the basis of that, I pretty much excluded the whole northern levee from consideration.

Q. Okay.

How about along the eastern levee there, including the levee alongside the sedimentation basins? Do you do that, also largely exclude that?

A. No. That is the beginning of what I would consider -- again, these are boundaries that are very hypothetical. I considered that the beginning of viable spawning habitat in the sense of that which will occur on the three-to-one slope levee.

Then as you continue down towards the south, along that far eastern edge below the sedimentation basin, you run into standing timber zones. And you run into areas where they will pile brush near to shore as part of the lake management plan.

6-13

And along those areas, spawning for crappie and shad should be significant.

Q. Okay.

Are they going to be piling this brush and stuff right up next to the -- I'll call it the levee -- the cooling lake dam?

A. Yes. I believe that their intention is to have these brush rows placed no deeper than five feet below the surface of the lake during low water periods, and so that puts it fairly close to the bank.

Q. That's why I'm asking. Normally there's objections to piling things on the sides of levees and dams.

I just wondered if in this case they were going to actually pile the trees and the mounds of dirt and stuff on the side slope of that dam.

A. Well, my understanding is that the reason for doing this is to allow bank fishing and to have access to prime foraging habitat for game species. Therefore, the preferred size class for sport fishery will be available to bank fishermen.

Therefore, they have to pile the stuff fairly close in.

Q. Is it your understanding that people will be allowed to walk along that dam and fish along that eastern

6-14

dam edge?

A. That's my understanding. Portions of it, yes, sir.

Q. Do you know which portions?

A. Well, I believe the public will have -- My understanding is the public will have access for the entire periphery other than -- again, the restricted area, probably something having to do with some of the sedimentation basin area where machinery and whatnot is in operation.

Q. Okay. Let me ask you this.

Is it your understanding that there will be a road that cars are allowed to go up and down along that --

MR. NEWMAN: Mr. Chairman, I believe we have now strayed beyond anything within this witness' testimony, and indeed, outside the scope of what Mr. Scott himself said he was interested in, which was the spawning area.

Now we're all of a sudden talking about roads and cars and accessways.

It's an absolutely irrelevant question.

MR. SCOTT: We're talking about a viable fishery. And if the fishermen can't get access to the fish, then --

JUDGE WOLFE: Then you've left the spawning

6-15

topic altogether?

MR. SCOTT: No. We're still involved with that.

JUDGE WOLFE: Fishermen --

MR. SCOTT: The point is: What good is a spawning area that the fishermen can't catch the fish that spawn there from?

I mean, I understand that fish can spawn one place and move another place. But there's also information about their mobility and how far they'll stray from where they're born, and that sort of thing.

JUDGE WOLFE: Well, I'm no fly rodsman, but I wouldn't think that you would be out there fishing for ....

Thank you, Judge Linenberger. My fishing associate here. I was searching for a word for young fish.

JUDGE CHEATUM: Fish eggs and baby fish.

JUDGE WOLFE: Thank you, Judge.

I wouldn't think that fishermen would go to the spawning area to catch full-grown fish. At best they would catch the newly born ... whatever they're called ... the minnows.

Small fry.

So I don't really see, Mr. Scott, how you

6-16

can possibly bring this question in, so far as the spawning aspect of this contention is involved.

Objection sustained.

BY MR. SCOTT:

Q. Dr. Sanders, approximately what is the length of that eastern dam?

A. Gee, it's measured in thousands of feet. I --

Q. If you look at the scale right beneath -- estimate in miles.

A. Very roughly three miles long, the whole eastern levee.

Q. Okay.

Do you have any information about the likelihood by species of fish being born at one place and then becoming catchable size three miles away?

A. With specific reference to crappie, I would like to point out that these are schoolers, have great migration ability within a particular system. It is completely within reason to expect a crappie born at one end of the lake to be caught at the opposite end of the lake -- to at least during its lifetime have that as a probability.

Q. Yes, I realize that.

But do you have any information as to the

6-17

probability that this crappie is going to go that far?

A. Sir, you're way beyond the knowledge in the field -- mass movements of individual fish and schools of fish in freshwaters, especially turbid systems that the crappie enjoy, have not been researched heavily.

This is an expensive, time-consuming technique of radiotelemetry. There are very few data on that for free-ranging natural populations in freshwaters.

They really are only done for those generally anadromous fish, like salmon, the steelhead or protected endangered species, such as white sturgeon that have a high esthetic value.

Otherwise, they're just too expensive to do.

Q. Are you saying that there's no studies done on that subject matter then?

A. There are studies, yes, sir. But I'm saying that we have poor data on the vast majority of game fish, in terms of their eventual range within a given lifetime.

We have information on home range -- preferred home range, something of this nature.

Q. Let's limit it to that for the crappie. What's the preferred home range?

A. Well, crappie are schoolers, are great

migrators. I would say that on a daily basis you would find them moving on the range of hundreds of yards.

They move offshore at night and move onshore during the day.

And those on/offshore movements can be considerable.

Q. Okay.

A. This is during non-spawning periods.

Q. Do they tend to stick near home during spawning periods?

A. They are nest builders, sir; and the male defends the nest. So they're -- That is their only period of territoriality ... the white crappie.

Q. Okay.

Do you have any enlightenment that you can give myself on the distribution across this some five thousand acre lake as to where the fish are going to be?

Let's take crappie, for example --

A. Uh-huh.

Q. There has been some mention made by some other witnesses of a possible 200-pounds-per-acre fishery for all of the fish. Some fraction of that is crappie. Just for assumptions, assuming that's a hundred pounds per acre across the lake, on an average -- I assume

6-19

that meant to be -- Do you happen to know --

Can you enlighten us any as to what that range of crappie is likely to be across the lake?

MR. NEWMAN: Mr. Chairman, I'm going to object to that question. It was specifically asked and answered at Transcript 4290.

MR. SCOTT: My question was never answered.

MR. NEWMAN: The question that was at 4290 was: "Do you have any predictive ability as to where the crappie are likely to be in the lake, or where they are likely to go? Or will they be everywhere?"

"Answer: Well, I expect they will be everywhere there is suitable foraging habitat. They prefer obstacles, primarily brush piles, these sorts of things. And so wherever you find dead stands of brush, you would certainly find sizable crappie populations within the depths of the confines of the reservoir," and so forth.

It has all been answered.

MR. SCOTT: Within the what did you say?

MR. NEWMAN: "Within the depths of the reservoir."

(Bench conference.)

JUDGE WOLFE: Sustained.

///

6-20

BY MR. SCOTT:

Q Dr. Sanders, in answering that, you used the word "sizable populations," can you put any percentages on that as to the variation that might be across the lake?

A (No immediate response.)

Q For example, you know, in a hypothetical experiment somebody flies over with an airplane that can drop a net with one-acre squares on it, and it plops down there, and then you go in and you could pull out all of the crappie within each one of those one-acre squares, and you plot the distribution --

MR. NEWMAN: Mr. Chairman, I'm going to object to that question.

My concern now is not asked and answered. It really is a question of concern for the meaningfulness of the record.

I think postulated questions involving the dropping of nets out of airplanes just have no place in the record. They confuse things, and they don't help the Board or the parties.

MR. SCOTT: Mr. Chairman, this is very relevant. The reference to dropping nets out of airplanes was just a way of making it clear to the witness the question I'm asking, which is the distribution in the

lake --

MR. NEWMAN: Then why didn't he just ask for the distribution in the lake?

MR. SCOTT: That's what the other attorney did, and he gave this vague answer of "sizable." I'm trying to get something we can hang our hat on. You know, it might be that there's one pound in 90 percent of the lake and --

JUDGE WOLFE: Mr. Witness, is there some way to determine the distribution of fish --

MR. SCOTT: Crappie.

JUDGE WOLFE: -- crappie within the cooling lake? Is there some way?

DR. SANDERS: Do you mean are there sampling methods?

MR. SCOTT: That's not quite the question.

I'm just trying to find out, based upon the sum total of your knowledge, if crappie distributions for this lake -- how you might expect them to be distributed.

DR. SANDERS: Well, can I answer that question?

BY MR. SCOTT:

Q. Sure.

A. Okay.

I have already stated that crappie are schoolers. They will, therefore, have a clumped distribution within the lake.

They will be aggregated at specific areas within the lake. And again, this will be in association with foraging habitat, as previously described.

And if you look at the lake management plan, those areas that have brush along the shoreline, those areas that have standing timber are the areas where you will find these clumped distributions.

Openwater habitat is not the preferred habitat of crappie.

Therefore, in those areas where you have openwater habitat, you will find the minimum population densities per unit of surface area.

Q. Okay.

That's helpful. But we haven't gone quite far enough yet.

I just still don't have a good feel for the difference between the minimum and the maximum.

A. Well, it could be running from zero to -- since we're already considered the factor of 60 percent of a 200-pound standing crop, then -- pounds per acre standing crop, then that would be your maximum. If you want to consider --

6-23

Q. Okay.

A. -- a fairly out-of-world maximum, because there would be other game fish, of course.

Q. So then you are saying then that it's reasonable -- possible -- that you might have zero crappie within a large number of these one-acre areas in the center of the lake?

A. In openwater habitat, that is to be assumed from the biology of the species, yes, sir.

Q. Okay.

I realize this is taking a lot longer than --

A. This is during the daytime. At night they will forage in other environments, which do include openwater.

Q. Okay.

Now --

A. But I'd like to make a comment here --

Q. Sure.

A. -- as far as crappie. The crappie have a unique feeding structure. They have both gill rakers, which allow them to feed on zooplankton, and they have these large protrusive mouths that allow them to capture fish.

And they will seasonally change their diet, and -- according to their own size change their preferred

food items and utilize both openwater and these more -- well, foraging habitat associated with brush and what not.

Okay? So they have a broad range. But, in general, they are schoolers; and so you will find them clumped, day/night cycles.

Q Okay.

Is it fair to say though that -- Well, I thought I heard you earlier say that the day/night range tended to be on the order of a few hundred yards.

A I'm just giving a rough approximation. I have never seen any figures. But these schools are not in the category of anadromous fish that migrate miles per night. Okay?

So I just tried to scale that back to provide some frame of reference. But I would not, if pressed, stick to that figure from any basis of absolute knowledge.

Q Sure.

I'm just trying to get the feeling of whether or not a fish might spend the day on the west bank and the night -- I mean on the east bank -- and then -- the day on the east bank and the night on the west bank, some two miles away.

A I would say that would be fairly improbable for crappie.

7-1

BY MR. SCOTT:

Q Are the crappie going to tend to go to the shallow areas of the bank, the brush areas, at least once a day?

MR. NEWMAN: Migratory habits of the crappie have been asked and answered.

I object to the question.

MR. SCOTT: That question has not been asked.

I'm not asking some general question about migratory habits.

I asked a specific question. Unless he can find where that question has been asked, I want it answered.

MR. NEWMAN: Migratory habits of the crappie at 4288, 4290.

MR. SCOTT: Read the question.

MR. NEWMAN: I'm not going to read the transcript for you. I'm giving you the transcript references.

You're an attorney. Go read the transcript and find out.

MR. SCOTT: Then I'm saying my question has not been asked.

MR. NEWMAN: Your problem is, Mr. Scott, that you didn't read this transcript before you came

7-2

in here to start your cross-examination.

MR. SCOTT: I didn't need to. I was here. I know what was said.

That question was not asked.

MR. NEWMAN: Then your memory must be a lot better than mine, because I can't pull off feats of memory like that.

I apologize for those remarks, Mr. Chairman. They were out of order.

MR. BLACK: I agree it's been asked and answered, but I am more concerned now that Mr. Scott is not productively fulfilling the time limitations that have been given to him by the Board.

MR. SCOTT: That's Mr. Scott's problem; he's been limited to two hours.

MR. BLACK: You are plowing over ground that's been gone over before, but if that's the way you wish to put your two hours to productive use, then that's all well and good.

MR. SCOTT: Thank you.

JUDGE WOLFE: Isn't that so?

MR. NEWMAN: Well, yes and no, Mr. Chairman.

From the standpoint of wasting time, Mr. Scott is obviously adept at doing that --

JUDGE WOLFE: You have your own record to

make.

MR. NEWMAN: That's exactly right. My concern is for the record, and it seems to me that if you keep on asking the same questions over and over and over again, the witness will have shades of meaning and the record becomes blurred.

JUDGE WOLFE: Objection sustained.

BY MR. SCOTT:

Q Dr. Sanders, it looks like you're going to have to help me with getting my information out.

What percentage of the lake area is likely to have at least a hundred pounds per acre of crappie in it at least half the time?

MR. NEWMAN: Mr. Chairman, I'm going to object to that question.

I believe that Dr. Sanders earlier testified he had no personal information on how to evaluate the stocking of the fish, the poundage per acre.

Without that foundation, the question has no basis.

MR. SCOTT: I've given him, based on other testimony in this hearing, an assumption to use for poundage.

We're just using this to get ratios.

MR. NEWMAN: Go ahead. The witness can

7-4

can answer the question, if he can. Fine.

JUDGE WOLFE: Go ahead.

THE WITNESS: Well a hundred pounds per acre is a fairly sizable stand of crappie.

I would suspect that very few acres will have that high a standing crop, except for brief periods of the year.

Under less than say fifty to a hundred pounds per acre, in that range, somewhere in the area of maybe 15 to 20 percent of the lake surface would have standing crops in those ranges.

BY MR. SCOTT:

Q. Okay.

Would that 10 to 15 percent tend to be near the edges and to the southern end of the lake?

A. Well, first of all, I said 15 to 20 percent, and that would be predominantly the bluff areas and the area on the west side that had standing brush piles.

It would also include all the flooded timber areas in my estimation, those left standing during construction.

Q. Aren't those in the southern end of the lake?

A. The standing timber areas are distributed throughout the lake with a small portion of them in the north end.

7-5

Q Okay. I've finally crept up on you, to use the Board's term, and you can pounce away now.

If the lake is capable of sustaining 200 pounds per acre, how could it sustain in limited portions of it some number that's five to seven or eight times larger than that?

MR. BLACK: I'm going to object.

I don't believe there's been any foundation laid for that question.

I don't recall any such assumption in the record.

MR. NEWMAN: There is none, sir.

This question is without a predicate.

MR. SCOTT: It was clear in my mind that we had established that the crappie tended to move on the order of a few hundred yards between day and night and they would always be during at least one part of the day in more shallow water near the trees, brush areas; and then they go out a few hundred yards to forage for food, and then they come back.

With that information and with the distribution of where home in daytime areas are, you can look at the map and see that a small part of the cooling lake would be used by the crappie.

Then since we have a certain amount of

7-6

crappie and a certain distribution that the lake can carry of nutrients and whatever, you are going to tend to have a considerable increased crowding in those areas where they are going to base, and something like 80 to 85 percent of the lake most of the crappie will not be there.

MR. NEWMAN: Judge Wolfe, I think this really indicates what the defect is in this question.

Counsel does not have a piece of direct testimony to work from.

What he's trying to do is testify into the record, and on that basis to get an answer from the witness, testifying, by the way, on many different matters in the course of the question.

It is just the type of question which makes for a poor record.

JUDGE WOLFE: Yes. I see no basis in fact that's been established through this witness as a predicate for that question.

Objection sustained.

For that matter, I don't know anything else in the record that would serve as a predicate for this question.

MR. SCOTT: Well, it would help if I had my own witness here. I'll grant you that, but in any case --

7-7

BY MR. SCOTT:

Q Dr. Sanders --

MR. NEWMAN: Mr. Chairman, the irony of that, I can't let that get passed over in the record.

He did have his, quote, expert aquatic biologist sitting on the stand for the better part of two days.

That question could have been put to him and a predicate could have been laid, if in fact what he is asserting is true.

JUDGE WOLFE: All right.

MR. SCOTT: I didn't have the chance to lay those kinds of predicates and stuff.

I wasn't allowed to cross-examine my own witness.

MR. BLACK: You could have done it in direct testimony, though.

MR. SCOTT: Not in the timeframe where we were limited to having to get it in, in real short deadlines.

We were lucky to get in what we did.

JUDGE WOLFE: Well, the record will speak for itself on the time given for submission of direct testimony.

All right. Go to your next question, Mr. Scott.

7-8

MR. SCOTT: Okay.

BY MR. SCOTT:

Q. Based upon your testimony that large portions of the lake, something on the order of 80 to 85 percent of it, would have only a small portion of the total crappie, and based upon the fact that the crappie are expected to be the majority of the weight of the sports fish in this lake, and considering the fact that you've said that the range of the crappie between day and night is only over a few hundred yards, is it not true that major portions of the center -- major portions of this lake would tend to have a very low amount of crappie in them?

I thought we had already said that, but --

A. We've already been over that, I believe, sir.

Q. Now, if that is true, does that not mean that the portions of the lake where the crappie do exist would be higher by that same ratio than if we were talking about 20 percent of the lake with no crappie -- I mean, 80 percent of the lake with no crappie, then the 20 percent that had the crappie would have to be five times as dense as the average crappie population; is that not correct?

A. Sir, with respect to clumped distributions, you will have very high densities in very small surface

7-9

areas.

The figure of 200-pound standing crop per acre is on the basis of the entire lake as an average figure.

Q. I'm assuming that.

A. That 200 pounds -- Populations will distribute themselves according to preferred habitat.

The food resources that they consume will utilize resources in other parts of the lake and by shifting, foraging, on the basis of day-night rhythms and whatnot, they can utilize a substantial fraction of the lake, and they in fact will, given again this dual feeding habit that makes crappie so productive and so sustainable in these turbid water systems.

So I think it's somewhat unclear, or it doesn't really make a lot of ecological sense to me to say that 20 percent of the lake will contain all of the crappie at all times.

Q. I'm not saying at all times. We're talking about on an average.

A. I said that their prime foraging habitat from the daytime associated with brush piles is within this approximate 20 percent area; and again, at night they can spread out into a much greater area, given open-water foraging habits.

Q Okay, but is it not true that it's only a few hundred yards from their daytime areas?

MR. NEWMAN: Mr. Chairman, I'm going to object to this questioning.

It's cumulative at this point and objectionable.

The witness has now testified ad nauseam about the distribution of the crappie in the lake and about their migratory habits.

I don't see this questioning going anywhere.

Again, it's his time to waste, but it's my record to be concerned about.

JUDGE WOLFE: Yes. Sustained.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Dr. Sanders, would you explain how it is that the productivity of life in the center of the lake contributes to food for the crappie?

A Well, it's on the basis of food web dynamics. Primary production occurs everywhere; it is consumed everywhere by zooplankton, and these are pelagic organisms subject to the currents that move water through or that reflect water movements in the lake.

So production in one end of the lake in one particular level of the food web can in fact be consumed at the far opposite end of the lake.

7-11

Again, it's just a function of food web dynamics, that there are no strictly isolated cells in this system that have no contact with other nearby adjacent cells.

You don't have that. You have a dynamic system, both from the standpoint of the hydraulics -- or hydrology and with respect to the fish moving through as highly mobile organisms.

Q Okay.

Now, inherent in what you said was -- you mentioned the water circulated and it carried the zooplankton.

A Well, sir, a fish could essentially sit in one place, if it's a planktivore, and have a stream of food constantly passing by the window of its eyes, if it so desired.

That doesn't mean it may not do poorly under that circumstance, but that is given the ubiquitous nature of the distribution of the plankton in any system such as this reservoir.

Q Okay.

Now, what I'm asking, does the food that is suspended in the lake water, it moves with the motion of the lake water, coming by the fish that wants to sit still and get fed, maybe insufficiently? What types of food is that that just moves with the lake water as

opposed to exerting its own energy to try to stay still?

A. Are we again speaking of crappie, sir?

Q. No, we're talking about food at the lower levels that eventually is consumed by the crappie after going through several chains?

A. Well, sir, all production, with probably very few exceptions, are available, and all production by given organisms is available to organisms higher up the food web; so effectively, it would be the entire species list that we could dream up for this system.

Your question to me, sir, if I may say so is way too broad to have any real meaning to me.

Q. Well, that's no doubt my fault.

The question I'm trying to elicit is how much of the movement of the food supply is determined by the movement of the lake water?

If I'm a bass and I'm sitting there defending my nest, that water can pass on me at ten miles an hour for a week and I'm going to still be right there.

But if I'm an amoeba, I'm just going to basically drift with the water.

You see the distinction?

A. Yes, sir.

Q. I want to know what percentage of the nutrient value of this lake, as far as the food chain,

7-13

is moving with the lake water?

A. Well, given --

Q. By that I mean the circulation of the lake water.

A. Ninety-nine percent, at least.

Q. Okay.

A. That's from the standpoint of the fact that biomass will be overwhelming in the low eutrophic levels.

MR. NEWMAN: Mr. Chairman, just for the record, because I have the feeling the reviewer one day, the Appeal Board or the courts, will have to look at this, are we still in the spawning area or have we now departed more generally into the viability of the fishery?

JUDGE CHEATUM: Fish distribution, I believe.

MR. NEWMAN: I guess we are at fish distribution, but I didn't detect the end of fish spawning.

Can we now conclude that fish spawning has now been exhaustively treated and your questions are done?

MR. SCOTT: No.

MR. NEWMAN: You're going to come back to fish spawning?

MR. SCOTT: Sure. I might. I'm leaving that option open.

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MR. NEWMAN: Where are you going now? What issues?

MR. SCOTT: Well, I'd rather not have to explain to you.

MR. NEWMAN: What issue are you dealing with right now?

MR. SCOTT: This is the same thing that we've been through before.

I'd like to be able to ask my questions.

JUDGE WOLFE: Well, the Board will ask the question.

What topic or what issue are you on now?

MR. SCOTT: Okay. We're talking about the food supply that supports the higher forms of life, the crappie, the bass, the higher forms of life.

If 90 percent -- this is why I hate doing this, but --

JUDGE WOLFE: I just wanted to know whether you had left spawning and now you are on a different topic.

That was my only question.

MR. SCOTT: Temporarily I've left spawning, yes.

JUDGE WOLFE: All right.

MR. NEWMAN: Mr. Chairman, I cannot find

7-15

anything to do -- I think he must identify what portion of the contention his cross-examination is related to.

I can't find it.

MR. SCOTT: Viability of the cooling lake as a fishery.

MR. NEWMAN: But that is within four or five specialized areas that are defined in the contention as --

MR. SCOTT: It may not even be one of those. We're talking about the viability of the fishery.

MR. NEWMAN: The contention says that the lake will not be a viable fishery because, and then there's one, two, three, four, five, six.

Which of the six are you in now?

MR. SCOTT: Several of them.

MR. NEWMAN: I'm going to direct that question through the Chair, sir.

MR. SCOTT: It's including at least the chlorine releases, the sewer discharges, the heavy metals and the cold shock.

JUDGE WOLFE: All right.

Ask your question then. What is your question.

BY MR. SCOTT:

Q What is going to happen to these lower forms

7-16

of life as they circulate through the condenser water or the cooling water and through the reactor?

A. You are asking me to reflect upon the nature of the stresses occurring subsequent to uptake?

Q. Yes.

MR. BLACK: Objection.

There is certainly no evidence on record in this proceeding that this cooling lake water will circulate through the reactor.

MR. SCOTT: By reactor, I do not mean where the fuel rods are at. I mean the plant, the nuclear power plant.

MR. NEWMAN: Mr. Chairman, viewed in its best light, this may be a question relating to the passage of water through the condenser cooling system.

Dr. Sanders has already testified that that's a part of the story which is not part of his testimony.

He is not an expert in how the plant handles water that comes through for cooling.

MR. SCOTT: I'm not into that at all.

MR. BLACK: This whole line of questioning has been asked and answered by one of Applicant's witnesses, and it does pertain somewhat to the issues at hand.

Since it's been on the record before, I submit we just go on.

7-17

MR. NEWMAN: I'll withdraw that objection. Just go on.

JUDGE WOLFE: All right.

BY MR. SCOTT:

Q What is going to be the nature of stresses to these forms of life when they go through the temperature increase, the chlorine being put on them, when they go through that system?

MR. NEWMAN: What system are you referring to? Excuse me.

MR. SCOTT: The same one as earlier, the plant condenser cooling water that goes in the intake canal and goes out the discharge canal.

THE WITNESS: You just mentioned three shear stresses and that is/stresses having to do with high velocity passage through narrow restricted channels; heat stress, sudden heat shock; and chlorine discharges, which occur at a frequency of twice a day for 15-minute periods.

MR. SCOTT: Uh-huh.

JUDGE WOLFE: We'll recess until a quarter of 2:00.

MR. SCOTT: Could I get the answer?

JUDGE CHEATUM: He's answered it.

MR. SCOTT: No. The question was what will

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happen to the things that are subject to those three stresses.

THE WITNESS: Okay.

Plankton will probably to a fair degree be able to recover, although there will be some mortality.

The mortality associated with entrainment of larval fish will be size-dependent on those larval fish.

There is evidence to show now that survival can be as high as 90 percent, although I think it's certainly not appropriate to assume that.

For worst case assumptions we assume that a hundred percent mortality may occur.

Those are --

BY MR. SCOTT:

Q. How about the zooplankton?

A. They are part of the plankton. They have variable mortalities.

They may recover.

Q. Can you give me some percentage, even if it's just approximate, of the survival rate of the zooplankton and protoplankton?

A. Well, just very roughly, my understanding is that, say, 50 percent of those may end up being viable at the other end of the line.

It depends, of course -- It's species

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dependent for the zooplanktorsspecifically, because they have different mechanisms, different body forms and types, different mechanical abilities to resist abrasion and whatnot.

JUDGE WOLFE: We'll recess until 2:00 o'clock.

(Whereupon, at 12:45 p.m., the hearing was recessed, to reconvene at 2:00 p.m., the same day.)

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AFTERNOON SESSION

2:00 p.m.

JUDGE WOLFE: The hearing is resumed.

It is one minute after 2:00. Mr. Copeland is present, Mr. Black is present and Mr. Doherty is present.

Mr. Scott is not in attendance.

We stand in recess for five minutes.

(Recess taken.)

JUDGE WOLFE: All right. Two minutes after 2:00. Mr. Scott is now present.

Continue with your cross, Mr. Scott.

MR. SCOTT: Mr. Chairman, not that I think you are trying to make anything special out of the two minutes, but my clock had exactly 2:00 when I came in.

JUDGE WOLFE: Came in where?

MR. SCOTT: To my seat.

BY MR. SCOTT:

Q Do you remember where we were at when we quit?

A Very, very roughly, yes.

Q Refresh my memory.

MR. COPELAND: Objection, Your Honor.

MR. BLACK: Objection, Your Honor.

That's the examiner's duty to do that.

JUDGE WOLFE: Sustained.

8-2

BY MR. SCOTT:

Q As I remember it, you had just testified that something like 90 percent of the microorganisms in the Allens Creek cooling lake would travel with the recirculating water in the same time periods of, say, the water in the lake circulates through the plant cooling system.

These microorganisms would also circulate through the plant cooling system; is that correct?

A Yes, sir, the plankton will cycle through the cooling system in the sense that whatever water is taken up that contains those organisms, of course, will go through the plant and be discharged at the other end of the line.

They are too small to be impinged on the screens or to get out of the way of the sort of water velocities being postulated or being proposed for this design.

Q Okay.

Is it true that you stated in somewhat of an approximation that 50 percent of those microorganisms would die by virtue of the stresses they receive from the temperature, the chlorine and the friction?

A That's a fair average to look at if you want to just look at an average situation.

8-3

Well, primarily, zooplankton. Algae may have a slightly higher survival rate, because they are so much smaller.

Q. Wouldn't their survival depend significantly upon what stage they were in in their growth?

A. These are the zooplankton now?

Q. No, the algae.

A. Well, algae divide by cell division and there is, of course, some changes in cell size; but stage of growth of algae is not -- what I'm trying to say is it's not really a viable way of picturing algal biology, per se, in terms of the phytoplankton.

Q. How about the blue/green algae?

A. Well, the same thing there, except for possibly colony development, and that is, sizes of colonies change with time as the individuals within those colonies multiply; but the average individual would be about the same size, more or less.

Q. Okay, and didn't you say that to be conservative you assumed a hundred percent of the slightly higher forms of life would die, the larvae of fish?

A. Yes. You would -- It would certainly be accepted practice to postulate 100 percent mortality for the benefit of making some comparisons on potential impact on the fishery; but then I qualified that to say that data

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studies done, experiments done, can show a survivalship as high as 90 percent, depending on the actual size of the larval fish going through and entrainment and discharge sequence.

Q. You are restricting that to the fish?

I'm also interested in all forms of life between -- the hierarchy between algae and bacteria up to fish.

A. Well, I just made broad categorizations.

The hundred percent mortality figure is usually only assumed for larval fish themselves.

Q. Okay.

Now, is it not true that the impact that this death rate, whatever it is, from going through the condenser cooling system, upon the productivity of the lake is going to depend upon the ability to reproduce and recycle of the various microorganisms and fish?

A. Yes, the ability of the system to withstand powerplant cropping will be dependent upon the turnover of water through the system with respect to regeneration rates, generation time, this sort of thing, considering the system as a whole.

Q. What is the reproductive -- the time from birth to the time of the ability to reproduce of a typical fish to be found in Allens Creek?

3-5

A. Well, a typical fish. Specifically, you are talking about --

Q. Black bass; start off with that, largemouth bass?

A. Sexual maturity would probably not be reached before the second year in the largemouth black bass.

Q. Crappie?

A. Roughly the same.

Q. Shad?

A. Shad could probably spawn by the end of their first year.

Q. Okay.

What's a typical life cycle for some of the things that shad feed upon?

A. Well, some of the zooplankton will have many generations a year, lasting maybe as short as three weeks or so.

It depends, of course, on what species you are talking about and temperatures and that sort of thing.

MR. COPELAND: Your Honor, can I inquire if all of this is going to the question of the effects of entrainment and impingement on aquatic productivity, because if it is, I think it's objectionable.

It's not relevant to TexPirg's contention.

8-6

MR. SCOTT: That's basically where I'm heading, and I don't see anything that could be more relevant.

We're not restricting this to fish, but it's the basis of the source of food for the fish.

I'm not sure I'm proving anything at this point, but to the extent that that is depleted, it should be accounted for in determining the viability of this lake as a fishery.

MR. COPELAND: Well, Your Honor, the TexPirg contention specifically is that there is not adequate spawning habitat in the lake.

If Mr. Scott had wanted to introduce a contention that said that the lake would not be viable because of the effects of entrainment and impingement, that would have been a quite simple subpart of the contention to add.

I believe that it is beyond the scope of the contention.

MR. SCOTT: There are several hundred such things we could have added.

We thought we only had to add one thing to have a viable contention.

JUDGE WOLFE: As you recall, and I hope I don't have to go over this again, the Board suggested that the parties get together and agree on a summarization of

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the contentions.

We also suggested at the time, and it's always been permitted by our regulations, for parties once their contentions to have been admitted, to amend them to any extent deemed fit, provided the Board concurred, so that this was left open to any party Intervenor to so amend their contentions to add or take away various sub-issues or sub-contentions.

TexPirg Contention 2, as admitted, does not relate to the area that you're questioning seeks to reach.

Therefore, the objection is sustained.

BY MR. SCOTT:

Q Dr. Sanders, which parts of Allens Creek Lake has a hard bottom?

MR. COPELAND: Asked and answered, Your Honor.

MR. SCOTT: It's never been answered is all I can say.

MR. COPELAND: He asked the witness before -- Well, all right.

I'm assuming he means rocky bottom by the use of the term "hard bottom," so I withdraw my objection.

MR. SCOTT: I'm not --

THE WITNESS: Well, all the clays that exist along the bluff areas would be considered hard bottom,

3-8

and, also, of course, the rip-rap dike area would be hard bottom.

The flooded agricultural soils in the middle of the lake very soon after flooding and with some organic accumulation will be considered soft bottom areas.

Q. How about the shoreline, other than that part that's rip-rap along side the dam?

A. Well, that part that is natural bluff is considered -- it's clay, I believe, its main composition, and that is a relatively hard bottom.

It can be utilized by fish, certainly, but it's not considered a soft oozy bottom sort of substrate.

Q. What's the difference between the composition of the soils on the so-called bluff and that of the rest of the roughly 5,000 acres of the cooling lake, other than it's got about a 15 foot difference in elevation?

A. Just s ving, I don't have any soil maps in front of me; but one an alluvial deposition area that is flat, currently agricultural, ground, and the other is a bluff that historically has gone through an erosion sequence.

I'm assuming that the reason why it is still standing is because it has a high composition of clays and therefore, can maintain its angle of repose, its steep angle of repose.

3-9

Q. Is it possible that the bluff is nothing other than where the bank of the river was at one time in history?

A. Well, that's exactly what it was in the sense of its general conformation; however, it's gone through a weathering process most certainly since the river has migrated considerably deeper than the current bluff elevation.

So you're talking about certainly time scales in the thousands of years.

Q. Okay.

Have you heard testimony to the fact that blue/green algal blooms will be limited to the July and August timeframes of the year?

A. I believe what we've said is that the nuisance algal blooms would be restricted to that late summer period.

Q. Would you consider blue/green algal bloom as a nuisance algal bloom?

A. Only if it forms a surface scum.

In other words, let me point out that in phytoplankton ecology blue/greens are always present in these sorts of systems.

As a matter of fact, they are present in high eutrophic systems, and seasonally they may dominate the

8-10

microplankton and, therefore, constitute a bloom, but in fact be inconsequential in terms of the aesthetics or posing any problems to other organisms in the system and, therefore, not be considered a nuisance.

I believe all our probing here has been directed primarily to the formation of nuisance algae, scums, or what have you, that would be detrimental to the ecology of the system in one fashion or another.

Q. Is it not possible that that could be without forming a surface scum?

Would it not be possible to have a blue/green algal bloom of a magnitude to kill a lot of fish and other aquatic organisms, even be detrimental to people swimming in it, and yet not have a scum?

A. Well, sir, in this part of the world and in these subtropical systems, we do not find the sort of blue/green algal blooms that release neurotoxins and kill fish and completely choke off all oxygen in the sense of decaying mass of vegetation and this sort of thing with a regular frequency.

What we've said is that these surface scums may form in these areas. It's within the realm of probability that they could form during low circulation periods in late summer.

However, it's also been stated repeatedly that

8-11

this seems to be a fairly rare occurrence in Southeast Texas -- or southern Texas reservoirs. That's Southeast Texas.

So I cannot conclude from information I've gathered that it would be a regular occurrence in Allens Creek.

Q. Are you saying that algal blooms are less likely to occur in Texas than in more temperate climates?

A. Blue/green algal blooms --

Q. Yes.

A. -- will certainly occur. It's the species, the blue/green species now, that we have to become more aware of, those that cause problems to other biota.

They will occur both temperate, north temperate and in subtropical areas with regular frequency in the sense of blue/greens as a general class of organisms.

So, again, I've been trying to focus back to the problem algae, the nuisance algae, okay, and those particular organisms, that is say the microsistus or the antibienna types, they do not apparently form blooms of any regularity in these systems.

The normal mechanisms that operate in north temperate lakes apparently do not operate, functionally operate, in reservoirs of this area.

I'd like to add that the reasons are essentially unknown, in the sense of -- especially in the nutrient

limitation sense.

Q. Is it fair to say that typically when you have nuisances from the blue/green algae that it's during the warmer parts of the year?

A. Typically, yes.

Q. So wouldn't it -- this is a first hand -- wouldn't you think that in an area that stayed warmer more of the year, you'd probably have the problem more of the time?

MR. COPELAND: Your Honor, I'm going to object that as being impermissibly vague.

We've got to specify what area we're talking about.

This witness has answered the question with respect to this part of the country and what the problem is.

I don't know if Mr. Scott is attempting to again replow that ground or if we're now talking about some other area.

MR. SCOTT: Mr. Chairman, the witness -- All I've heard out of the witness is he is not aware of the blue/green algae creating a problem in Texas.

Now, we can go at length if you want to into the amount of time he's spent here in Texas looking for it, but the fact that he hasn't seen it is not terribly

meaningful.

We're trying to inquire as to whether or not there is any sort of basis for expecting it should be as frequent, in fact more frequent here, than in more temperate climates nearby, you know, just north of here.

MR. COPELAND: Your Honor, my objection was that the question was impermissibly vague.

That is all I said. I would like to get some definition of the area that we're speaking about.

JUDGE WOLFE: The area we're speaking about in this part of Texas?

MR. COPELAND: No, sir, in the question. It was, "Isn't it likely that where you're in an area where it's warmer than otner areas, you're likely to have an algal bloom?"

Where are these areas that we're talking about?

JUDGE WOLFE: All right.

Define that. Rephrase and define that in your question then, Mr. Scott.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Dr. Sanders, do you have any reason to believe that an area that has an average of warmer, hotter temperatures, that it should on an average have more

3-14

blue/green algae blooms than an area that has less warm water temperatures?

It's a very general question.

A. If I was to isolate that factor in a laboratory --

Q. Correct.

A. -- then -- and you were to raise temperatures considerably, say above 96 degrees Fahrenheit, in a mixed species culture, then you would probably find blue/greens gaining dominance with specific relationship to temperature and temperature only in a controlled situation.

Q. That's a good way to answer it. That's all I was after.

Now, what specific factors, if any, do you know of that would prevent that phenomenon that you say you would expect to occur in the laboratory from occurring in the Allens Creek cooling lake, as compared to another lake with warmer -- cooler temperatures?

MR. BLACK: "With warmer cooler temperatures"?

MR. SCOTT: Scratch the "warmer."

THE WITNESS: Well, there are two dominant mechanisms that have been postulated by the contacts that I have made, which I again will go over.

This is Olin Lynn of Baylor, J. Silvie of

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North Texas State, Gus Fruh of The University of Texas, William Clark of The University of Texas and Alex Horne of UC, Berkeley, that have been postulated to account for this lack of observance by these -- well, by four of those individuals, the first four.

First off, is the high cropping rate of the algae by the zooplankton and by the planktivores fish.

It's well known that these organisms can control the size structure of phytoplankton. They tend to strain out the large organisms and leave the more desirable microplankton, which is in these cases around here the diatoms.

And secondly, we do not seemingly have a functional nutrient limitation for nitrogen in these systems with high inorganic silt suspended in the water column.

In other words, the blue/greens cannot gain elemental dominance with respect to their ability to fix/ nitrogen into ammonia and thereby outcompete other algae who do not have this similar process available to them in their biochemistry.

It's not known really why this nutrient limitation thing doesn't really occur even under seasonal nutrient loading regimes where you only have certain seasons of nutrient inputs into the systems.

3-16

That's a question that Olin Lynn is currently pursuing via his own personal research and directing his graduate students to pursue that as a research area.

I can only again state that the occurrences are not reported if they go on, and Olin Lynn and other people have spent a lot of time looking for these sorts of events in Southeast Texas reservoirs.

So I can only state that the usual mechanisms that we can postulate operating in north temperate lakes do not operate in Southeast Texas.

Q. Okay.

A. These are taking all factors into consideration and you certainly cannot use temperature alone.

That would be inaccurate.

Q. Is it fair to summarize what you've said that you would expect blue/green algae to be more predominant in warmer water, so long as it wasn't so warm as to kill the blue/green algae, but that's not reported as happening in Texas, and that there's a couple of theories as to why this might be but they are not really understood, either?

MR. COPELAND: Your Honor, I'm going to object to that attempt to characterize the witness' last answer.

I think the witness' last answer was a very detailed thorough explanation of the phenomena as the witness understands it.

-17

There's no reason to have the witness try to agree or disagree with Mr. Scott's characterization of his answer.

JUDGE WOLFE: Sustained. There's no purpose to that.

Let's proceed to your next question.

MR. SCOTT: Okay, sir.

BY MR. SCOTT:

Q Do you know of any reason that if blue/green algae is going to occur in Allens Creek in late summer, July and August, they wouldn't also occur in May and June?

MR. COPELAND: Asked and answered, Your Honor.

The witness has explained that the blue/green algaes are in the lake almost at all times.

MR. SCOTT: I'm talking about as a bloom problem.

JUDGE WOLFE: Still asked and answered.

Sustained.

BY MR. SCOTT:

Q What reasons, if any, do you have for limiting the blue/green algal problem to the late summer, as opposed to all summer?

MR. COPELAND: This subject has been discussed in detail, Your Honor, as to why these occurrences occur in the summertime.

8-18

Asked and answered. This is unduly repetitious.

JUDGE WOLFE: Sustained.

MR. SCOTT: Mr. Chairman, I'd like to point out that what I asked was not what Mr. Copeland asked.

I'm trying to draw the distinction between early summer and late summer.

MR. COPELAND: Even if that's true, Your Honor, what is the purpose?

MR. SCOTT: I sure hate doing this, but the purpose is that if it occurs all summer, that messes up swimming all year essentially.

The other way you could have swimming part time.

(Bench conference held.)

JUDGE CHEATUM: Mr. Scott, in prior questions to Dr. Sanders, that question -- the answers to that question have been explained by Dr. Sanders, and particularly in relation to any effects that the blooming of the blue/green algae would have on contact sports.

So I really can't see how you can add to that which has already been discussed.

JUDGE WOLFE: All right.

Next question, Mr. Scott.

MR. SCOTT: Okay.

3-19

BY MR. SCOTT:

Q. Dr. Sanders, do you have any reason to believe there could not also be blue/green algae blooms in early summer?

MR. COPELAND: Your Honor --

MR. BLACK: Objection. That's the same line of questioning.

JUDGE WOLFE: Sustained.

MR. SCOTT: I guess I'm not clear on the basis for what the objection was.

JUDGE WOLFE: Asked and answered.

MR. SCOTT: This is certainly a different question.

BY MR. SCOTT:

Q. Dr. Sanders, are you aware of the biology book by Thomas Brock, B-r-o-c-k, entitled Biology of Microorganisms?

A. Well, I am aware of the book. I haven't read that particular one, sir.

Q. To your knowledge, is that a book that would be considered an authoritative source for people in your field?

A. Well, Dr. Brock, if he's the same one -- Could you give me his initials, by the way?

Q. Thomas D.

8-20

A. Thomas D., yes, I believe that's the same Brock.

Yes, he's a credible scientist. Hopefully, I have the right Brock.

Q. The University of Wisconsin?

A. I really don't know where he is.

Could I look at the book a minute? I could answer that question.

- - -

MR. BLACK: I object to what's going on up there now. He went up there for purposes of showing the book, and now he's going into more than that. Let him lay a foundation.

JUDGE WOLFE: That is right, Mr. Black.

BY MR. SCOTT:

Q. Is that the Thomas C. Brock that you're familiar with?

A. I believe so, yes.

Q. Is that the textbook you're familiar with?

A. Well, again, I have not seen that textbook. I'm just aware of it. I haven't gone through it. As a matter of fact, I've read almost nothing in that text-book.

Q. Okay.

A. In the sense of what's printed there. I have read some of the papers, I'm sure. He's drawing from his own background -- research background.

Q. Yes.

In the particular diagram that I am interested in, it's his own research.

A. Uh-huh.

Q. I'd like to show you a figure in that book, have you look it over and see if there's anything about it that you disagree with.

9-2

MR. BLACK: I'm not certain where we're going with this. The witness has said he may or may not be familiar with this.

MR. SCOTT: Well --

JUDGE LINENBERGER: What is the subject of the illustration that you're about to show the witness?

MR. BLACK: We're getting into some type of algal blooms in a lake in Wisconsin, which to me has very little relevancy to us.

So maybe we can -- We have talked about blue-green algae blooms in a lake in Wisconsin. The chart shows they occur in spring, summer, fall --

I don't know. But as far as I can see, there's no relevance. Besides, I don't think that a proper foundation has been laid through this witness to determine that.

MR. SCOTT: I'm trying to lay that foundation.

JUDGE WOLFE: All right.

Hand him the book and then ask him a question and we'll see where we go from there.

(Document is handed to witness.)

JUDGE WOLFE: Now step back, Mr. Scott. Ask him the question on the record.

(Pause while document is examined by witness.)

9-3

BY MR. SCOTT:

Q Dr. Sanders, do you have any reason to doubt the information contained in the figure that I've shown you --

JUDGE WOLFE: Well, now on my own motion, that sort of question means nothing at all on the record to this Board at this time.

So your general question--you hand the witness a book and you ask him a general question like that, the Board has absolutely no idea what you have in mind.

Or if he said yes or no, what weight to give such a question.

MR. SCOTT: Well, I thought we had already been through this. But Dr. --

JUDGE WOLFE: Now we have not been through this.

I am telling you that the Board cannot accept that sort of question.

BY MR. SCOTT:

Q Dr. Sanders, do you accept the work of Mr. Thomas D. Brock as being authoritative -- in your field of endeavor?

MR. BLACK: Whose field of endeavor?

MR. SCOTT: Dr. Sanders.

MR. BLACK: That's impermissibly vague.

MR. SCOTT: Okay. We'll limit it to blue-green algae biology.

MR. BLACK: Is the question whether Dr. Sanders accept Mr. Brock as an expert in the field of blue-green algae? Is that the question?

MR. SCOTT: Yes.

DR. SANDERS: Yes, I do. He has a very high reputation, especially in the study of blue-green algae in thermal springs -- very hot, unusually abnormally hot areas.

Yellowstone National Park is an example.

BY MR. SCOTT:

Q Okay.

That being the case -- Well, have you examined a figure in his BIOLOGY OF MICROORGANISMS?

MR. BLACK: Please identify the figure for the record.

JUDGE WOLFE: And at what page.

MR. SCOTT: Page 632, Figure 19.13.

JUDGE WOLFE: And what is the caption, please?

MR. SCOTT: "Development of Sino-Bacterial Blooms in Lake Menadotta, Wisconsin during the 1976 Season."

JUDGE WOLFE: All right. Now what is your

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question?

BY MR. SCOTT:

Q Dr. Sanders, do you have any reason to dispute the information shown in that figure?

MR. BLACK: I'm not certain that's a very good question either. It's hard to say that Dr. Sanders can dispute anything, because he hasn't had an opportunity to look at and digest the material beyond the figure.

So I say this line of questioning of whether he disputes it or disagrees with it is totally impermissible.

MR. COPELAND: Your Honor, I would also object that the description Mr. Scott has just read, which, by my reading is correct, states that this is a figure developed on bacterial blooms in Wisconsin.

And the chart does indeed show that the cycle for these blooms peaks in about -- both the summer and the fall.

But there is no demonstration through this witness that he believes that the experience with algal blooms in a lake in Wisconsin, in the first instance, is representative of what might occur in a cooling lake in Texas.

And that seems to me to be something that has to be established before we get to the point of whether

indeed Dr. Sanders even agrees that the chart accurately shows what did in fact occur in this cooling lake in Wisconsin.

I believe we're several steps removed from laying a foundation for a question of this witness on agreement with this chart.

MR. SCOTT: I don't think I'm that far away.

I'm not presenting this for whether or not it's true or correct. I'm just trying to get a basis of that so that we can start discussing this figure.

MR. BLACK: Why don't you just tell him what the chart shows and then ask him if your characterization of that chart is correct, and go on from there.

(Bench conference.)

MR. SCOTT: For a starter, that's okay.

MR. BLACK: Well, ask him --

JUDGE WOLFE: Well, I think there are too many suggestions going on here at the same time. I think there's sort of cross-purposes even between Applicant's and Staff's counsel on the proper questions to pose.

But I suggest that you go forward with Mr. Copeland's question first: Is there any parallel between the sort of bloom in Wisconsin as against what prevails in Texas.

DR. SANDERS: Do you want me to answer that question?

JUDGE WOLFE: Yes, answer that question.

Is there any parallel -- is there any -- well, taken in comparison between the two states?

DR. SANDERS: I would say no. Because one is a subtropical system and the one at Lake Mendotta is a north temperate system.

As I have already stated, the mechanisms used for forecasting algal blooms in north temperate systems do not apparently operate in the subtropical systems. They have totally different ecologies.

JUDGE WOLFE: All right, Mr. Scott. You really don't want to pursue that line anymore, do you?

MR. SCOTT: Yes, I do.

JUDGE WOLFE: Ask your next question.

MR. SCOTT: I'm not trying to prove that what happens in Mendotta, Wisconsin is the same as happens in Texas.

I'm just trying to show that this has happened in Wisconsin. I'll let the Board draw their own conclusions.

JUDGE WOLFE: Ask your next question. I'll rule on the objection.

///

BY MR. SCOTT:

Q. Dr. Sanders, did this figure that we've previously discussed show peaks of approximate same magnitude all the way from July through November?

MR. NEWMAN: Mr. Chairman, I'm going to have to object to that question, again because of the need to protect the record.

There is just no way --

JUDGE WOLFE: Irrelevant. Sustained.

Next question.

BY MR. SCOTT:

Q. Dr. Sanders, are you aware of the number or density of crappie in the Brazos River?

A. Well, it's hard to attest to either of those in a quantitative sense.

I will say that they are present, but currently are present in low numbers, since this is considered a fairly poor river fishery -- at least in the main Brazos itself.

Q. What is the extent of your knowledge as to the number per acre of surface area in the Brazos River?

A. Well, sir, they will be primarily in backwater habitat in the Brazos River. So if you want to average that out over the entire river system, I'm sure that the figure is very low in terms of pounds per acre of standing

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crop.

Q Well, if we considered not only the sum in the river, but both sides and its backwaters and whatever, and talked in terms of length of river channel, would you have any idea as to the number that are there, say, per mile in the Brazos River?

MR. BLACK: Objection. That's impermissibly vague.

MR. SCOTT: Let's limit that further, in the area within ten miles of the proposed Allens Creek plant.

MR. BLACK: Objection. That's still impermissibly vague.

I believe the question was how many would be per square mile or per river mile, or something like that. I think that is totally irrelevant.

MR. SCOTT: I don't know how to make anything more clear than that.

(Bench conference.)

MR. COPELAND: It's also largely irrelevant. I thougnt we were talking about productivity in this lake and not in the river.

MR. SCOTT: I'm talking about the river.

MR. COPELAND: Well, then that's outside the contention, Your Honor, clearly.

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MR. SCOTT: It's --

(Bench conference.)

JUDGE WOLFE: Sustained.

That's not within the scope of this contention.

MR. SCOTT: Mr. Chairman, I would like to explain that it has been stated that there will not be a stocking of the Allens Creek lake, that the crappie are supposed to come from the Brazos River.

So it's very relevant as to whether or not any crappie and if some, how many, are likely to get into that lake.

MR. COPELAND: And the witness has already answered that in his opinion, there is an adequate amount of crappie that will come in through Allens Creek and through pumping from the Brazos to suffice for stocking the lake.

Now if Mr. Scott has a problem with the specific statement that he made, he ought to point to the place in the transcript and pursue it from there.

But that has been covered, Your Honor. I'm going to object. It's unduly repetitious.

MR. SCOTT: Mr. Chairman, there's nothing in the record as to the number of crappie in Allens Creek, nor is there anything from any of the witnesses that

have testified so far as to the number that's going to be in the Brazos River, other than a statement that Applicant's counsel made that there was going to be enough.

Now I am pursuing the knowledge as to what is enough.

MR. COPELAND: I believe the witness has answered that question as well, Your Honor.

MR. BLACK: I'm not certain that this witness has answered that question. I believe it went back to a previous Applicant witness.

I believe a certain line of inquiry along the -- of how many crappie are in the Brazos River, since that will be a source of the reservoir's is appropriate. I don't object to a certain line of questioning in that regard.

MR. COPELAND: Well, I'll withdraw my objection and let him go ahead.

JUDGE WOLFE: All right.

DR. SANDERS: What we're talking about is innoculation of a new system, and not stocking, there is a very significant difference.

In other words, we just want to get that species in there and get it rolling, and it will take care of itself. So it will be part of a self-sustaining -- Well, it will be self-sustaining within the cooling

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reservoir.

In terms of the number of individuals needed to innoculate the system, even though fecundity of females is highly variable, female crappie are able to lay a few hundred thousand eggs at a given season.

And it wouldn't take very many seasons with only a few crappie in this system to get a very sizable young of the year crop established, and from then on the individuals would reproduce within the system on a natural fashion.

So I think there's no question, and certainly any fisheries ecologist with experience in this area would be totally aghast to believe that crappie would not enter the system in significant numbers to suffice for innoculation of the system.

I might also comment that that's a direct statement from Robert Bounds also, that there's no question that crappie will not be innoculated into the system from the Brazos River in sufficient quantities to get the crappie off and running.

BY MR. SCOTT:

Q. Did he gave any basis for that statement to you?

A. No. I would say in his files at Austin, tens of years of sampling data from the rivers and

a broad basis of personal experience.

Q Did he show any of that to you? Did he ever get into -- Did his data indicate, for example, that he knew of a single crappie in the Brazos River to --

A Crappie have been found in the sampling program submitted by the Applicant in the Brazos River near the proposed cooling reservoir.

Q Do you remember how many?

A Not offhand, no, sir. I can't tell you the exact numbers obtained through the various sampling techniques.

Also, I could point out that samplings in these highly variable systems, and especially turbid flowing systems, do not necessarily reflect true population densities in those systems.

We have a tremendous problem with getting actual headcounts. If you find some, it's a fairly good indication that they are there.

The fact that they are there -- and it follows from Robert Bounds' experience that -- in my professional estimation that they will be innoculated into this reservoir.

Q Okay.

I want to ask you a question about chlorination.

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Is it your understanding that it's very difficult to accurately measure the amount of total residual chlorine at the .2 milligrams per liter level?

A. I believe that a competent chemist can go below the .2 milligrams of chlorine per liter level with the amperometric technique available.

I believe it's way below that, say, in the low parts per billion range that one begins to have problems with accuracy and the analytical techniques.

But two hundred parts per billion, I believe, is certainly within reason.

This is again for a given quality lab and quality personnel.

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BY MR. SCOTT:

Q Okay.

The same question as to free available chlorine. Is it difficult to measure accurately? The free available chlorine at the .2 milligrams per liter range.

A Well, I can't honestly remember what the bottom is on the sensitivity of free residual chlorine. So I would only assume that it's within the realm of possibility to get a reasonable handle on free residual chlorine concentrations within that range.

Q That is the range, is it not, that the Applicant is proposing to measure at the condenser block?

A That's what they've calculated would be a discharge. I haven't seen much about their proposal to actually measure it, per se. But that's what they calculate to be a discharge.

Now --

Q Well --

A I would assume they would attempt, of course, to measure samples coming out of the discharge. Therefore, they would be very interested in getting accurate measurements down within those ranges ... in the mid parts per billion range.

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Q Let me ask you this: I had assumed that there was a feedback system on their -- a monitor on their system that's used to release the chlorine into the system.

A Uh-huh.

Q Such that they could release it and keep the chlorine levels at -- you know, keep it from exceeding the limits that they said they would keep it from exceeding; namely, .2 milligrams per liter.

So do you know the method to do that? You know, how -- If you're putting in chlorine at one point and measuring at another point, how do you calculate the amount you release, or how do you control the amount you release, without being able to measure what you're receiving at the measuring point?

A Well, they can, I'm sure, take water samples and gain measurements on the total residual chlorine in those samples.

I have not been considering that particular aspect of chlorination. I have been considering only the impact of chlorine discharges at the 2.2 milligrams of chlorine per liter level -- TRC level -- into the cooling lake.

Q Well, that's my concern, is how do we know that the Applicant is going to be able to keep the chlorine

9-17

within those levels.

MR. BLACK: Objection, Mr. Chairman. The witness has indicated he does not know the mechanism for the chlorination -- the quantities going in and the releases -- or how those releases are calculated.

There is an NPDES permit that does put limitations on the chlorine; and that's what the witness went by.

I think that's the scope of his testimony.

(Bench conference.)

MR. SCOTT: I'd like to ask the witness if that is in fact --

JUDGE WOLFE: Well, the question has been objected to. It's sustained.

BY MR. SCOTT:

Q Dr. Schlicht -- Scratch that.

Dr. Sanders -- excuse me -- Okay. Do you have Dr. Tischler's testimony handy?

A I can get it, yes.

Q Look near the back at Appendix -- Attachment 3, page three of that attachment.

(Pause.)

A Okay.

Q Would you read the bottom sentence there, starting off with the number one.

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Well, maybe you ought to go ahead and read the whole sentence, three or four lines above that to reach the starting point.

A. Are you talking about the paragraph -- or the indented paragraph labelled number one?

Q. Yes.

And so that it would make sense -- it would probably make more sense to start with "The results." It's part of that sentence.

A. Okay.

"Over the range of 0.0 to 0.2 mg/l TRC and free available chlorine the average overall precision (standard deviation) of the method is 0.0275 mg/l for TRC and 0.333 mg/l for free available chlorine."

Q. Doesn't that say that the measurement technique that's proposed to be used has a standard deviation that's greater than the magnitude of the amount they're attempting to measure?

MR. COPELAND: Your Honor, the statement says what it says. He's now trying to get Dr. Sanders to interpret a statement made by Dr. Tischler. It's totally impermissible.

Dr. Sanders cannot interpret the meaning of something Dr. Tischler wrote.

MR. SCOTT: Mr. Chairman, any scientist

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can interpret that sentence. This is something that's in the record.

I'm just asking the witness to verify the significance of it.

MR. COPELAND: That was not his question, Your Honor.

JUDGE WOLFE: No, that was not your question.

What now is your question?

BY MR. SCOTT:

Q Dr. Sanders, what is the standard deviation for this method of measurement for free available chlorine in the range from 0.0 to 0.2 milligrams per liter?

MR. COPELAND: Objection, Your Honor. The question is impermissibly vague. He refers to "this method."

We don't know which method we're talking about in this proceeding.

MR. SCOTT: We're talking about the method that the Applicant is proposing to use to measure total residual chlorine and free available chlorine.

MR. COPELAND: This is not --

MR. BLACK: Is that proven --

MR. COPELAND: -- what this attachment is

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talking about, Mr. Scott.

MR. SCOTT: This attachment is trying to argue that we can't set these tight limits on amounts of free available chlorine because the measurements -- the instruments we use to measure it are not accurate enough to be sure what we're measuring -- that we might, in fact, be below that level and be measuring something that looked like it was above that level.

MR. COPELAND: Your Honor, those questions of interpreting that attachment could have obviously been put to Dr. Tischler.

This whole line of inquiry is of no significance -- It's impossible to pursue with Dr. Sanders because he didn't write it.

Mr. Scott has now exhausted his two hours. I believe that it's an excellent time to terminate the matter because we're pursuing something that's impossible to pursue.

I would ask that we now terminate Mr. Scott's cross-examination.

MR. SCOTT: Mr. Chairman, I ask respectfully, and all those various things, that I be allowed to continue.

I am right in the midst of making -- well, in fact, I've made it to the Board -- I'm confident, I'm

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not sure that it's legally in the record, but I'm sure all of the Board members understand the point that I'm driving at.

So maybe to that extent I can drop it.

But --

MR. COPELAND: Then if he is confident of that, Your Honor, just drop it right here. His time is up. Let's get on.

MR. SCOTT: I'm confident that the Board understands; I'm not confident that the Board is allowed to make a finding unless it's in the record.

For that reason I want to continue.

JUDGE WOLFE: Now your -- Yes.

MR. BLACK: Let me interject my objections to this line of questioning.

It's fairly clear to me in my brief reading of this Appendix III of Dr. Tischler's -- or Attachment III to Dr. Tischler's testimony that he, in fact, is talking about a certain method for the determination of residual chlorine in powerplant main condenser cooling waters.

This is certainly one method that Dr. Tischler is talking about.

But Dr. Tischler's statement that Mr. Scott had Dr. Sanders read was -- at least from my understanding -- Dr. Tischler's evaluation of that particular method, and

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what the standards of precision were that he got from those methods.

I think it's objectionable to have Dr. Sanders interpret Dr. Tischler's work on this.

JUDGE WOLFE: Isn't that really what you're seeking to establish through this questioning, Mr. Scott?

MR. SCOTT: Dr. Tischler's testimony --

JUDGE WOLFE: Mr. Scott, yes or no. Then explain.

Isn't that what you're attempting to establish through this witness?

MR. SCOTT: I don't think so.

JUDGE WOLFE: What is your purpose then?

MR. SCOTT: I'm seeking to establish that the method of measurement that the Applicant is proposing to use--and that's inferred by the fact that the Applicant's expert witness, being an expert in this, researched all of the available means and ended up saying that the most accurate one had such error in it, that the standard deviation was roughly one and a half times that of the measurement that was attempting to be made.

Namely, that it's a very inaccurate way of

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measurement, and that's the best way that they have.

MR. BLACK: The Applicant's witness so concludes in that attachment.

MR. SCOTT: Okay --

JUDGE WOLFE: All right. So what are you trying to establish then?

MR. SCOTT: So given that, this is a two-edged sword that cuts my way, by virtue of the fact that the Applicant has got the burden of proof; namely, how can the Applicant be sure that he's not exceeding the .2, if in fact he can't measure it accurately?

JUDGE WOLFE: Aren't you happy with that now in the record, if that's --

MR. SCOTT: If it's in the record, I'm happy.

JUDGE WOLFE: Well, isn't that part of the attachment to Dr. Tischler's testimony?

I haven't read it that closely. I'm just going by what you're saying.

If that's in the record, why ... what's the purpose in proceeding to ask this witness about it?

MR. SCOTT: I'm not sure it's in the record. What's in the record is the points about the accuracy of measurement.

What I need to pursue then is how the method

used in putting the chlorine into the stream of water, how they have a feedback system to control that and whether or not they have some method or not to --

MR. COPELAND: Your Honor, then that's taking us right back to the very point that you have sustained an objection on. And that is that the EPA permit sets the limits.

We have to meet those limits. Dr. Sanders used that as a starting basis.

Now all he's trying to do is flaunt the Board's order sustaining that earlier objection. It's quite clear now what his attack is.

His time is up. Let's get on to something else.

(Bench conference.)

MR. SCOTT: Mr. Chairman --

JUDGE WOLFE: One final word, Mr. Scott.

MR. SCOTT: I would like to -- This is very important -- get into the record -- or actually it's already in the record -- point out something that's in the record to the Board about --

MR. COPELAND: Then be brief.

MR. SCOTT: The NPDES permit ... Okay.

BY MR. SCOTT:

Q Dr. Sanders, can you look at the back of

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page --

JUDGE WOLFE: No. I'll sustain the objection to the outstanding question.

Do you have a new question?

MR. SCOTT: Yes.

JUDGE WOLFE: One more question. Go ahead.

MR. SCOTT: I had hoped I could ask several, but in any case ....

BY MR. SCOTT:

Q In the Final Supplement to the Final Environmental Statement --

A Yes, sir.

Q Do you see on page S.F-1 -- Do you see that?

MR. BLACK: See what?

MR. SCOTT: The page number.

DR. SANDERS: I have the page, yes, sir.

MR. SCOTT: S.F-1.

BY MR. SCOTT:

Q On that page, turning to the page number down at the bottom and looking over to the left, would you read the next-to-the-last sentence --

MR. COPELAND: Your Honor, it speaks for itself. It's in the record. There's no reason to read it.

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MR. SCOTT: Mr. Chairman, please let me continue this.

JUDGE WOLFE: It is in the record.

All right, Mr. Witness, you can read that into the record, the one sentence. Go ahead.

DR. SANDERS: I don't even know what sentence you're referring to.

MR. SCOTT: Yes, that's the problem.

It starts with "This permit and the authorization."

DR. SANDERS: Okay.

BY MR. SCOTT:

Q Go ahead and read that complete sentence.

A I hope I have the right sentence. But the one I see here is: "This permit and the authorization to discharge shall expire at midnight, August 5, 1983."

MR. SCOTT: Now I would like to ask the witness if he thinks it feasible that there will be any discharge from this powerplant by that date.

MR. COPELAND: Your Honor, it's obvious that there won't be any discharge in the plant by that date.

His time has expired. He's nine minutes now over.

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MR. SCOTT: Mr. Chairman, I can understand Applicant's attorney's reluctance. But --

JUDGE WOLFE: Well, isn't the answer to that question self-evident?

MR. SCOTT: I hope so.

JUDGE WOLFE: All right.

So that will be your last question then, because it is now past the three o'clock deadline.

MR. SCOTT: Well, I would very much like to be able to --

JUDGE WOLFE: It's ten after three.

So pursuant to our authority, we will cut off repetitious and cumulative cross-examination. Much of the cross-examination, Mr. Scott, in addition, has been non-productive.

We've listened to it. We've tried to determine where the questions were directed. We see no purpose ... no probative value at all to the answers being elicited.

So, therefore, pursuant to Section 2.757, we do cut off your cross-examination; and we will now proceed to redirect by Mr. Black.

Mr. Black.

MR. BLACK: I have no questions.

JUDGE WOLFE: We will now proceed to Board

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questions.

Judge Cheatum.

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MR. SCOTT: I'm not sure of the proper time, but at some point we have got to raise the question of whether or not it is necessary to bring back Dr. Marrack. Does that have to be done now?

JUDGE WOLFE: Well, we are still finishing off Board questions here on Dr. Sanders' testimony. Then there will be cross-examination, and any redirect by Mr. Black on cross-examination arising from Board questions.

Thereafter, when we have completed that, and excuse Dr. Sanders, then we will give consideration to your calling Dr. Marrack for any oral supplementary direct testimony.

All right.

BOARD EXAMINATION

BY JUDGE CHEATUM:

Q Dr. Sanders, in generally describing the character of this proposed cooling lake, particularly its character as a base for the development of fish populations and other biomass associated, you described it as a unique ecological system.

A Yes.

Q I would like for you to be a bit more specific as to the character of this proposed body of water which makes it unique in relation to other lakes.

A. All right. What I was referring to there would be the general aspects of the types of stresses to be --

Q. Type of what?

A. Type of stresses to be put on this system once it is there, and that is it certainly will receive heat and chlorine.

In combination with aspects of its morphology and average depth struture; that is, the average depth of the shorline development, the surface to volume ratios, the steepness of the banks.

It is my opinion this basically actually has been stressed to me by Mr. Robert Bounds and Dr. Clark Hubbs, that considering all these factors together it is a unique system with respect to the more typical Texas reservoir, which either a mainstream, or a site-on impoundment, which had a dendritic drainage, oh, different aspects with shoreline development, but not an average depth different surface to volume ratios, and with respect to these aspects Allens Creek is going to be very different.

Now, this does not preclude it in any way, shape, or form from supporting, maintaining, providing adequate biomass at the lower trophic levels for consumption by fish. It is just that there are enough factors in the maintenance of the upper trophic levels

that this term "uniqueness" has come in, and that has lead the Texas Department of Parks and Wildlife to adopt sort of a wait-and-see attitude about what develops in certain parts of the fishery.

Again, this is stressing the uniqueness aspect with respect to their experience in other reservoirs of the systems in Texas.

So, that still, I guess, is a general pursuit of your question, but I have not tried to quantify these aspects, such as shoreline development ratios, and what have you, for placing this system within some sort of environmental matrix and find it lying outside of a normal matrix, or something of this nature. I have not done that.

Q. Well, from a standpoint of nutrient inputs expected, would you say there is anything unique about that?

A. Not nutrients, no, sir.

Q. I note in your research work and in your general qualifications you have specialized, really, in the field of, I would say, almost biomass production in relation to various bodies of water, particularly as it dealt with the Algal forms, but I would assume that probably would have also extended to Zooplankton, the other microrganisms associated with the primary production

and secondary production below the highest trophic levels of the predator fish, et cetera.

Have you, just out of curiosity, made any rough estimates of what you might consider the total biomass production protential of this lake on a per-acre basis?

A. No, sir. I have done that. I did not feel any particular need to do so. It would have been an academic curiosity on my part. I have not done that, no, sir.

I would have done that, again, via contacts with other experts, talking about where this would lie within the scheme of Texas reservoirs in relation to other water bodies in the U.S. that I may be more familiar with. It would have been an academic interest to me.

Q. Then you are satisfied, I assume, without that basic information on the probable biomass production which provides food base for 200-pounds per acre of fish, you are satisfied with the empirical judgments made on the experience of Dr. Schlicht as related to us?

A. Well, I never had any reason, with all my contacts of various professionals in the State of Texas, to feel that I would gain any better fix on the potential for this system to produce biomass by, say, coming out of

nutrient model approach, or by trying to locate it once again upon some curve of production versus surface area, or production with relation to other water bodies in general; in other words, how bodies stack up against each other in a relative sense.

So, I just never felt the need to try to quantify things to that lower trophic level. It is fairly obvious for subtropical systems with temperatures that prevail, and with this high nutrient loading, and with the wind turnover, and powerplant-drive circulation that you will sustain very high levels of Phytoplankton production, and I would never just consider this system a food-limited system.

Q. You say you would assume this inspite of the powerplant cropping of the --

A. Well, I would say if anything the powerplant, especially during spring and fall, would stimulate production.

As a matter of fact, I would say it would tend to increase the viability of the food resource -- well, not the viability but the availability of food resources to the game fish.

I think what we would have is a heat-stress period in the summer, which would cause some loss of body condition, loss of weight, associated with added

heat to a warmwater system. Naturally, a warmwater system. But that, in terms of the overall production of the lake, I felt that that wouldn't cause any significant deleterious effects.

Powerplant cropping here is, again, given the flow patterns that the Applicant has provided with turnover time is on the order of months along the periphery where the littoral zones occur, just seemed to me to be another way of providing a regenerated nutrient source at the upper end of the lake and that is those organisms killed by entrainment would in fact enter the nutrient pool and -- We just should see very high levels of production at the lower trophic levels in this system. That's my best judgment.

JUDGE CHEATUM: I had several other questions, but during the course of cross-examination I think I am satisfied with the answers so far.

I don't believe I have any more questions. Thank you very much.

BY JUDGE LINENBERGER:

Q Sir, I am not convinced that all witnesses have used certain terms in exactly the same way. Rather than trying to make a contrast, let me just ask you to briefly define what you mean when you used the following three words: bioaccumulation, bioconcentration, and

biomagnification.

A. Okay. Bioaccumulation is where an organism takes up a toxicant directly from its surrounding environment, directly from the ambient environment. That can be from air or from water.

Q. Takes up what?

A. A toxicant directly from the ambient environment; does not have to pass through another organism first, in that sense.

Biomagnification is the food ingestion pathway for toxicant incorporation into an organism; that would come from ingested food.

I believe your last term was just --

Q. Bioconcentration.

A. Well, bioconcentration.

Q. I'm not sure that you used that word, but it has been used. Does it have a special meaning to you?

A. Well, I wouldn't -- I believe I have been trying to avoid using that particular --

Q. All right. Then I won't --

A. -- term, sir.

Q. -- ask you to define it, if you don't use it.

Well, irrespective, then, of whether it is -- Just a moment here.

Some aquatic life, I understand have

the property whereby if they are put into water-carrying exhibiting a certain concentration of some element, have the ability to take that element and increase its concentration considerably within their own structures.

Now, that buildup of concentration of element to a higher value within aquatic form of life than exists in the water in which it lives, what is that process?

A. That's bioaccumulation.

Q. And does that say that this buildup cannot occur through food ingestion, which would be I think by your definition biomagnification?

A. No. It doesn't say that it would not occur. Basically, what I have tried to do is separate the dominant pathways, or give indications where they may both be prevalent for a particular heavy metal.

Q. Okay. But both --

A. They both probably go on simultaneously, but to greater or less extents.

Q. Fine. I just want to be sure how you use --

A. There is a relationship between the two, however, in that once bioaccumulation has occurred, let's say once a body burden has been developed in an organism his ability to transfer ions across any permeable membranes may be impaired, and, therefore, the biochemical process exchange with regard to bioaccumulation and biomagnification

may change.

Q. Understood. Okay. Now, would you just briefly summarize what you personally understand that the Texas Department of Parks and Wildlife will do with respect to the Allens Creek Lake.

A. Okay. Specifically with respect to stocking, fish stocking?

Q. I wasn't going to limit it.

A. Okay.

Q. I purposely was not limiting it to stocking, but a brief summary of what you understand they will do.

A. Okay. My understanding is that they will develop a park with respect to -- in conjunction with Houston Lighting & Power. They will have some interplay of designs, and what not. And this will lead to, significantly for me, a boat launching ramp and shoreline areas for fishermen to cast their lures and baits out from shore.

And then the active part of the Texas Department of Parks and Wildlife will be in providing, if necessary, fish to the system, those game species which may not, if in fact this is the case, be able to maintain themselves in the system through natural reproduction.

And Bob Bounds has provided me a lake management plan that he has developed as part of his duties

as director of inland fisheries, which gives a stocking program. And it is my understanding that this is a first-five-year program that he will if allowed to put this stocking program into effect. And after that it is going to be a wait-and-see attitude. So they will have five years of stocking at various rates, various species, and then they will monitor the system and see what happens.

The least amount of work he will do after that five-year program, I believe, is do a complete survey I think on a frequency of every seven years. So the worst-case thing would be stock for five years, and then have the state ignore this system and come back seven years later and take a reading. But I believe it is certainly within his authority to suggest that they do something more than that, and that is keep a little closer track of the system.

Q. Okay.

A. Now, that's about as far as my understanding goes. He, again, is very unable to give me hard, well-defined legally printed out statements of exactly what he will do.

Q. Now, I gather from some of the discussions we have heard that the shad, while may not be game fish, is an important factor in the chain for the game fish.

A. Uh-huh.

Q. Let's assume for the moment that when the buildup of game fish in the lake is first getting underway through whatever mechanism that the shad are abundantly productive, and let's say overproduced so far as the requirements of the game fish in the lake are concerned, are there viable mechanisms to control shad population to prevent this kind of thing from happening?

A. Well, I believe the best approach is to start stocking immediately upon having the cooling lake filled with water. And that is you get in there with the first shad that have come in through makeup water pumping.

If shad absolutely dominate the biomass after a short period of time, say a couple of years, and you have decided that you must eliminate the shad, I don't believe there is anything you can do to the system that wouldn't kill other fish, as well, and that is add poisons to the system. There are no selective poisons that I know of that -- you can try seining, do a tremendous number of seining operations, or something of this type, and try to reduce their biomass as a mechanical harvesting technique.

Q. Well, suppose before the shad becomes dominant you suspect things are trending that way, would increasing the stock of bass, for example, introduce a measure of control for the shad?

A. Well, yes, if you could supply abundant

predators, you will control their populations. That is the --

Q. Is that a practical thing to do to keep a --

A. I would --

Q. -- shad census, if you will, and insure that it doesn't become dominant through use of predators.

A. Right. I would say probably not, because you are talking about stocking a fairly large fish, which would be, therefore, a fairly expensive fish to have raised to that size class. The only way to get around that expense would be if you have established nursery ponds and rearing ponds on site, and you have been able to do this fairly cheaply for direct release into the cooling reservoir.

But I believe that one of the important points here is that given the thermal loading of this system and the tendency for forage fish to migrate to the plume area in the spring and the fall during high-growth periods of the game fish, what that will do is tend to make these forage fish concentrate in areas where high feeding will go on, and that is one of the mechanisms proposed to account for this shift between game fish and rough fish ratios in cooling reservoirs where you get a higher percentage of game fish established. They get two seasons of the year in which they can really crop these

planktivorous fish down, and I would suspect that over time that is what we will find, at least something on the order of a sizeable abundance of piscivorous fish really cropping these planktivorous fish in the spring and fall in the upper part of the lake.

Q. All right, sir. On Page 6 of your pre-filed testimony about the middle of the page there is a statement that in part says that this reservoir concentration cycle is not expected to exceed a factor of two.

Would you just define for me what you mean by "reservoir concentration"?

A. Okay. That was just a reference to this two times concentration factor that has been determined by the hydrologist in the sense of the concentrating effect of seepage and -- well, it wasn't really straight concentrating, but effect of, I guess, evaporation losses on a system with respect to a total dissolved solids. They come up with a maximum concentration scenario of two. You will get it no more than twice the concentration of TDS in the cooling lake as you will, for instance, have in the Brazos River.

Q. No more than twice the concentration of what?

A. Of the total dissolved solids.

Q. Yes.

A. So that would be -- Now, those are very

conservative elements, of course. That would be a worst-case concentrating scenario. If you had a non-conservative element, of something, that precipitate out or gets bound up in biomass, or removed in other ways, then it should be less than that.

Q. Well, I don't want to dwell too long on this, but just so I understand it, can you use this concept in the following way: Could you, say, when the lake is first filled, or let's say one month after the lake is first filled, the plant is running, make a measurement of total dissolved solids, and then if one came back at some arbitrary date about a year later, would this significance of this concentration cycle concept be that no time later would you ever find total dissolved solids more than twice higher concentration than initially existed?

A. Yes. This would be the peak of the annual concentrating cycle. You would have cycles of dilution and concentration. So at no time during that year would you find total dissolved solids greater than twice the amount that was originally there at the beginning of the plant.

Q. All right.

A. Every year you will have these wash-out phenomenon which will restart the cycle.

Q. There has been recognition in the testimony

of the fact that during the dry part of the year there will neither be water coming into the proposed lake from Allens Creek or being pumped into the proposed lake from the Brazos River, so that during that time evaportion will result a lowering of the lake levels.

Do you have any knowledge of approximately how much the elevation of the lake surface can be expected to drop during the time that water is not coming into it?

A. Well, I believe the figure --

MR. COPELAND: I believe the witness is looking for Figure 3.6, if that is the one Mr. Schuessler had.

THE WITNESS: Yes.

JUDGE LINENBERGER: Pardon me. What is the Figure number again?

MR. COPELAND: S.3.6.

JUDGE LINENBERGER: Thank you.

BY JUDGE LINENBERGER:

Q. Now, are those levels shown on there representative of the drop in level due to periods when there is no inflow?

A. Well, what they have listed there are number of levels associated with basically different periods of the year.

Q. Yes.

A. I am trying to recall whether this normal upper

water level listed is, in fact, the mean sea level elevation of the bottom of the overflow channel back into the Brazos River, and so I was trying to get a maximum fix for you. It would be from the elevation of the overflow channel to this probable low water level of 113, 113 feet. That may be greater than the five-foot differential given here in this figure.

Q Well, at any rate, let me move on to a question about the consequence of this. We see that something between five and a ten-foot lowering of the surface of the reservoir might occur due to evaporation during the dry season.

The only question I have about that is whether or not that is exposing a significant area of the perimeter of the lake where special habitats or spawning areas or feeding areas have been established, is it a time of year when there can be damage from this lowering, or is it a time of year when you don't expect damage from such a lowering? Would you comment on that, please?

A Okay. I have done it on the basis of the five-foot annual variation, as an average annual variation. Okay? Now, the basis of that you will find your low-water period during the late summer, and at that period your spawning activity is gone. Most of the game fish that we consider important here will spawn in the, well,

February and March, essentially, and this spawn will have resulted in juveniles of a reasonable size class by this periods. In other words, they are highly mobile at that period, so they can come in and out of shallow water as the lake level drops.

Now, what will happen is that the back-water area present at the Allens Creek confluence will become much more limited during these low-water periods. In other words, that literal zone in terms of those total surface area will become significantly lower. And that certainly will have an effect on the availability of nursery habitat.

However, the lake development plan proposes to place brush piles along the eastern exterior levee that are at a minimum of five feet below the low-water level, so those will not be exposed, so there will be a whole series of habitats established, plus a long row of brush habitat established that will not come into -- will not be lost during those periods, and on the natural bluff area because that is a fairly steep slope of timber up and down it will just keep having more or less the same habitat available.

The big problem would be if you had rapid declines of water would be where microphyte beds would suddenly be exposed and die, and you wouldn't have

enough time for those beds to regrow as the water level is dropping.

Now, the rate of decline I would assume is going to be slow enough so that the microphyte bed development, whatever is there in the shallows, will more or less keep up with them, except for those things such as cattails, and much more slower growing microphytes.

Well, there will be other hydrophytes that should be able to keep up with the dropping water levels and provide habitat. So I would say that the part that would concern me at all would be in that Allens Creek confluence area.

Q Okay. I think just one last question. With respect to the Supplement to the FES on Page S.2-9, there has been considerable discussion about that table there S.2.6. Most of the data, if not almost all the data in that table, apparently were collected in 1974 or very late 1973.

Leaving aside the sampling and analysis techniques that might reflect themselves in some way in the data shown there, I am interested in one different aspect of this table. If one were to repeat these measurements would the same sampling techniques, same analytical techniques today, would you find the values represented here representative of the water now? Has

anything significant changed with respect to point source releases in the Brazos, different uses of agricultural materials, or whatever, such that these are no longer representative compositions for the Brazos River?

A. Right. Well, that was my whole point about going to USGS at Richmond, is looking at the time trends of water quality data that could be perceived. They have bi-monthly sampling, and it is my opinion from reviewing their data that in fact the water quality has improved, if anything, over the period of time since 1974, and what exactly that is a result of, I can't say, but their data does not show, for instance, these periodic high mercury pulses or these higher Cadmium pulses. That does not show that from the mid seventies on.

Now, you realize Dr. Tischler speculated that it was --

Q. Yes.

A. Okay. Right.

JUDGE LINENBERGER: I just wanted your comment on that.

That's all the questions I have for Dr. Sanders. However, while we are open to this place in the FES Supplement I should like to ask Mr. Copeland with respect to our visit tomorrow, if you will look here there is a Figure 3.2.3 in this Supplement, same page, which is

essentially the plat of the Allens Creek site. Is there a similar Figure already in existence for the site we will be visiting tomorrow that we could get a copy of? We don't want you to draw up any figures especially for us, but if there is something --

MR. COPELAND: I think there is one in the STP Environmental Statement.

JUDGE LINENBERGER: I was assuming there might be.

MR. COPELAND: I will check and find out.

JUDGE LINENBERGER: If you would perhaps have a xerox of the analogue of this figure for us to look at tomorrow, we would appreciate it.

MR. COPELAND: We will have something.

JUDGE LINENBERGER: Thank you.

That's all I have, Judge Wolfe.

JUDGE WOLFE: I have no questions. I thank the witness for providing a word I was searching for, namely "newly born fish or juveniles."

MR. COPELAND: I thought you might have been laughing at the idea that anybody who has a juvenile knows that they are highly motile.

(Laughter.)

JUDGE WOLFE: We will have cross-examination now directed solely to Board questions.

Mr. Copeland?

MR. COPELAND: I have no questions.

JUDGE WOLFE: Mr. Doherty?

MR. DOHERTY: I have none, either. I was checking my notes is what took so long.

JUDGE WOLFE: Mr. Scott?

MR. SCOTT: Yes.

RECROSS-EXAMINATION

BY MR. SCOTT:

Q Dr. Sanders, I belive that you have twice, certainly once, you have mentioned discussions with Mr. Bob Bounds with the Texas Parks and Wildlife Department, and you have always -- leastways once for sure -- put in there, made the statement that Mr. Bob Bounds didn't have any authority to carry out this plan, or he wasn't sure he had the authority, or something. Could you elaborate on that?

MR. COPELAND: I object to that, Your Honor. That is a mischaracterization.

MR. SCOTT: Either the witness can explain what he said, or I will ask that the record be read. I know that it is in there, and it's twice it's showed up.

JUDGE WOLFE: Do you recall what you had to say with regard to responsibility or authority of this individual?

THE WITNESS: Well, I said he has the responsibility for the state to enhance and protect the fisheries of the state where he deems fit to concentrate his efforts, but he cannot provide some sort of a legal contract to me on my request saying that he will in fact do the following absolutely without fail; this is a formal commitment of the state, what have you. I asked him specifically to give that sort of information, and he said, "All we can give you is the plan to do so," but they maintain all options to reverse plans, or whatever they want to do as they see fit within the confines of his authority.

MR. SCOTT: That's at least a partial explanation.

BY MR. SCOTT:

Q. You also used the term "if allowed," like that maybe there was someone above Mr. Bounds that could overrule his plan.

A. He certainly has supervisors, and I am sure receives direction from them on occasion.

Q. But has the Texas Parks and Wildlife Department in any way officially approved a plan, admitting the fact that they might change it the next day, but have they ever officially -- has the Board, has the Commission approved a particular plan?

MR. COPELAND: Your Honor, that question has been asked and answered. It is outside the scope of the question put by Dr. Linenberger, which was simply to explain what this witness understood the state was going to do.

Now, he has gone off into an inquiry that has already been covered. This line of questions was put to Dr. Schlicht. Certain questions were even put to me about the status of those matters.

JUDGE WOLFE: Sustained.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Do you have some knowledge as to why their planning -- the State of Texas commitment is limited to -- well, that's not the correct way to say it.

You said that their minimum commitment was that they would survey the lake after seven years; is that not correct?

A Well, that, I believe, is like the least thing that they try to do for any fishery, freshwater fishery in the State of Texas. In other words, they don't ignore fisheries completely, no matter where they are. They try to get to them at least once every seven years and make a survey.

Q Would you characterize that more of a general

practice as opposed to some sort of standard that has to be met by each and every lake every seven years?

A. Well, my understanding is that is a standard operating procedure based on manpower, resource limitations within the Texas Department of Parks and Wildlife.

Q. Is this limited to, this standard limited to lakes, or does it also apply to streams?

MR. BLACK: Objection. No relevance.

(Bench conference.)

MR. SCOTT: I think I could make some relevance, but it's probably not worth it.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Do you have any experience with how well the State of Texas enforces its various plans?

MR. BLACK: Objection. No relevance.

MR. SCOTT: Now, this is relevant.

MR. COPELAND: Clearly beyond --

MR. BLACK: That is beyond the scope of the Board's questioning.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Dr. Sanders, have you made any study of past enforcement of plans by the State of Texas?

MR. BLACK: Objection. Outside the scope, and

no relevance.

MR. SCOTT: Mr. Chairman, a plan is worthless. That's a sheet of paper. The Board needs to do some investigation into the likelihood that this plan will be carried out through some some fruited --

MR. COPELAND: The Board has done that investigation, counsel. Those questions were put to Dr. Schlicht, and myself, and that question has been answered. And, Your Honor, it is clearly outside the scope of what Dr. Linenberger inquired into of this witness.

JUDGE CHEATUM: Mr. Scott, the Board will, indeed, give consideration as to whether it needs additional evidence directly from the Texas Parks and Wildlife Department relating to an implementation of the fisheries management plan. We will consider that.

MR. SCOTT: Okay.

JUDGE WOLFE: But this is outside Judge Linenberger's examination of this witness, his questions.

MR. SCOTT: I thought his question was specificially what would be the plan to be carried out --

JUDGE LINENBERGER: Mr. Scott, my question to Dr. Sanders was what was his understanding of what the State of Texas will do.

MR. SCOTT: And that's --

JUDGE LINENBERGER: I was interested in this because of a particular aspect of the record, but not interested in it from the point of view of the reliability, dependability, promptness, or anything else, of the State of Texas. I was just interested in what the witness understood the State of Texas was going to do with respect to this lake, not their performance, reliability, dependability, legal requirements, or any of those aspects.

MR. SCOTT: Yes, sir, and my concern is exactly your question, leastways as stated on the record.

JUDGE LINENBERGER: The witness was able to give me his understanding of what the State of Texas would do with respect to --

MR. SCOTT: And that's what I --

JUDGE LINENBERGER: -- development of the park and the stocking of the pond, and my interest did not go to any characteristics of the State of Texas and their wildlife management program.

MR. SCOTT: But I believe the record will show thatyou asked his understanding as to what they would do, not what they said they was going to, or what they could do, but what they would do, and that is what I am trying to pursue.

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JUDGE WOLFE: By bringing in other lakes, what the Texas Wildlife Commission has done with regard to other lakes?

MR. SCOTT: That included, but also --

JUDGE WOLFE: You are stringing this out, Mr. Scott. I have already ruled on that.

Go to your next question.

BY MR. SCOTT:

Q Dr. Sanders, have you made any calculations, studies as to the likely anticipated growth of shad in the Allens Creek Lake as compared to the other fishes in the lake? I'm talking about specifically whether or not they are likely to predominate. I think that was the discussion of --

MR. COPELAND: That question has been asked and answered, Your Honor, because the witness said he did not believe that the shad would predominate.

JUDGE WOLFE: Sustained.

MR. SCOTT: Okay. My question still stands.

JUDGE WOLFE: The objection to your question has been sustained. Therefore, your question does not stand.

MR. SCOTT: I will rephrase it then.

BY MR. SCOTT:

Q. After the first six months what will be the shad production per acre of surface area?

A. This is six months after the filling of the cooling reservoir?

Q. Yes.

A. Well, sir, I am not sure exactly what all the ups and downs will be before some sort of rough equilibrium centering around this 200-pound standing crop per acre will be at the onset of the life of the plant.

Q. Let me explain I am not talking about --

A. Those early-life dynamics of the facility have not basically --

Q. Mr. Sanders, I am not discussing the 200-pounds per acre figure. I am talking specifically the shad, out of the 200 or whatever it is how many of them -- what will be the shad count after the first six months.

MR. COPELAND: Asked and answered, Your Honor. The witness said he didn't know.

MR. SCOTT: He has never said that.

JUDGE WOLFE: Do you or do you not know the answer to that question?

THE WITNESS: I would just speculate that on first principle at this point. I haven't tried to work that out.

JUDGE WOLFE: All right. Now you have exhausted that, Mr. Scott.

BY MR. SCOTT:

Q Well, Dr. Sanders, if it is speculation, and you don't have anything to base a determination on that shad would not dominate, how can you just say that they won't predominate, without any basis?

MR. COPELAND: He has answered the question, Your Honor, earlier, as to what he thought would be the way in which this lake would develop. I submit that we have now gotten outside the scope of the question put to the witness by Mr. Linenberger, because the question asked what could be done to control the shad if there was an overproduction of shad, and the witness answered that question and then went on to explain that he didn't think that that would occur.

MR. SCOTT: Mr. Chairman, I'm not denying that he didn't say it wouldn't occur. I am trying to now see if he can explain why it wouldn't occur, some basis.

MR. COPELAND: And he did explain why. This has been thoroughly explained.

MR. SCOTT: I never heard any explanation.

JUDGE WOLFE: I will sustain the objection.

BY MR. SCOTT:

Q To the extent that your answer is based upon -- that you claim that the shad will not predominate because bass will eat them up, how many shad per day will a bass eat?

MR. BLACK: Objection, Your Honor. That is way beyond the scope of the Board's question.

MR. SCOTT: How many bass will be in the lake --

JUDGE WOLFE: Sustained.

MR. SCOTT: What will be their sizes?

JUDGE WOLFE: Sustained.

MR. SCOTT: We need some basis.

JUDGE WOLFE: You have no outstanding question. I sustained the objection.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Dr. Sanders, -- I take it it is Sanders instead of Saunders; right?

A Yes.

Q What is the variations in the mercury levels to be contained in the Allens Creek Lake that come from variations of pH levels in the lake?

MR. BLACK: Objection. That's way beyond the scope of the Board's questions.

JUDGE WOLFE: Yes, Mr. Scott, and I must

caution you --

MR. SCOTT: Mr. Chairman, there was a question about the reasonable concentration cycle --

JUDGE LINENBERGER: Mr. Scott, wouldn't it be worthwhile to let the Chairman finish his statement, or do you find this too difficult to do?

(Bench conference.)

JUDGE LINENBERGER: I'm sorry, Mr. Scott, I will finish Judge Wolfe's comments here, since I asked the question about Table S.2.6, which does, indeed, have a column labeled "Mercury."

My question about this table, which also has a column labeled "Mercury" had to do with whether the general quality of water in the river might have improved since 1974 when these data were taken.

The answer was readily explained, carefully explained by the witness, it had nothing to do with mercury concentrations versus pH level whatsoever.

Your question is outside the scope of my examination of the witness.

JUDGE WOLFE: And what I was going to add to that, Mr. Scott, was that this witness will be excused before 5:00 o'clock, and you continuing to go outside the scope of the Board's questioning will not be allowed to interfere with the dismissal of this witness tonight.

So with that in mind, continue your examination.

MR. DOHERTY: Mr. Chairman?

JUDGE WOLFE: Yes.

MR. DOHERTY: The last conference of the Board might well have been audible.

JUDGE WOLFE: Pardon?

MR. DOHERTY: I say the last conference of the Board, the three-person conference, might have been audible through the PA.

JUDGE WOLFE: What conference?

MR. DOHERTY: The last time that you huddled aside off the record.

JUDGE WOLFE: Thank you.

MR. SCOTT: I am feeling great levels of frustration at not being able to pursue what I thought was the exact questions the Board asked, namely what levels --

MR. COPELAND: Your Honor, Mr. Scott is stalling for time. The Board cut him off --

MR. SCOTT: Mr. Chairman --

MR. COPELAND: -- and Mr. Scott --

MR. SCOTT: -- I wish you would not let him continually characterize my performance. If he wishes to say something --

JUDGE WOLFE: Well, at the same time, Mr Scott, you put yourself in that position, because once we have made the ruling then you start arguing with the Board about why you think you should be allowed to continue, or what you were trying to do, and when we have ruled, why, that's it. So you leave yourself open to those sort of comments.

I don't approve either of your arguments nor comments made on your arguments, but you are the one that initiates them by these comments. So cut it, and let's get on with the next question.

MR. SCOTT: I would like to explain that --

JUDGE WOLFE: I don't care to hear your explanation.

MR. SCOTT: That's what bothers me.

JUDGE WOLFE: The ruling is there. The record will speak for itself. As I indicated before, if the Board is wrong, you may appeal.

MR. SCOTT: Okay.

JUDGE WOLFE: Hopefull at the time the initial decision is rendered, rather than via interlocutory appeals. But go ahead.

MR. SCOTT: It probably will be both ways.

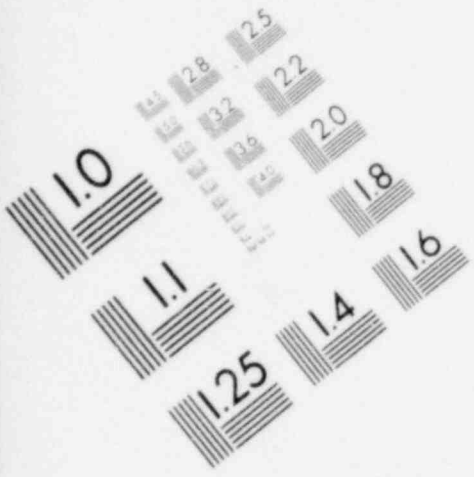
JUDGE WOLFE: Well, I won't say anything on that. We will have to rule on that, too, eventually.

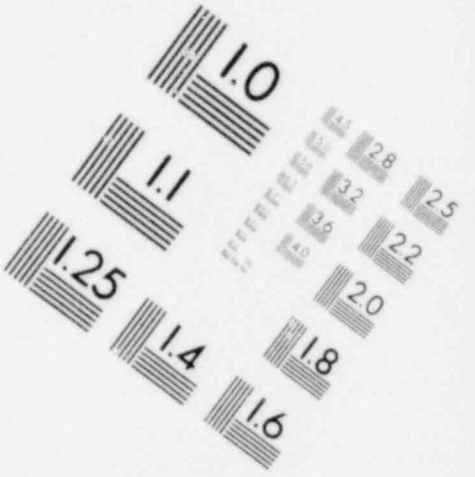
MR. SCOTT: I suppose I am going to have to ask Judge Linenberger to explain again the limits of his concern about total dissolved solids, the factor of two concentration factor. That's all I'm trying to talk about,and I fail to see why I am outside the limits.

MR. COPELAND: Your Honor, I request that Mr. Scott be given five minutes to complete his cross-examination on Board questions. The Board has already cut him off today because he wasted the whole day. These were the Board's questions. The Board asked the question so that they could clarify the record. There is no purpose in having Mr. Scott assist the Board through his cross-examination. Five minutes. That's plenty of time.

MR. SCOTT: Mr. Chairman, the purpose of Board's questions, I believe, is to clarify the record, not just to satisfy the Board as to whether or not they have got the record the way they would like it. Now, if a Board question being asked and receiving an answer is the end of it, then there is no need for any recross. I am strictly trying to clarify the record on levels of total dissolved solids.

This witness very clearly said that the factor of two was a maximum. I'm in the process to show that that's not correct. In fact, it can be off by factors of five or six orders of magnitude.





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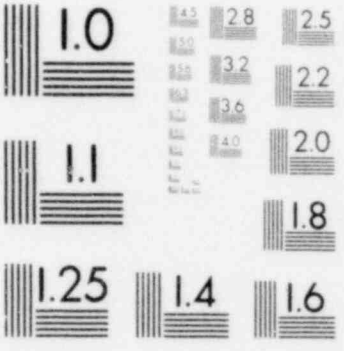

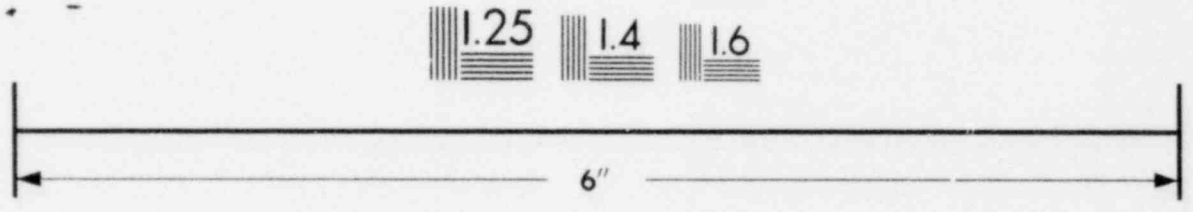

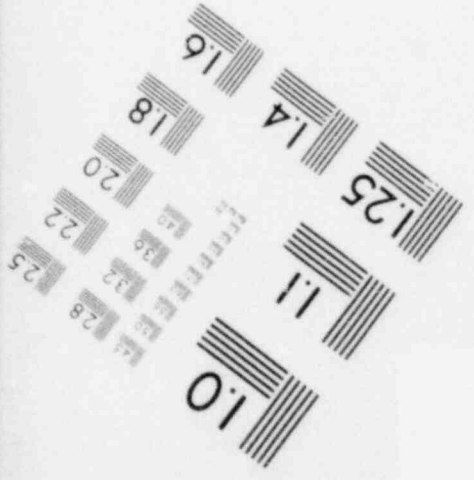

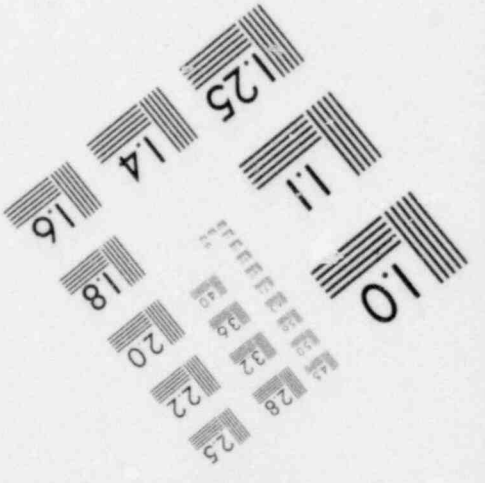

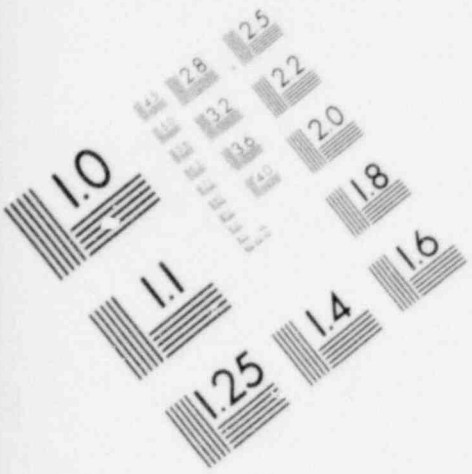

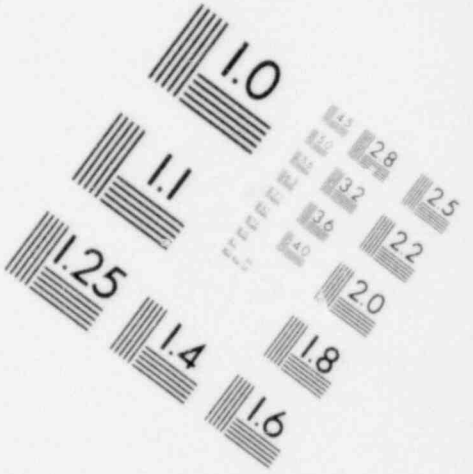

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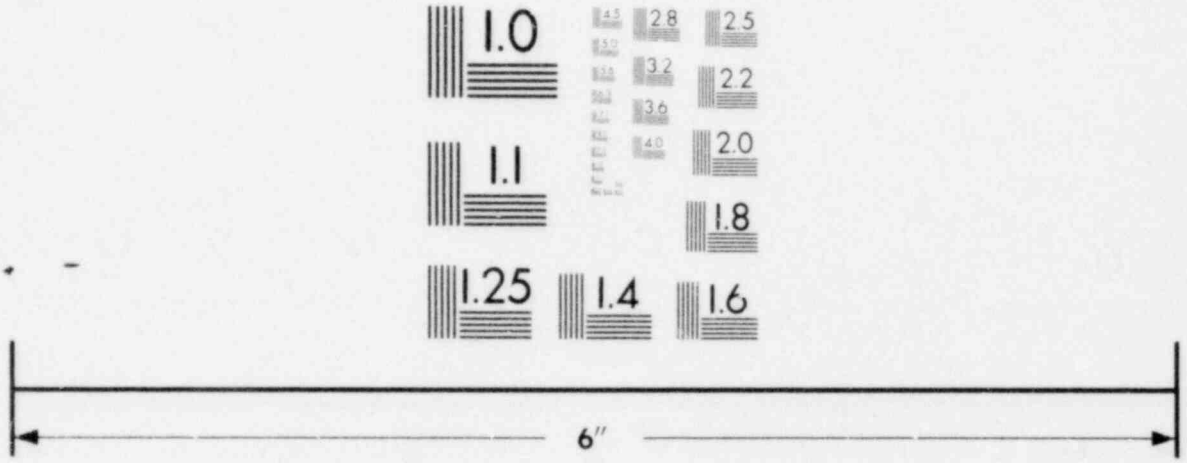

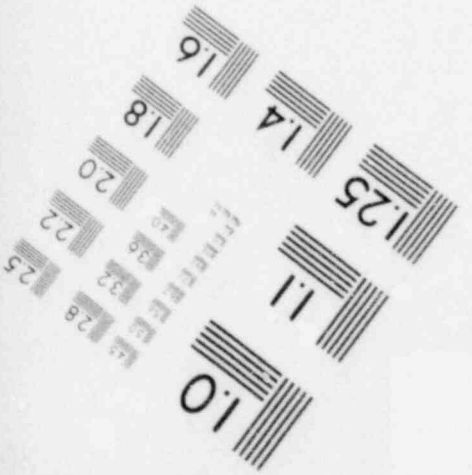

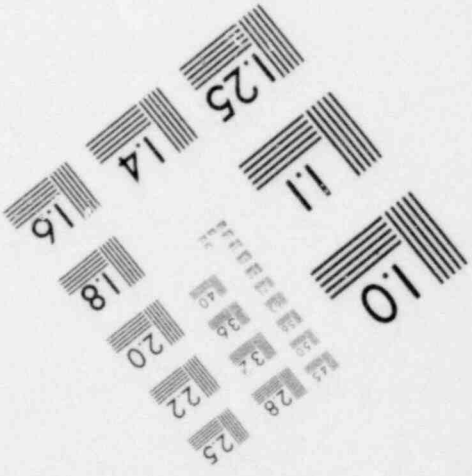

(Bench conference.)

JUDGE WOLFE: There is no connection, Mr. Scott, between that question that you are seeking, or what you seek to develop through this witness and the question put by Judge Linenberger. So, proceed to your next question.

MR. SCOTT: How does this Board, what's its procedure for allowing evidence to be put into the record so the Appeal Board can examine it, not to put it into the record for the initial decision, but to see if the Appeal Board determined whether or not it was of relevant train of inquiry that should have been allowed?

MR. BLACK: Mr. Chairman, I've got another problem here I would like to present to the Board. Dr. Sanders has a 5:30 flight, and if he is going to catch that flight, which is the last flight that gets into Oak Ridge tonight, he has got to leave in a very, very short time. In fact, the cab is waiting.

If we are going to get into procedure questions, I request that the witness be excused. We have strayed way beyond what I think is reasonable recross of Board questions, and I totally support the Applicant's request for a time limitation. In fact, I request that he be excused right now.

MR. SCOTT: Mr. Chairman, I very strongly

object to that. I've got at least two more major trains of thought here to pursue.

JUDGE WOLFE: You are going to have, as of this moment, ten minutes in which to pursue that. It is now 4:10. Your cross-examiantion solely on Board questions will be completed by no later than 4:20.

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BY MR. SCOTT:

Q. Okay. Dr. Sanders, the Board was interested in the effects of the change in levels of cooling lake upon the spawning in the -- on the shorelines. I believe you explained that that problem was alleviated by having mounds of dirt and trees piled in the lake in various places such that the tops of those things was at least five foot below the maximum low-water level so that at all times there would be in low-water levels a place for spawning. Is that correct?

A. No. What I said was that low-water level fluctuations happening primarily in the latter part of the summer would in fact not affect spawning at all. Spawning will have occurred four or five months previous to that.

Q. In explaining that did you not say that these mounds and piles of brush would be at least five foot below the low-water level, I believe it's the 108 foot on the chart?

A. It says in Applicant's Exhibit C that they should be no more than five feet below the five-year draw-down or low-water flucuation level.

Q. Where are you reading that from?

A. Applicant's Exhibit C, as presented to me, anyhow. I hope I did not misrepresent any aspect of --

Q. What's the title of that exhibit?

A. "Recommended Preimpoundment Fishing, Recreation Development For The Proposed Allens Creek Reservoir, Austin County, Texas."

Q. Does it show when that was submitted into the record?

A. I don't have anyreference to that at all. I just have a copy of the reservoir management plan.

JUDGE LINENBERGER: So you can move along here, Mr. Scott, Exhibit 3 is Chapter 2 of the PSAR, and it was brought into the record quite a few years ago.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q. Would you read that complete sentence that discusses the five foot?

A. Let me -- I misread you a sentence in Area A. What I wanted to read you was something from Area C, which would be "Brush rows at 200-yard intervals running from depths of five feet to fifteen feet below spillway level."

So, in fact, dropping water levels -- well, dropping water levels of five feet my assumption still basically stands. Again, I really don't remember what the elevation of the spillway level is for the moment.

BY MR. SCOTT:

Q. If it is five foot below the 108 foot low-water level, do you still stand by that as approximately correct?

A. What is approximately correct, again?

Q. That these piles of brush and mounds of dirt at 200-foot or -yard intervals would be at least five foot below the low-water level, which is shown on Page S.3-7 as 108 foot?

A. No. I would have to say that they would be five to fifteen feet below spillway level.

Q. Is it a fair characterization --

A. I confused two different aspects of the lake development plan when I made that initial comment, and my apologies to the Board.

Q. Is it fair to say that I have been useful in clarifying that point to the Board?

A. Well, --

JUDGE WOLFE: Are you asking the witness that?

MR. SCOTT: Yes, and I want the Board to hear it.

JUDGE WOLFE: You don't have to answer that, doctor.

BY MR. SCOTT:

Q. You mentioned, I think, that the -- if anything there had been some improvement on the brush -- the heavy metal data taken by the Geological Survey at Richmond. Have you made any plots of levels measured versus time for any of the heavy metals listed that we have been discussing in this proceeding?

A. I have developed a personal table from data restrieved from a data base, whose input data comes from the U. S. Geological Survey at Richmond, which shows that the time trends definitely show, to my satisfaction, a general increase in water quality over the timeframes I have discussed, and with sampling frequencies, again, discussed.

Q. Do you have those numbers available for Cadmium, say, so that we could give numbers, say, by yearly averages, or something?

A. I can read off values to you.

Q. Okay.

A. I'l say flatly that from the second month in 1971 all the way through the last sampling date that I have in 1977 the USGS estimated Cadmium concentration in the Brazos River is zero.

Q. Zero.

A. Now that is, again, from the data base that I

tied into.

Q Let me ask you this: If it was zero, how could it have been showing any improvement?

MR. NEWMAN: Mr. Chairman, I am going to object to that question. I think he is beginning to argue with the witness. We are now well outside the scope of any question from the Board.

MR. SCOTT: Mr. Chairman, it's just right on point. There is nothing flying about that at all.

JUDGE WOLFE: There is nothing what?

MR. SCOTT: Out of line, or irrelevant about it. The man has made statements that there is improvement, and the first thing I asked about there was no improvement.

(Bench conference.)

JUDGE LINENBERGER: Mr. Scott, the witness, I believe, answer you that the later results, more recent results indicate zero Cadmium concentration in Brazos River water. Is that a correct statement?

THE WITNESS: Yes, sir.

JUDGE LINENBERGER: And so your question about how could that possibly represent an improvement, Mr. Scott, is really completely off base and incomprehensible. The way it can represent an improvement is obvious from looking at the table that I had asked Dr. Sanders about, so instead of arguing that point, why don't you try to use the

rest of your time effectively here. Ask a question.

MR. SCOTT: God, this is frustrating. If it -- I just -- There --

If values were zero at the early point, and zero at the later point, there is no improvement. It maybe didn't get any worse, but there is no improvement. It's not just that there was zero --

JUDGE LINENBERGER: Mr. Scott, you are arguing with us. Now, --

MR. SCOTT: Well, the record will be mischaracterized.

JUDGE LINENBERGER: Mr. Scott, hold still, please.

MR. SCOTT: Yes, sir.

JUDGE LINENBERGER: I don't know why I keep trying to help you, but I guess you need it so bad I cannot resist.

Will you look at Table S.2.6, and read that in October of 1974 there was a 13 part per billion concentration of Cadmium in Brazos River water. The witness said more recent dates show it is zero. Now, if that is not an improvement, I don't want to hear any more argument about it.

Now, will you go to your next question, or are you finished?

MR. SCOTT: Well, I will not argue, but this --

JUDGE LINENBERGER: Thank you, sir. Please go to your next question.

BY MR. SCOTT:

Q Dr. Sanders, did the same parties take the data -- Let's put it this way: Did the Geological Survey take the data that is recorded in Table S.2.6?

MR. NEWMAN: Judge Wolfe, what is going on now is just pure argumentation with the witness, in an attempt to get around the prior rulings of the Board, the prior statements of Mr. Linenberger, and, really, trying to chew up the clock.

MR. SCOTT: Mr. Chairman, it is quite to the contrary. My points could have all been made very quickly simply except for the parties, including the Board, disrupting me. It is obviously very relevant to whether or not -- You can't take one group of people's measurements and another group's, and say because one is higher than the other say there has been improvement. It's illogical.

MR. BLACK: Mr. Chairman, I think he is being argumentative now. I clearly remember the witness saying that the water quality has improved over time, and that it wasn't specifically limited to Cadmium. So whether Cadmium has gone from zero to zero is irrelevant, and I

think we have run out of time, anyway.

MR. SCOTT: Well, I would like to pursue some of the other elements.

MR. NEWMAN: Mr. Chairman, I would request that the Board adhere to its earlier ruling, and terminate the questioning, it now being 4:20.

JUDGE WOLFE: You have run out of time now, so we will now proceed to hear any redirect by Mr. Black.

MR. BLACK: No questions.

JUDGE WOLFE: The witness is permanently excused.

(Whereupon, the witness was excused.)

JUDGE WOLFE: We will take a ten-minute recess.

MR. SCOTT: Mr. Chairman, it is very important that we get a clarification. He may not be permanently dismissed, because it may be that we need to call -- Well, I guess I am incorrect on that. Dr. Marrack may have to be recalled.

JUDGE WOLFE: We are in recess.

(A short recess was taken.)

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JUDGE WOLFE: All right, Mr. Copeland.

MR. COPELAND: Your Honor, I would like to call at this time two of our first witnesses on the question of alternative energy matters, as a generic matter. First, I would like to have the witnesses sworn. They are Mr. D. E. Simmons, and Dr. J. D. Guy.

JUDGE WOLFE: Which is which?

MR. COPELAND: Mr. Simmons is on the left, and Dr. Guy is on the right.

JUDGE WOLFE: All right, gentlemen, would you rise and raise your right hand.

Whereupon,

MR. D. E. SIMMONS
-and-
DR. J. D. GUY

witnesses herein, having first been duly sworn and cautioned to testify the truth, the whole truth and nothing but the truth, were examined and did proceed to testify upon their oath as follows:

DIRECT EXAMINATION

BY MR. COPELAND:

Q Mr. Simmons, do you have in front of you --

MR. SCOTT: Mr. Chairman, I would like to raise a preliminary issue. It is my understanding that these gentlemen would be brought as individuals. I don't mind them being sworn in together, so long as we can treat

them as individuals, instead of a panel, because they told us they would not be as a panel.

MR. COPELAND: Well, that's fine, Your Honor. I would like to proceed with cross-examination first of Mr. Simmons, and if we finish with him today, then proceed directly with Dr. Guy.

JUDGE WOLFE: All right.

MR. COPELAND: And as I have explained before, if we are not through with their cross-examination by Tuesday, I would like to have them step aside to put on Dr. Woodson, and they will be available as soon as Dr. Woodson is finished, to complete their examination.

MR. SCOTT: Mr. Chairman?

JUDGE WOLFE: Yes.

MR. SCOTT: I have some reluctance in allowing this "step aside." I think it has been stated, leastways to the local witnesses, that they should set straight through.

MR. COPELAND: Well, I mean to step aside only in the sense that they will be here and will be ready to go immediately back on the witness stand as soon as Dr. Woodson is completed.

JUDGE WOLFE: Dr. Woodson is from out of town?

MR. COPELAND: Yes, sir.

JUDGE WOLFE: So it is to accommodate Dr. Woodson that these two local witnesses would step aside.

MR. SCOTT: Well, even so, I think you need to inquire as to what is "out of town" and how much inconvenience it would be for that person to be here.

See, there is an inconvenience to Intervenors in their preparation, if they don't know who it is facing in what order.

MR. COPELAND: Well, Your Honor, this procedure was suggested by me at least two days ago on the record, as I recall. There was no objection at that time.

JUDGE WOLFE: Yes. That was on Monday, February 2nd, you explained the schedule for the calling of witnesses. Actually, you are somewhat behind now. You had planned to call Dr. Simmons on Wednesday afternoon. Today is Friday. So we are a little bit behind schedule. Dr. Woodson, I guess, was to have been called on Thursday.

MR. COPELAND: Yes, sir, and when we got to Thursday, which was yesterday, and we didn't get to Dr. Woodson, I explained at Page 4848 of the transcript that Mr. Simmons and Dr. Guy would be here tomorrow, i.e. today, and that it would be our intention to put them on, and to have them continue on through Monday.

I stated that Dr. Woodson was coming to town on Tuesday. I would like to put him on Tuesday, and --

JUDGE WOLFE: Dr. Woodson is from where?

MR. COPELAND: Austin. He is a professor at Austin.

JUDGE WOLFE: Yes.

MR. COPELAND: And Mr. Scott was here. There was no objection at that to that proposed procedure.

MR. SCOTT: Well, I would like to note that I don't have near the objection to this procedure as I do to just having it apply to Applicant's witnesses instead of our witnesses.

JUDGE WOLFE: What witnesses, all witnesses, all other witnesses are you speaking to?

MR. SCOTT: Dr. Marrack, Clarence Johnson. I want to make sure that my witnesses will have that same privilege of being here when they can be here, and not having to be here when they can't be here.

MR. COPELAND: Your Honor, it is clear that if there is a particular problem with Mr. Johnson, who is from out of town, being here that that can be accommodated. There is no dispute at this point to resolve.

JUDGE WOLFE: As I have told you, the Board will take every step it can to accommodate out-of-town

witnesses. I can go no farther than to say that.

MR. SCOTT: Could I --

JUDGE WOLFE: If you want some sort of firm commitment when he will have to be here, when he can be excused, I can't say that right now. Even you can't tell me when he'll be here and when he can't be here.

MR. SCOTT: I would just like to note for the record that Dr. Marrack is out of town, also.

MR. COPELAND: He lives in a suburb of Houston.

JUDGE WOLFE: That was my understanding, that he was a local citizen.

MR. SCOTT: He does not live in Houston.

MR. COPELAND: He lives in the suburb of Stafford, Texas.

MR. SCOTT: He does not live in Stafford, Texas, either.

MR. COPELAND: Your Honor, --

JUDGE WOLFE: We will take each case as it comes up. We have the two witnesses now. They have been sworn.

Proceed, Mr. Copeland.

BY MR. COPELAND:

Q Mr. Simmons, do you have in front of you the document entitled, "DIRECT TESTIMONY OF D. E. SIMMONS ON BEHALF OF HOUSTON LIGHTING & POWER COMPANY RE TEX PIRG

ADDITIONAL CONTENTION 12"?

A. Yes. I do.

Q. Was that testimony prepared by you or under your supervision?

A. Yes. It was.

Q. Do you have any corrections to make at this time?

A. No. I do not.

Q. To the best of your knowledge, is this testimony true and correct?

A. Yes.

Q. Do you adopt this as your testimony in this proceeding?

A. I do.

Q. Excuse me, Mr. Simmons. Attached to your testimony are two exhibits entitled "Applicant Exhibit No. (DES-1)" and "DES-2." Is that correct?

A. That is correct.

Q. And those are part of your testimony?

A. Yes. It is.

MR. COPELAND: Your Honor, at this time I would move the admission of Mr. Simmons' testimony into the record as though read, including the two attachments marked Exhibits DES-1 and DES-2.

MR. SCOTT: Mr. Chairman, I would like to take

Mr. Simmons on voir dire to see if he is, in fact, an expert.

JUDGE WOLFE: All right.

VOIR DIRE

BY MR. SCOTT:

Q. Is it Dr. Simmons or Mr. Simmons?

A. It is Mr. Simmons.

Q. Okay. When did you start attending college?

A. 1943. Excuse me. October 1942.

Q. Okay. And what courses did you take as an undergraduate in interconnection theory?

A. None.

Q. Do you have any graduate degrees?

A. No. I do not.

Q. Have you had any graduate school training?

A. No. I have not.

Q. Have you ever designed a high-voltage transmission line?

A. What do you mean by "design"?

Q. Decided upon the separation of cables and the diameter of the cables, and that sort of thing, to optimize the line for its purposes?

A. Yes. I have.

Q. Okay. What voltage line was that?

A. Several. 69 kV 138 and 345.

Q. Were you in charge of that whole project, or were you only -- were you working underneath another engineer?

MR. COPELAND: Objection.

A. What do you mean "the whole project"?

BY MR. SCOTT:

Q. The transmission line?

A. What do you mean "the transmission line"?

Q. Let's take the 69 kV line.

A. I don't understand the question.

Q. Okay. Is it not true that when you decide to run a high-voltage line between two points that someone is put in charge of the project to run that line between those two points?

MR. COPELAND: Counsel, the problem here is that the witness has testified that he has designed numerous trasmission lines, and you have asked him "Were you in charge that project?" There is a vast inconsistency between your question and his prior answer, and that's the problem.

MR. SCOTT: Maybe it can be explained this way.

BY MR. SCOTT:

Q. The first 69 kilovolt line that you were involved with, were you an engineer working on that

project, or was you the project manager for the whole project?

A. Mr. Scott, I spent 30, over 34 years --

Q. Would you please answer the question?

A. No, I cannot answer the question as you have put it, no.

Q. You cannot say whether or not you were the project manager for the first 69 kilovolt line that you worked with?

A. I don't understand your question. I have done a lot of work in a lot of different areas, including being in charge of all the transmission engineering for Houston Lighting & Power, and I have done a lot of that type work.

Q. Okay. Approximately what is the line loss for a 345-kilovolt line over a stretch of, let's say, 100 miles?

MR. COPELAND: Your Honor, I am going to object to that question. It does not go to Mr. Simmons' background or training.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Mr. Simmons, didn't you say that you had designed 345-kilovolt lines?

A. Yes. I did.

Q Okay.

MR. COPELAND: And that is the end of the matter, Your Honor.

MR. SCOTT: It is not.

BY MR. SCOTT:

Q In designing such lines, isn't it important to know the line losses?

MR. COPELAND: Objection, Your Honor. It is irrelevant as to whether Mr. Simmons is in fact -- This is the gentleman who is in fact in charge of all HL&P's planning for transmission. There is no way to impeach that fact by asking him these kind of detailed questions.

MR. SCOTT: Mr. Chairman, he says -- Applicant's counsel, at least, has said that he is in charge some big projects. But the question here is whether or not he is competent to be in charge of such projects, in the sense that he is competent to provide competent testimony for this Board.

And there cannot be any quicker way to determine someone's competence in that way than asking one of the very most basic simple questions and see if they know how to answer it. He could never have designed a line, if he can't answer this question. And he could never have been in charge of other people designing a line.

MR. COPELAND: Your Honor, the point is he is in charge --

MR. SCOTT: Mr. Chairman --

MR. COPELAND: That is a fact.

MR. SCOTT: -- what is counsel's objection?

MR. COPELAND: The objection is that it does not go to the question of whether he is in fact in charge of the transmission planning for Houston Lighting & Power Company.

MR. SCOTT: That's not the question I'm asking.

JUDGE WOLFE: I'll allow the question. Let's end the haggling here.

MR. SCOTT: Do you remember the question?

THE WITNESS: No. I do not.

BY MR. SCOTT:

Q For a 345-kilovolt line, 100 miles long, you start out transmitting a certain amount of power. What percentage of that will reach a destination where it can be used 100 miles away? In other words, what are the line losses transmitting this power over that type of line for 100 miles?

A I think that would depend on a lot of things. The --

Q Explain them.

MR. COPELAND: He was in the process, Mr. Scott.

A (Continuing) Mainly relating to the loading on the line. I do not recall the specific losses that would occur. It would depend on the design of the line, and the loading of the line.

If you can tell me what design, and what loading of the line you are talking about, then I will try to answer the question.

BY MR. SCOTT:

Q Well, let's take the most -- the line that you have designed that had the largest line losses, carrying its maximum load, maximum design load.

MR. COPELAND: Object, Your Honor, to any further questions along this line. The witness demonstrated that he knew how to determine line losses. There is no point in pursuing the matter any further.

MR. BLACK: I support this objection.

MR. SCOTT: Mr. Chairman --

MR. BLACK: This doesn't go to qualify the witness as an expert. This type of questioning goes into the weight to be given to his testimony once it is admitted. It does not go to whether he can be qualified as an expert.

MR. SCOTT: Mr. Chairman, he cannot be an

expert for this sort of testimony, if he can't answer this type of question.

JUDGE WOLFE: Well, he has given you his best answer.

MR. SCOTT: No.

JUDGE WOLFE: And he is asking you to fill in any voids so that he can answer more specifically.

MR. SCOTT: And I did. Now I am waiting for him to answer. I added specifically conditions of maximum design load, and his most inefficient design that he has worked with, namely, the one that had the greatest line losses. That would narrow it down. He gave me two conditions, and I have given him specifics for both of them.

MR. COPELAND: I will withdraw the objection. He can answer. I can't believe he can answer that question, so I'm going to withdraw the objection.

MR. SCOTT: Mr. Chairman, I object very much to Applicant's counsel signaling his witness what to say.

(Bench conference.)

JUDGE WOLFE: Yes. Mr. Copeland, if you have a comment to make, it should be directed to your objection without any other comment that might be deemed by the witness to indicate to him how he should testify.

All right, Mr. Scott.

BY MR. SCOTT:

Q. Go ahead, Mr. Simmons.

A. Would you mind repeating the question?

Q. Okay. We are trying to determine the line losses that took place in -- at the powerline that you was involved in working with; namely, the 345-kilovolt line that had the highest line losses when operating at its maximum design load.

A. Mr. Scott, there have been a lot of transmission lines I have designed. I do not recall what the maximum line losses were of any of the lines which I was involved in.

Q. Okay. Could you give me an approximate average of design losses of the lines that you have worked with?

MR. COPELAND: This is probing the witness' recollection of fact, Your Honor. It does not go to the question of whether he has competency to make those kinds of judgments.

JUDGE WOLFE: That's my -- I have an uneasy feeling about this line of questioning, Mr. Scott. It would seem to me that it is more in the line of cross-examination than it is to establish or discredit the knowledge and/or experience, i.e. the expertise of this witness.

I have an uneasy feeling that this is not the purpose of your questioning. However, I will allow another one or two questions, and then I will have to step in on my own motion.

Go ahead.

BY MR. SCOTT:

Q. Can you tell me an approximate reasonable line loss for --

A. No. I cannot, Mr. Scott.

Q. Do you have any idea at all what the line losses are on high-voltage transmission lines?

A. The line losses on transmission lines generally are very low. They are in the order of a few percent, or less than one percent of the total power being carried by the line.

Q. Is that true even for distances of approximately 100 miles?

A. The line losses increase with distance, --

Q. But my question still stands.

A. -- generally.

Q. Is your approximately one percent number still true for a transmission line 100 miles long?

MR. COPELAND: Asked and answered, Your Honor.

MR. SCOTT: It has not been answered.

JUDGE WOLFE: Overruled.

THE WITNESS: Line losses are greater for lines of longer distances. They would be in the order of a few percent of the total power being carried by the line.

MR. SCOTT: I think that is the same answer you gave before.

MR. COPELAND: And that is the answer, Your Honor.

MR. SCOTT: I don't consider that responsive, because he has given no indication yet of the length involved. I am confident that it can be shown that if a line 24,000 miles long it would be more than a few percent losses.

MR. COPELAND: That is not voir dire. That is cross-examination, Your Honor, and I submit that we have now proven that he has not been in voir dire for ten minutes.

MR. SCOTT: I don't see the difference between impeaching a witness' credibility and cross-examination as to this point. So far we have had a man here talk in generalities.

I would say that any engineering student, or in fact any high school student could probably do that.

JUDGE LINENBERGER: Pardon me, Mr. Scott, but Judge Wolfe, I have a different kind of problem. I notice

that this testimony is specifically addressed to subjects of interconnection, purchase of power. I can personally well perceive a person being an expert in those areas and knowing nothing about transmission line design characteristics. So I guess I have a question about the relevancy of this line of questioning about his expertise in transmission line design.

With your permission I would like to ask Mr. Scott to establish the relevancy here, since the testimony does not go to transmission line design.

MR SCOTT: I don't know how to separate transmission design from the viability of using transmission lines to accomplish certain purposes. You have to be able to know what the lines can do in order to know whether or not they can be used for certain purposes, like interconnecting with neighboring utilities, saving power, and, you know, you can't make a decision without that information.

JUDGE LINENBERGER: Mr. Scott, a corporate officer can certainly make a decision about purchase of power and intertized with other systems, without knowing how to do the engineering analysis that goes into the design of a transmission line. So I don't hear you connecting up your voir dire with the area of testimony.

MR. SCOTT: Mr. Chairman, at a very minimum, in

his testimony here he claims to have been involved in duties of the power department, and --

MR. COPELAND: Your Honor, I believe Mr. Scott is doing nothing more than arguing with the Board at this point. If he wishes to direct some questions to the witness, it seems to me that that is the best way to proceed.

JUDGE WOLFE: Well, I am concerned, and my concern now is spilling over into a firm ruling. I think what you are really engaging in is cross-examination of this witness, rather than questioning him on his knowledge, experience, and some his expertise. It seems to me that the type of questioning you have been engaging in is cross-examination. It is attempting to discredit, perhaps, on a point, or to disagree with him on a particular point, such as loss of voltage or loss of power.

I am going to call a halt to this line of questioning, and you may proceed, however, as is permitted to test the expertise of this witness.

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BY MR. SCOTT:

Q. Mr. Simmons, have you ever been involved with a -- Let's put it this way:

Has Houston Lighting & Power ever in your -- Scratch that, again.

Have you ever been involved in interconnecting, a line between the company you worked for and that of another company located in another state?

A. Yes.

Q. Which state was that?

A. Well, let me explain. I have been involved in the interconnecting of a line between a portion of the Houston Lighting & Power Company and an interstate company located near Huntsville, which will tie into other, into Louisiana, Oklahoma and Arkansas; I have been involved in that line.

Q. Okay. But have you been involved in interconnecting directly from your utility to a utility that is out of state?

A. No. To a utility?

Q. That is out of state.

A. This line involves a utility which operates in both Texas and another state.

Q. Would that be Gulf States Utilities?

A. It is -- Gulf States Utilities will have an

interconnection at the termination of the line coming into the system, the Houston Lighting & Power system, yes.

Q You said "will have." My question is whether or not an interconnection had ever been completed?

A No. The interconnection has not been completed.

Q Okay. So how do we have any way of knowing whether or not you have been able to make a correct decision into long distance transmission lines?

MR. COPELAND: Your Honor, that is impermissibly vague. There is no way this witness can answer a question that requires that.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q Well, staying within the State of Texas, what is the longest distance transmission line you have been involved with that interconnected between Houston Lighting & Power and some other utility?

MR. COPELAND: Objection, Your Honor. There is no showing that there is any relevance in terms of transmission line lengths and Mr. Simmons' expertise in evaluating interconnection.

MR. SCOTT: The man is here saying he's got many years experience in this sort of thing, and I'm trying to find out one interconnection he has ever been involved

in that ever got completed.

MR. BLACK: Mr. Chairman, I have to interject and indicate what the Staff's understanding of the rule of voir dire in qualifying an expert witness is.

Clearly, it states in Rule 702 of the Federal Rules of Evidence that an expert can be qualified by reason of knowledge, skill, experience, training, or education.

Now, certainly, it is eminently clear to Staff that if a person has an electrical engineering degree and is the vice-president of a major utility for system engineering and operation, that he can be qualified as an expert in system planning and interconnection.

Whether the utility or whether that person has done any of that competently, or what have you, does not go to the question of whether he is an expert. That is a fairly clear-cut decision based on eduction, experience, training, or otherwise.

The competency goes to the weight of the evidence. It does not go to whether that person can be qualified as an expert. I think all this line of questioning --

JUDGE WOLFE: So one never conducts voir dire of any claimed expert then, say, someone who is a professor or science and is offered as an expert witness

because he is a professor you do not conduct voir dire on him? Is that what you are saying?

MR. BLACK: If he is a professor and has, let's say a Phd in aquatic biology, and he is offered to present testimony on aquatic biology I submit he is an expert. Now, whether he is a competent aquatic biologist goes to the weight of the evidence. It does not go to whether he can qualify as an expert.

JUDGE WOLFE: So you never conduct voir dire on a professor of science or a high corporate officer; is that what you are saying?

MR. BLACK: No. I am not saying that at all. I think that it is fairly clear from what we have here that this man qualifies as an expert for the purpose of his testimony, and I certainly would submit that this line of questioning going to whether Houston Lighting & Power did it correctly or whether they have done certain interconnections in the past can only go to the weight of the evidence, not as to whether this person can qualify as an expert.

MR. SCOTT: Mr. Chairman, I can say this, that there is a clear NRC ruling that you cannot become an expert only by virtue of your training or position -- I mean your education or position. You have to also have had actual experience.

JUDGE WOLFE: Well, I am overruling the objection.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q Mr. Simmons, what transmission lines that have been completed and in operation have you worked on?

MR. COPELAND: Objection, Your Honor. What does he mean by "worked on"?

JUDGE WOLFE: Clarify, Mr. Scott.

BY MR. SCOTT:

Q Well, let's first say that he was in charge of, he was project manager or above. I'm talking about completed lines, not just in some planning stage.

MR. COPELAND: Then, Your Honor, this question obviously goes back to the very point that Mr. Linenberger raised, and that is his technical competence to physically design a transmission line.

JUDGE WOLFE: Is that your question, as to his personal --

MR. SCOTT: No, I'm not limiting it to the physical design. It would be well to know whether or not the system worked that he is involved in the planning for, but whether or not it had a line loss of one percent or 1.2 percent I'm not inquiring into that.

JUDGE WOLFE: Mr. Scott, you seem to dislike

assistance by the Board. I am not going to offer you any assistance. I suggest you sharpen your questions and test the expertise of this witness. I'm not going to help you.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q What courses in transmission lines have you had, Mr. Simmons?

A I don't recall the specific names of the courses. They were included in the electrical engineering courses that I took at Rice University.

Q Was that in the 1940's?

A Yes. It was.

Q At that time do you know what the maximum voltage on an operating line was, operating high-voltage line?

MR. COPELAND: Your Honor, --

JUDGE WOLFE: At that time in the forties?

MR. SCOTT: Yes.

JUDGE WOLFE: What does that have to do with anything the gentleman knows now?

MR. SCOTT: Well, it is my understanding that they didn't have high-voltage lines at that time.

JUDGE WOLFE: Oh, this is one of your creep-and-pounce questions. I'm sorry. (Laughter.)

Excuse me. Go right ahead. Answer the question.

THE WITNESS: What is the question?

BY MR. SCOTT:

Q. What is the maximum voltage with any of the high-voltage transmission lines that you studied about when you were going to undergraduate school?

A. I don't recall.

Q. Do you remember the approximate magnitude?

A. No. I do not.

Q. Do you remember anything about those courses?

A. Very little.

Q. Okay. I note that you say you were an expert witness -- this is on Page 4 of your testimony -- in the case of West Texas Utilities Company versus Texas Electric Service Company.

Could you give me the nature of your testimony?

A. Where are you referring to in the testimony?

Q. Line 10 on Page 4.

MR. COPELAND: Well, Your Honor, I submit that Mr. Scott had this direct prepared testimony for weeks, if not months, and if he wanted to go read that case and find out what Mr. Simmons testified there he certainly could have done so.

JUDGE WOLFE: Yes. You may question about his knowledge of the studies that he examined relating to feasibility and desirability of interconnecting ERCOT and SWPP. I would agree with Applicant's counsel that a review of the case, of the filings, and of the transcript in that case would certainly serve to explain to you the witness' participation in that case.

Objection sustained.

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BY MR. SCOTT:

Q. Did you testify in that case as an expert on the technical feasibility of interconnection of high-voltage transmission lines?

A. I testified in that case on several aspects.

Q. Did one of them include the part that I asked you about?

A. Well, ask me again.

JUDGE WOLFE: Mr. Simmons, do you hear Mr. Scott well? Is there a problem in hearing Mr. Scott, or anyone?

THE WITNESS: No, sir. I can hear very plainly. I have a problem understanding his question.

JUDGE WOLFE: All right.

BY MR. SCOTT:

Q. I asked you whether or not you testified as a technical expert witness on the feasibility of long-distance interconnections.

MR. COPELAND: I am going to object to that, Your Honor, as being impermissibly vague. What does Mr. Scott mean about "technical feasibility and long-distance interconnections"? There has been no basis that indeed those were considered a long-distance interconnection.

MR. SCOTT: Well, then he could have said --

MR. COPELAND: And I would further add, Your

Honor, this just goes right back to the question of whether Mr. Scott could have availed himself of the record in that proceeding. In fact, he had a discovery request that he put to us. He requested the entire record of that proceeding, and he never once showed up to look at it.

MR. SCOTT: Mr. Chairman, I am not asking these questions for me to decide whether or not he's an expert witness. I've decided that. This is to help the Board to decide.

JUDGE WOLFE: Well, don't worry about the Board. When you have completed with your voir dire, we will have a pretty good idea. You just worry about making out your case to disestablish that this man is an expert.

I will sustain that objection.

BY MR. SCOTT:

Q. Mr. Simmons, I believe you have stated you are thoroughly familiar with all the studies examining the feasibility and desirability of interconnecting ERCOT and SWPP; is that correct?

A. Yes.

Q. Did you do any of those studies?

A. Yes.

Q. Which ones?

A. I did a study on analyzing the cost and

reliability impacts of interconnecting ERCOT and Southwest Power Pool synchronously.

Q. Would you explain what the difference between synchronously -- I can't even pronounce it -- and asynchronoughly would be?

A. Well, when you connect synchronoughly you utilize alternating current lines, and you have a synchronizing of all the generators between ERCOT and Southwest Power Pool, so that you have synchronizing flows and that the units operate together in synchronism.

When you do it asynchronously or with direct current lines there is no synchronism between the two, but you still have the capability of interchanging power between the systems in an asynchronous mode.

Q. Are most interconnections done by the AC or the DC method?

A. When you say "interconnections" do you mean interconnections between systems?

Q. Yes.

A. Yes. They are.

Q. Yes, they are done which way?

A. Synchronously.

Q. Okay. Is Houston Lighting & Power proposing to interconnect between two systems?

MR. COPELAND: That's cross-examination, Your

Honor.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Have you recommended that this typical AC method of interconnection be used in connection between Houston Lighting & Power and SWPP?

MR. COPELAND: Same objection, Your Honor.

JUDGE WOLFE: Sustained.

Mr. Scott, this is getting somewhat painful, and painfully prolonged. Just ask questions to disestablish that this man is an expert witness; expert by knowledge, expert by experience, expert by education, whatever. You are simply not asking crisp good questions, and it is just prolonging this proceeding.

I will give you another five minutes, and then we will have to call a halt to it.

JUDGE LINENBERGER: But let me just inject here, Mr. Scott, stick to your needs in this matter. Don't anticipate what the Board's problems are.

MR. SCOTT: Okay.

BY MR. SCOTT:

Q. I think it is fair to say that you didn't remember anything or very much of what you learned in undergraduate --

MR. COPELAND: Objection, Your Honor.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Have you taken any continuing education courses since your undergraduate days?

A. No. I have not.

Q. Have you attended any -- Have you taught any courses in transmission-line theory?

A. No. I have not.

Q. Have you given any seminars in transmission-line theory?

A. No.

Q. Are you an economist?

A. No.

Q. Are you an expert in systems reliability?

A. I have knowledge about system reliabilty.

Q. Are you an expert?

A. I have enough knowledge that I think I can answer questions, and I think I am quite knowledgeable about system reliability.

Q. Okay. Let me ask you this: Does a systems reliability tend to increase or decrease as the number of interconnections within that system increases?

MR. COPELAND: Objection, Your Honor. It goes to cross-examination.

JUDGE WOLFE: That's a marginal question. I

will allow that one.

A. Well, I think every case would have to be studied on its own. Generally, there is some marginal increase in improvement in reliabi ity with additional interconnections.

BY MR. SCOTT:

Q. Is there anything unique about the State of Texas that would keep that general theory from applying in the State of Texas?

MR. COPELAND: Objection. Cross-examination.

JUDGE WOLFE: Sustained.

BY MR. SCOTT:

Q. Mr. Simmons, does the addition of large generating units -- Well, let's put it this way:

If you had a system with ten small units, and you replaced that with a system that included two large generating units of the same capacity instead of the ten smaller ones, which one would tend to have the most reliability?

A. Well, if you further add that both the small and the large generators have the same outage rates, then the system would be smaller,generators would have a higher reliability level.

JUDGE WOLFE: All right. It is now 5:20. Is there any other voir dire, or any objections to the

incorporation of Mr. Simmons' testimony into the record?

MR. DOHERTY: I have a single question I would like to ask on voir dire.

JUDGE WOLFE: Yes.

BY MR. DOHERTY:

Q Mr. Simmons, do you as part of your duties instruct other employees of Houston Lighting & Power in the management of the interconnection system?

A Yes.

MR. DOHERTY: That was my question. Thank you.

JUDGE WOLFE: Absent objection, the written testimony of Mr. Simmons, inclusive of the two attached exhibits DES-1 and DES-2 are incorporated --

MR. SCOTT: Mr. Chairman, I hope that's -- You are assuming no objection, because --

JUDGE WOLFE: Well, I asked for objections, and I heard none.

MR. SCOTT: Well, I thought you was going to go down the row and let me be last. I do object.

JUDGE WOLFE: Grounds?

MR. SCOTT: The testimony that we have elicited here, he's not got a graduate degree. He says he has forgotten much if not most of what he did know. He has not had any additional training since then. He has not

been involved in any long-distance interconnection projects that have, you know, been tested to see if they worked.

It seems what we have here is a gentleman who is a high official in the company, who because of some litigation was put in charge of following that litigation. I fail to perceive much more than that.

JUDGE WOLFE: Well, --

MR. COPELAND: I'm not sure I need to respond to that, Your Honor. If you wish me to, I will. I think Mr. Simmons' testimony speaks for itself. The man has had an incredible range of experience in running an electrical utility system.

JUDGE WOLFE: Yes. I understand that you have had over 33 years of experience with HL&P; is that correct, Mr. Simmons?

THE WITNESS: Yes, sir.

JUDGE WOLFE: The Board has read your testimony and your background, and experience, and we have had occasion to refer to Federal Rule of Evidence 702, that a witness may be qualified as an expert by knowledge, skill, experience, training, or education. I think the witness has established that. We will at all times give due weight to an expert witness' testimony.

So, we overrule the objection and

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So, we overrule the objection and

incorporate into the record, as if read, Mr. Simmons' testimony and the two exhibits attached thereto, DES-1 and -2.

All right. I think now is time to recess, but before we do recess there is at least one matter.

We plan to meet tomorrow at the Exhibit Hall, is that the -- of STP. Is that correct, Mr. Copeland?

MR. COPELAND: Visitor's Center.

JUDGE WOLFE: Visitor's Center. That will be at 10:00 o'clock.

Yes, Mr. Doherty;

MR. DOHERTY: Well, finishing your planning for tomorrow.

JUDGE WOLFE: We plan to meet there at 10:00 o'clock. Any of the intervening parties who wish to avail themselves for this site visit should now contact, if they have not before, Mr. Copeland.

Anything else?

MR. DOHERTY: Starting Monday, then, I would like to inquire of Applicant's counsel, we will expect Mr. Guy, or Dr. Guy and Mr. Simmons both to be available at 9:00 o'clock; is that correct?

MR. COPELAND: Yes.

DIRECT TESTIMONY OF

D. E. SIMMONS

ON BEHALF OF HOUSTON LIGHTING & POWER COMPANY

RE TEX PIRG ADDITIONAL CONTENTION 12

INTERCONNECTION/PURCHASE OF POWER

Q. Please state your name and position.

A. My name is D. E. Simmons. I am the Vice President of System Engineering and Operations for Houston Lighting & Power Company (HL&P).

Q. Please describe the various positions you have held since employed by HL&P.

A. I was first employed in 1946 by HL&P as a draftsman in the Land Rights Division while attending Rice University. In 1947 I graduated from Rice University with the degree of Bachelor of Science in Electrical Engineering and then transferred to the Distribution Engineering Division of HL&P. In 1951 I transferred to the Electrical Engineering section with principal duties in system control applications, supervisory and load frequency control, technical support to the dispatching office, liason with Power Department and outside power plant architect engineer on electrical features of power plants under design and construction. In 1959 I was promoted to Assistant Superintendent of the electrical engineering division of the Engineering Department. In 1962 I was promoted to Superintendent of Electrical Engineering. In 1963 I was transferred to be Superintendent of the Planning Division of the Engineering Department. In 1965 I was transferred to Superintendent of System Engineering Division of the Engineering Department.

In 1969 I was promoted to Assistant General Manager of the Engineering Department. In 1970 I was appointed Administrative Assistant to the Senior Vice President of Operations. In 1971 I was appointed Manager of Environmental and Inter-Utility Relations. In 1972 I was elected Vice President of Environmental and Inter-Utility Affairs. In 1976 I became Vice President of Corporate Planning and I continued in that capacity until I became the Vice President of System Engineering and Operations in February, 1980.

Q. Please describe your responsibilities as Vice President of System Engineering and Operations.

A. I oversee planning, construction and operation of HL&P's transmission and distribution system, and operation of the generation system. In so doing it is my responsibility to evaluate the feasibility and desirability of interconnections with other electric utilities. This is an area that I have been involved in for many years before taking over my present responsibilities.

Q. Please describe the work you have done in the area of interconnections.

A. As Vice President of Inter-Utility Affairs I had the primary responsibility of joint planning with other electric utilities. I have been dealing with the other electric systems on a continuous basis for ten to fifteen years, both in the context of bilateral negotiations

and joint planning efforts. In regard to the latter point I have represented HL&P for many years in the two statewide planning organizations, the Texas Interconnected Systems (TIS) and the Electric Reliability Council of Texas (ERCOT). I have also served as the ERCOT representative on the National Electric Reliability Council - Technical Advisory Committee. While serving in each of these various capacities I have been heavily involved in the planning and operation of interconnected operations of electric system.

Q. While serving as Vice President of Corporate Planning were you involved in the process of evaluating interconnected operations?

A. I was very much involved in evaluating the impacts of interconnected operation on our corporate planning process. It became my responsibility during that time to negotiate with other electric utilities for the purchase of capacity to cover the expected shortage in reserves during the 1980's. I have continued with this responsibility in my present capacity. Accordingly, it is my responsibility to maintain current knowledge of the capacity which may be available for sale to HL&P from any and all neighboring electric systems.

Q. Have you had any involvement in evaluating the feasibility of interconnecting with utilities outside Texas?

A. Yes. As the Board and the parties may know, HL&P has been engaged in litigation for the past four years concerning the question of whether the electric utility systems operating in the Electric Reliability Council of Texas (ERCOT) should be interconnected with the electric utility systems operating in the Southwest Power Pool (SWPP). I have been the HL&P officer in charge of this litigation since its inception. I testified as an expert witness on this question in the case of West Texas Utilities Company, et al. v. Texas Electric Service Company, et al., 470 F. Supp. 789 (1979), and other related litigation referenced in the Court's decision. Because of this litigation I am thoroughly familiar with all of the studies that examine the feasibility and desirability of interconnecting ERCOT and SWPP.

Q. Is HL&P a member of ERCOT?

A. Yes. It is the planning organization made up of all the electric systems operating solely within the State of Texas.

Q. What area is covered by the SWPP?

A. That area includes the electric utilities in the states surrounding Texas to the north and east.

Q. Why has the examination of interconnections with neighboring states focused only on the SWPP.

A. The states to the west of Texas are very sparsely populated so there is no concentration of power plants and power lines along the western border of Texas which could be interconnected on an economic basis.

Q. In its Contention No. 12 TexPirg alleges that HL&P could obviate the need for Allens Creek if it would interconnect with utilities outside the State of Texas, because the interconnections would permit a reduction in reserve margins. Is TexPirg's allegation correct?

A. No. The studies which have been done on this question demonstrate that reserve margins in ERCOT cannot be reduced through interconnections with SWPP, which as I stated earlier has been the area of focus in the studies done on this subject. The basic reason that ERCOT would not reduce reserves in reliance upon interconnections with SWPP is that the SWPP has had a chronic problem of reserve shortages. As an example, the following report on SWPP reserves is provided in the National Electric Reliability Council's 1975 Annual Report [App. Exh. ____ (DES 1)]:

> "The impact of presently planned construction cutbacks will take effect in 1979 and later years. For example, the Middle South System announced in mid-year 1975, cancellation of two nuclear fueled units and delay of a third nuclear unit plus two coal fired units.
>
> "...This represents a 25% reduction of reserves considered desirable and proven by experience to be

adequate. This very significant reduction in reserves can have a decidedly adverse affect on bulk power system reliability in this area. Should presently halted construction not be resumed according to plan, there will be a further substantial decrease in reserves already considered too low and, by 1979, reserves will be less than one-third of those formerly planned and considered adequate."

The situation in the SWPP has not improved materially in the last five years. The SWPP section of the National Electric Reliability Council's 1979 Annual Report underscores the fact that the electric systems in SWPP must proceed with the timely construction of new nuclear and coal plants if they are to meet their expected load requirements:

"At present, [the Southwest Power Pool] SPP is highly dependent on natural gas and oil as a boiler fuel, which supplies almost 70% of the electric energy requirements of the region. The nuclear and coal-fired generating capacity addition program for the next ten years is an attempt by SPP systems to reduce their reliance on natural gas and oil.

"To meet the present forecasted load demands in SPP, it is imperative that the presently planned coal-fired and nuclear generating unit construction programs continue on schedule. However, delays are being experienced with the licensing of these units. The lack of timely rate relief will also affect the ability of the SPP systems to maintain this program on schedule. Should delays continue to occur, future power supply within the SPP region will become inadequate.

"The current maze of uncertainty which has been injected into the electric utility industry by outside forces causes concern on the part of the member systems of SPP. The key factor in future reliability and adequacy in SPP lies in completion of the current generating capacity plans in a timely manner without unnecessary delays." [See App. Exh. ____ (DES 2)].

In evaluating the potential for interconnecting with the SWPP we rely on these reports because they constitute the official reports of the companies in SWPP on the status of their reserves. I have concluded from these reports and many other sources of data that the SWPP companies have reserve shortages so we could not reduce our own reserve margins in reliance upon interconnections with them.

Q. Would it be feasible for HL&P to forego construction of Allens Creek in reliance upon purchases of capacity in the SWPP?

A. No. We would be derelict in foregoing construction of our own coal and nuclear plants in reliance upon the remote possibility that there might be sufficient excess reserves in SWPP for the next forty years to replace the Allens Creek project. They do not have that kind of excess capacity now and there is no reason to believe they will have it forty years from now.

Q. Where you have found other electric utilities which have excess reserves are they interested in selling capacity in their base load coal and nuclear plants?

A. Generally, those utilities in the southwestern U.S. which have excess reserves want to sell only those reserves that they generate on higher priced gas or oil; they save the lower cost coal and nuclear capacity for

their own system needs. Thus, where such reserves are available they are not economically competitive with power produced by Allens Creek (see Testimony of Dr. Perl). Moreover, by deferring Allens Creek we would cause an increase in oil and gas consumption on our system and neighboring systems. It would be contrary to national policy, as established in the Powerplant and Industrial Fuel Use Act, to encourage the increased consumption of oil and gas by deferring construction of new nuclear plants. All of the companies in ERCOT and SWPP are under a legal obligation under the Fuel Use Act to reduce our reliance on oil and gas.

Q. Are you aware of any studies that address the question of reducing reserves in reliance upon interconnections?

A. In 1978 the Federal Energy Regulatory Commission (FERC) studied the question of interconnecting the SWPP and ERCOT and concluded that "the value of interconnection facilities [between ERCOT and SWPP] as a means for reducing reserve requirements or improving reliability is negligible." (See Staff Report on Electric Reliability Council of Texas, Interconnection and Reliability Evaluation, March 1978). Their focus in this study was on ERCOT. Subsequently the FERC also examined the potential for reducing reserves in SWPP through interconnections

with ERCOT and concluded that SWPP would not benefit from an interconnection with ERCOT. (See Staff Report on Southwest Power Pool Reliability Assessment, March 1979). Both of these studies demonstrate that TexPirg is wrong in alleging that there can be a reduction in reserve margins if the SWPP and ERCOT are interconnected.

Q. Have you examined the most recently reported reserve margins for the SWPP to determine whether there is a substantial amount of excess capacity in the SWPP?

A. Yes. I have examined the SWPP's Order 411 Report to the Department of Energy, filed on April 1, 1980. That report shows that for the next 10 years the SWPP will have reserves of about 20% in 1980 dropping to 16% by 1989. These reserve margins are dependent upon the timely completion of plants now in construction, which casts some doubt on the validity of these projections.

Q. What conclusions do you draw from those reserve margins?

A. I would conclude that the SWPP has no excess reserves to export to other regions. They need all their reserves themselves to operate reliably when operating with the large coal and nuclear plants now being added in the SWPP. In my opinion, they will actually have less than adequate reserves in the next 10 years and will obviously not be in position to export the substantial

amount of capacity which would be required to replace ACNGS Unit No. 1.

Q. Finally, TexPirg has asserted that there is some type of nationwide conservation program at work which has resulted in nationwide excess of generating capacity. Is TexPirg correct?

A. This is a totally unsubstantiated claim and is, in fact, untrue. The National Electric Reliability Council (NERC), which has the responsibility for reviewing the adequacy and reliability of bulk electric power supply for the entire United States, has provided a very gloomy forecast of the future adequacy of electric power supply:

> "The overriding concerns of NERC at this time, however, are the discernible and disturbing trends which point to a future bulk (electric) power supply system which will be unable to maintain an adequate and reliable electric power supply for the United States....
>
> * * *
>
> "NERC believes that the current peak electric load growth projections for the next decade assume an increasing impact of load conservation, which reflects the industry's recent peak load experience and the growing awareness and concern on the part of the public for the need for conservation. Furthermore, we believe that conservation will be an important factor in minimizing the need for additional power supply facilities. However, even with this anticipated conservation effort, additional generating capacity must be installed -- from 25,000 to 30,000 MW per year over the next decade -- if we are to maintain a reliable and adequate bulk power supply system.

> "There are many impediments to the construction program for new coal-fired and nuclear generating units, and it is urgent that these impediments be removed to minimize the impact of what now appears to be an inevitable future shortfall in electric generating capacity with its attendant negative impact on the well-being of the United States and Canada. [See App. Exh. ____ (DES 2), at pp. 3-4].

In short, the NERC report indicates that whatever excess reserves savings may have resulted from conservation, it is not enough to prevent the severe crisis that we will face on a nationwide basis if we do not accelerate construction of new coal and nuclear plants.

Q. Returning for a moment to the litigation you mentioned earlier, have you now reached a settlement which will result in interconnections between ERCOT and SWPP?

A. Yes, we have.

Q. Would you explain the basis for the settlement?

A. The settlement will permit the Central and Southwest Corporation, our main protagonist in that litigation, to directly interconnect its four operating companies by the use of two direct current (DC) interconnections, having a total capacity of 700 MW. I would note that our agreement to these interconnections was not based upon a demonstration that the interconnections were economically desirable. They are being constructed by CSW to integrate its holding company operations. Moreover,

the interconnections are not being built so that CSW can forego building new plants. They are being built with the intention of giving CSW the ability to construct new nuclear and coal plants to be jointly owned by the four CSW operating companies.

We have no objection to the DC interconnections, as compared to the originally proposed AC interconnections, because they will have no adverse economic or electrical impact on our system. Unlike the situation with AC interconnections, the flows over the DC lines can be controlled by CSW to flow through the CSW system on a predetermined basis. We do not have to add internal transmission additions in order to accommodate the scheduled and unscheduled flows that were associated with CSW's AC interconnection proposal. The result is that, in addition to preserving our present degree of reliability, the DC interconnections are much cheaper for us than the AC interconnections.

Q. Does HL&P have a right to use any of the capacity in the DC interconnections?

A. As part of the settlement we have agreed to pay for 200 MW of the 700 MW of capacity that is being installed. In return, we will have the right to use the 200 MW of capacity. We have no specific plan at this time for the use of the capacity. However, our maximum use of the

line will be limited to 200 MW, so there is no way to obtain enough capacity over the line to replace Allens Creek even assuming that we could purchase 1200 MW capacity in the SWPP, which we cannot. In direct response to TexPirg's contention, I would point out that none of the electric systems in ERCOT or SWPP are planning to reduce reserves in reliance upon the DC interconnections, nor is any electric system in ERCOT or SWPP planning to forego construction of new power plants in reliance upon the interconnections.

Q. Does this complete your testimony?

A. Yes.

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MR. DOHERTY: And then on Tuesday we expect Mr. Woodson.

MR. COPELAND: Dr. Woodson, that is correct.

MR. DOHERTY: I'm sorry, yes.

And then making an assumption that's unproven, that not by Wednesday has he finished then we would expect both gentlemen to return; is that right?

MR. COPELAND: Yes.

MR. DOHERTY: So they are going to be a panel?

MR. COPELAND: Then we would proceed from there with Dr. Perl and Dr. Anderson.

MR. DOHERTY: I see, and will they be a panel?

MR. COPELAND: Yes.

MR. DOHERTY: And, Mr. Black, I think told me that after that five had finished your group will be on; is that correct?

MR. COPELAND: Well, we have one more witness in that lineup, which is Dr. Hamilton. We just have to guess at this time as to when he could get on.

MR. DOHERTY: Will you endeavor to notify us as soon as you can when he is ready? That will help us a lot. We have to do a lot of preparing, and if we know what we are preparing for it helps.

MR. COPELAND: I have totally lost any capability to predict, you know, when we are going to be

able to put witnesses on. That's the best I can do for next week.

MR. DOHERTY: Thank you very much, counsel. I have lost the ability to predict, too.

JUDGE WOLFE: I do note, Mr. Doherty, that you have outstanding some sort of motion with relation to the cross-examination of panel witnesses. Did you intend that to be a formal motion as such, or did you intend that merely to bring to the Board's attention a potential problem with the cross-examination of panel members? I'm just not certain that in any formalized sense that it is properly a motion.

Do you wish the Board to consider it as a motion and rule on it, or to determine that it is sort of a request in vacuo that doesn't pertain to any concrete situation?

I am very prone at this time just to rule from the bench that it is -- that we don't deem it to be a motion. Necessarily, we have to be governed by the circumstance of any individual case. I mean you understand what I am saying to you?

MR. DOHERTY: I think so.

JUDGE WOLFE: You want the Board to consider it as a motion, or just something to alert the Board that there may be a problem, certainly as to you perhaps in the

future, in the cross-examination of panel witnesses?

MR. DOHERTY: Well, it was -- this is the motion that was submitted before the break, before the one-week break; right?

JUDGE WOLFE: Yes.

MR. DOHERTY: I believe Applicant responded to it; is that right?

JUDGE WOLFE: I believe that is right, yes.

MR. COPELAND: I didn't understand it had anything to do with the panels.

MR. DOHERTY: Well, it did mention panels. Judge Wolfe is, you know, correct on that.

Did the Applicant want to respond formally to it -- Pardon me. Did the Staff want to respond to it formally or not?

MR. BLACK: As I indicated previously, I said that we were not going to respond formally, because I thought it would come up in the context of these hearings befpre we could respond formally, and, therefore, I would rather it be disposed of orally. We had indicated that Tuesday, or earlier this week sometime.

MR. DOHERTY: I probably was absent then, which I apologize for. I think ruling -- I do want it to be a formal motion. I do want you to rule on it in an expeditious manner, for instance, from the bench. I

think that is much more sensible. Does that cause a problem?

JUDGE WOLFE: No, it doesn't cause any problem. I'm just -- Well, --

MR. DOHERTY: If I may interject a minute, if it is approaching mootness, I guess.

MR. COPELAND: Well, I thought it had already been mooted, because as I understood the thrust of the motion it was that Mr. Doherty requested that Intervenors be permitted to come in at any time during the proceeding, and if, for example, Mr. Doherty were cross-examining he could step aside and anybody who walked in at that point could cross-examine.

And as I understand the Board's ruling that was made during the course of this week when the matter of Mr. Bishop's coming and going was raised that the Board made it very clear that Intervenors were to be here to cross-examine in order, alphabetical order, and if they were not here that when their time came to cross-examine that they had to show good cause for going out of turn.

So, as far as I understood, that moots Mr. Doherty's motion.

MR. SCOTT: Mr. Chairman --

MR. DOHERTY: I think the critical difference is the showing of good cause. What I was urging was that

there be no requirement for good cause, and the Board has since that time I think steadily stuck to a policy of requiring good cause, and this is to what I refer.

And, frankly, I don't know, I don't have anything, really, further to say. I am aware that that was submitted somewhat before some of the rulings were made by the Board, and they --

JUDGE WOLFE: Well, I wasn't certain on whether you wanted the Board to entertain that, review it as a formal motion. Since you do, we will review it as a formal motion, and we will rule on it.

MR. DOHERTY: Could I ask one question on this formal?

JUDGE WOLFE: Yes.

MR. DOHERTY: Would that mean you would have to go back to Washington, write out something, give it to your secretary, send it through all of the mail, and all that? Would that be required?

I would just as soon see that skipped. I don't see any point in burdening people with that.

JUDGE WOLFE: Well, not necessarily. When we are at trial and out of town, often times we could just orally -- we would have to write up, obviously, a format and somewhat indepth ruling, and then orally state it into the record. So that is the extent of it. It does require

preparation, but not as to particularly your motion. I think we can dispose of that in a few lines. So that is not at issue.

But since you do want a formal ruling, we will treat it as a formal motion.

MR. DOHERTY: Thank you.

JUDGE WOLFE: All right. We will recess then until 9:00 a.m. Monday morning.

(Whereupon, at 5:35 p.m., hearing in the above-entitled matter was recessed, to reconvene at 9:00 a.m., Monday, February 9, 1981.)

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This is to certify that the attached proceedings before the

NUCLEAR REGULATORY COMMISSION

in the matter of: HOUSTON LIGHTING & POWER COMPANY

Date of Proceeding: February 6, 1981

Docket Number: 50-466

Place of Proceedings: Houston, Texas

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Mary L. Bagby

Official Reporter (Typed)

Mary L. Bagby

Official Reporter (Signature)