impacts both continuing or alleged continuing harm. We're not talking about remedies here.

As you all know, there were motions filed before the Thanksgiving break, we ruled on those over Thanksgiving, and ordered a supplemental report from Mr. Scott. I'm going to allow Mr. Nance to go back into this legacy phosphorus issue.

We're going to take a break first. We're sitting at 10:45. We'll be in recess for ten minutes.

*(Short recess)*

**THE COURT:** Mr. Nance.

**MR. NANCE:** Thank you, Your Honor.

**REDIRECT EXAMINATION**

**BY MR. NANCE:**

**Q.** Sir, do you know the term "legacy phosphorus"?

**A.** I do.

**Q.** Will you tell the court how you understand -- what you understand legacy phosphorus to be?

**A.** Legacy phosphorus is phosphorus above the natural content that's a result of human activities.

**Q.** Okay. So it's a human creation and not a creation of nature?

**A.** Yes.

**Q.** Okay. Now, going back to basics, what is the significance of soil test phosphorus 65 on a field?

**A.** Generally speaking, land-grant universities establish

some level of phosphorus saturation that would meet all of the crop needs for that year. So in Oklahoma, 65 would be 100 percent of needed phosphorus for any crop grown.

**Q.** Okay. Now, if poultry litter is land-applied on a field that starts with 65 STP, does the STP go up?

**A.** Yes.

**Q.** And if it happens year after year after year, does it keep going up?

**A.** Yes.

**Q.** Now, we've talked about the STP not being the only phosphorus in the system; right?

**A.** Correct.

**Q.** There are the adsorb phosphorus and the chemically bound phosphorus and the reactions that make the equilibrium; right?

**A.** Right.

**Q.** Okay. If the soil test phosphorus goes up very high, then does the other kind of phosphorus go up high as well?

**A.** It should.

**Q.** Yes. And over a period of a long number of years perhaps, does that phosphorus leak out of the system and into water if there's water nearby?

**A.** It can depending on the soil's ability to tie up that phosphorus for long periods, many years.

**Q.** Okay. So the leaking phosphorus problem is one that will take many years to work itself out?

**A.** Yes.

**Q.** Okay. Let me share with you the court's finding of fact, 357, which he alluded to -- the judge alluded to, in that the judge said -- or the court said, "Even years after the cessation of poultry litter application, runoff water quality can be affected because of phosphorus stored in the soil."

Is that a true statement?

**A.** It is.

**Q.** I'm not talking about any remedy for that problem, but is the problem itself inexorable, will it just happen no matter what?

**A.** Are you talking about the excess concentration of phosphorus in runoff water?

**Q.** Yeah. The leaking of the phosphorus into the water.

**A.** It will continue to leak into the water until equilibrium is achieved in that soil.

**Q.** Okay. And if there's an awful lot of phosphorus in the soil, does it take an awful long time to quit?

**A.** It can.

**Q.** We'd all like to win a legacy or get a legacy. Let's talk about a legacy in the bank.

Is this storage of phosphorus that comes from land application like putting money into a bank account, a phosphorus bank account?

**A.** It can be.

**Q.** It can be. And is the taking of phosphorus from the phosphorus bank account to grow forages a withdrawal from the bank account?

**A.** Yes.

**Q.** So the total phosphorus in the soil, am I understanding correctly, is going to be the difference between what goes in and what comes out?

**A.** Right.

**Q.** And if it comes out in the Illinois River watershed, is it likely to get into the water?

**MR. TODD:** Objection, Your Honor. Your Honor, there's been no -- well, no foundation for an opinion specific to the IRW. This witness has -- well, first of all, no such foundation has been disclosed. Secondly, the witness has testified that whether phosphorus leaves a particular field requires a site-specific analysis, which they already testified he has not done. So this witness can testify generally about legacy phosphorus but he cannot give the opinion he was just asked for. Objection.

**THE COURT:** Sustained. Rephrase, please.

**MR. NANCE:** Just a moment.

**Q.** **(BY MR. NANCE)** Did your report on page -- just a moment -- 2 say that so long as poultry waste and phosphorus are land-applied in the IRW, phosphorus concentrations in the soil will continue to climb?

**MR. TODD:** Objection, your Honor. The report is hearsay. I don't dispute the report states that. The testimony -- the testimony here today confirms the witness can give that opinion, and if the witness is allowed to give that opinion, Your Honor, that is an undisclosed retained expert Rule 26(a)(2)(B) opinion that should have been the subject of a full expert report disclosed to defendants, to be challenged by our own experts, subject to deposition, subject to discovery in the proper course. This witness cannot state that opinion in this court. I object.

**THE COURT:** Rephrase the question, please.

**Q. (BY MR. NANCE)** Are you a retained expert? Are you being paid to be here other than your regular salary?

**MR. TODD:** Objection; calls for a legal conclusion.

**THE COURT:** I'm sorry?

**MR. TODD:** Legal conclusion, Your Honor. He can't testify as to what type of expert he is under the rules and "retained" doesn't necessarily mean paid. I'm happy to have that argument to the court as to who's what type of expert, but this witness I don't think can answer that question, although he can testify as to whether he's being paid.

**THE COURT:** Overruled. Are you being paid?

**THE WITNESS:** My regular hourly salary, yes.

**THE COURT:** All right. Let me just ask here: As a -- and we're not talking about specifically the IRW. But do

you understand here that the ODAFF allows phosphorus to be placed on the land up to 300 STP? Do you understand that?

**THE WITNESS:** Yes.

**THE COURT:** And you understand and you've established here that 65 STP is the agronomic need; correct?

**THE WITNESS:** Yes.

**THE COURT:** Okay. And do you remember Dr. Johnson? Did you ever work with him at OSU?

**THE WITNESS:** Knew of him, yes.

**THE COURT:** All right. Well, he had testified in the earlier proceeding that the limit ought to be 120 and I adopted that. I mean, very credible. But the Oklahoma ag department allows up to 300.

So just generally, if you have a situation with phosphorus applied up to the point where the soil test phosphorus is 300 STP and the agronomic need is 65, do you have -- and I'm sure the answer is complex depending on the gradient of the soil, etcetera -- but do you have an understanding of how long -- and I know part of your supplementary report talked about length and it seems to -- length of a legacy phosphorus, and it seems to depend on the topography, which is part what was geomorphologists do; correct?

So any idea of how long phosphorus would remain in the soil if the STP is 300 if no litter was applied from this point on?

**MR. TODD:** Objection, Your Honor.

**THE COURT:** Is it -- overruled.

**MR. TODD:** Thank you.

**THE COURT:** Overruled. Go ahead.

**THE WITNESS:** So if I have an STP of 300 today --

**THE COURT:** Yes.

**THE WITNESS:** -- the residence time for that is going to depend on how quickly I empty my bank balance.

**THE COURT:** Right.

**THE WITNESS:** If I empty my bank balance with corn, that balance will go down quicker than if I --

**THE COURT:** Okay. We have very little corn production in the IRW, okay? So I'm talking about --

**THE WITNESS:** Bermuda grass.

**THE COURT:** -- Bermuda.

**THE WITNESS:** Bermuda grass will remove about seven and a half to ten pounds of phosphorus per ton of hay per year. So a considered opinion that's been published would be that 30 years of hay would remove that 300 level down below the agronomic sufficiency.

**THE COURT:** How many years?

**THE WITNESS:** Thirty.

**THE COURT:** All right. Mr. Nance.

**MR. NANCE:** Thank you, Your Honor.

**Q. (BY MR. NANCE)** In that thirty years of haying the

property, would the hay have to be removed from the property?

**A.** Yes. It would require export --

**MR. TODD:** Objection, Your Honor. We're getting into remedies again.

**THE COURT:** Overruled.

**Q.** **(BY MR. NANCE)** You may answer. Would the hay have to be removed in order to reduce the STP in the ground?

**A.** Well, yes.

**Q.** Okay. So 30 years, if you're growing hay and taking it off the property, during that 30 years would the process that we've talked about -- I'm just going to call it "leaking phosphorus" -- if there's water available, would the phosphorus continue to leak into the water?

**A.** Yes.

**Q.** Okay. And if --

**MR. NANCE:** Well, that's argument. I'm not going to ask him that.

Your Honor, do you have a satisfactory understanding for yourself about the legacy phosphorus problem?

**THE COURT:** Let me ask: In your supplemental report, you seem to suggest that there is science for the proposition that our friend from Iowa talked about, that slope is a factor, the specific soil composition in a particular place is a factor; correct? And does it matter where in the topography the phosphorus has been deposited to determine the

time of the legacy that the phosphorus is leaving? In other words -- that's a poorly worded question. But does topography have an effect on the length of the legacy?

**THE WITNESS:** Yes.

**THE COURT:** All right. Could you expound on that generally? And I'm not talking about the Illinois River watershed, but just generally as a soil scientist, as a geomorphologist, how does that play a factor?

**THE WITNESS:** Current research has been looking at watershed-sized sites, and the important point that comes out of that is that the heterogeneity when you look at slope, soil type, the ability of the soil to absorb and fix phosphorus, the ability of sites to generate erosion creates a watershed system that is extremely complex and the residence time for dissolved phosphorus or particulate phosphorus is just highly variable within that watershed. The critical measurement point is where the water exits the watershed system. That would be the summation of all of the contributions and entrainments.

**THE COURT:** Well, if there's a terminal lake and phosphorus that is adsorbed to the soil is eroded by streambank erosion, what form does that phosphorus take in lakebed sediments?

**THE WITNESS:** It is held in place until anaerobic biochemical reactions can release it out of those sediments as dissolved phosphorus.

**THE COURT:** Mr. Nance, anything further?

**MR. NANCE:** Sir?

**THE COURT:** Anything further, sir?

**MR. NANCE:** No, sir. I think you've -- I think you've -- I've done all I can.

**THE COURT:** All right. Mr. Todd. Hold on. I'm sorry.

*(Discussion held off the record)*

**THE COURT:** Yes, sir.

**MR. TODD:** Your Honor, before I start, I don't believe I've ever objected to a judge's question before and --

**THE COURT:** You've done it a couple times here.

**MR. TODD:** And I want to apologize to the court. I meant no disrespect. I have a record to make.

**THE COURT:** Well, I mean, the first time it was clear that his opinion related both to horizontal and vertical transportation of phosphorus. So let's just use a little judgment. Go ahead, Mr Todd.

**MR. TODD:** Your Honor, I believe there's a difference between groundwater and what --

**THE COURT:** Let's proceed.

**MR. TODD:** Yes, sir.

**RECROSS-EXAMINATION**

**BY MR. TODD:**

**Q.** Mr. Scott, clear one thing up for us. What is a