EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Could you state your name, please.

A Wes Slaymaker, S-L-A-Y-M-A-K-E-R.

Q And Mr. Slaymaker, you filed some direct testimony in this case?

A That's correct.

Q Is it true and correct to the best of your knowledge?

A It is.

MR. REYNOLDS: All right. That's it.

EXAMINER NEWMARK: Okay. You're excused.

(Witness excused.)

EXAMINER NEWMARK: All right. Who's next?

MR. REYNOLDS: Dr. SCHOMER.

PAUL SCHOMER, TOWN OF FOREST WITNESS, DULY SWORN

EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Can you state your name, please.

A Paul Schomer.

Q All right. And have you filed testimony in this case?

A Yes.

Q All right. In the form of direct?

A Yes.
Q And rebuttal?
A Surrebuttal.
Q Yeah, whatever.
A Yes.
Q Did you bring that testimony with you?
A I did not.
Q All right. And since giving that testimony, have you received other information such as Roberts surrebuttal or listening to the testimony of Mr. Hessler? Do you have anything to add to that testimony that you've already given in written form?
A I would have comment on what Mr. Hessler said this morning.
Q All right.
A That would be all.
Q Go ahead.
A There's two points I would make very briefly and very simply. One has to do with the pseudo-noise, and he's talked about it. We've talked about it a lot. It's a very important issue in terms of being able to measure things around a wind farm, and Mr. Hessler's introduced it. He and his father did a study which was published in NCEJ, which he referred to this morning.

And when you're dealing with wind noise -- I'm going to try to make this very simple -- there's two kinds of turbulence. Turbulence is the air moving around for one reason or another. One kind of turbulence is just like the -- if you put a stick in water, a stream, and you see the line go out behind the stick, and that's called wake turbulence because it's just like a wake from a boat.

And there's another kind of turbulence called intrinsic turbulence. This is the air moving around on its own, heating the air against the ground or being turned over by buildings nearby or stones or shrubbery or whatever makes the air mixed up and not steady. So there's these two kinds of turbulence that is pseudo-noise, and this is what we're trying to get rid of so that we can make measurements that are accurate.

Q Okay. So what's your comment on Mr. Hessler's comment?

A The comment is that Mr. Hessler and his father measured only the wake turbulence in the wind tunnel because it was very smooth flow. It didn't have intrinsic turbulence, and the intrinsic turbulence is the much more dominating factor. And so the numbers he quotes for -- for what turbulence causes are quite

low compared to what you measure in reality.
Q All right. And how is that relevant to what we're considering here?
A That's relevant in the difference between the level of the turbine noise and the level of the background, that the level of the turbine compared to the level of the background exceeds 10 dBA. It's not less than 10 dBA.
Q And why is that important?
A That is -- 10 dBA is thought of when you start to have serious problems with a new noise source compared to what was existing. And so this exceedance is significant, and the numbers presented by Mr. Hessler are identical to what has been published for just the total pseudo-noise.
Q All right. Do you have any comments on the issue of low frequency sound emanated from large turbines defined as above 2.3 megawatts versus low turbines, smaller turbines, less than 2 megawatts?
A I would expect in just about any machine, as the machine gets bigger, the dimensions get bigger. It's how it couples energy out of it. As the sound radiated will get bigger, which means the wavelength is longer. The fundamental dimension to the sound gets bigger, which means it's lower frequency. This

would -- I would expect from any machine, and I'm not surprised to see the data for this machine go that way.

Q And would that explain the wide or rather consistent complaints of health effects from the residents at Shirley that have 2.5 megawatt machines as opposed to other wind farms?

MR. WILSON: I'm going to object to that question to the extent that it goes to health impact. I don't think he's qualified as a health expert.

EXAMINER NEWMARK: Okay. I'll sustain that.

BY MR. REYNOLDS:

Q You have given testimony on the -- do you have information about the relative impacts of low frequency sound on health?

A Yes.

MR. WILSON: Objection.

MR. REYNOLDS: This has been the part of it. He's testified to this. We've had Mr. Hankard who testified about annoyance versus health.

EXAMINER NEWMARK: The first question, did you say complaints or did you say health?

MS. BENSKY: That was just a foundational

question.

MR. REYNOLDS: Yes. Exactly.

EXAMINER NEWMARK: That's fine. Let him answer.

THE WITNESS: What question am I answering now?

EXAMINER NEWMARK: None. Let him think.

BY MR. REYNOLDS:

Q All right. There has been testimony about -- from the Shirley Wind residents who have machines that are 2.5 megawatts, and then we've had testimony about -- from complaints that -- that are more of the sleep category as opposed to the nausea, headache, earache category, okay? You've given testimony that the infrasound impacts to human health focus on those kinds of symptoms like headache, nausea, vertigo, feeling of ill at ease, right?

A Yes.

Q Would the size of the turbines at Shirley and its likely higher production of low frequency noise have a potential explanation for why the folks at Shirley are having such difficulty?

A I think it's a potential explanation, but I think I could come up with -- there's other explanations maybe. But that's certainly a potential explanation.

Q All right. Well, the whole -- the point of this hearing is to try to determine whether the project as designed for the Town of Forest is -- is appropriate.
A Yes.
Q And size of turbines is one factor?
A It is a factor.
Q What else?
A I think that -- that the -- to me, one of the important factors has been the nature of the community being somewhat unique. This is -- the basic things that have been talked about here are most important. The testimony you had yesterday, although I was not here, I've heard that kind of thing before, and I think that the issue before us is whether that's going to continue. The people are being taken out of their homes by the sound. This is not new. As I've pointed out in my testimony, this has been going on for 30 years, not with wind farms but with low frequency noise, and especially pulsating noise.

The notion that wind farms is somehow different is just not -- makes sense. And that we know and we've known for years that these same symptoms have occurred over time with different kinds of sources of low frequency sound, and the result is

always the same. There's a fraction of the population, we don't think it's a large fraction, that has these symptoms to the point where some are driven out of their homes.

EXAMINER NEWMARK: Okay. Sir, I think wasn't the question what -- what was your question, what things can be done to prevent this, to reduce this?

MR. REYNOLDS: Yes.

BY MR. REYNOLDS:

Q Okay. So there are -- in your view, you've made a recommendation that if this project is -- is -- is approved, that the -- that the noise limits be reduced?

A I have made a recommendation that the noise limits be reduced and that the -- I have made a recommendation that the prediction based upon the average is not consistent with what's been put together as the procedures in Wisconsin.

Q All right. Explain that.

EXAMINER NEWMARK: Well, is this in his testimony already? He said he explained this.

MR. REYNOLDS: All right. Yeah.

EXAMINER NEWMARK: Okay.

BY MR. REYNOLDS:

Q Well, let me ask you this. We've been talking about average noise limits and maximum noise limits.
A Correct.
Q What are the limits that we should be shooting for here?
A Well, what I think about always is are things logical, is this what was meant. And as I understand it in Wisconsin and in this proceeding, people have said there's a 45 dB nighttime limit, and it has to be designed for 100 percent of the houses, the homes of nonparticipating residents meet 45 dB. It wouldn't be acceptable for 50 percent of the homes to meet 45 dB.

And then I ask the question, if 100 percent of the homes have to meet 45 dB, how can you have 100 percent of the homes meeting it half the time is somehow different than half the homes meeting it all the time. To me the two are the very same thing, just on a basis of logic that if you have a rule of 45 dB, it should be that way. You can't have it -- it's met half the time at all the houses but it -- the two are the same.

Q So is that the -- is your recommendation for a 39 dB limit designed then to make sure that the maximum doesn't exceed 45?

A No. I was saying that we should model using zero at a minimum, model using zero as the modeling rather than .5.
Q Okay.
A So that there is -- you get closer to this realization that you have a limit met all the time at all the houses and not -- well, all the time at some of the houses you wouldn't permit, but some of the time at all the houses is permitted. And the two are identical, so it's difficult to understand the distinction.
Q So when you first looked at this, the model that you looked at in the application was based upon a zero coefficient?
A The original material presented, I think it was called Appendix V as I recall, had zero for the modeling.
Q And you thought that was an appropriate number?
A I believe that is an appropriate number.
Q And why be conservative in modeling?
A Well, one of the reasons I came to this -- two reasons I come to this. One is the one I've just illuminated, that if you have a rule that all the houses meet it and then you say half the time, and then you say but you can't have -- it's met 100

percent of the time at half the houses, there's no logic there.

The other reason is that this is supposed to be done in terms of the ISO standard. People say we're applying ISO 9613, and ISO 9613 calls for -- if you follow it, it says we're making a conservative prediction and that the only permissible way and to say you're using 9613 is to make the prediction, and then if you want to have a time average according to ISO 9613, there's a specific procedure in the standard for doing that, and that's not being followed.

So I do it on the basis of logic, of what the rule is, and I've come to that conclusion on the basis of following the standards, which have not been followed.

Q So is it -- is it fair to say that a conservative model will err, if at all, on the side of public safety?

A I wouldn't call it erring, but it will certainly be on the side of public safety.

MR. REYNOLDS: Okay. That's all I have.

EXAMINER NEWMARK: Okay. Other questions?

CROSS-EXAMINATION

BY MR. WILSON:

Q Mr. Schomer, have you visited the site?
A No.
Q So that means you haven't taken any data at the site?
A No.
Q You testified in response to some questions from Mr. Reynolds that the nature of this community was very unique. If you haven't been to the site, how can you understand whether this community is unique or not?
A I find the unique factor in the activities this community has engaged in in terms of trying to maintain the quiet, rural nature of the community, and I find that to be similar to situations I've seen in other parts of the country where that kind of community existed, and I've seen very unique reactions when that exists.
Q So if I understood your testimony, what's unique about this community is that they're -- at least some people in the community are fighting the project?
A No. I said that in the testimony I've read that's been put in place in this, that this community has a land use plan of some kind. I don't profess to be a planner and get all the terms right, but that this community has gone out and said we want to maintain the quiet, rural nature of this community, we don't

want to plan for industry, we want a plan for five-acre homes and the maintenance of farms. That's where they're unique.

And the similarity I find that was I -- plans that the FAA tried to implement some probably 25 or 30 years ago, and probably the one example I can think of where the FAA was eventually stopped by Congress because of the uproar. And I find this -- the dynamics of this community to be along those lines.

Q So you've reviewed the comprehensive plan for the Town of Forest?

A I've reviewed the testimony.

Q But you haven't reviewed the plan?

A I've not reviewed the document, no.

Q Are you familiar with the fact that in Wisconsin, most local communities have to do some type of comprehensive plan by law?

A Yes.

Q Okay. So they're not unique from that perspective?

A No.

Q Okay. You don't have any medical training; is that right?

A That's correct.

Q You have an engineering degree?

A Correct.
Q So if you take a look at page 2 of your direct testimony. You have a copy of your testimony with you?
A I wasn't asked to bring them, so I am at the mercy of somebody to give me a copy.
MR. REYNOLDS: What do you want, direct?
MR. WILSON: For the time being, yes.
MR. REYNOLDS: All right.
MR. WILSON: He'll need sur, too.
MR. REYNOLDS: He is on direct.
THE WITNESS: All right. Page 2.
BY MR. WILSON:
Q Line 17 and 18, I find within a reasonable degree of engineering certainty that there will be significant health impacts. Can you explain to me the relationship between engineering and health impacts?
A I think that we've heard Mr. Hessler testify, and I think that on the same basis we have been observing and learning about these problems for many years. And, no, we're not going to give prescriptions out and -- but we understand better the acoustics and the physics, and I think that there's a shared burden to do these things properly, but we are part of the team.

Q Okay. Are you saying that -- you've already testified you're not a health expert; is that correct?
A I have testified, and I'm certainly not trained as a health expert.
Q Are you a health expert?
A I think I understand something about the health effects of noise from the literature that I follow. Does that say I'm a doctor, no.

MR. WILSON: Did you give him his sur?

MR. REYNOLDS: He's got it.

BY MR. WILSON:
Q So at page 11 of your sur, you're talking about your conclusion that the 0.00 contour is appropriate?

THE WITNESS: I have to ask for page 11 of the sur.

MR. REYNOLDS: I'm sorry?

THE WITNESS: The surrebuttal.

MR. REYNOLDS: It's right there.

THE WITNESS: It is?

MR. REYNOLDS: Yeah. It's all tabbed together.

THE WITNESS: Oh, right behind that?

MR. REYNOLDS: Yep.

THE WITNESS: Okay. That should be easy.

Page 11.

MR. WILSON: Yes.

BY MR. WILSON:

Q So at 11 there, you are testifying at line 15 about the appropriateness of the zero contour, correct?

A Correct.

Q And you would agree that that contour is the most conservative possible?

A It's the most conservative possible using 9613.

Q Okay. Now, if we could go back to your direct testimony on page 9. On page 9 in the middle of the page there you're describing your Exhibit 2, which is, you know, the results of you running a model, and in this case you used -- you used both zero and .5; is that correct --

A Yes.

Q -- to produce Exhibit 2?

A That is true.

Q Okay. And reviewing your testimony here on page 9, there's nowhere where you indicate in your direct testimony here that using the .5 is inappropriate?

A At that point in time, we had not received the operation of the source levels from proponent as perhaps you recall, and I was trying to make sense out of this with data that we had been able to

collect off the internet, which were apparently precursor data to the real data. And my whole original testimony is somewhat screwed up because we didn't have the source data that should have been a part of the application.

Q Are you done?

A I'm saying I did the best I could given the data we did and didn't have.

Q Fair enough.

A And I did analysis of .5, but the analysis I did of .5 was equal to the zero case because the source data that I found were that much higher.

Q Okay. But you used a ground factor of .5 in your initial creation of Exhibit 2, correct?

A That was one of the numbers I looked at.

Q Okay. And why did you not at that time use zero for the entire run to create Exhibit 2?

A As I just told you, I was trying to figure out what was going on because I could not understand even what was being recommended by proponent, whether it was zero or .5, what the data were that were to be used. When I made my .5 predictions, they came out zero. The zero predictions of the report, I didn't know if the report was labeled wrong, whether there was 141 houses as Mr. Hessler criticized my report for. It

was just -- would have been much better if we had the source data.

Q Okay. You have a fundamental belief that these models should be run using the zero contour, correct?

A I think that that's something that I thought about. I've not articulated it.

Q But you articulated it in your testimony?

A In this. Not up until here. I have -- I've come to that conclusion for Wisconsin for two reasons. One is because the standard that you say is being used calls for it. And the second is, when I read the rule, or as I understand the rule, and I have read the rule, there just doesn't seem to be a difference between the application two different ways. I have made predictions using the annual average for sources that call for that specifically. When you make predictions for an airport, it calls for the annual average. When you make predictions for a highway, these are called for. I didn't see that they were called for here. I saw a different kind of thing.

Q Okay. So you testified that you just recently came to the conclusion that zero is appropriate only here in Wisconsin; is that correct?

A No. I think it's probably a good idea all over, but it's something that we haven't done in this country

in transportation noise sources.
Q Okay. But this was a recent revelation that you've had; is that correct?
A This actually occurred serendipitously. I was asked to give a lecture this coming November on ISO 9613. And when I started to put the lecture together, I realized that it was calling for this conservative prediction and that indeed I had been misusing the standard, and I was on the committee that wrote it when it was written.
Q So does this revelation occur between the time that you submitted your direct testimony and the time you submitted your surrebuttal testimony?
A That part of it does, yes.
Q Yeah. So that explains why you were willing to use a .5 in your direct testimony but not in your surrebuttal testimony?
A No. The .5, as I've tried to say, is lots of reasons for it being there. Part of it is I tried to understand what was going on.
MR. WILSON: I think that's all we have.
EXAMINER NEWMARK: May or may not be. I want to let you know before you stop, I've decided to allow that Schomer page 6 on surrebuttal in. Basically we have so many standards at this point in

the record, and the studies we let in refer to WHO and all kinds of European standards, day and night standards. Let's just put it all in, and I'll give you a chance to cross him on that if you need to. None?

MR. WILSON: We're just fine with your ruling.

EXAMINER NEWMARK: All right. Any other questions?

MS. BENSKY: I have a few.

CROSS-EXAMINATION

BY MS. BENSKY:

Q We've talked a lot about this ISO 9613 standard. You said you were on the committee that wrote it?

A Correct.

Q Mr. McKeever is passing them out to everyone so I think it will be helpful to --

A I can't hear so well at my -- you have to speak up a little bit.

Q You spent too much time around wind turbines? Sorry. That was a joke. It was funny.

So you've just been handed a piece of paper. Is this the international standard 9613-2 that you helped create?

A Yes.

Q And this was designed in 1996, correct?
A This was first edition it says 1996, December 15th.
Q And has it been revised since then?
A No.
Q Was this standard designed specifically for wind turbine noise?
A No.
Q And if you turn to page -- I don't know what page it is -- the pages don't appear to be numbered. If you turn five pages in, it says acoustics.
A Okay. Maybe you have a clause number.
Q Part 2, acoustics attenuation of sound during propagation outdoors. It's the fifth page in.
A I'm not sure I know what -- there's Clause 2 is the following -- there's normative references. Are you in the --

EXAMINER NEWMARK: I think you have it right in front there.

THE WITNESS: Part 2, yes. That's all dealing with Part 2. Part 1 is air absorption, tables of air absorption.

EXAMINER NEWMARK: Can I have that back, please? I'm going to follow along.

THE WITNESS: Okay. Part 2.

BY MS. BENSKY:

Q And there are two columns on this page, and the right-hand column, the second paragraph beginning with the word, this method is applicable. Do you see where I am? That's on the right-hand column near the top.
A This method is applicable, yes.
Q Uh-huh. And it says, it is applicable directly or indirectly to most situations concerning road or rail traffic, industrial noise sources, construction activities, and many other ground-based noise sources. Is a wind turbine a ground-based noise source?
A Probably not. There's no other standard to use.
Q So this is the best standard, but it's not quite right?
A It's not going to be quite right.
Q But this standard specifically does not apply to sound from aircraft and flight or blast waves from mining, right?
A Okay. That was probably inserted by me.
Q Is one of the reasons why you are calling for using this very conservative absorption coefficient because of this limitation?
A That would be one of the reasons. We have -- we studied in my laboratory air to ground versus ground

to ground propagation by having one experiment where we had 100-foot-high tower that we did sound propagation measurements for, and then we had a source on the ground that we did the propagation measurements for, and the difference of 100-foot-high tower versus on the ground was -- oh, I've got published papers on it. I don't know that I remember the exact numbers. The levels -- the higher levels are about the same, but they're three times more often, then you're up 100 feet.

Q What happens if you're up 100 meters?

A It's going to possibly be even more frequent. Possibly be the same. I guess that didn't answer much, but that's the best I can do.

Q Well, the point is that we just don't know?

A Well, I know it won't be less, but I don't know that -- I haven't reached the saturation or that it's going to continue to grow.

Q Having this in your hand, and if you can do it very quickly, can you point to other paragraphs that encourage the model to be used in a conservative manner?

A Say that again, please.

Q Well, you talked about after looking through this, you realized that the intention was to obtain

conservative results; is that correct?
A Yes.
Q And I'm asking you where in the document we should look to get that information.
A Okay. That is one place. When it talks about the cement, and I just have to find where it talks about that. Well, in 3.2 in definitions it gives equivalent continuous downwind octave band sound pressure level, and downwind is a shorthand name for sound -- propagated sound where it travels in the louder manner. Because as everybody knows, you're downwind outdoors, it's louder than if you're upwind, and that's what the downwind means here, that you're getting a prediction that's hearing-enhanced propagation. So in 3.2, the definition of downwind indicates this. And then it talks about predicting the downwind. Let's see. I think on Equation 5 and 6 -- in 5 it talks about the downwind again.
EXAMINER NEWMARK: That's meteorological conditions, number five? Is that where you're at?
THE WITNESS: No. I'm on Equation 5 on the unknown page, but it's in the end of Clause 6.
EXAMINER NEWMARK: Oh.
THE WITNESS: And this is the basic equation for using ISO 9613, and it talks about

downwind. And as I said, if one wants to calculate the long-term -- the long-term averages, if you look at the bottom of just before you get to 7, there's -- you go up two paragraphs, it says the long-term average weighted sound pressure LAT, paren, LT for long-term, shall be calculated according to the equation there, and that's not been done.

BY MS. BENSKY:

Q In this project?

A In this project.

Q And what's the significance of that?

A Well, this is the procedure that was designed in the standard for going from downwind to long-term if long-term wanted to be used. What this does is it says that if you're up in the air, which is what I just -- we know we are, they recognized when this was written, they being -- this was really based upon a German standard initially -- that when you have an elevated source, you're going to get this high level more of the time, as I said, three times as often, which was a whole lot of the time from 100-foot high. When you look at this case, this standard says that you never have anything but the high levels from an elevated source and that the -- the average that's

used for other sources shouldn't be used for this because it is elevated, and I think that's the difference that comes in here.

MS. BENSKY: Thank you.

EXAMINER NEWMARK: Anything else?

MS. BENSKY: Briefly.

BY MS. BENSKY:

Q Is it necessary for you to visit a site to be able to analyze data that was taken at that site?

A No.

Q Is this something that you do all the time in your professional work?

A Well, I like to judge the people that have made the measurements and have some feel for things, but I would say that things that are done by Mr. Hankard or Mr. Hessler, I believe the measurements in general. Now, I've said that I thought he was wrong on the empty pseudo-noise, but that's a separate thing.

Q And even though that you -- so, is your own experimentation necessary to be able to reach the opinions that you've reached in this case? Is it necessary for you personally to conduct experiments in order for you to reach the opinions that you have reached in this case?

A No. As I've said, even if I had done studies that

would be part of the team, that I think that nothing is done by one person alone.

Q And in fact, whoever uses this model is to some extent relying on your work, right?

A They're relying on my work. They're relying on the Deutsches In -- DIN, Deutsches Institut fur Normung.

Q So even though you've not been to the site, and even though you haven't done your own experimentation, can you still state the opinions that you stated in this case to a reasonable degree of scientific certainty?

A Yes, I do.

MS.

MS. BENSKY: Thank you.

EXAMINER NEWMARK: Okay. Other questions?

RECROSS-EXAMINATION

BY MR. WILSON:

Q Just a couple questions following up on ISO 9613-2. When you testified earlier that you were implementing a method incorrectly, was it this method that you were --

A I'm sorry? I don't quite follow the question.

Q Well, you told me -- you told me before when I was asking you questions that you had this recent epiphany which is the result now of using -- you're saying you use the zero ground contour, and you told

me that up until recently something had been -- had been implemented improperly by yourself as well.

A Yes. I had forgotten. I don't -- you know, I don't use 9613 that often. It's used for this, but it's not used -- I use 9613 for this, and I use it for small arms ranges occasionally.

Q Okay.

A But when you're doing airports or highways or other things, there's models put out by the DOT for those kinds of sources. So if you do general work, which I do in all kinds of noise areas, you use different things at different times. What I was saying is until I had looked over this to prepare this lecture for Brazil when I'll be there, I remembered that this was for the downwind situation, which is also called for in ISO 1996, which I do know because I'm chairman of that committee.

Q Okay. I just have one other question for you. Have you done any studies that implement this standard with your new recollection against actual sound measurements to be able to tell whether it's a good fit?

A Well, you're not looking for a good fit. When you're --

Q That's not my -- my question is this, have you

compared your calculations using this method against actual sound measurements with your recent recollection that you've got to do in a certain way?

A Well, of course I haven't.

MR. WILSON: Thank you. That's all.

EXAMINER NEWMARK: Okay. Redirect?

MR. REYNOLDS: Just a couple questions.

MR. LORENCE: Your Honor --

EXAMINER NEWMARK: Oh.

MR. LORENCE: -- I may have a question before we get to redirect.

MR. REYNOLDS: Sorry. Go ahead.

EXAMINER NEWMARK: While you're doing that, I was going to take a minute. Did we verify his testimony?

MR. REYNOLDS: If I didn't -- I thought I did.

EXAMINER NEWMARK: Did you? You know what, just do it again just in case because I don't remember.

FURTHER DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Dr. Schomer, do you verify that the rebuttal or surrebuttal that you've given, or direct and surrebuttal, is true and correct?

A Yes.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: And these Exhibits 1 through 4 as well?

MR. WILSON: Your Honor, I think given the discussion of this document, it probably ought to go in as an exhibit.

MR. McKEEVER: Yes.

MR. LORENCE: I'm going to ask a couple questions on it, so you may want to hold off on that.

EXAMINER NEWMARK: Okay. Let me just have him answer. Are Exhibits 1 through 4 -- sir? Mr. Schomer, Exhibits 1 through 4, were they filed -- are they correct to the best of your knowledge?

THE WITNESS: I'm sorry?

EXAMINER NEWMARK: Your Exhibits 1 through 4, are they correct to the best of your knowledge?

THE WITNESS: Yes.

EXAMINER NEWMARK: Okay. Thanks.

All right. Commission staff.

CROSS-EXAMINATION

BY MR. LORENCE:

Q Dr. Schomer, on page 12 of your surrebuttal

testimony, and I'm looking on lines 6 through 8.
A Uh-huh. I guess I'm not fast enough. All right. I got to page 12.
Q On lines 6 through 8 you say, ISO 1996 requires what is termed "downwind" or weather-enhanced propagation conditions so that model predictions are only infrequently exceeded. Do you see that sentence?
A Yes.
Q I have never seen ISO 9613-2 before today. Could you tell me where that's required in this -- in this ISO 9613?
A Those are the questions we just answered, but I can go through it again.
Q Well, you talked about the downwind stuff, but you say it says that it's only infrequently exceeded, and I'm wondering if it says that in here anywhere?
A That's what the downwind nomenclature means, and I believe it's in either 9613 -- I know it's in either 9613 or in 1996, which 9613 incorporates by reference.
Q I have one more question, and again this shows my complete ignorance on this standard. In Section 7.3, that's called ground effects, and again there's not a page number here, but if you could turn to that.
A Okay. 7.3. 7.3, ground effects, yes.

Q Is this section equivalent of the ground factor that we've been talking about the last two days?
A This section is -- makes use of the ground factor. It's not equivalent. This is where the ground factor comes in. What you have is on the next page there's graphs showing the -- what the sound propagation is in different octave bands. And then in the implementation there's a table on the next page, Table 3, and in Table 3 if you look in there, there's A sub S or A sub R in the middle column at the top, and that's for the source or receiver region. We've been talking about there's really three factors, the .5 or the zero whatever. You have a factor for the source region, a factor for the middle, and a factor for the receiver region. And if you look at the formulas under A sub R of the middle column, you'll see a G. That's the ground factor that goes between zero and 1.
Q And that's the ground factor we have been talking about for two days?
A There's three of them technically: one for the source, one for the receiver, and one for the middle.
Q So if we turn back one page where it begins with the letter A, then it says hard ground.
A Hard ground, yes.

Q That first paragraph ends -- it says, for hard ground G equals zero. So this is the ground factor zero that we've been talking about, correct?
A Correct.
Q And then for porous ground in B, it's G equals 1?
A Correct.
Q And then for mixed ground, it says it's someplace in between zero and 1. Do you see that?
A I see that.
Q So this is the ground factor we've been talking about here?
A Yes. But to understand that is a question that was earlier. You've got a source up in the air and not on the ground, so does this standard really apply. And my answer was, it's the best we have, but you can't apply it exactly the way you would if it was on the ground because the source is as high in the air, it changes what the propagation is. So that the definition of what is hard and what is soft, you have a source that's 100 meters in the air on average. That's not on the ground as one of the other counsel's pointed out.
Q But it has to get to the ground -- the sound has to get to the ground eventually, doesn't it?
A It has to get to the ground eventually.

Q And once it's on the ground, won't it travel along the ground?
A No. It's only -- the only thing you have is an effect of the microphone height at your receiver. The other -- it doesn't -- it doesn't come down to the ground and then travel across the ground like this. It doesn't do that. What you're interested in is the path that goes straight from this up in the air source to your receiver, which may be near the ground, but you don't have any other path. If you do, it's because you don't have good propagation. Then it's poor propagation conditions.

MR. LORENCE: Thank you. I have no further questions.

MS. BENSKY: Your Honor, can I follow up on that? This is really important, and I want to make sure I understand.

RECROSS-EXAMINATION

BY MS. BENSKY:
Q So are you saying that if we have a flat -- if we have a flat ground, if there's a source that's close to the ground emanating sound, that sound can just go and be absorbed in the ground, correct?
A Ground absorption -- what happens, and this is more related to people's experience. You know, if we went

through all the details, it would be complicated, but I think people's experience is useful here. First of all, the first rule is that if you're downwind, it's louder than if you're upwind, and there's -- the reason is the downwind, and this is going to seem strange, we think of sound almost as rays, sound rays rather than waves.

And let's put it this way. Let's say you were behind the barrier. You expect it to be quieter. It's quieter because there's no direct path from the sound to you. It has to come around the corner just like if you had a -- something to stop the sun or a reflector of light. You go behind it, it's not as light as in front of it. Sound is the same thing. If you have a barrier or something that prevents the sound from getting to you, it's quieter than if you don't have that. Well, on a sunny day and you're upwind, you don't hear things. But if you're downwind, you do.

Another thing -- example, if you're out in a boat, do you hear things far away out in a boat? You've seen that? This is the hard surface of the water, and frequently above the water there's a temperature inversion because of the cooling and heating of the water. And those two can form two

layers that the sound gets trapped in, and then you have very -- you hear the people whispering on the shore, and it's like they're 10 feet away from you. I'm sure many of you have experienced this. This has to do with the propagation downwind versus upwind, has to do with the propagation.

The physics is complicated, but the effects -- same thing. Ever hear sources very early in the morning? You wake up at 5:00 a.m. and you hear a distant train or horns or the wheels? Have you experienced that? That again has -- at that time of day, you've got a direct path from the source, which is -- you don't hear the rest of the day to you. It has to do with the physics of the situation.

I'm not going to attempt to go into the physics, but I'm trying to give you different examples out of your daily life that show you this is what goes on. We don't want to really go into the details of what's going on.

Q So if there's a source up in the air that's emitting sound, the sound's going to come down and it's going to hit the receptor before it hits the ground and absorbs; is that correct?

A It's going to hit the receptor directly. There will be -- it gets confusing.

Q That's for sure.
A The ground is important only that it gives a reflection that can enhance or interfere with the direct path. But it does hit the microphone, that's the first thing it hits in time. The sound will arrive at the microphone before -- it comes directly from the source, so it will arrive first.
Q So somebody standing outside near a wind turbine or any source up in the air, that sound wave is going to travel down, and it's going to hit that person's ear before it goes down to the ground and gets absorbed?
A Well, won't be totally absorbed but, yes, it does hit you before it's absorbed. And I think your point is good, that as you're traveling along the ground, from ground to ground it will be absorbing some of the sounds, and that alone is -- that's part of the reason that the air-to-ground path is louder.
Q And so do you think it's proper to assume no absorption and use that 0.0 coefficient for this reason?
A That's part of the reason. Part of the reason is the -- in order to have a prediction that is what is called for in the standard, which is a prediction that is -- if you like the term conservative, a prediction that predicts what's going to happen 90

percent of the time or 95 percent of the time or some percentage of the time, I actually think that from the data that I know of, the prediction is probably the -- about 85 percent of the time would be included, and 15 percent of the time you would be above what's being predicted with the 0.00 prediction. It's not the most conservative prediction in the world by any means.

Q But considering we have to use this model because we don't have anything better, the best way to use this model for a source that's 100 meters in the air is to use that 0.0 coefficient?

A 0.00 is the best you can do with this.

MS. BENSKY: Great. That's very helpful. Thank you.

MR. REYNOLDS: Couple questions on redirect.

REDIRECT EXAMINATION

BY MR. REYNOLDS:

Q Dr. Schomer, is it the heart of it that the challenge of creating a model to reflect what the citizens of Forest will actually experience, is that the heart of why it's better to have conservative estimates than not conservative estimates of sound? Because we're trying to figure out what's going to happen to the

citizens in Forest.

A I think there's probably lots of reasons I can think of for doing this. Again, we're dealing with a low frequency sound primarily. The A-weighted sound is going to correlate with it as it does with nearly all noise sources.

I think it's important to understand how the ear hears because that's all a part of this, and the ear doesn't hear all frequencies equally. It doesn't process all frequencies equally, and it gets very different at low frequencies. The ear gets very different at low frequencies, and this is one of the reasons I would say this is important. We -- I think Mr. Hessler testified that the threshold of hearing changes, or maybe it was in that paper that was passed out, but the threshold of hearing is very different from one person to another.

But what's even more important is that at the middle frequencies, like 1,000 hertz, a change of 10 decibels is a doubling or a cutting in half of loudness. At these low frequencies, like let's say 10 hertz, at 10 hertz, about a 2 dB change is a doubling of loudness. So at low frequencies, anything that you're off gets magnified by the ear. If you're off by 5 dB at low frequencies, that's a

factor of four in loudness. Whereas if you're off by 5 dB at a middle frequency in a prediction, that's not even a factor of two in loudness. So errors get magnified at the low frequencies just because of how we hear.

Q That was one of the reasons for looking at the more conservative model. Are there any others?

A Well, let's see. I've talked about the standard calling for it. I've talked about it makes sense from the -- from the way the rule is written. Certainly it makes sense from being conservative from just the standpoint of how the ear hears. I think that just what we've talked about, the health effects and the fact that there's people that may be affected just like in one other community, somehow it seems like it calls for us to be cautious.

I think that if -- if it were some other area where government was involved directly, let's say, we're going to install -- we're going to license fire detectors that only work 90 percent of the time and 10 percent of the time people aren't warned about the fire protector, but that's good enough. People wouldn't say that's good enough, so the fire protection has to work all the time. And I think when we're talking about people literally being

driven out of their homes, we have to be a little bit cautious.

MR. REYNOLDS: Thank you. I don't have anything else.

EXAMINER NEWMARK: Highland?

MR. WILSON: No.

EXAMINER NEWMARK: All right. What are we doing with our ISO 9613-2?

MS. BENSKY: I'd like to move it into evidence.

EXAMINER NEWMARK: All right. Any objections?

MR. LORENCE: I guess I'd like to talk about that for a second.

EXAMINER NEWMARK: Okay.

MR. LORENCE: We've kept out all kinds of reports and exhibits today because they didn't come in at the proper time. Professor Schomer could have put it in at any time with his exhibits. I recognize that counsel here is not -- is not -- his witness is not asking this. But I guess I would ask the ALJ that under the theory that, you know, we've been keeping out late-filed things and this is awfully dense information, whether this should go in the record.

EXAMINER NEWMARK: Okay.

MR. LORENCE: And I just as a second aside for counsel, I'm not positive, but I think that these are usually under copyright, and is this something that we would be able to place on our website and make available to the world if -- I don't want to get you in any kind of copyright trouble if that's the case.

MR. McKEEVER: I'll just say I got it on the internet.

MR. LORENCE: Yeah.

MR. REYNOLDS: And this is the standard that has been used by all the measurers of sound, so this is -- this is kind of the bible of sound measurement.

MR. LORENCE: And I guess that reinforces my question then. Anybody could have put it in. Any of the experts could have put it in from direct testimony on it. So whether we get it here at this late hour or not, I'll defer to the decision, but I'm -- given what we've done today with other things, I just wanted to raise that point.

MS. BENSKY: I guess the nature of this exhibit is totally different. This exhibit doesn't give any opinions. It's just a standard that

everybody -- all the sound people in this case have used and relied upon. So I think it would be helpful to have it in. And even if it wasn't in, I think it's the type of material that could be quoted and briefed anyway, so --

EXAMINER NEWMARK: Let's not get into that.

MR. WILSON: I think at the risk of making it look like Ms. Bensky and I are on the same team --

EXAMINER NEWMARK: We would like to see that.

MR. WILSON: I agree.

EXAMINER NEWMARK: Okay.

MR. WILSON: It should come in.

EXAMINER NEWMARK: I understand.

MR. WILSON: There's a lot of testimony on it.

EXAMINER NEWMARK: Let me say the overarching concern I have or rationale for letting it in is we've cited to equations and all kinds of portions of this document which I think can only be correctly or adequately explained or referenced by having the document. So for the abundance of caution for making the record even larger, I think

it would enhance the Commissioner's review of the testimony we've just heard. So what's the number for this one? It's 9, Schomer 9, is that --

MR. REYNOLDS: I thought it was 5.

EXAMINER NEWMARK: Well, I don't know if we ever marked your other ones. I might have mentioned on the record because Mr. Schomer, I was not accepting his Exhibits 5 through 8, and I am pretty sure I referenced that at the beginning of the hearing. So we're just going to call this 9.

MS. BENSKY: Okay.

(Schomer Exhibit No. 9 marked and received.)

EXAMINER NEWMARK: All right. I think you're done.

THE WITNESS: Thanks.

EXAMINER NEWMARK: You're excused.

(Witness excused.)

EXAMINER NEWMARK: 3 o'clock. Let's take 15 minutes.

(Break taken from 3:05 p.m. to 3:20 p.m.)

EXAMINER NEWMARK: Well, got enough people back, I guess. You want to start off the record?

MR. McKEEVER: Yeah.

(Discussion held off the record.)

EXAMINER NEWMARK: All right. Next?