STATE OF MISSOURI

PUBLIC SERVICE COMMISSION

TRANSCRIPT OF PROCEEDINGS

Evidentiary Hearing
April 2, 2014
Jefferson City, Missouri
Volume 7

In the Matter of the Application of Union Electric Company d/b/a Ameren Missouri For Permission and Approval and a Certificate of Public Convenience and Necessity Authorizing it to Construct, Install, Own, Operate, Maintain and Otherwise Control and Manage a Utility Waste Landfill and Related Facilities at its Labadie Energy Center.	File No. EA-2012-0281

MORRIS L. WOODRUFF, presiding,
CHIEF REGULATORY LAW JUDGE
ROBERT S. KENNEY, Chairman,
STEPHEN M. STOLL,
WILLIAM P. KENNEY,
DANIEL Y. HALL,
COMMISSIONERS.

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P R O C E E D I N G S

(WHEREUPON, the evidentiary hearing began at 8:30 a.m.)

JUDGE WOODRUFF: We're back today for one more witness, Mr. Gass, but before we went on the record there was a discussion indicating that Mr. Norris wanted to take the stand again, so we'll bring Mr. Norris up.

Good morning, sir, and you are still under oath from yesterday.

JUDGE WOODRUFF: You may inquire.

CHARLES G. NORRIS, P.G. testified as follows:

ADDITIONAL TESTIMONY BY MS. LIPELES:

Q. Mr. Norris, do you have anything to add to your testimony?

Mr. Norris -- I'm sorry. I wasn't on.

Do you -- I understand that you want to correct something that you said yesterday. Could you please do so.

A. Yes, at least something I may have said yesterday. I'm not sure. But when I woke up this morning, I have an uneasy feeling that I may have misstated something at the end of my testimony last -- yesterday.

When I was discussing the flow within the alluvial aquifer, as characterized by Ameren's

engineers, I was discussing the fact that for the southern monitoring wells, they interpreted the aggregate flow direction over the course of a year, considering all of the individual flow measurements, as being toward the bluffs instead of toward the river, and that is correct.

I think I may have also said that that flow direction was to the east southeast. It's to the east southeast during the most severe movements of the -- during the course of the year, but the aggregate over the course of the year is still toward the bluffs but it's to the north northeast, not the east southeast.

And because I gave a specific direction I wanted to make sure that -- that I had the right direction in the record and I don't know that -- I don't know that I did.

JUDGE WOODRUFF: Okay. Anyone wish to cross-examine based on that clarification?

MR. TRIPP: Yes, Your Honor.

JUDGE WOODRUFF: Go ahead.

CROSS-EXAMINATION BY MR. TRIPP:

Q. Isn't it true, Mr. Norris, that the flow goes south southeast during high flood conditions or high water conditions?

A. During the summer months that's when the east

southeast direction -- compass directions, correct.

Q. But the general flow is toward the river?

A. No, not for the southern -- not for the southern wells.

MR. TRIPP: All right. Thank you.

JUDGE WOODRUFF: All right.

Any Commission, questions for this witness?

I'll clarify --

COMMISSIONER KEENEY: Since I have no idea what he's talking about --

JUDGE WOODRUFF: I'll explain. Before -- as you were coming down, Mr. Norris indicated that he may have misstated something in his testimony yesterday and he wanted to come back on the stand to clarify that.

COMMISSIONER KEENEY: No problem.

JUDGE WOODRUFF: And it was about the flow of the water in the aquifer, in the alluvial aquifer.

COMMISSIONER KEENEY: No questions. Thank you.

COMMISSIONER STOLL: No questions.

JUDGE WOODRUFF: All right.

Then you may step down.

THE WITNESS: Thank you.

JUDGE WOODRUFF: And then we're ready for Mr. Gass.

Please raise your right hand and I'll swear you in.

(Witness sworn/affirm.)

JUDGE WOODRUFF: Thank you.

TYLER E. GASS testified as follows:

DIRECT EXAMINATION BY MR. TRIPP:

Q. Sir, would you introduce yourself for the record?

A. My name is Tyler E. Gass.

Q. And, sir, what do you do?

A. I'm a hydrogeologist.

Q. And are you the same Tyler Gass that caused to be prepared for filing in this action surrebuttal testimony that we've labeled as Exhibit No. 10, sur-surrebuttal testimony we've labeled as Exhibit 11 and supplemental testimony we've labeled as Exhibit 12?

A. Yes.

Q. And is that testimony true and correct to the best of your belief and knowledge?

A. Yes, it is.

Q. Mr. Gass, if I were to ask you those same questions that are in your prefiled testimony today, would your answers be the same?

A. Yes, they would.

MR. TRIPP: Your Honor, we move into evidence

Exhibits 10, 11 and 12.

JUDGE WOODRUFF: 10, 11 and 12 have been offered.

Any objections to their receipt?

Hearing none they will be received.

(AMEREN MISSOURI EXHIBIT NOS. 10 THROUGH 12 WERE RECEIVED INTO EVIDENCE.)

MR. TRIPP: I tender the witness for cross-examination.

JUDGE WOODRUFF: Okay.

And for cross we begin with Staff.

MR. WILLIAMS: No questions.

JUDGE WOODRUFF: Public Counsel.

MR. MILLS: I have no questions.

JUDGE WOODRUFF: LEO and Sierra Club.

MS. HUBERTZ: Yes, we have some questions.

I'm going to move up here if that's okay.

JUDGE WOODRUFF: That would be great.

CROSS-EXAMINATION BY MS. HUBERTZ:

Q. Good morning, Mr. Gass. My name is Liz Hubertz, and I represent LEO and the Sierra Club, the intervenors in this case.

A. Good morning.

Q. Just to clear one thing up right out of the way, are you licensed as a professional geologist in

Missouri?

A. No, I'm not.

Q. Okay. Are you're licensed as a professional engineer in Missouri either, are you?

A. No, I'm not.

Q. Okay. I just wanted to clear that up.

Now, you had agreed with the question in your surrebuttal testimony, and that's at page 6, lines 4 through 10 if you'd like to follow along, that Ameren has proposed an effective groundwater monitoring network with a sufficient number of upgradient monitoring wells to prevent identification of changes in groundwater quality in the vicinity of the UWL, utility waste landfill.

Do you see where that testimony is?

A. Yes.

Q. Okay. And is that your testimony today?

A. Yes, it is.

Q. Okay. And the purpose of a monitoring well network is to provide early detection of any chemical compounds that could potentially migrate into the groundwater?

A. The purpose of the detection monitoring system is to detect early.

Q. And is that the type of monitoring well

system that rings the utility waste landfill at Labadie?

A. Yes.

Q. Okay. Thank you.

And there's no equivalent groundwater monitoring or detection network in place that would permit identification of changes of groundwater -- groundwater quality in the vicinity of the existing coal ash ponds at the Labadie plant?

A. There is no specific system that was designed to do that around the coal ash ponds.

Q. Okay. So it's not like there is wells that ring the ponds the way there are at the proposed landfill site?

A. That's correct.

Q. Are there any upgradient groundwater wells in the vicinity of the existing ash ponds that would permit identification of changes in groundwater quality?

A. Could you rephrase that?

Q. Well, that's -- yeah.

Are there any upgradient wells from the existing ash ponds?

A. No, there are not.

Q. Okay. Do you consider the -- you refer to three bedrock monitoring wells in your sur-surrebuttal testimony at page 2, line 6. They're described as being

upgradient from the ash ponds I believe. Why don't you take a look.

A. What page was referenced?

Q. I had sur-surrebuttal, page 2 on -- let me check.

Yeah, three bedrock monitoring wells.

A. Yes. And I -- I believe it states that they are upgradient of the UWL.

Q. Okay. Are they also upgradient of the ash ponds, if you know?

A. They're not directly upgradient of the ash ponds.

Q. Okay. Thank you.

Well, are they -- are they downgradient of the ash ponds?

A. No, they're not.

Q. Okay. Is the proposed landfill site downgradient of the ash ponds?

A. At -- at certain times of the year they appear to be, based on the groundwater flow data, the ash ponds would be down-- upgradient of the landfill.

Q. Thank you.

Okay. I think you started to answer this, but are there any wells downgradient of the ash ponds that could detect chemical compounds that could

potentially migrate from the ash ponds?

A. Yes, there are wells that were installed along the west edge of the UWL that could potentially encounter groundwater coming from beneath the ash land-- ash ponds.

Q. Okay. And at page 12 of your surrebuttal testimony, lines 14 to 15, you had stated -- and I'm sort of paraphrasing -- that the results of two separate rounds of sampling from the 28 monitoring wells installed by Ameren that ring the proposed UWL site are indicating that there has been no impact to the UWL area from the ash ponds over the last 40 years.

Do you see where that is?

A. Yes.

Q. Okay. The rounds of sampling at the wells -- when you mention the wells along the less-- west edge of the proposed landfill site, are those wells sampled during the two rounds of monitoring from the 28 monitoring wells?

A. Yes, they were.

Q. Okay. And I believe results of the monitoring were found in Schedule 13 that was attached to Lisa Bradley's testimony. And I have a copy of it if you don't have that with you. I don't think it was attached to your testimony. But you refer to it there

on page 14.

I say that with confidence. It may be misplaced.

No. Here we go.

MS. HUBERTZ: May I approach?

JUDGE WOODRUFF: You may.

MS. HUBERTZ: I'm not going to have the -- it's already . . .

BY MS. HUBERTZ:

Q. This was attached to Lisa Bradley's prefiled testimony, so it's already in evidence.

Okay. And if you can turn to the -- it's Table 2 and it's, like, the third from the -- it's the page that's third from the end.

Okay. And just before I get into this, you didn't do any independent testing of the groundwater at the Labadie plant site, did you?

A. No, I haven't.

Q. Or the proposed landfill site. Right?

A. No.

Q. Okay. All right. So Table 1 I believe depicts the first round of sampling that was done by Gredell and Reitz & Jens. Looking at that do you agree?

A. Yes.

Q. Okay. And so Table 2 shows that at 11 out of

the 29 wells exceeded the EPA's regional screening level for arsenic and an additional 8 exceeded both EPA's maximum contaminant level and the regional screening level for arsenic.

And I'm sorry to make you count in public, but that's -- that's the numbers that I came up with.

So 11 in green and an additional 8 in blue?

A. Is there a question?

Q. Yes. I was asking if you could agree with that.

A. Yes.

Q. Okay. Thank you.

And is arsenic one of the chemical compounds found in coal ash?

A. Yes, it is.

Q. Now I'll flip ahead and take a look at Table 3, the next table in this exhibit, and this is the August -- results of the August 2013 round of sampling at the same wells.

And in the arsenic column 14 out of 29 wells exceeded either EPA's regional screening levels or both the regional and maximum contaminant levels.

Does that appear to be correct?

A. That appears to be correct --

Q. Okay.

A. -- but there is not necessarily a correlation between these arsenic levels and either the ash ponds or the proposed UWL.

Q. Well, right now I was just asking if that was correct, so it is.

Okay. And just to be -- these are shallow wells, the wells that we're talking about on this -- that were sampled as part of this groundwater -- two rounds of groundwater monitoring?

A. That's correct.

Q. And by shallow, as I understand it, that means that the water table was sampled at depths of less than twelve feet?

A. That's not correct.

Q. Okay. What depths were they sampled?

A. These wells were typically screened between 16 and 25 feet.

Q. Okay. And do you know where they were sampled? Were they sampled at the screen level or were they sampled higher?

A. I'm not sure what depth they took the sample, but it would not really matter because they purge the wells of water that is stagnant, bring in freshwater in through the screened interval.

So whether you're sampling above the screen,

which is quite common or within the screen interval, it is still water coming in from the aquifer adjacent to the screened interval.

Q. Okay. All right. Now, you had also testified about Ameren's -- in your supplemental testimony at page 3, line 11, about Ameren's addition of seven groundwater monitoring wells to the revised construction permit application.

Do you remember that?

A. Could you read -- please, repeat the page and line number.

Q. Sure. It's page 3, line 11, but I don't think there's actually line numbers in this one.

A. Nor do I have line numbers on mine.

Q. Okay. I think I just counted the lines, so it's kind of, like, almost halfway down the page.

You were talking about the addition of seven groundwater monitoring wells to the revised construction permit application?

A. Yes.

Q. Okay. And this included the addition of three deep wells, if you recall?

A. That's correct.

Q. Okay. And you testified -- and this is at page 5 near the top, that the three deep wells were

added on the theory -- and I understand you don't agree with the theory -- that contaminants may migrate vertically down and evade detection by the other 28 wells. Is that correct?

A. My understanding in reviewing the Andrew Engineering reports basically was the deep wells were in part to -- were basically requested to define the vertical hydraulic gradients of the area.

Q. Okay. Had the vertical hydraulic gradients been defined before?

A. Not directly. In an environment such as this where you have primarily during the course of the year a gaining stream -- and a gaining stream is a stream in which groundwater contributes, so it's called a gaining stream because groundwater is flowing into it -- that gradients in these areas -- if you look at textbooks, almost every textbook has a classic river valley scenario, and they all have a slight upward gradient as groundwater flows in towards the river.

Q. Okay. I think we'll get to that in a minute, but me let me ask you first here: It is -- is it pos-- is it at least a possibility -- is the downward migration of contaminants into the water table at least a possibility in this setting?

A. No.

Q. Not at all?

A. Not at all.

Q. Okay. And you had testified earlier -- at your supplemental testimony, page 5, you had said that the horizontal conductivity of the aquifer is one or two orders of magnitude greater than the vertical conductivity of the aquifer. Is that right?

A. That's correct.

Q. Okay. And -- but you had also said earlier in your sur-surrebuttal testimony, page 4, line 5, that the aquifer's ability to transmit water within the aquifer is 10 to 100 times the -- its ability to transmit water vertically. Is that correct?

A. I'm not following you because I'm not going through it, but let me -- let me clarify, because both reports should have said the same thing, that -- that the ability to transmit water horizontally in an alluvial aquifer with this type of sediment is typically 10 to 100 times the capability of the formation to transmit a fluid vertically. So the preferential flow tends to be horizontal.

Q. Okay. And in order to figure out horizontal flow, you need to multiply horizontal gradient by horizontal conductivity to get horizontal flow. Is that correct?

A. In lay terms that -- that will pass.

Q. Okay. Well, that's the -- believe me, they had to dumb it down for me, so I appreciate that.

So you need to know the horizontal conductivity, which is what you were just talking about, right, with the -- that's the 10 to 100 times greater than the vertical conductivity?

A. That's correct.

Q. Okay. And then you also need to know the horizontal gradient because you're going to multiply the gradient by the conductivity in order to get the flow. Is that right?

A. That's correct.

Q. And there may be -- there may be some other things in there, and it's much more complicated than people like me understand but I wanted to get the basic concept there.

And the same is true for vertical flow. Correct? You multiply vertical conductivity by vertical -- I'm sorry -- vertical gradient by vertical conductivity and you get vertical flow. Is that correct?

A. That's correct.

Q. And then you can sort of plot the results of the two, so it's like horizontal movement over 10 or

over 100, vertical movement down, you know, 1 or 10, and then you've got a line like that -- I'm sorry. I'm indicating because I don't know any better way of doing it.

A. Would you like me to explain hydraulic gradient?

Q. Probably not. You can tell -- your lawyer can ask you to explain it, but for right now I'm just trying to -- as I understand it, it's sort of like plotting things on an X, Y basis.

You have horizontal, you have vertical and from that you can determine where the water flows?

A. Yes.

Q. Okay. All right. Do we know the horizontal gradient in the aquifer beneath the Labadie plant or the proposed landfill site?

A. We know the horizontal gradient, the average annual horizontal gradient.

Q. It's going to vary from month to month?

A. It does vary from month to month.

Q. And do we know the vertical gradient?

A. No, we do not know the vertical gradient.

Q. So -- okay. So we have -- we can multiply -- do the first one then. We know horizontal gradient because that's been measured. We know horizontal

conductivity, or at least based on -- you -- you feel confident about horizontal conductivity. So we can figure out horizontal flow. Right?

A. Right. We have -- we've actually -- Ameren has done -- when they put in the original 100 piezometers, many of them were tested for hydraulic conductivity values throughout the area, so that's the -- the average of those was what was used to determine a representative hydraulic conductivity.

Q. Okay. And that makes sense.

And so we don't know vertical gradient, right, and we sort of know vertical conductivity because you said it's 10 to 100 times less than ver-- than horizontal conductivity. Is that right?

A. That's correct.

Q. Okay. So we can call that -- I guess call that an estimate. Has it been measured?

A. No, but it's -- typically -- it's representative. Again, it's hydrogeology 101 and --

Q. Right. And that's -- in this kind of -- because conductivity varies under conditions. Right?

I mean, the conditions of the soil through which the water is moving, you can have different conductivity levels?

A. I'm not sure I'm understanding you or you're

explaining it correctly.

Q. I know. It may have been dumbed down a little bit too much.

But my understanding is as soil conditions vary, like the difference between sandy soil and soil with, like, shale or clay in it, the conductivity also varies; it's just harder for water to move through some soils?

A. That's correct. In an alluvial formations of this nature, hydraulic -- the materials tend to be heterogeneous. They vary both with horizontal lateral distance and they vary with vertical distance. So no one point is a lone representative of what the hydraulic conductivity would be.

Q. Okay. So when you're -- you're basing -- you're guessing -- guessing is not right. You're estimating the vertical conductivity because you know what it's like in this kind of soil and this kind of aquifer?

A. In this particular situation, if I were designing a groundwater monitoring network for this site for a detection groundwater monitoring network, I would not be concerned at this point in time with the vertical hydraulic conductivity.

And back in the late 1970s I actually

assisted EPA in writing the guidance document for groundwater monitoring around RCRA facilities, both dealing with detection and assessment monitoring.

And all that we looked at in that point in time was putting in wells in proximity to where we thought we'd be most likely to encounter groundwater contamination if a release occurred at a RCRA facility. And that is what was done here. That's consistent with the MDNR regulations.

Q. I under-- and that's based on the horizontal flow. Correct?

A. It's based on the horizontal flow.

Q. Okay. And the vertical flow, one part, the gradient hasn't been measured and we can estimate what the vertical conductivity is but we would have to put a question mark as to what the vertical flow actually is at this site?

A. We don't have quantification of a vertical gradient at this site.

Q. Okay. Now, you've testified that the bottoms of the shallow monitoring wells were at 16 to 25 feet. Correct?

A. Yes.

Q. And I think they were sampled higher but you don't think that that matters, so I'm not going to go

into a detailed description of where the intake tubing actually was at each of these wells, but that's --

A. You have to understand the sampling procedures. You purge the well of several volumes of groundwater before sampling it, so that the water you pull in is fresh and representative of the aquifer in the vicinity of the intake portion of the well.

You don't want to sample too deep and sometimes you don't want to sample within the well screen because you may get fine materials.

So whether you sample in the well screen or sample above the well screen isn't really relative. The water in the column within the well, from the top of the water table surface in that well down to the screen at the point you sample is hemogenous.

Q. Okay. And you obviously can't sample water that is below the water of the well, below the bottom of the screened area, because the well doesn't go down that far?

A. That's correct.

Q. That's -- I know. That's -- I think that I have dumbed this down so much that you are having trouble answering my questions but that's okay.

So I'm going to take your figures about the mov-- the conductivity being 10 times -- 10 to 100

times greater in a horizontal direction than it is in a vertical direction.

So for those of us who are not good at math, that means that it moves 100 feet in a horizontal direction and moves one foot in a vertical direction. Is that correct?

A. That's very good.

Q. And then you have a thousand feet, it's ten feet. Correct?

A. Yes.

Q. Okay. And we can just do all of these numbers. So if it's 1,600 feet, 16 --

A. But you're -- you're -- you're forgetting a component of the equation, which is what is the gradient.

Q. Well, but we don't know what the vertical gradient is.

A. Well, we could assume in this type of environment that it's going to be an upward gradient.

Q. Okay. That's your -- we don't know. It hasn't been measured. That's -- your guess is that it's going to head up rather than down?

A. Based on the many sites I've worked, in alluvial systems, near rivers and streams, and based on almost every textbook we could open up, this is the

scenario you're going to find.

Q. Okay. It's heading up and not down?

A. Yes.

Q. Do you know how far the closest point of the unlined ash pond is to the monitoring well that is closest to the -- the monitoring wells that ring the proposed landfill site is to the -- let me start over. That's a horrible question.

All right. The nearest point of the existing ash ponds and the nearest monitoring well of the 29 monitoring wells that ring the proposed ash pond site.

MS. LIPELES: Proposed landfill site.

MS. HUBERTZ: What?

MS. LIPELES: Proposed landfill site.

MS. HUBERTZ: Proposed landfill site. I'm sorry.

THE WITNESS: If I understand your question, you're asking me what is the distance between the unlined ash impoundment. Is that correct?

BY MS. HUBERTZ:

Q. Correct.

A. And the closest monitoring well?

Q. Yes.

A. I actually haven't measured it, but I'd say

it's probably 1,500 to 2,000 feet perhaps.

MS. HUBERTZ: I think I came up with over 2,000 but that's probably in that neighborhood. Okay.

Actually, I believe that's all I have.

No. It's not all I have. Hold on.

I had to meet with my lawyers.

BY MS. HUBERTZ:

Q. As I understand it, the mon-- the 29 monitoring wells were using low-flow techniques which draw water from a precise interval in the screen. Is that your under-- so the wells weren't purged. They were drawn in this low-flow technique. They're measured at a precise point. Is that your understanding?

A. At my age I don't want to challenge my memory, but I was told they used a low-flow technique but the wells were purged before sampling.

Q. Okay. If they weren't purged, would that change your testimony?

A. If they did a low-flow technique and they sampled within the screen interval, it would not change my testimony.

Q. Okay. If they sampled above the screen level, would it?

A. It depends on how far above, but ordinarily it's not -- again, it's a function of the process of how

much water was removed during a sampling process even if they used the low-flow technique.

Q. Okay. And returning to the discussion of gradients, which I admit is not my strength here.

All right. As I understand it, you said that the gradient would be upward within the alluvial aquifer around the area of the ash ponds. Is that correct?

A. For most of the year, yes.

Q. Okay. Now, as I understand it, water flows downgradient to the river and that's the -- and that's the direction that most of the alluvial aquifer is going. The river -- the water under the river might be flowing up but the water above the river is going to be flowing down because the water wants to get to the river.

So is that -- am I being correct in that?

A. If I could explain, if I may.

Q. Okay. This may help.

A. All right. We -- we start with groundwater in the Ozark aquifer system, which is basically --

Q. The bedrock aquifer?

A. -- the bedrock, if that -- that pleases the court.

The bedrock aquifer system and the water levels in the bedrock aquifer system are higher that is

flowing down and begins to come up as it approaches the stream.

In the alluvial formation primarily -- in this type of environment you'll primarily see horizontal flow with the shallow horizontal gradient. And, again, as it approaches the stream, the flow lines begin to curve upward in towards the stream.

So to say that it's just flowing down, the surface would be in a downward direction, but at depths you would see it migrating out.

And a great example of this would be when I was a teaching assistant, I took my students out to a stream -- actually -- well, I don't know whether you'd call it a stream or a creek. It was about 20 feet wide.

And the challenge was to put a pipe in the ground -- it was a four-inch pipe -- and the water table was very shallow adjacent to the stream, and you measure the water table in there from the depth of the -- the top of the pipe to the water level, and then you do the same thing -- a similar situation, because the rock -- the pipe is right adjacent to the stream.

And it's equal. And I said -- I asked them to say, is the water level -- what happens when we drive this pipe down three feet into the ground?

And most of them said it would still be the

same. Some of them said it would drop. Some of them said it would go up.

Well, in reality, in a gaining stream situation, where groundwater is flowing into the stream, as you drive it down -- it doesn't have to be directly in the stream because I didn't feel like getting wet.

Driving the pipe down adjacent to the river, we saw the water level rise in the pipe above the level of the stream.

The reason being that you keep on encountering higher and higher hydraulic head because that water wants to push up into the stream.

Q. Okay. I think that I understand.

And you consider the existing ash ponds to be adjacent to the river?

A. I didn't say they were adjacent to the river. I'm just giving an example because --

Q. Okay. I'm just trying to clear -- you're saying that is what is going on at the existing ash ponds, though. Is that your testimony?

A. I believe the flow -- I'll state that the flow is horizontal at the existing ash ponds.

Q. Okay. But you're saying that it becomes positively vertical as it approaches the river?

A. It doesn't become vertical. There's a

vertical component --

Q. Okay.

A. -- a small vertical component as you begin to approach the river.

So you have -- have your overriding horizontal component. That's clear. But as you approach the river --

MR. WILLIAMS: If I may --

MS. HUBERTZ: This has been -- yeah, this has been introduced --

MR. WILLIAMS: This is Exhibit 1000, 1000.

MS. HUBERTZ: -- before and I may have to take a closer look at it, but I'll let you --

JUDGE WOODRUFF: Just so the record is clear, the counsel for Staff handed Exhibit 1000 to the --

MS. HUBERTZ: It was a Commission exhibit.

JUDGE WOODRUFF: Yes.

THE WITNESS: And this -- this is almost a textbook diagram. This is what you would find.

Most of your flow is -- is horizontal as you're moving from the bluffs to the river. As you get close to the river, not necessarily beneath the river, but as you begin to get close to the river, there is going to be a small component of vertical flow; that is, the heads will want -- are going to want to push the

water upwards.

Part of that is resisted by just the simple fact that the hy-- the horizontal hydraulic conductivity is much higher than the vertical hydraulic conductivity, but the tendency, the potential, is that the flow is going to be upward into -- towards the stream as you approach the stream.

BY MS. HUBERTZ:

Q. Okay. And is that represented by those two -- there are two little arrows towards the right-hand side of the yellow level in this cross-section that are right next to and right -- or sort of right below the Missouri River there.

Is that what you're referring to when you say this is a textbook example?

A. It's a -- yes, that's -- well, I'm actually -- I mean, this is not the best representation but it's a reasonable representation. Yes, that's what I'm referring to.

Q. Okay. And the monitoring wells are further back towards the bluff from that area on this map. Correct?

A. The monitoring wells are further back towards the facility.

Q. And not in the area where the upward arrow is

that we just talked about?

A. That is purely -- this is a model for convenience, a person such as yourself, but if I were looking -- if you looked --

Q. I am going to try not to be offended at that.

A. Please don't.

You -- you tried to simplify it. I'm really trying to be -- I'm not --

Q. No. I understand. It's just that you said that this map was a textbook representation --

A. It is a text--

Q. -- and if it's not, that's okay.

A. Okay.

Q. We can close it and go home right now. So that's --

A. So let me -- let me try to explain it.

If -- if you go to the point -- and I don't know if the Commissioners have this in front of them.

If you go to the point where you see MW-1 and P-1 printed on the land surface, and if you -- you see an arrow there that is primarily horizontal, I would opine that that would actually be slightly up at that particular point in time.

Q. Okay. So it's not shown that way on this map but you think it's close enough to the river that it

would be up?

A. Yes. And you're also seeing it in the bedrock occurring in that particular issue. If we're going to be specific about the arrows, you know, you begin to get that upward movement. The bedrock goes from just flowing horizontally to slightly moving upward.

Q. Okay. But no one has taken measurements to know whether that's true. Correct?

A. That's -- that's correct.

Q. Okay. So we don't actually know what the vertical flow is because we need to know the gradient and the conductivity. Correct?

A. Right.

MS. LIPELES: Okay. That's it. Thank you. That's all I have.

JUDGE WOODRUFF: All right.

Questions from the bench.

Mr. Chairman.

QUESTIONS BY CHAIRMAN KENNEY:

Q. Good morning, Mr. Gass.

A. Good morning.

Q. So a person such as myself who has been using this map all week, so if there is something wrong with it, I'm in trouble because it's been right propped up

here.

Let me just ask you a few questions about -- I'm going to turn to your supplemental testimony --

A. Sure.

Q. -- which was your last piece of testimony, the January 2014, and I want to look on page 2 and ask you about your conclusions.

These are the same conclusions I think you rendered in your rebuttal testimony, your surrebuttal testimony, and you rendered them again in light of the amended CPA, but they remain the same. Correct?

A. Yes.

Q. So let me -- I want to ask you first a separate question.

To the extent that there are elevated levels of arsenic, is it your opinion -- and this was noted on those three tables where the arsenic levels were elevated. You had a conversation with counsel about that at the beginning of your testimony. Do you remember?

A. Yes.

Q. Is it your opinion that that's not due to any contamination caused by the existing ash impoundments?

A. That's correct, because of the distribution

where those elevated levels appear. So you'd expect it to be -- all of them to show up closest to that area, the wells that are nearest to the ash ponds, but you don't see that distribution. It tends to be variable.

So it's my opinion that this is characteristic of natural groundwater because of the geochemistry or possibly some of the influences of arsenic that may be present in the Missouri River.

Q. From what source though?

A. Agricultural sources.

Q. Because it's elevated, right, so it's more -- it's more than background level?

A. It's elevated.

Q. And so it's more than background level?

A. No. It's -- it's -- in the alluvial system those are the background wells. Some of the wells where we have -- most of them are not -- most of them -- there is no set pattern is what I'm trying to say, I guess is the best way of saying it.

You find some on the west side of the proposed footprint of the landfill. You find some on the east side. You find some up on the north side.

Q. So it's your opinion that it's either background levels, naturally occurring arsenic or agricultural sources?

A. Potentially agricultural sources I'm sure.

Q. How confident are you in that opinion?

A. I'm -- I'm more confident that it's background levels than agricultural sources, but, you know, I've dealt with areas where arsenic has been used pervasively in pesticides, and very often we have high concentrations in groundwater in alluvial systems in those areas.

Q. Did Ameren take any additional steps to isolate the source of that arsenic?

A. Not that I'm aware of.

Q. Okay. So now let me look at your conclusions, and if you look at the top of page 3, your four bullet points there.

And the third bullet point says that the design of the proposed utility waste landfill essentially isolates the coal combustion products from the effects of high groundwater levels or flood waters.

I want to restate it in a way that I understand and you tell me if I'm correct.

Are you saying that even if there is a flood, that the CCPs would not cause any kind of groundwater contamination because of the design of the utility waste landfill?

A. In reference to the utility waste landfill,

yes. It's -- and I think I perhaps explain this best in my surrebuttal report, the original surrebuttal report, where essentially you have a liner system that far exceeds regulatory requirements.

Q. Right.

A. So it's -- it's basically the liner system both composite -- the plastic liner is twice what is required in thickness, and the clay liner is 100 times less permeable than it's required by regulation.

Q. So you have the plastic composite and then you have the clay below that?

A. Right.

Q. So you're saying that even in a flood that state-of-the-art technology would prevent contamination?

A. That's correct.

Q. Now, is it your hydrogeologic opinion that contaminants cannot migrate vertically? Is that a more simplified way of saying what you guys were saying earlier?

A. And there are cases where it does. So we have compounds that are pulled dense and equally as phase liquids, that are so dense they sink through the water table even against hydraulic gradient. So there can be vertical migrations of compounds in certain environments.

Q. Like heavy metals? What would that be?

A. It would -- it tends to be compounds like solvents, chlorinated solvents, for example. The density of them could be up to twice the density of water. They tend to sink.

PCB's com-- you probably all have heard of polychlorinated biphenyls. They are heavier than water and tend to sink through water. So that if you poured them into a glass, you would watch it just sink to the bottom of the glass.

So those -- under those circumstances you would have a condition where it would migrate downward.

Q. But the contaminants that we typically associated with coal combustion residues or coal combustion products those would not migrate vertically?

A. Not typically. They dissolve, and at the concentrations they dissolve, then they continue -- they would not create a dense plume.

Q. So you also opined that the addi-- so Ameren installs seven additional groundwater wells, monitoring wells, at the suggestion of Andrews Engineering. Right?

A. That's correct.

Q. Three shallow and four deep or four shallow --

A. I believe it's four deep -- four shallow and

three deep.

Q. And you say those are unnecessary?

A. I don't think they dramatically changed anything. I mean, it's always nice to have additional points of data, but from the standpoint of improving the effectiveness of the tech (phonetic sp.) groundwater contamination, I don't believe they added to the existing -- the preexisting system.

Q. All right. Now I want to ask you some questions about your experience in cases that you've testified in and how much you're charging for your services and those kinds of questions.

A. Okay.

Q. I expect you were deposed and some of these questions may have been asked of you but I don't know so I'm going to find out.

So I want to look at your surrebuttal testimony, which is where I believe your CV is and a list of cases that you've worked on, representative and relevant experiences.

Starting on -- it's Exhibit 8 of your surrebuttal testimony. Right? Do you got it?

A. Yes.

Q. And there are about 19 cases that are listed there, if I counted them correctly, representative

litigation support activities, and there's a RCRA compliance program and then there's a list of some additional cases, but there are about 19 cases listed there.

And I think you said that is a representative sampling of cases. How many cases have you provided litigation support activities in total, if you could estimate?

A. I probably would assume four or five times that amount.

Q. Okay. So it's substantially more than that list there?

A. That's correct.

Q. And then of those 19 cases that are listed, if I was correct in my reading, none of them were on behalf of environmental organizations, is that correct, or were there any?

A. There were three cases where I either represented individuals who were harmed --

Q. Okay.

A. -- or represented a class action lawsuit against the utility company --

Q. Okay.

A. -- and a town that was looking into whether or not their landfill had contaminated their groundwater

supply.

Q. And then of the -- five times 20 would be, like, 100 cases. Of the 100 cases, or approximately, how many times have you testified for utilities versus a group like Sierra Club, if you could just estimate?

A. Yeah. I would say I probably had the opportunity to work for independent groups such as LEO or working for a town that may have been impacted by a system or an individual probably three to five times.

Q. Out of the total 100?

A. Out of the total 100.

Q. And then I'm assuming you don't work for free, so what do you -- what did you charge Ameren to prepare your three pieces of testimony?

A. $365 an hour.

Q. And are -- do you charge the same rate to appear here at hearing or is that more?

A. No. It's the same rate.

CHAIRMAN KENNEY: All right. Well, I appreciate your time and expertise, and I don't have any additional questions. Thank you.

THE WITNESS: You're welcome.

JUDGE WOODRUFF: Commissioner Stoll.

COMMISSIONER STOLL: Mr. Gass, thank you for your testimony and I have no questions, but I wanted to

say that I did appreciate the review of some of the concepts that I learned in the geology class that I took at the University of Missouri-Columbia as an undergraduate and very much appreciated that. Thank you.

THE WITNESS: You're welcome.

JUDGE WOODRUFF: Commissioner Kenney.

COMMISSIONER KENNEY: I have no questions. Thank you, Mr. Gass.

JUDGE WOODRUFF: Commissioner Hall.

COMMISSIONER HALL: Just a few.

QUESTIONS BY COMMISSIONER HALL:

Q. Good morning.

A. Good morning.

Q. I note in your surrebuttal testimony on page 6, and -- and I think you even alluded to this or said it expressly a couple times this morning, lines 10 and 11.

You say Ameren Missouri's proposed detection groundwater monitoring network meets or exceeds all regulatory requirements. Is that correct?

A. That's correct.

Q. So I assume from that that you are generally familiar with DNR regulations concerning utility waste landfills?

A. That's correct.

Q. Okay. Well, my questions relate to the monitoring, the testing -- that may be redundant -- and the reporting to DNR.

What -- what are the DNR requirements for reports of this monitoring program?

A. I believe they require quarterly monitoring be performed and that a report containing the data that is generated submitted to them.

Q. And are those -- are those requirements also applicable for the existing ash ponds?

A. No.

Q. Why is that?

A. Currently there don't appear to be any regulatory requirements in terms of monitoring around ash impoundments.

Q. That seems odd to me. Does that seem odd to you?

A. It does seem odd to me.

Q. So the only testing that's been done by Ameren on the existing ash ponds was related to this proceeding?

A. The -- and that was specifically related to the utility waste landfill and not the ash ponds.

Q. Correct.

A. That's correct.

COMMISSIONER HALL: Okay. I have no further questions. Thank you.

JUDGE WOODRUFF: Mr. Gass, I just have a question.

QUESTIONS BY JUDGE WOODRUFF:

Q. I'm trying to understand more about your testimony, and I'm concerned about the -- you indicated that water from the bedrock aquifer would flow up into the -- into the river, the Missouri River. Does that essentially merge with the alluvial aquifer at that point?

A. There's -- and MDNR basically agrees with this. They look upon -- the alluvial aquifer and the bedrock aquifer is two separate systems, a relatively significant change in how quickly water will be transmitted through the alluvium versus the bedrock aquifer which transmits water at a much lower rate. And -- but it does ultimately -- the bedroom aquifer ultimately discharges to the river.

Q. Okay. And what is -- you indicated that water from the bedrock aquifer would move upgradient into the river. Is that right?

A. Yes. I think you're -- you're understanding what I'm saying, but the flow actually begins to migrate

upward.

Q. Right. And what is the mechanism? Why does it -- why does it move upward?

A. Well, you have -- if -- and again, I'm lacking something to draw with.

We used to use in laboratory and hydrogeology a -- kind of a glass U-tube. You may remember them from chemistry days.

And if I pour water in the high side, the water is going to drop down until it comes up equal to the water on the -- the other side. So it wants to equilibrate.

Well, the water levels in the bluffs and in the Ozark aquifer are higher than that of the river, so they're going to migrate through the rock and ultimately discharge to the river, because they have really no place to go because they're dealing with a similar situation from the north side of the Missouri River.

Q. Okay.

A. So the discharge point for the bedrock system is the river.

Q. So it's just the water pressure from up on the bluffs pushes it up into the river?

A. That's correct.

JUDGE WOODRUFF: Okay. Thank you. That

helps me understand it.

Then we'll move on to recross based on questions from the bench, beginning with Staff.

MR. WILLIAMS: No questions.

JUDGE WOODRUFF: Public Counsel.

MR. MILLS: No questions.

JUDGE WOODRUFF: Sierra Club.

MS. HUBERTZ: I just have a couple.

RECROSS-EXAMINATION BY MS. HUBERTZ:

Q. I think you've already testified to this, but I just wanted to make sure.

There are no upgradient shallow wells drilled in the vicinity of the ash ponds, are there?

A. That's correct.

Q. Okay. So -- and upgradient wells are commonly used to detect the background levels -- the background quality of the water before it hits a contamination source?

A. Or before it penetrates an area where there's a potential for contamination, not necessarily where it hits the source.

Q. Okay. But that's the idea; that would be background?

A. That's correct.

Q. Okay. And you had talked also about the

utility waste landfill being floodproof and -- which I understand about the liner, but my understanding is also that when water hits the surface of coal ash, the water becomes contaminated. So when it rains, coal ash particles mix with the water and become leachate. Is that correct?

A. There is some leachate generated. I should also point out, coal cash of the nature that is disposed of at these sites, I've actually used in groundwater remediation programs to tie up metals and organic compounds from migrating any further.

So there is some leachate generated. That's why there are leachate collection systems.

Q. Right.

A. But for the most part it tends to be relatively inert.

Q. Okay. So if they got extremely flooded, are you saying that no leachate -- no additional leachate would form and it would just stay inert because that's --

A. Well, if I understand your question correctly, you have your liner system -- and, again, it's a liner system that far exceeds existing State requirements -- and it isolates -- that liner system is essentially isolating the ash material from surrounding

groundwater or surface waters.

Q. And one of the reasons for removal of the leachate is so that it doesn't build up and put pressure on the inside of the liner system. Correct?

A. One of the -- it isn't on the inside of the liner system. It's basically you have to convey it away somehow and that's why you have a leachate collection system.

Q. But otherwise it would just sit there in the bottom of the landfill?

A. Right.

Q. Okay. As more rain -- as more rain fell, more water would collect because it's not going out of the liner. Right?

A. Well, to some extent there would be evaporation, so you would have to examine how much evaporation versus how much --

Q. I know. I'm dumbing it done but that's the -- okay.

THE COURT REPORTER: I'm sorry. The end you said, so you would have to examine how much?

THE WITNESS: Evaporation is occurring, so that if -- very often in an area like this you may get 40 some odd inches of rainfall a year. You may have an evaporation rate of 15 inches of moisture a year.

MS. HUBERTZ: Okay. That's all I have for you. Thank you.

THE WITNESS: Thank you.

JUDGE WOODRUFF: Redirect.

REDIRECT EXAMINATION BY MR. TRIPP:

Q. Mr. Gass, you were asked questions regarding whether or not -- or about the wells that are on westernmost portion of that UWL footprint and their relationship to the existing ash ponds. Do you recall those questions?

A. Yes.

Q. And I think you were asked about the impact that we see or don't see in those existing groundwater monitoring wells from the ash ponds.

Could you explain to us especially with regard to those west wells what your determination is as a hydrogeologist and looking at the results there and whether they'd be indicative of contamination from an ash pond?

A. Based on the concentrations and distribution of high arsenic, high manganese, high total dissolved solids, you'd expect the highest concentrations, if there were -- being if those wells on the western side of the proposed utility waste landfill were being affected, you would expect to see the highest

concentrations along that western and northwestern edge.

And you don't see a set pattern. You see a widely distributed pattern. And over 40 years of time given the amount of variation that occurs on an annual basis with the flow directions, you'd expect that wells, if they were going to be impacted, they would primarily be impacted in those areas closest to the ash ponds and you'd have less concentration and no concentration further away.

And some of the wells that would have some of the higher concentrations of arsenic or manganese are actually on the eastern side of the proposed landfill footprint.

Q. So when we look at Schedule 13 of Lisa Bradley's testimony, and particularly Tables 2 and 3 that have the groundwater monitoring results, just because there is an exceedance of arsenic or some other constituent from coal ash that is in that nearest monitoring well, that alone in and of itself, is that sufficient to draw a conclusion that there's an influence from the ash ponds?

A. No, it's not.

Q. You were asked about the addition of the three deep wells and the four shallow wells as a result of Andrews Engineering review. Do you recall those

questions?

A. Yes.

Q. And there was -- and I think you've talked about this somewhat, but you said there was not a possibility of a downward migration of contaminants. Why is that?

A. Generally environments like this, again, the -- the gradients tend to be primarily horizontal. The preferential flow because of differences in between horizontal hydraulic conductivity or the ability to transmit to water horizontally both -- both -- versus vertically is so much higher that the primary flow is going to be horizontal and close to the surface.

Q. So when we talk about the fact that we don't know with any specificity what the vertical gradient is of the alluvial aquifer, does that change your opinion about whether or not those additional wells were needed?

A. No. I guess the best way of describing it, I've described -- I did my first monitoring well installation and design of a monitoring well installation back in 1973.

That in those situations I would expect it to remain -- be relatively shallow. I would have actually designed a system for this site in the same way I've designed hundreds of other monitoring well systems for

detection monitoring.

Q. One of the questions about vertical gradient, and particularly with regard to where you would find ash contaminants that's been raised is the question of whether, for example, a heavy rainfall would drive down contaminants from the ash pond down below where these monitoring wells would be able to detect them. Do you agree with that?

A. No, I don't.

Q. Why not?

A. It doesn't occur. The rainfall is migrating through the soil so slowly that there's no push down and there is time for the water to diffuse -- the compounds to diffuse throughout the entire water column.

Q. And just as a clarification point, when you were talking about your work with the EPA and the fact that you weren't concerned with really vertical conductivity but more so horizontal conductivity in these types of situations, you mentioned RCRA?

A. Right.

Q. What is that?

A. Resource Conservation and Recovery Act.

Q. And it applies to?

A. It applies to solid waste disposal sites, which is Subpart D, and hazardous waste, Subpart C.

Q. And I'm sorry. My notes are a little bit not in order, so this relates to something we've already talked about.

But you were asked about the distance of the nearest groundwater monitoring well to the unlined ash pond, and I think you estimated 15 to 2,000 -- 1,500 to 2,000 feet. Ms. Hubertz's may be more than 2,000, but somewhere in that range.

Does the fact that it's that far away in any way call into question your opinion that those monitoring wells are not showing an influence of contamination from the ash pond?

A. Given the 40-year time interval that has occurred since the original ash pond went into place, you'd expect anything that would be emanating from the ash pond to pretty much have extended beyond even that point.

And as you move further and further away from the ash pond, the contaminants spread laterally outward, as well as downgradient.

So these wells would be -- have a high likelihood of being able to detect any contamination that may be migrating from the ash ponds.

Q. With regard to the addition of the four shallow wells that Ameren agreed to do, I think -- do

you recall, first of all, what the thinking behind this was at least from Andrews' viewpoint as to why those were necessary?

A. Andrews brought up a concern related to the type of tear that -- or the length of a tear that would occur in a liner system.

And they felt that the 100-foot interval that was originally used in the -- in the initial modeling may be -- optimistic is the wrong term, but they thought it would be too large and that a -- perhaps a smaller tear would be more representative.

And it's -- to some extent I could understand their concerns about the length of the tear in the plastic liner, but once -- if you did have a tear of that nature in a plastic liner, once it reached the surface of the clay -- and this is basically impermeable clay -- that it would spread laterally over the clay. So it would spread out over a much greater distance.

So even if you had a one-foot or a five-foot tear in a plastic liner, what ultimately would spread out across the clay would be in the tens if not hundreds of feet.

Q. Assuming, you know -- assuming Andrews' theory that there was a likelihood of -- a more likelihood of a five-foot tear in the liner system, and

we're talking about the HPDE liner and even the clay liner, can you think of any scenario where you would have an instance of a five-foot tear in that entire liner system?

A. So you're referring to a five-foot tear at the same location through the plas-- through the HPDE liner and the clay --

Q. Yes.

A. -- if I got the question correct?

The only thing I can think of is if you had a small meteorite penetrate through both at that same location.

Q. But under natural conditions?

A. I -- I really can't think of anything that would simultaneously cause both to fail at that particular location.

Q. And again, I apologize. This is a little bit out of order, but we were talking earlier and you were asked questions about the influence of those ash ponds on the alluvial aquifer, whether the contamination was present and whether the monitoring wells would catch it.

Yesterday we heard Mr. Norris talk about a comparison of the testing results from the bedrock aquifers from the bluffs and a comparison with the levels, for example, of arsenic in the alluvial aquifer.

In your opinion as a hydrogeologist is that a comparison that is helpful in understanding whether or not there is influence of the ash ponds?

A. No, it's not, because the -- the groundwater moving through any formation is affected by the geochemistry of a formation.

So as you go from one type of formation materials, such as bedrock to an alluvial aquifer system, their base -- they're characteristic of the rock that makes up the aquifer.

So you're leaving the bedrock aquifer, which is sand, stones and limestone, and moving into an alluvial aquifer system which basically consists of particles that were derived from upstream in Missouri -- you know, upstream the Missouri River. There's no direct geochemical comparison between the two.

So to compare water quality in the bedrock aquifer as being equivalent under natural conditions to the alluvial aquifer, it's just something that would ordinarily not be done by a hydrogeologist.

Q. Mr. Gass, at the end of Ms. Hubertz's questions she was asking you about the leachate collection system and posing a scenario where there would be rain.

In your view is the leachate collection

system as designed for this utility waste landfill going to be challenged or going to be deficient in any way with regard to the ability for it to collect leachate from even rain?

A. That's probably a question better posed to the engineers than -- than a hydrogeologist, but at least from what I read and -- and understand having worked with engineers, it appears to be appropriate.

MR. TRIPP: I don't have any other questions.

JUDGE WOODRUFF: Okay.

And, Mr. Gass, you can step down.

THE WITNESS: Thank you.

JUDGE WOODRUFF: And I believe that's all of the testimony for today -- or for this hearing.

I'm just looking through my schedule of exhibits. It looks like everything has been marked and received.

The procedural schedule indicated briefs would be filed on -- initial briefs filed on April 30th and reply briefs following on May 21st.

I'll go ahead and expedite the transcripts so that it will be ready for a week from today, April 9th.

There is one other thing I want to take up, or actually a couple things.

Staff on March 26th had filed a notice request that the Commission take administrative notice of a couple documents. I believe those documents were ultimately offered as exhibits in this hearing, so we don't need to worry about the taking administrative notice of it.

Is that correct, Mr. Williams?

MR. WILLIAMS: I believe we did that on the first day of the hearing.

JUDGE WOODRUFF: We did.

And the other thing I wanted to bring up was the stipulations that were filed on March 25th, which is a stipulation of 17 facts agreed to by all of the parties, I'm thinking we probably want to mark that as an exhibit so that it's easier to refer to.

Mr. Williams, do you want to mark it as a Staff exhibit? Is that all right?

MR. WILLIAMS: However the Commission wants to handle it is fine with me.

JUDGE WOODRUFF: Let's call it Staff Exhibit -- your next one.

MR. TRIPP: 108.

JUDGE WOODRUFF: Yes, 108.

JUDGE WOODRUFF: Mr. Williams, do you have a copy of that we can give to the court reporter?

MR. WILLIAMS: I believe I do.

MR. LOWERY: I do if you don't.

Yeah, I've got it.

MR. WILLIAMS: If you have it handy, that would be great.

JUDGE WOODRUFF: And that will be received into evidence, Exhibit 108.

(STAFF EXHIBIT NO. 108 WAS MARKED FOR IDENTIFICATION BY THE COURT REPORTER AND RECEIVED INTO EVIDENCE.)

JUDGE WOODRUFF: Anything else we need to take care off while we're on the record?

Hearing nothing then, we are adjourned.

Thank you.

WHEREUPON, the evidentiary hearing concluded at 9:40 a.m.

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CERTIFICATE OF REPORTER

I, Patricia A. Stewart, RMR, RPR, CCR, a Certified Court Reporter in the State of Missouri, do hereby certify that the testimony that appears in the foregoing transcript was taken by me to the best of my ability and thereafter reduced to typewriting by me; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this hearing was taken, and further that I am not a relative or employee of any attorney or counsel employed by the parties thereto, nor financially or otherwise interested in the outcome of the action.

_____

Patricia A. Stewart

CCR No. 401

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