STATE OF NORTH DAKOTA

PUBLIC SERVICE COMMISSION

Coyote Creek Mining Company, L.L.C.	:	**Case No.**
Permit NACC-1302	:	**RC-13-850**
Application	:	

TRANSCRIPT OF

FORMAL HEARING

VOLUME II - (Pages 149-351)

Taken At
State Capitol
Bismarck, North Dakota
December 23, 2014

BEFORE WADE MANN
-- ADMINISTRATIVE LAW JUDGE --

A P P E A R A N C E S

COMMISSIONERS PRESENT:

COMMISSIONER BRIAN P. KALK
COMMISSIONER JULIE FEDORCHAK
COMMISSIONER RANDY CHRISTMANN

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FOR THE COMMISSION.

C O N T E N T S

C O N T E N T S (Continued)

MARK A. ANDERSON

VOIGT EXHIBITS:

C O N T E N T S (Continued)

VOIGT EXHIBITS:

(The proceedings were continued, commencing at 8:30 a.m., Tuesday, December 23, 2014, as follows:)

JUDGE MANN: Good morning, everybody. We'll go ahead and get started.

Let the record show that it's 8:30 a.m. on December 23rd. This is the continuation of the formal hearing in Public Service Commission Case No. RC-13-850. It's the matter of the Coyote Creek Mining Company, L.L.C.'s Permit No. NACC-1302.

This is a continuation of the hearing that began last Friday, December 19. Initially ALJ Janet Seaworth was the procedural ALJ in this matter. She has had a family emergency and is unable to preside over today's part of the hearing.

My name is Wade Mann, and I'm the director of OAH and also an administrative law judge, and I will be presiding over the remainder of this hearing as the procedural administrative law judge.

It's my understanding that we took testimony from Mr. Voigt on Friday and also members of the public. I don't think we need to go through all of the preliminaries at this point, but I would, just for my benefit and maybe the benefit of anybody in the audience and listening, just have

everybody note their appearances again for me for the record, beginning with Coyote Creek.

MR. BJELLA: Yes, Your Honor. My name is Brian Bjella with the law firm of Crowley Fleck in Bismarck representing Coyote Creek Mining Company. Along with me is Mr. Blaine Johnson of our firm and quite a few members of the Coyote Creek Mining Company.

JUDGE MANN: Could you just identify who is at the table with you?

MR. BJELLA: Mr. Donn Steffen, D-o-n-n S-t-e-f-f-e-n, environmental manager, Coyote Creek, and Sarah Flath, F-l-a-t-h, environmental specialist at Coyote Creek.

JUDGE MANN: Mr. Braaten.

MR. BRAATEN: Derrick Braaten with Baumstark Braaten Law Partners in Bismarck on behalf of Casey Voigt, who requested the hearing. I also have with me J.J. England, another attorney in the firm, and right behind me is Mark Anderson, one of our experts who will be testifying today.

MS. JEFFCOAT-SACCO: Illona Jeffcoat-Sacco as Commission counsel, and with me is the director of the reclamation program, Jim Deutsch; assistant director, Dean Moos; and one of the environmental

scientists, Guy Welch.

JUDGE MANN: And before, I guess, we begin with the testimony, are there any additional preliminary matters, Mr. Bjella?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Mr. Braaten?

MR. BRAATEN: Yeah, I would bring up one thing. Ms. Jeffcoat-Sacco mentioned on Friday that she would like the ability for some of her staff members to be able to ask questions of the expert witnesses that we put on, and at the time I had said I would like to reserve my objection. I would like to reserve it for individual questions depending on what's being asked. In general I'm okay with that, as long as everybody is willing to indulge me consulting with my experts during my examination of others as well.

JUDGE MANN: Okay. Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: Sir, we did -- Derrick and I did discuss that after the hearing and I think we're on the same page, and I'm okay with that also.

JUDGE MANN: You're comfortable with that?

MS. JEFFCOAT-SACCO: Yes.

JUDGE MANN: Mr. -- okay. Go ahead. Go

ahead, Ms. Jeffcoat-Sacco.

MS. JEFFCOAT-SACCO: This was a different topic, if Mr. Bjella has a --

JUDGE MANN: Mr. Bjella?

MR. BJELLA: Yes, we're fine with that.

JUDGE MANN: Okay. So Mr. Deutsch will be able to ask questions and, Mr. Braaten, you'll be able to consult with your experts, if necessary, during your questioning.

Ms. Jeffcoat-Sacco, other preliminary issues?

MS. JEFFCOAT-SACCO: Well, only that -- I'm not sure if the little indicator of the first two topics means that you might misunderstand, but the order of the presentations today is not the company first like a normal application. It's the landowner first and then the company and then the Commission.

JUDGE MANN: Judge Seaworth did indicate that that's how we were proceeding. Okay. Thank you.

Before we get started, Commissioners, do you have anything to say before we get going? Commissioner Christmann?

COMMISSIONER CHRISTMANN: Not really,

except to point out that there was some discussion about needing a third day and I think there was some dates floated around and discussion. I don't know if anything is finalized on that. I'm still hopeful that, you know, if we can get done today, that that would be nice, but if we need to bring people back, the most important thing is, in my mind, that we get all the information necessary to make a good decision.

JUDGE MANN: Sure. Commissioner Kalk?

COMMISSIONER KALK: No, Your Honor.

JUDGE MANN: Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: No comments.

JUDGE MANN: Mr. Braaten, is Mr. Voigt's testimony complete? Are you on to your next witness then?

MR. BRAATEN: Yes, Your Honor. We're calling one of our first expert witnesses, who is going to be testifying by phone this morning.

JUDGE MANN: Okay. What's the witness's name?

MR. BRAATEN: His name is Charles Norris.

COMMISSIONER KALK: Chuck.

MR. BRAATEN: It is Chuck.

JUDGE MANN: Mr. Norris?

MR. NORRIS: Yes.

JUDGE MANN: This is Wade Mann. I'm the administrative law judge, and we've got you on the speaker in the hearing room at the Public Service Commission.

MR. NORRIS: Okay.

JUDGE MANN: And are you prepared to testify?

MR. NORRIS: I am.

JUDGE MANN: All right. Before doing so, I'm required to give an oath and I need to advise you of the penalty for perjury. In North Dakota it is a Class C felony, punishable by a maximum fine of $10,000, maximum five years imprisonment or both.

(Witness sworn.)

JUDGE MANN: All right. Go ahead, Mr. Braaten.

MR. BRAATEN: Just one thing preliminarily. I would like to cover some of Mr. Norris's background. I've just handed everybody basically a resume that has his full qualifications. What I would like to ask opposing counsel is if we could stipulate to the expertise as represented on this, and that way I can just

cover his background very briefly rather than going through it in detail and just save some time today.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No objection, Your Honor.

MS. JEFFCOAT-SACCO: Your Honor.

JUDGE MANN: Sorry.

MS. JEFFCOAT-SACCO: I have no objection, but I thought -- I think for the record perhaps you should state the topic or topics or subject areas that you are qualifying him as an expert in.

MR. BRAATEN: Sure.

JUDGE MANN: Hang on. Also then I assume you'd like the CV or the resume marked as an exhibit as well.

MR. BRAATEN: Yes, I would, if there's no objection.

JUDGE MANN: And I guess I don't know how we started. I think there was only one exhibit in last time and it was identified as Coyote Creek No. 1. Should we identify this as Voigt No. 1? Would that be the easiest, I think?

MR. BRAATEN: Yeah, that makes sense to me.

JUDGE MANN: Let's do that. It will be Voigt Exhibit No. 1. Then you can go ahead.

CHARLES H. NORRIS,

being first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. BRAATEN:

Q. Mr. Norris, can you state your name and business address for the record, please.

A. Charles H. Norris, N-o-r-r-i-s. I work for Geo-Hydro, Incorporated, 1928 East 14th Avenue, Denver, Colorado 80206.

Q. And can you give us just a brief background of your education and professional experience?

A. I received a bachelor's degree in geology in 1969 from the University of Illinois, a master's in geology in 1970 from the University of Washington in Seattle. I returned to a Ph.D. program in the -- I believe it was in '87 at the University of Illinois and pursued that through a preliminary examination, but I did not finish the dissertation.

I started my professional geology career in 1972. I have been continuously employed as a geologist. I currently work for Geo-Hydro, Incorporated, a company I started in the mid-'90s

here in Colorado. Geo-Hydro is essentially a full-service consulting company in geology but specializes in water issues.

In the course of my career I've done a great deal of consulting for -- related to surface mining throughout Appalachia, the middle part of the country, and out here in the west. Clients vary from individual citizens to small citizens groups to larger consulting companies to coal companies and power companies, and have served on assessment committees -- or an assessment committee for West Virginia with respect to a yearlong program looking at assessing their cumulative hydrologic impact assessments.

Q. And can you give us just a brief description of the testimony that you're going to give today with respect to your expertise?

A. Yes. I will be testifying with respect to alluvial valley floor determinations for the Coyote Creek mine area.

Q. Okay. Can you give us just a very brief description of your experience analyzing or looking at information related to alluvial valley floor determinations?

A. Yeah. And anytime one is involved with

looking at a mine permit or mine operations west of the hundredth meridian, alluvial valley floors become an issue with respect to mine plans and mine design. I've personally been involved with those -- that aspect of mines at Alton Coal Mine in Utah, currently Otter Creek in Montana. Several years ago I analyzed in detail the AVF information for South Heart in North Dakota and now the Coyote Creek Mine. I've also looked at a mine on behalf of Pittsburg & Midway Coal Company, the York Canyon Mine in New Mexico. The issues I was looking at there were water quality issues, however, rather than specifically alluvial valley floor issues.

Q. Okay. And have you reviewed documentation related to the Coyote Creek mine permit that is pertinent to the issue of alluvial valley floors?

A. Yes.

Q. Okay. And in your opinion, is there sufficient information within the actual permit application for someone to make a scientifically valid determination with respect to alluvial valley floors?

A. There is not.

Q. Okay. And what parts of the actual permit application address alluvial valley floors?

A. Within the permit application itself, I found discussion of alluvial valley floors, which, if it's all right, I will tend to refer to AVFs just for convenience sake.

Q. Sure.

A. In parts -- Section 2.6.1, which is entitled alluvial valley floor determination, and Section 2.6.2, which is a map of various AVF determination areas.

Q. And what data was presented in Sections 2.6.1 and 2.6.2 of the application?

A. No data pertinent to a determination of AVF within the impact area of the proposed mine were presented.

Q. Okay. And if no data were presented, what was presented in those sections of the permit application?

A. Section 2.6.2 was a map that displayed various areas that were part of one or more AVF studies in the area. Section 2.6.1 presented a one-paragraph summary of an initial study by Dr. Bickel dated the 20th of March, 2013, Alluvial Valley Floor Determination Report. It included an agency letter of deficiencies with respect to that report that was dated the 13th of May, 2013, and

the company's response to the deficiency letter with a revised report of 20 August 2013, and finally presented the agency's determination of no AVF on 26 of August, 2013.

Q. Okay. And did the agency produce any other documents related to the alluvial valley floor determination?

A. Yes.

Q. And what was that?

A. Well, it presented a discussion in a cumulative hydrologic impact assessment of AVF.

Q. And what discussion was provided? My understanding is that cumulative hydrologic impact assessment is often shortened to CHIA. Is it all right if we refer to it as that?

A. I would from habit tend to automatically call it CHIA, and I'm very amenable to that.

Q. Can you tell us what was discussed in the CHIA?

A. The CHIA identified the 2013 initial and revised Bickel reports, that was the Coyote Creek AVF report, and identified the August 26th, 2013, determination by the agency that there were no AVFs. The CHIA referenced a 2009 AVF report by Dakota Westmoreland Company that was produced as

part of a revision of permit KRSB-8603 that overlapped the area of the Bickel report of 2013. The agency asserted that the Coyote Creek AVF report information, quote, was based on existing information available in published work, approved mining permits and related data in the public domain from the surface mining reclamation and regulatory process, and observations of professionals involved in the acquisition of baseline data for the application of Permits NACC-1301 and NACC-1302.

Q. Okay. So a similar question to before. Did the CHIA provide any independent data with respect to the presence or absence of alluvial valley floors?

A. No.

Q. Okay. Did the CHIA include the 2013 Bickel report?

A. The Bickel report was not attached to the CHIA.

Q. Okay. And what about the Dakota Westmoreland Company 2009 report, was that included in the CHIA?

A. No.

Q. Okay. And you said the CHIA mentioned

existing information available in the published work, approved mining permits and related data in the public domain from the surface mining reclamation and regulatory process, and observations of professionals. Were any of those items included within the CHIA?

A. No, they were not specifically identified and none were included.

MR. BRAATEN: Okay. Just as a side note for the folks in the room and the commissioners, I passed out the various reports he's discussing. I'm going to be asking for one of them to be admitted into evidence, but, otherwise, I'm just giving them to you so you can reference them while he's testifying about them.

Q. (MR. BRAATEN CONTINUING) We talked about the 2013 report by Bickel. Did you have an opportunity to review that?

A. I did.

Q. Okay. And did that report include any independent data regarding the presence or absence of alluvial valley floors?

A. No.

Q. Okay. What did that report provide?

A. It provided a summary of previous work in

the area, including reference to the Dakota Westmoreland Company 2009 report and excerpts from a 1985 report entitled Draft Reconnaissance Maps to Assist in Identifying Alluvial Valley Floors West Central North Dakota by the Office of Surface Mining Reclamation and Enforcement, which for convenience sake, if it's acceptable, I will just refer to that organization as OSM from here on out.

Q. Sure.

A. It also similarly asserted reliance like the CHIA to, quote, existing information available in published work, approved mining permits and related data in the public domain from surface mining reclamation and regulatory process.

Q. Okay. Did the report provide any information from any new investigations of the site?

A. No.

Q. And independent of the contents of the permit application in the CHIA, did you have an opportunity to review the 1985 OSM Draft Reconnaissance Report that we referenced?

A. Yes, I did.

Q. And did that report provide any independent data or observations with respect to

the existence of alluvial valley floors at the mine site?

A. Yes, it did.

Q. Can you describe what that was for us?

A. Data or observations were provided with respect to the land forms or geomorphology of Coyote Creek valley and with respect to the implications of remote imagery that existed for the area.

Q. Okay. And what observations were made regarding the land forms and geomorphology?

A. On page 16 of the 1985 OSM report, Coyote Creek was described as a perennial stream with multiple alluvial terraces, the higher of which could be flood irrigated. In the upper reaches of the creek a single terrace is also described that is flood irrigable and partially floods naturally.

MR. BRAATEN: For those following along, it looks like the numbering was a little bit different on one of the documents we gave to Mr. Norris, but in the ones we handed out here, this information would appear on page 20.

THE WITNESS: The number -- the page 16, I believe, is the document page number.

Q. (MR. BRAATEN CONTINUING) Right. And I'm

not sure if you covered this, but were there observations made regarding implications of the available remote imagery for the area?

A. Yes, there was. The imagery that was available is Landsat imagery, and from the frequency of the imaging that was done, subirrigation was inferred based upon moisture content that was indicated for the vegetation. Where imagery indicated that vegetative growth in the late growing season occurred for most of the five years of reviewed data, that is, they eliminated the wet years, where vegetative growth late in the season was indicated, subirrigation was inferred.

COMMISSIONER FEDORCHAK: Excuse me. Can you restate what page we're on in this report because the page numbers are kind of cut off on some of the copies?

MR. BRAATEN: It would be page 20 as the numbers appear on the very bottom in the middle. There's a section on that page for Coyote Creek specifically.

MS. JEFFCOAT-SACCO: Could we take a minute and --

COMMISSIONER FEDORCHAK: I don't see that.

MS. JEFFCOAT-SACCO: -- number the pages because we don't have any numbers on our copy.

COMMISSIONER FEDORCHAK: So we just count 20 pages in and we'll be there?

MR. BRAATEN: No.

MS. JEFFCOAT-SACCO: No, because there's a different cover.

JUDGE MANN: About five pages from the back.

(Discussion had off the record.)

Q. (MR. BRAATEN CONTINUING) Okay. Mr. Norris, was there an assessment in this report made with respect to alluvial valley floors in the Coyote Creek valley?

A. Yes, there was. It was assessed as a potential AVF in part because, quote, subirrigation of natural flood irrigation are important, end of quote, and that's found on page 11 of the document -- or the page that is designated 11 in the document.

And then quoting from page 1, this means that the area is one that is likely, and "likely" is emphasized in the OSM document, which means that the area is one that is likely to meet the definition of AVF, end of quote.

Q. Can you explain the significance of subirrigation and natural irrigation with respect to alluvial valley floors and their importance?

A. Yes. The concept of alluvial valley floors in the surface mining law is that areas that are irrigated or irrigable are an important economic feature for agriculture in the arid west, and that when the water is available in alluvial sediments for irrigation, that those lands are afforded additional protection under the regulations. And the use of the water in an alluvial valley can either be anthropogenic, that is, human -- human-engineered systems that make water that's available in the valley available to the crops or water in the sediments that occurs at depths that they are available to enhance the production of crops beyond what would exist in areas where that subsurface water is not available, and that natural subsurface irrigation of agricultural crops is called subirrigation.

Q. Okay. And we also talked about a 2009 report produced by Dakota Westmoreland Company. Did you have an opportunity to review that?

A. Yes, I did.

Q. And did that report provide any

independent data with respect to the potential existence of AVF?

A. Yes, it did.

Q. And what independent data or observations did that report contain?

A. The report presented anecdotal information to the effect that hay production on the alluvial valley terrace of the Voigt property was significantly greater than hay production on the uplands on the ranch. The report also provided an anecdotal description of visual observations of vegetative conditions on the alluvial terrace at the Voigt property during a walkover of the property conducted in the spring of 2009, perhaps in mid-May.

Q. And maybe this is something we should have started with, but we've been talking about subirrigation and flood irrigation, and so forth, and you explained the connection for us between subirrigation and alluvial valley floors, but can I have you just back up for a moment and just give us a description or a definition of alluvial valley floors and their importance?

A. Alluvial valley floors are areas that are composed of alluvial sediments, which are

unconsolidated water-deposited sediments associated with streams and rivers that have sufficient water in the alluvial sediments and/or the stream that allow irrigation, either artificially man-designed irrigation or natural subirrigation, the results of which are enhanced agricultural production.

Q. Okay. And is there a definition for a perennial stream?

A. Perennial stream is a stream that flows all year long. It's not one that dries out -- routinely dries out during the dry season. It still has water in it 365 days a year.

Q. Okay. And there was a comment in the Dakota Westmoreland Company report stating that the terrace was comprised of water-deposited unconsolidated sediments. Actually I should ask, did the report determine that?

A. The Westmoreland report accepted existing interpretations that the sediments in Coyote Creek were water-deposited unconsolidated sediments. That was not an investigation they expressly did of the sediments themselves. They just accepted that based on existing data and previous opinions, including relying on the 1985 OSM report.

Q. Okay. And same question with respect to

Coyote Creek being a perennial stream, did the Dakota Westmoreland report make that determination?

A. No. As with the nature of the sediments, the report did accept that as being the case based upon existing data and previous studies.

Q. Okay. And did the Dakota Westmoreland report make a determination as to whether or not AVF existed in the Coyote Creek Valley?

A. Yes, it did.

Q. And what was that finding?

A. The report in the summary conclusions on page 30 concluded that Coyote Creek Valley contains no AVF within the study area.

Q. Okay. And what was the rationale or basis for that finding?

A. There were four subfindings that led to the summary conclusion. Those four subfindings are found on page 30 of the report.

The first subfinding was an acknowledgment that alluvial sediments are in the valley, that the unconsolidated sediments in the valley are alluvial sediments, and that is one of the requirements for AVF.

The second and third conclusions were, respectively, that artificial flood irrigation of

the Voigt land was not presently occurring and that there was no evidence that it had occurred -- had ever occurred. Such irrigation would be evidence for AVF had there been such flood irrigation.

The fourth conclusion and, therefore, the controlling one in this case, was that subirrigation does not play a role in enhancement of crop production in the study area. That conclusion that there is no subirrigation then is what precipitates the summary conclusion that there is no AVF.

Q. Okay. And so do you agree with that fourth conclusion regarding the existence of subirrigation enhancing crop production?

A. No, I do not.

Q. Okay. And do you hold that opinion to a reasonable degree of scientific certainty?

A. I do.

Q. And would you explain the basis for your opinion?

A. Certainly. The entirety of the investigation when it's reviewed, it is apparent that the sole basis for asserting no role for subirrigation is the subjective perception that plant vigor and density may have decreased as one

walked from the edge of the valley toward the creek.

Two sentences of this 31-page report comprise really the entirety of the case against the role of subirrigation for crop enhancement. Those two sentences are found in the last paragraph on page 29, and I'd like to emphasize those, quoting that paragraph, "Surveys revealed that those plants nearest to the creek which should have the best access to subirrigation were, if anything, in poorer condition and/or had poorer population densities than the average plant in the field. The most productive plants were the beneficiaries of additional surface water, not ground water, by virtue of their location in or near the footslope position."

The first problem with this two-sentence conclusion and the observations that were being looked at, the first problem is that the walkover of the field was conducted at the worst time of the year to assess the impact of subirrigation. It was done in early spring, mid-May, at a time of early annual growth. Late summer, long after spring rains, snowmelts, the spring water are gone, is the appropriate time to investigate subirrigation if

there's going to be any.

Q. Can you explain why that is?

A. It's the time of year when subirrigation will be supporting the plant growth. During the spring there's lots of water in virtually any area for the early growth of crops. It's in the mid and late summer when things heat up, dry out, that you've lost the impact of spring rains and snowmelt, that there is not enough active water being provided by precipitation for active plant growth. That's the time of year when the influence of subirrigation can be observed.

Q. Okay. And you mentioned that you had other problems with this two-sentence conclusion in the report. Can you tell us what the other problems were?

A. Yes. Another problem is that the subjective perception that there are progressive changes of plant vigor and population across the site is without any supporting data or documentation at least in the report. I found no maps in the report depicting the traverses across the fields. There was no photographic evidence that I saw of the vegetative trends. There were no counts of plant density, numbers and varieties or

any quantification of plant vigor.

If the vegetative -- if the vegetative trends that were reported did exist in mid-May of 2009, the assessment of the observations did not address or apparently consider potential causes of those variations beyond asserting that it is evidence of the lack of subirrigation.

Since the walkover was performed at the start of the growing season, the observations are not the result of the twenty-nine -- 2009 growing season. They're the conditions going into the 2009 growing season. The previous winter, December of '08, January and February of '09, were exceptionally wet in Beulah. Those three months were 250 percent -- precipitation was 250 percent of the 30-year climatic average. March of 2009 recorded seven and a half times the normal precipitation. This is based on USDA climate data, the WETS table, that can be found at agacis.rec-acis.org/38057.

There was no consideration that, for example, what was being looked at in terms of plant distributions was not stressed to the area, observed that the stress to the area was simply the result of perhaps prolonged submergence and

scouring by flood waters in the areas nearest the stream in response to exceptional March precipitation that followed immediately after an unusually wet, snowy winter. Something other than a dismissal of subirrigation would appropriately have been considered and discussed, particularly since it was not the time of year when you can even see the effects of subirrigation.

Q. You discussed the observations made with respect to the vegetation and the fact that it was less dense near the river. Assuming those observations are true, would that change your opinion with respect to the existence of subirrigation?

A. No. No, it wouldn't. Even were the anecdotal evidence valid and it were reflective of persistent conditions, it would simply reflect a pattern that is common for alluvial valley floodplains with subirrigation.

Q. And did you develop a schematic to explain why that's common?

A. Yes, I did.

MR. BRAATEN: And I handed that out to everyone. I intend it as a demonstrative exhibit just to aid with Mr. Norris's explanation.

Q. (MR. BRAATEN CONTINUING) But, Mr. Norris, we're all looking at the schematic you developed. Can you just explain what you're showing on that schematic with respect to subirrigation?

A. Yes. The schematic shows a half width of an alluvial valley sediment, an alluvial valley with -- that has been cut into bedrock and has alluvial valley sediments in it so that your -- on the left-hand side of the schematic you've got the highlands with the bedrock and the soils associated with the bedrock. You move in -- as you move to the right, there is a package of alluvial sediments, sediments laid by the stream in the valley, and at the far right is the creek, which in this case would be Coyote Creek.

Then within the alluvial sediments I have depicted a water table, if you will, water saturated sediments at the bottom of the alluvial sediments, unsaturated sediments at the top, and a boundary between the two of partially saturated sediments. That boundary between saturation and unsaturation at the position of the creek will be the elevation of the creek, and as one moves away from the creek to the left, that saturated -- the boundary between saturated and unsaturated will

gain in elevation as one moves away from the creek. So the elevation of the -- of the water within the sediments is higher at the edge of the valley than it is where the creek is in the valley.

In this particular case you will notice that the creek is depicted as being incised or eroded down into its own sediments, which is the condition that's observed in Coyote Creek. The top of the alluvial floodplain is above the creek level, so there's a lip or an escarpment at the face of the -- at the face of the alluvial sediments next to the creek.

So with that description, the point is that the assertion that the plants nearest the creek, quote, should have the best access to subirrigation, unquote, has no scientific basis as an expectation or rule of thumb for a stream like Coyote Creek.

For a stream that is incised into its floodplain, as Coyote Creek is, the lip of the terrace closest to the creek will undergo the deepest and most rapid decline of groundwater levels as the creek levels decline in the spring and summer into the dry season.

In areas away from the creek towards the

side of the alluvial valley, groundwater levels decline less and decline more slowly than right at the creek. Any part of the floodplain terrace -- if any part of the floodplain terrace were to see groundwater levels drop below the effective depth for subirrigation, it will be in the areas closest to the stream, and those would be the areas you would expect to see dry season stress to the crops.

If the plant patterns perceived by the author in the 2009 report in fact exist, those patterns reflect drought stress rather than some other end -- I'm sorry -- if those patterns reflect drought stress rather than some other process or event. That stress is found exactly where it would be expected in the alluvial valley sediments that do not have subirrigation support. It is a verification of the observation of OSM in 1985 that subirrigation in Coyote Creek drainage is important and it is a confirmation of OSM's expectation that AVF is likely.

Q. And before we move on from the 2009 report, are there any other problems or things that you would take issue with as far as the findings in that report?

A. Yes, there is. The second sentence of the

two-sentence dismissal of the AVF, I think, is inaccurate or misleading. The assertion that areas perceived as having denser or more vigorous growth are not beneficiaries of subirrigation by groundwater, but of, quote, additional surface water, unquote, I think is without merit.

There is no evidence that any of the crops are receiving water from anything but groundwater. For the sake of argument perhaps, there is more surface water recharging the alluvial valley in the vicinity of the footslope at the site of the valley. It's irrelevant. Regardless of its origin, the water is alluvial groundwater when it is taken up by the plants on the floodplain, and it is that groundwater that is taken up by the plants that enhances the agricultural production. And everyone agrees that the floodplain has higher production.

None of the groundwater in an alluvial valley originates in the alluvial aquifer. The groundwater is a composite of precipitation of recharge from Coyote Creek when it is high, discharge from runoff -- I'm sorry -- recharge from runoff from the uplands, recharge from any side streams that flow across or onto the alluvial

valley and bedrock discharges that flow into it from the sides or beneath. All those sources of water contribute to the hydrology of the aquifer. There is no separate accounting system that negates the contribution of some particular source of water with respect to whether or not subirrigation is effective. All of the water contributes to the subirrigation when it exists. It all counts.

Q. Do you have a professional opinion to a reasonable degree of scientific certainty as to whether AVF exists in the Coyote Creek drainage at the Voigt property?

A. Yes.

Q. And what's that opinion?

A. AVF is demonstrated to exist in the Coyote Creek drainage where the Voigt property is used for hay production.

Q. And do you have a professional opinion to a reasonable degree of scientific certainty as to whether AVF exists elsewhere in the Coyote Creek drainage?

A. Yes.

Q. And what's that opinion?

A. I share the opinion of OSM in 1985 that AVF is likely to occur elsewhere in the Coyote

Creek drainage.

Q. Okay. And you indicate that it likely occurs, so your opinion is certain with respect to the Coyote Creek drainage where the Voigt property is used for hay production and you believe it likely occurs elsewhere in the Coyote Creek drainage. Can you explain that?

A. Yes. In the Voigt property the vegetative patterns that are described in the 2009 Dakota Westmoreland are consistent with a confirmation of alluvial valley floor in those locations. I have seen no investigations or data from other areas that would allow one to move from an opinion of likely existence to demonstrated existence except in the Voigt areas.

Q. Okay. And have you seen any investigations or data from other areas of Coyote Creek -- the Coyote Creek drainage that demonstrate AVF does not exist?

A. No.

Q. Okay. And just one more quick question. We've been talking about the OSM report. Is it your understanding that this was a report of findings produced by the Office of Surface Mining?

A. Yes.

MR. BRAATEN: I have no further questions and would offer the OSM report in as Voigt Exhibit No. 2.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: I have no objection to Exhibit 2, but I would state that he has -- Mr. Norris has testified substantially from the Dakota Westmoreland report, so I believe it must be admitted as an exhibit.

JUDGE MANN: Mr. Braaten?

MR. BRAATEN: I have no objection. The reason I'm asking for the OSM report and not the others, and I'll let Illona correct me if I'm wrong, but my understanding is that the others are part of the administrative record and this one isn't. But if we want to make that an exhibit to this proceeding, I have no problem with that either.

MS. JEFFCOAT-SACCO: I was going to ask for the same request as Mr. Bjella. Everything that's been docketed as part of the administrative record is not evidence in the evidentiary record of the hearing, and if we want it in, even the permit, somebody has got to put it in. So I would also hope that the Westmoreland report is coming in, and

then I'm not sure what the others were here that we -- if we talked about them or not, if they have to go in.

MR. BRAATEN: There would be two others, the CHIA, Cumulative Hydrologic Impact Assessment, which is in the form of a memorandum, I believe, produced by the PSC. What was the other one? Oh, and the Bickel report, which I think was produced by Coyote Creek -- or Mr. Bickel was hired by Coyote Creek.

MS. JEFFCOAT-SACCO: I would ask for them all to come in and just someone give them their names and numbers.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: I would concur, Your Honor.

JUDGE MANN: The OSM report will be Voigt Exhibit No. 2. The Coyote Creek Alluvial Valley Study, looks like conducted by Dakota Westmoreland, October 2009 revision, that will be Exhibit -- Voigt Exhibit No. 3. And the October 15th, 2014, memorandum, Public Service Commission -- what did you reference that document as?

MR. BRAATEN: The CHIA, Cumulative Hydrologic Impact Assessment.

JUDGE MANN: All right. That will be

identified as Voigt Exhibit 4.

The Alluvial Valley Floor Evaluation Report prepared by Dr. David Bickel, that will be Voigt Exhibit No. 5.

And then I think it also makes sense to have in the diagram as well. That will be Voigt Exhibit No. 6.

Mr. Bjella, did you have any objections to any of these exhibits that have been offered, 2 through 6?

MR. BJELLA: Could I just ask a question of Mr. Norris with respect to No. 6?

JUDGE MANN: That's fine. Well, you'll have the ability to cross-examine him soon, so -- I mean, if you want to do it right now, just a quick one before admitting the exhibit, that's fine.

Mr. Norris, Mr. Bjella is going to ask you a question.

THE WITNESS: Sure.

MR. BJELLA: No. 6, if I understand it, is just illustrative. This is not an actual diagram of Coyote Creek; is that correct?

THE WITNESS: That's correct.

MR. BJELLA: I have no objection.

JUDGE MANN: Ms. Jeffcoat-Sacco, any

objections to 2 through 6 -- Voigt?

MS. JEFFCOAT-SACCO: We have no objections. We may have a question we'll discuss with Derrick at the break.

JUDGE MANN: Certainly. And, Mr. Braaten, that concluded your examination at this time?

MR. BRAATEN: Yes, Your Honor.

JUDGE MANN: Mr. Bjella, cross-examination?

MR. BJELLA: Yes, Your Honor.

EXAMINATION

BY MR. BJELLA:

Q. Mr. Norris, referring to Exhibit No. 2, the OSM report -- since you're not here and I can't show it to you, I assume you have a copy with you.

A. Yes, I do.

Q. I'm going to turn to page 1, and I'm not sure if that's what the commissioners have for page 1. It starts at the top, top draft and then the word "introduction." Do you have that?

A. Just a moment. Yes, I have that.

Q. It's my page 1, but I'm not sure if it's everybody else's. And so since I can't show this to you, if you'd go to the -- I guess it would be paragraph 4, it starts with the word, "These maps"

do you see that?

A. Yes. The last paragraph on the page?

Q. Right. Could you read those first two sentences?

A. Sure. "These maps represent only a reconnaissance-level effort in the identification of areas which are likely -- likely underlined -- to meet this definition, and these areas, therefore, are called potential -- potential underlined -- alluvial valley floors. The intent of this mapping effort is to identify areas which might at a future date be designated as alluvial valley floors.

Q. So this document is not a criteria in determination of alluvial valley floor for Coyote Creek, is it?

A. I'm not sure what you mean by "criteria."

Q. Well, this doesn't determine that Coyote Creek is an alluvial valley floor, does it?

A. No. It just says that it likely is.

Q. And this was a very large-scale study over a wide area of western North Dakota at a very high level, was it not?

A. Yes.

Q. Now, you are aware, are you not, that when

alluvial valley floor determinations are submitted by mining companies to the Public Service Commission, that the Public Service Commission not only reviews that report, but makes its own independent determination and often its own investigation? Are you aware of that?

A. I am aware that the Public Service Commission can do an independent investigation and it can collect its own data. I don't know whether or not that was done in this case.

Q. So you're not aware of the letter from the Public Service Commission to the mining company which indicates it did its own independent verification and found and agreed no AVF? You're not aware of that letter?

A. I am aware of the letter indicating that the agency found -- made a finding of no alluvial valley floor.

Q. And that letter indicates it made an independent determination of that fact. Are you aware of that?

A. I don't, as I sit here, recall the exact wording of the agency's letter.

Q. So now what we have presented and what you have presented are two very detailed, long reports

prepared by what appear to be experts in the field, certainly Mr. Bickel and Dakota Westmoreland, both of which have made studies of Coyote Creek and both of which have determined there is no AVF. You're aware of that, are you not?

A. I am aware and have read both the Bickel and the Dakota Westmoreland studies. I've read the OSM reconnaissance study in both the Bickel -- the Bickel report simply summarized the previous reports, and the Westmoreland had a great deal of data and discussion in it, but the bulk of that was unrelated to alluvial valley floors, and the only data and discussions related specifically to alluvial valley floors in the Westmoreland, which is, I think, of the documents, the key document. The only portion of that that really dealt with the possible evidence for or against alluvial valley floors was the walkover data.

The rest of it was interesting, it contributes to your understanding of the hydrology of the lands surrounding Coyote Creek, but it is not explicitly -- does not explicitly investigate or is directly applicable to a determination for an alluvial valley floor determination. There's remarkably little that actually investigated the

potential for alluvial valley floors in either of those documents.

Q. Well, I'm going to refer you to -- it's your Exhibit 5, this is Mr. Bickel's report, and it would be page 2, the second paragraph. I'm going to state -- I'm just going to sort of paraphrase there because, again, you're not here. It says the report is based on existing information and published work, approved mining permits and related data in the public domain from surface mining reclamation and regulatory agencies. However, observations made by environmental professionals involved in the acquisition of baseline data for future Coyote Creek Mining Company permit applications are incorporated and attributed to individuals where appropriate.

That right there is a demonstration of independent data having been reviewed by Mr. Bickel, is it not?

A. It indicates he reviewed other people's data -- unspecified data from unspecified people. It's a generic statement that is repeated verbatim in the other documents, but these documents do not present that data, and most of the data that they do reference and present in these reports are

pertinent to hydrologic aspects of the mine area, but not to alluvial valley floor determination.

Q. With respect to the Bickel report, Exhibit 5, did you review the climate and hydrologic -- hydrology section of the Bickel report, starting on page 8?

A. I did.

Q. And did you review the soil section of the Bickel report, starting on page 16?

A. I did.

Q. If you look at those pages, they're full of independent data. How can you dispute that?

A. I don't dispute that there is a lot of data presented in those parts of the report.

Q. Mr. Norris, did you visit the Coyote Creek site to make this assessment you made today?

A. No. I used only the information in -- or related to the alluvial valley floor discussions in the permit application and the findings documents.

Q. So to your criticism of the other experts, you too have made no independent study and independent data review, have you?

A. That's correct.

MR. BJELLA: I have no further questions.

JUDGE MANN: Ms. Jeffcoat-Sacco.

MS. JEFFCOAT-SACCO: I believe this is Exhibit A for asking if Director Deutsch could question this witness, please.

MR. BRAATEN: Certainly.

JUDGE MANN: Go ahead, Mr. Deutsch.

EXAMINATION

BY MR. DEUTSCH:

Q. Mr. Norris, you mentioned at the beginning of your testimony that you felt the AVF section of the actual permit application was deficient. Are you aware that the state, as well as federal rules, require the -- a preapplication determination for alluvial valley floor determinations?

A. Yes, I am aware of that. However, I would -- I did not make any judgments as to whether there was a deficiency in the application. I merely made the observation that the documents that were referenced were not part of the application.

Q. But included in the application was a reference to the studies that had been conducted then as well as including a copy of the letter that we issued making our AVF determination? That was included in the application?

A. Yes.

Q. With regard to what's been labeled as

Voigt Exhibit 2, on that introduction section that Mr. Bjella mentioned earlier, I noticed on this the way things were copied that there's some discussion about the background going in for this reconnaissance report that was prepared by OSM, then going to the next page it appears that part of that is missing. Do you have that available to you right now? It's part of that -- that paragraph carries over onto the next page and the top of that next page is cut off. So it appears what is in Exhibit 2 here is incomplete. I don't know if there's anything -- critical comments here that have been omitted from that, the way it was copied, or not.

JUDGE MANN: What page is that? Can you identify that again for me?

MR. DEUTSCH: It would be on page 1. Then you go to page 2, then it's -- the copy that we have, it's sideways and part of it is cut off. It's marked as page 2.

JUDGE MANN: The exhibit that I have it's not cut off. Do we have a number of different -- why doesn't everybody have the same exhibit, I guess?

MR. BRAATEN: I don't know. I think that

one of these copies just got something screwed up in our printer when we were printing them out. I don't notice anyone else having that issue, and I just handed them another one.

JUDGE MANN: The record contains a full -- it appears that the record contains a full copy, but I just want to make sure that everybody who's, you know, reviewing the documents is looking at the same thing.

COMMISSIONER CHRISTMANN: Your Honor, my page 2 is cut off.

JUDGE MANN: Yours is cut off?

COMMISSIONER KALK: I think all three of ours are.

JUDGE MANN: All right.

MR. BRAATEN: Sorry about that.

JUDGE MANN: I think as long as we have the full document in the record, it's okay, but I think it's important that everybody have the opportunity to -- right now to view the full document while we're doing examination of the witness.

COMMISSIONER CHRISTMANN: The same thing happens, Your Honor, on a couple other pages, like 18 and some later than that.

JUDGE MANN: Mr. Braaten, do you have any others? I mean, the one that's in the record, the one that I've marked as Exhibit 2, appears to be a full copy of the document. Do you have others that are like this one?

MR. BRAATEN: I have now handed my others -- all the others.

JUDGE MANN: Why don't we just take a real short break right now and see if we can get full copies of the Exhibit No. 2 to the commissioners and the parties. Why don't we do that. Is that okay? Let's go off the record.

(Recess taken at 9:38 a.m. to 9:54 a.m.)

JUDGE MANN: Mr. Norris, this is the administrative law judge again.

THE WITNESS: Yes.

JUDGE MANN: We're back on the record and we're going to continue with your examination. Okay?

THE WITNESS: Okay.

JUDGE MANN: Mr. Deutsch, did you have additional questions?

MR. DEUTSCH: Just a couple.

JUDGE MANN: Go ahead.

Q. (MR. DEUTSCH CONTINUING) Mr. Norris, I

guess, going to the 2009 Dakota Westmoreland Coyote Creek AVF study, on -- at the bottom of page 28, then going to the top of page 29, it discusses some wells that were in the area of the farmstead occupied by Casey Voigt, and going to the first complete paragraph on page 29, would you read those last two sentences of that paragraph on page 29?

A. I am a little confused. You're talking about the Bickel report?

Q. No. I'm talking about the Dakota Westmoreland.

A. Oh, the Dakota Westmoreland. All right. Just a minute. I'm sorry. And you are on page 28 of the --

Q. It started on page 28 under the heading existing subirrigation, then going to page 29.

A. Okay.

Q. That first complete paragraph on the top of page 29, those last two sentences that start out, "The landowner also reported." Could you read those two sentences?

A. "The landowner has also reported well water levels at 15 to 20 feet. Root systems of the annual crops and forage grasses grown in Sections 19, 30, and 31 typically" --

JUDGE MANN: Mr. Norris, sorry. Can you speak up a little.

THE WITNESS: Okay. I will try. I will try again. "The landowner has also reported well water levels at 15 to 20 feet. Root systems of the annual crops and forage grasses grown in Sections 19, 30, and 31 typically would not tap water resources at such depths to significantly increase yields, nor would rangeland plants subjected to grazing."

Q. (MR. DEUTSCH CONTINUING) Okay. With regard to that last sentence, kind of the conclusion that was drawn about the water tables being down 15 to 20 feet and having -- you know, with the result of that depth of water table, that that would be basically insignificant to increasing yields, would you agree or disagree with that statement?

A. Well, with no more information than that, I can't agree or disagree with it because the position of the wells being explicitly talked about there relative to where the plants are being observed or the hayfields are is not clear. The other thing that is important with respect to subirrigation is an appreciation of the fact that

the plant roots do not need to get to the water table to have the water table providing them useful water.

There is a zone of partial saturation that extends above the water table, and depending on the specific types of sediments and the drain sizes, the partially saturated zone above the water table can extend for quite a few feet. So that although the water table -- if the water table were 15 feet below a terrace level, the crop roots would not likely hit the water table itself, but they don't need the water table. They just need sufficient saturation that the saturation is above the wilting point of the plant, and that can extend several feet, in finer sediment five or ten feet above the water table itself.

The crops themselves offer the best measure of whether or not they're getting that water. If you want to see whether the crops are getting the water other than their productivity, like a second hay crop or something like that, then you need to put in piezometers at the water table and watch for the daily fluctuations that represent plant uptake during the day.

None of those studies have been proposed

here, but the sentences that you asked me to read are certainly a caution. It says if there's subirrigation going on here, it has to be documented, it has to -- you need to be concerned if the water level is 15 feet or 20 feet below the land surface under the crops, but it doesn't preclude that there's subirrigation going on.

Q. Doesn't that statement imply that at those depths that the root systems would probably get very little water that will help sustain plant growth?

A. At the point of that well perhaps, but as you move -- if you're going to have that kind of depth, based on the unsized nature of that floodplain, I'm guessing that those wells that are being talked about are near the creek. As you move away from the creek and the water table rises, then that depth to water at the well is going to vary, is going to decrease as you move to the edge of the valley.

It's just one point, and it's an important observation, but the suggestion -- the observation that the crops don't look as good near the lip of the floodplain, that's what this 10 or 15 would say, yeah, that might not be surprising. But where

the crops are still good and you know the water table is going to be higher, similarly that depth in other parts of that field are not going to be that great.

Q. Okay. I guess along those lines, that gets to the next question I have and that deals with the diagram that you provided, what was marked as Exhibit 6.

A. Yes.

Q. Do you have any data to show that that actually represents the conditions at Coyote Creek?

A. No. There have been -- there have not been the data collected that allows one to generate such a diagram for Coyote Creek. That is just a schematic of what would be expected in a normal floodplain with homogeneous floodplain materials that make it up. To my knowledge, there have been no detailed profiles made across the floodplain anywhere in Coyote Creek.

MR. DEUTSCH: I have nothing further.

MS. JEFFCOAT-SACCO: I have a question.

JUDGE MANN: Go ahead, Ms. Jeffcoat-Sacco.

EXAMINATION

BY MS. JEFFCOAT-SACCO:

Q. Mr. Norris, this is Illona, and I just had

one question. We're talking fourth-grade level here. But I need to know precisely what your recommendation is regarding this permit and this hearing. You did answer Mr. Deutsch and say you were not saying the permit information was deficient, so -- that was going to be one of my questions -- what is your recommendation?

A. I would recommend that the issue of no alluvial valley floor be revisited, that the requisite data to resolve ambiguities that have to be considered existent at this point because of a lack of information that's been collected, I think there need to be boring and piezometer profiles across the alluvial valley system --

Q. Could you repeat --

A. -- the schematic --

Q. Excuse me. Before you go on, could you repeat that first subrecommendation? There should be boring and what?

A. Piezometer profiles.

Q. Can you spell it?

A. Water level profiles that will allow -- allow the water table to both be documented at a given time, but also documented as to fluctuations in the water table literally on a daily basis,

installing pressure transducers that during August and September can look for daily fluctuations in the water elevation at the water table that can be indicative of plant uptake.

You literally can have a few hundredths of a foot of water level decline during the day when the sun is out and the plants are taking water and at night the water levels come back up and recover. It's direct evidence of the plants taking water from the groundwater. And you have then also the ability when you put in those piezometers to sample and describe the sediments that make up a profile across the Coyote Creek terrace so that you can fill in the yellow areas of that schematic as to exactly what exists where in that creek. You've got an idea of the drain sizes that are applicable to the floodplain so that you can then project the capillary fringe to partially saturated interval from which the plants typically will seek to draw their water. You can fill in that schematic with what the real condition is and that, I think, needs to be done in several places, not just on the Voigt property, but other places up creek or down creek from that to have a view as to whether or not the subirrigation that seems evident on the Voigt

property in fact also exists more extensively in the valley.

My recommendation would be a detailed and meaningful investigation of data that is pertinent to identifying subirrigation, and that is missing from what's been done to date.

MS. JEFFCOAT-SACCO: Thank you. That's all I have.

JUDGE MANN: Commissioner Christmann.

EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. I didn't write it down, but did you say something kind of earlier in your testimony about specific or different standard or requirement from OSM if AVF exists?

A. Yes. There are -- there are rules. If AVF exists, then there are additional parts of the surface mining law that specifically address the protection of the hydraulic function of the AVF areas, the ability of those to during and postmining continue to support the agriculture that they do at present.

Q. So does what you just said mean that OSM would require that those lands not be disturbed or that they be restored back to what they are now?

A. The AVF rules would preclude -- it's been a while since I specifically read them, but, as I recall, they would preclude mining through them. But in this case Coyote Creek is adjacent to, not -- not within the footprint of mining.

At issue here would be that the impacts of mining outside the actual mine area itself not interfere with the hydraulic function of those alluvial valley floors. And it's a -- the first step of the alluvial valley protection is clearly identifying whether or not alluvial valley floors exist, then it goes into a set of regulations that, okay, if they exist, these are the following determinations that need to be made, and there, I know, are sections of exemptions that can be sought or declared for particular lands or something else. But any alluvial valley floors that do not become exempted from the protections then are -- it isn't just the physical protection of the land from mining, it is a protection of the hydraulic function of those alluvial valley floors that make them work as a contributor to the agricultural economy.

Q. So none of the areas that you're certain contain AVF are in the areas that are going to be

mined directly?

A. I believe that to be the case, yes.

Q. But just close by so you're concerned that the adjacent mining will disturb -- will harm them?

A. My concern is that I believe there are AVFs there that are not being recognized, and by virtue of that the investigations necessary to determine whether there is a risk to them have not been done.

I don't have an opinion as to whether there is risk or is not risk at this point, because there is so little evidence that has even been sought for the determination of AVFs, that I think that is inadequate at the face level.

There is, I think, sufficient evidence that I'm convinced there is AVF under the Voigt hayfields. But the question of the risk to them would require yet further determination of what's going on out there. And so it's too early to say that I'm concerned about the effects on them. I'm concerned that there is a determination that they're not there.

Q. Okay. This morning Mr. Braaten put quite a bit of paperwork before us already, and in your testimony throughout I felt you were pretty

critical of some of the studies that have been done for just kind of -- in one case recycling someone else's information or not gathering information at the right times or not gathering very good and accurate information. And then in response to Mr. Bjella's last question, we find that you haven't been here at all.

So can you just elaborate on that more, why I should give a lot more credence to your assessment than what we should give to the other assessments that were handed out and were subsequently kind of criticized by you?

A. Yes. I would like to clarify that. The reports that were produced by Westmoreland and were produced for Coyote Creek by Bickel are not invaluable with respect to the issue of water availability to the Coyote Creek valley. They do talk about the hydrology, and certainly summary discussions of the hydrology of areas adjacent to or obviously within a mine are valuable. And, for instance, the Bickel report does summarize a lot of the hydrologic data that is hundreds and hundreds of pages in the permit application itself, and the Westmoreland document is the same.

To me the importance with respect to

alluvial valley floors, though, is not the summary of the other data that's available, as valuable as that summary may be, but that data does not address and does not investigate alluvial valley floors, which is the issue I'm trying to testify with respect to.

The overwhelming totality of those two reports is addressing, is there water available to the Coyote Creek drainage that alluvial valley floors may exist, and that really is not in dispute or at issue in that there are all kinds of springs and seeps and waters that are described as feeding Coyote Creek and its tributary.

Coyote Creek, everyone acknowledges, has a perennial stream running through it. That then says, okay, we've got the alluvial valley sediments that everybody is there -- says is there. We have a perennial stream, which is kind of absolute evidence that you have available water in that drainage. You have at least anecdotal acknowledgment of increased crop production. The only issue that really is there is subirrigation. And the Bickel report does not offer anything beyond the Westmoreland -- Dakota Westmoreland report and the OSM.

And if you look into the Dakota Westmoreland report, it too is discussing availability of water to the valley, but except for the walkover they made in May, it offers no direct observations or evidence of anything that addresses the question of is or is not there subirrigation that is contributing to the enhanced agriculture that's there.

So it's not that those reports do not have their value. It's not that they don't give you an understanding of the relationship between Coyote Creek and the uplands. They do provide that summary information, but they don't provide information that allows you to say that subirrigation is not operating in that valley. If anything, at least for the Voigt hayfields, what limited observations were directly made pertinent to that are evidence that that enhanced hay production is due to subirrigation of those fields.

Q. How far upstream of the Voigt ranch is the origination of Coyote Creek?

A. I don't know. I would have to look at a map. I believe it's quite a ways south of where the Voigt ranch is, but how many miles, I don't know.

COMMISSIONER CHRISTMANN: I have no other questions. Thank you.

JUDGE MANN: Commissioner Kalk.

COMMISSIONER KALK: Thank you, Your Honor.

EXAMINATION

BY COMMISSIONER KALK:

Q. Thank you, Mr. Norris, for your testimony today and your work in the field.

Just some more background questions, if I could. It looks like in your resume or vita, you've done a lot of work in West Virginia; is that correct?

A. There has been some very concentrated efforts that I've done in West Virginia, yes.

Q. Have you ever testified in front of the West Virginia commission?

A. Yes, I have.

Q. What kind of proceedings was that? What did that involve particularly or in general?

A. It would have been hydrologic issues related to mining. It would have varied in some cases between potential damage to streams and stream valleys related to underground mining or mountain top removal mining, geochemical issues related to groundwater contamination, reclamation

designs and programs there. In particular one of the bigger areas -- bigger projects that I worked on was a -- a reclamation plan that would have incorporated coal combustion fly ash into the reclamation plan in an attempt to control acid mine drainage. A pretty wide range of issues.

Q. All right. Thank you, Mr. Norris. I was just then trying to relate that back to North Dakota. Would you agree that the mining, the soil types and the types of coal and the coal depth are much different in these two states?

A. Oh, sure. And the climate, of course, is dramatically different between the areas.

Q. Okay. Then could you just clarify for the record where exactly the 100th meridian is? Give me some towns or something other than a hundredth meridian.

A. I, again, would have to go to a map and look for exactly where the hundredth meridian is.

Q. It seemed to me that was a critical point in your testimony about the hundredth meridian and how that tied into alluvial valley floors, so I would just like to get that location in relation to North Dakota coal.

A. Well, I could take a moment and look at a

map, but the importance of the hundredth meridian is that it is -- west of it the surface mining law considers -- I mean, alluvial valley floors do not exist within the surface mine east of the hundredth meridian. It is designed to protect the agricultural -- or the irrigation-dependent agriculture of the arid west.

Q. But you see my question, Mr. Norris, we're trying to relate this to North Dakota. So that's not for you, I guess. But I'll just move on then.

Commissioner Christmann kind of went down this road a little bit, but I want to just clarify. Are you questioning the data or the interpretation of the data or just lack of data?

A. Certainly I think there is a lack of data, but I also interpret -- or I also question the interpretation of the data. The issue of subirrigation under the Voigt properties, the pertinent data consists of what was described by somebody walking over the property in May, and that was the basis of the determination or the conclusion in the Dakota Westmoreland that subirrigation did not play a part. I question that interpretation. The description, the data that that delivered was a description that would be

perfectly consistent with the geometry between the alluvial terrace and the creek and affected subirrigation over parts of those hayfields.

Q. Mr. Norris, if I could just keep going. When did you start your work on this project?

A. About three weeks ago.

Q. So you feel that's given you enough time to fully look at all the literature that's tied to the history of these projects -- these type of projects in North Dakota?

A. I would very much have liked to have had more data -- or, I mean, more time, but it actually, I think, was adequate for the issue of the subirrigation finding. With more time I would have liked to have looked at other parts of the permit, but I'm comfortable that I understand what was in the permit application and what data was relied upon to come to -- to the conclusion there was no alluvial valley floor.

Q. And then in general for those doing research, wouldn't you trust the research of somebody doing a field study more than you would a report that you read? Wouldn't you rather have a determination being somebody who went out and walked the ground, looked at the soil types, looked

at the flow who had experience? Wouldn't that generally be preferred?

A. Boots on the ground is, given the opportunity, probably my first choice.

Q. And then just a couple questions about your illustration of the alluvial floodplain. When you say that -- I'm using your chart here, the blue area, alluvium, is that a makeup of O horizon, A horizon? Which soil horizon is that made up of, or what is it exactly?

A. Without borings in it, we don't know other than they are -- there is a general consensus it is unconsolidated water lane deposits, but certainly the bulk of what we're looking at there would be below the typical soil zonation designations. Those are just sediments that are not -- they underlie the soils, but the bulk of what we're looking at on that diagram would not be a soil profile.

Q. It has to be something. It's every an O horizon, an A horizon, an E horizon, B, C, or to the bedrock. It has to be classified as something.

A. Well, it would be a sediment horizon, yes, and I don't know -- I'm not a soil scientist. I don't know what the designations of those are.

Q. But you're drawing a conclusion, though.
A. I'm drawing a hydrologic conclusion.
Q. But don't you have to know the soil type before you can draw that conclusion?
A. Not with respect to the schematic that I drew.
Q. But you haven't done any borings out there.
A. No one has, to my knowledge.
Q. But then how can you draw the conclusion?
A. There are basic principles of groundwater flow that have to be honored regardless of what the label of a type of sediment are. A gravel has certain characteristics regardless of the name that's given it in terms of a soil designation. A sand has characteristics. Alluvial sediments behave in a generally predictable way regardless of the label that's on them.

You can improve greatly your understanding in the details, and if you had the borings and if you had the soil descriptions, the sediment descriptions and the water measurements, you would almost certainly find that that schematic that I gave is very oversimplified. The water table would not be a straight line from one side of the valley

to the other. It would have a topography, an elevation variation on it based on the sediments it's going through. But the overriding principle that will be there is that from the side of the valley to the stream there will be a slope on the water table that is highest at the valley edge and lowest at the creek, and that's all the schematic is trying to show.

Q. Understood. And just my last question, sir. If someone used a data set that had the different soil horizons that could clearly show the groundwater depth and used that in their determination, wouldn't that be considered the most accurate way to get a determination?

A. It would.

Q. So if a certain group used that, you would support that?

A. That is the sort of data that I believe, in response to an earlier question, that I think needs to be done for this permit.

Q. Are you sure that wasn't done? Have you reviewed all the data and literature that that maybe wasn't done somewhere when they did their determination?

A. I have not seen any evidence that that was

done in the area where Westmoreland came to the conclusion -- Dakota Westmoreland came to the conclusion that subirrigation was not a contributor to the enhanced production.

COMMISSIONER KALK: Thank you, sir.

JUDGE MANN: Commissioner Fedorchak.

COMMISSIONER FEDORCHAK: Thank you, Judge.

EXAMINATION

BY COMMISSIONER FEDORCHAK:

Q. Thank you, Mr. Norris, for your testimony so far. I just have a few questions, followup kind of summarizing your evaluation of the study of this AVF a little bit further.

So I too am, you know, focusing in on a couple of the statements that you said suggesting that there wasn't enough info in the permit application to address AVF and that there was so little evidence sought in determining the AVF.

Did you -- I wasn't quite clear with Jim -- Mr. Deutsch's questions to you and his reference to the pre-permit evaluation of the AVF. Did you read that?

A. Did I read what?

Q. The pre-permit -- the work done pre-permit to evaluate AVF.

A. Well --

Q. And what was that?

A. I read the documents that were cited as having been provided to the agency for the purpose of their determination, the original and the revised Bickel reports, the Dakota Westmoreland AVF study, the OSM 1985 reconnaissance investigation. Those documents which were cited in the permit application or mentioned in the permit application or were mentioned in the findings letter or were mentioned in the CHIA as being -- underlying the interpretation that there was no AVF I did review.

Q. And do you believe that that summarizes what was all the documents relating to the pre-permit evaluation of the AVF? Are we talking about the same thing here?

A. Well, I think -- I think the pre-permit determination of no AVF also probably relied upon, for instance, the baseline -- the baseline data collected for this mine. I have no reason to believe that it didn't rely on the types of and available material that was generically referenced but not specifically identified as to what was included. But where there was -- I mean, they alluded to a lot of information without indicating

exactly what it was they were relying -- I mean, what those were. There were the generic statements that were repeated in the Bickel report and in the CHIA that reference literally everything in all of the agency's files. Obviously I don't know, and could not know, what all of that information might be, nor could any citizen trying to review the decision. But where specific documents were provided that seem to provide a core of the decisions where the documents were explicitly cited or quoted, yes, I did review all of those.

Q. Okay. Thank you. So thank you for outlining what you feel should be done in terms of the boring and the water level profiles and the examination of that data. Can you tell me, is that the standard -- industry standard for evaluating AVF? Is that what is typically done in these kind of permits, boring throughout the permit area to basically determine the depth of the water tables throughout the permit area, or what's the standard for reviewing these?

A. It very much varies from state to state, and it appropriately varies from mine proposal to mine proposal even within a state. The type of data I'm talking about is being collected, has been

collected, for example, at Otter Creek in Montana in response to the agency sending the company back and saying you've got to collect information that actually does this. So profiles across a number of streams and a number of areas were -- were instrumented towards collecting exactly the kind of data I was talking about.

At South Heart in North Dakota there were, I believe, four or five piezometer profiles across streams in that -- for that mine that were installed and instrumented for a period of at least a full summer season and fall.

At Alton Creek in Utah, there the alluvial valley issue was not so much hydrologic as it was geologic and whether the sediments were or were not water lane alluvial sediments.

So it isn't a -- it's something that has to be defined and pursued given the geology and hydrology that's seen at the site, and I think the profiling that was done at South Heart in North Dakota and that has just been finished and is available for review at Otter Creek in Montana is the appropriate kind of investigation that needs to be done at Coyote Creek -- for Coyote Creek.

Q. And then in several locations in these

reports -- I'm looking specifically at the Dakota Westmoreland report -- they reference water levels at 15 to 20 feet throughout. What are those based on, those references to the water levels?

A. They are -- I mean, what you're reading is really all I know about them. They are wells. They do not seem to explicitly identify where they are. They appear to be in some cases relying on anecdotal information from a landowner as opposed to physical measurements. They are what they are. I don't -- I don't consider them reliable enough -- a reliable enough class of information to draw very many conclusions from them.

It suggests that there may be areas that are below the depth of plant roots, but I don't know where the wells are and I don't have where the wells are completed. I mean, it doesn't -- it doesn't offer very much of an indication other than at the footprint of that well, alfalfa might have trouble reaching usable water.

Q. And then how --

A. But we don't have any real measurements or anything that allows us to put it into a context.

Q. Thank you. To draw water conclusions about the depth of water tables, how many -- how

much data like that do you need, how many wells do you have to -- can you fairly estimate in a broad area the depth of the water table by a few borings, or what's necessary?

A. Typically when these kinds of profiles are made, the wells will be certainly hundreds of feet apart. You might have -- depending on the width of the alluvial valley you're trying -- trying to investigate, three to six wells in a profile would be the sort of thing you're looking for.

Q. And then in terms of the hayfields on Mr. Voigt's land, how large of an area is that that you believe that there is a potential for an alluvial valley to exist?

A. The only -- the only data that are there suggest that the appropriate decision is that there are alluvial valley floors there. Without detailed mapping, detailed crop records, further investigation, I have no way to estimate the area -- the aerial extent, the acreage that is or is not supported with subirrigation.

Q. So you haven't narrowed it down to any specific area?

A. There is no data with which to narrow it down, of which I'm aware, anyway.

Q. All right. And then in the Dakota Westmoreland study again, you had mentioned that the data was collected in the spring, which wouldn't be the appropriate time to indicate a plant relying on the water from the alluvial valley floor. I note on page 2 that the study says that it was -- used field investigations, interviews with producers, regulatory and land management agency, published reports, aerial photographs, and Landsat imagery.

Could any of that data have been used to draw the conclusion from this report that would lead them to the one that you object to, the two sentences you object to that the survey revealed that those plants nearest to the creek -- you say the survey was done at the wrong time -- could they have relied on other data or do you know that that's the survey data that was done in May and that's why that conclusion is in error?

A. I think it's -- it's quite evident from the report and it's leading up to the conclusion section, in fact, that they are relying on that site investigation. I mean, their number four conclusion discusses a depth of water table that exceeds 15 feet that appears to be anecdotal

evidence, and that the only other thing they reference is water quality in the vicinity of the homestead which would make flood irrigating problematic, but that isn't the issue that's being done.

As I read the report, they are relying on -- they're relying on that walkover for those particular lands and not the body of data that you're talking about.

COMMISSIONER FEDORCHAK: Okay. I think that concludes my questions, Mr. Norris. Thank you.

COMMISSIONER CHRISTMANN: I have one more.

JUDGE MANN: Go ahead, Commissioner Christmann.

FURTHER EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. From your expertise, when open pit surface mining like we do in North Dakota is going to occur in a region with AVFs, what is your recommendation? Is it just a particular setback to leave a buffer zone to avoid damage, or is it specific mine practices that need to occur just to prevent damage?

A. I don't -- I don't like -- when we're

talking about hydrogeology, hydrology, I'm uncomfortable with general rules of thumbs or setbacks or things like that. I think it requires a mine-specific understanding of the hydrology of the probable hydrologic consequences of this mine in its geologic and hydrologic setting to determine what the appropriate mine design and potentially even location is in order to protect alluvial valley floors.

If you try and establish a criteria of, say, an arbitrary setback, you're going to end up with situations where that isn't applicable for a particular mine and a particular siting. I think the objective needs to be a set of protocols, a set of guidances towards the investigation that leads to an investigation that then generates what's appropriate for this mine. And I think that's consistent with my understanding of how SMCRA works, is the mine plan has to be tied to the probable hydrologic consequences in order to make sure that excessive unallowable damage doesn't occur outside the permit area.

COMMISSIONER CHRISTMANN: Thank you.

JUDGE MANN: Mr. Braaten?

FURTHER EXAMINATION

BY MR. BRAATEN:

Q. Just a couple quick questions. Mr. Norris, in your resume, which is marked as Voigt Exhibit 1, you list a number of reports and presentations and publications. When you're doing a report such as some of the reports we've been discussing, if you have actual data that provides strong support for conclusions you're drawing, do you typically include that data or a citation to it in your report?

A. Absolutely.

Q. And is that a standard practice in your profession?

A. I -- it should be. It does vary a lot by individual and individual. Not everyone does. I think it's unfortunate.

Q. And when we first spoke about preparation for this hearing, you told me that you would only testify if you could limit your testimony to specific areas; right?

A. Yes.

Q. And that was specifically so that you had the time you thought sufficient to prepare your testimony in those areas?

A. That's correct.

MR. BRAATEN: No further questions.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: I might have one. I want to talk to Jim.

JUDGE MANN: Sure.

MS. JEFFCOAT-SACCO: We don't have any.

JUDGE MANN: Commissioner Christmann?

COMMISSIONER CHRISTMANN: No.

JUDGE MANN: Commissioner Kalk? Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: No.

JUDGE MANN: Thank you, Mr. Norris. You can disconnect.

THE WITNESS: All right. Thank you for the opportunity.

JUDGE MANN: Mr. Braaten, you can call your next witness.

MR. BRAATEN: Okay. I'm going to very briefly recall Casey Voigt for just a couple questions.

JUDGE MANN: Mr. Voigt, it's my understanding that you were previous -- you

previously testified in this matter and were sworn in.

THE WITNESS: On Friday, yes.

JUDGE MANN: I don't need to readminister the oath. You remain under the oath, though.

THE WITNESS: I respect that.

CASEY VOIGT,

having been previously duly sworn, was examined and testified as follows:

FURTHER EXAMINATION

BY MR. BRAATEN:

Q. Mr. Voigt, I've handed you a document. The title at the top is Voigt Ranch Alfalfa. Can you just tell us very briefly what this document is?

A. It's a summary of my production records from baling alfalfa on those fields and also included some other reference fields further to the northwest that would be away from the creek valley.

Q. Okay. And so which of these fields are in the area we've been discussing as potentially having alluvial valley floors?

A. The first two on the left. One is what we consider the field by the house, which is alfalfa, and then we also have the one by the scoria.

Q. Okay. Do you know what the legal description is of those offhand?

A. No, I do not.

Q. No problem. And then, just generally speaking, you have two other fields, branding corrals (north) and branding corrals (south). Can you give me an idea of where those are in location to the other two fields?

A. About a mile north and west and then -- Section 25, I believe. The first two would be in Section 30.

Q. And I notice on here for a number of these, especially in the house and scoria fields, you have a row for second cutting. Can you explain what that means?

A. Usually I try and start on those fields earlier because, as is evident, every year I do consistently get a second cutting alfalfa. So after we've cut the first cutting and hauled the bales off, the growth is usually substantial enough to where we go back in and take a second cutting. On normal -- on abnormally wet years, such as this year, we actually get a regrowth of a third cutting alfalfa.

Q. Tell us again, how long have you been

ranching?

A. My parents bought the current ranch in 1971.

Q. Okay. And in your experience ranching, is it unusual to get a second and particularly a third cutting of alfalfa on a field?

A. Yes, particularly on dry years. I have several neighbors here that can attest to how they drool over my second cutting dry years.

Q. And so in dry years in these areas where we've been discussing the potential of alluvial valley floors, even in those dry years you're getting sufficient water to the alfalfa fields to get a second and possibly a third cutting?

A. Yes. And evident on the production records in 2012, for example, to my knowledge, is the driest year in the history of our ranch, and I had in the studies done by Coyote Creek Mining pointed that out to Donn Steffen that even on a year like this I still get second cutting alfalfa off of these fields.

Q. Okay. And do you maintain records of your production on an annual basis when you do these cuttings?

A. Yes, I do.

Q. And to the best of your knowledge, is the information on this sheet an accurate description of the cuttings you've had from that alfalfa field?

A. Yes, it is.

MR. BRAATEN: I would offer this in as -- I don't remember which one we're on.

JUDGE MANN: It would be 7.

MR. BRAATEN: -- Voigt 7.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No objection, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: No objection.

JUDGE MANN: All right. Voigt Exhibit No. 7 is admitted.

MR. BRAATEN: Okay. And I have no further questions.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: Yes, Your Honor.

FURTHER EXAMINATION

BY MR. BJELLA:

Q. Mr. Voigt, looking at 2012, looking at the yield results you got there, they're substantially less than the -- let's say '9, '10, and '11, which were very wet years, were they not?

A. Yes.

Q. So wouldn't you agree it's by almost half or more if reduced production in 2012 indicates a lack of subirrigation, you don't have the groundwater that's there to keep your fields going?

A. No. It just enhances it and then you get more when you have a combination of surface and subwater.

MR. BJELLA: I have no further questions.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: We have no questions.

JUDGE MANN: Commissioner Christmann?

COMMISSIONER CHRISTMANN: I do not.

JUDGE MANN: Commissioner Kalk?

FURTHER EXAMINATION

BY COMMISSIONER KALK:

Q. Just briefly. Casey, thank you for coming back up today. I just want to walk through, how does the water flow in your property? Is it northwest to southeast? What general groundwater direction does it flow?

A. It flows to the north and most of it is from springs feeding the creek.

Q. Okay. Do you have a general feel or based on your time out there how deep the groundwater usually is in different areas? You must have some

wells that your family has used over the years.

A. Yes. There was one in the yard and one directly to the north of the yard, and I think the witness, Mr. Norris, had kind of touched on that, and I would have to agree with him that both of those wells are located on the creek banks itself. They are -- I think, 15 was one and 17 was the other one. And then I guess it would be my experience from different seminars and stuff that I've been to that alfalfa roots will go to 20 feet and maybe even beyond.

COMMISSIONER KALK: Thank you.

JUDGE MANN: Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: I don't have any questions. Thank you.

JUDGE MANN: Commissioner Christmann.

FURTHER EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. Now that I've had the additional couple minutes to think here, I'm not familiar with the branding corral areas, but I am with the ground where your yard is and the valley. The branding corral areas, those are hilltop --

A. Yes.

Q. -- higher elevation places? Besides the

groundwater issue that we're discussing, in normal fields in rolling areas isn't there usually better soil down in the low areas than in the higher areas, when you're going along with a baler or a combine, that the better production is in the lower areas?

A. Yes, that is true generally. But like in this instance, the fields that we are talking about up by my branding corrals to the northwest is an area that the PSC has agreed to reestablish back to cropland after mining, and according to Donn Steffen's summary of the soil qualities there, I think he said it was 4 percent less than what the other soil was on the prime farmland field.

COMMISSIONER CHRISTMANN: Thank you.

JUDGE MANN: Mr. Braaten, anything else?

MR. BRAATEN: No, Your Honor.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: Nothing. Thanks.

JUDGE MANN: Thank you, Mr. Voigt. You can step down. Or go ahead.

Mr. Braaten, you can call your next witness.

MR. BRAATEN: Okay. Our next witness is Steve Merrill, and he is the second one who will be testifying by phone.

JUDGE MANN: Is this Steve Merrill?

MR. MERRILL: Yes, it is.

JUDGE MANN: Mr. Merrill, this is the administrative law judge and we've got you on the speakerphone at the Public Service Commission's hearing room. Are you prepared to testify?

MR. MERRILL: I am.

JUDGE MANN: Okay. Before we do so, I need to administer an oath and in doing so I need to advise you of the penalty for perjury in North Dakota. It's a Class C felony, punishable by a maximum fine of $10,000, maximum five years imprisonment, or both.

(Witness sworn.)

JUDGE MANN: Okay. Go ahead, Mr. Braaten.

STEPHEN D. MERRILL,

being first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. BRAATEN:

Q. Hi, Steve. Can I have you state your name and your address for the record, please.

A. Okay. My name is Stephen D. Merrill, and that's spelled M-e-r-r-i-l-l. My address is 5317 Zenith Avenue South, Minneapolis, Minnesota 55410.

Q. And can you give us a brief description of your education background?

A. Okay. I received a bachelor's degree with a major in physics from Dartmouth College in 1961, a master's degree in biology from Dartmouth College in 1963, a Ph.D. from the University of California at Riverside in 1976.

Q. And can you give us just a general idea of the classes you were taking when you were seeking these degrees?

A. Yes. In the case of the master's degree with a major in physics, the major consisted of physics mainly and a heavy dose of mathematics with some other sciences involved, and I sought quite a bit of biochemistry.

In the case of the master's degree was a combination of -- it was a combination of both zoology and biology, biochemistry. I've also received a non-degree resulting -- as a result of training in biochemistry. In the case of soil science, that was coursework in many areas of soil science and allied areas, such as biology, plant-

water relationships, et cetera.

Q. Okay. And following or possibly during your Ph.D., can you give us an idea of what you were doing professionally?

A. Okay. Following my Ph.D. I -- shortly after -- no, I should say before I got my Ph.D. -- before I got my Ph.D., I became an employee of the Agricultural Research Service of the USDA in Riverside, California, and under the designation of -- I was a junior scientist under the designation of a physicist, and there I engaged in plant-soil relationships quite a bit, soil physics work. Then I obtained my degree and then I began working for the Agricultural Research Service. I worked in Mandan, North Dakota, and retired from the Agricultural Research Service in 2006. But subsequent to that -- or at the time of my retirement I became a volunteer scientist, it's called ARS, USDA -- I'll just abbreviate it -- and have continued that relationship as a volunteer scientist until the current time.

Q. Okay. And can you give us an idea of what kind of work you did with ARS, what kind of studies and what kind of issues you were looking into while you were there?

A. Okay. I had done a wide variety of things with ARS. At the very start of my term with ARS starting in 1977, I engaged in a team of scientists that were involved with mine land reclamation in the State of North Dakota in the Zap and Mercer County areas, and I continued that in a very active form until about the middle '80s. And after that I was involved in the science of data analysis and paperwork preparation, which is a very active form of science, you just don't have to be out in the field collecting data.

And then again in 2003 and 2004 I was actively involved in field studies of mining and reclamation. And off and on since then -- in fact even at the current time right now I am involved in studies of mine land reclamation, but not in terms of actually collecting data in the field.

And, of course, I'm involved in many, many other things within soil science, water erosion, wind erosion, crop studies, soil quality studies. I don't know. I think there's some I've probably even forgotten about.

Q. Sure. You mentioned -- and maybe you've gone through all of this in detail, but you mentioned that after you retired you continued on

as a volunteer scientist. Can you tell us --

A. Right.

Q. -- about what you were doing as a volunteer scientist after retirement?

A. Okay. My work as a volunteer scientist has mainly involved crop systems studies, the studies of how one crop plant through its effects on the soil affects the following crop plant. And then that has led to studies of soil quality, soil quality studies. And right now my main focus of my work is to take -- or mine land reclamation experiments done in the 1970s and again in the 2000s, 2003, 2004, and to examine them for soil quality effects, to reinterpret this data in terms of the interaction between soil quality effects at one scale, at the agronomic plant scale of several meters versus the functional fill slope scale of 50 to a hundred feet.

Q. Okay. Let's get some background on that. You mentioned studies in the '70s and then relooking at these studies in the 2000s. Can you give us some detail about what studies you worked on and were conducted in the '70s related to coal mine reclamation?

A. Okay. In the '70s there was a team of

scientists established and they were given the federal research in the United States. The Mandan Agricultural Research Laboratory was the point laboratory for western mine land reclamation studies. So we had a number of smaller-scale studies examining specifically the soil respreading concept, what qualities and depths of soil were necessary laying down the land to return the -- restore the soil to full productivity.

And then we -- under the leadership of a Dr. Jim Power, now deceased, we designed two very large-scale reclamation studies in which the main goal of the studies was to determine as specifically as possible the significance of soil material needed to be placed over sodic mine spoils to restore productivity.

And these experiments were done -- there were two of them. They were done in a form we call a wedge experiment where a wedge of subsoil materials varying in depth from zero to four to eight feet was laid upon the level of mine spoils, and then topsoil -- typically several depths of topsoil, anywheres from eight inches to two feet, were laid upon the subsoil. Okay. So that was -- studies in the 1970s, these wedge experiments. In

2003, 2004 --

Q. Mr. Merrill, let me stop you there. I want to ask just one more question about these wedge experiments. Is it your understanding that these experiments were used by the regulatory agencies to determine some of the regulation standards that they were developing?

A. I believe so. They had a considerable impact. Not that they were the only studies in the United States or Canada experimenting with topsoil with the depths of soil overlaying spoil, but they appeared to have considerable impact.

Q. Okay. And then you wanted to talk about the 2003 research. Before we get into the detail on that, can you just tell us what, generally speaking, the experiments were in 2003 and the purpose for which they were conducted?

A. Okay. The purpose of the 2003, 2004 studies was to reexamine the wedge experiments, both the Zap wedge and the Stanton wedge, the names of the towns near where these large-scale experiments were, to reexamine to see were we receiving the same productivity effects on the forage crops -- then we only had forage crops in 2003. And this was 28 years after the 1975 start

of the original wedge studies. So to examine what were the productivity effects in terms of were we getting the same response to the topographic lie of the land, the runon-runoff effects, because the original wedge experiments were made in the form of fill slopes.

And then secondary -- and also we wanted to examine the types of crops, species -- of forage species that were on the land, because originally in the original wedge experiments we had planted long strips of various forage crops and spring wheat also. Spring wheat was replaced by brome grass. So we also had alfalfa, crested wheat grass, Russian wildrye, native mix. We wanted to see how the species had changed. And, of course, you always have a change of these species. And then we also wanted to examine the soil chemistry, in particular the salt species, the salt loads, and have the -- have the salt species moved around.

Q. Okay. And can you tell us just briefly what were the specific findings after you conducted these experiments?

A. Okay. The general findings were -- the general findings, I would say, of the Stanton wedge was that the productivity in general increased up

to a depth of approximately -- I think the abstract of the paper says four -- three to four feet. But we observed considerable topographic effects too on top of that, where the productivity would increase because of the typical -- now, the fill slopes in effect were shallow, a grade of, say, 4 percent down to maybe 2 percent for the most shallow -- the least slope. Okay. But at the Zap wedge we were seeing this tremendous topographic effect where the productivity would increase up to a certain level and then it would decline towards the summit.

Now, at the Zap wedge we saw -- especially with the forage grass crops we saw that the topographic effects, runon-runoff effects, especially in the average rainfall to better than rainfall effects were quite large, almost overwhelming. But with the spring wheat crops we got a different response, because, you see, a lot of these forage grasses were dominated by cool season grasses which respond to the spring runon and runoff water, and also we theorize that the new -- newly reconstructed soil did not have the restoration of what we call mesostructure -- mesostructure, root holes, wormholes, et cetera, and so, therefore, the runon-runoff effects were a

salvage. And so, therefore, the crop effects would be more pronounced early on in the first -- we collected data for about, oh, three or four years or so. But with the spring wheat crops we were able to see the productivity effects of the increased depths of overspread soil better because spring wheat is using its water later in the season.

Q. So after having gathered all this various evidence and having relooked at these wedge experiments, it sounds like there's a lot of detail about the runoff, and so forth, but aside from that, did you draw any personal conclusions about the soil health or soil reclamation in general?

A. Yes. Because -- one of the conclusions we drew was that the -- in the restudy conducted in 2003, 2004, that would have been up to 20 years after the initial reconstruction of the soil, was that the soil -- it was apparent that the soil was functioning much better in terms of the near surface hydrology, the infiltration of water because of the -- you know, the soil fauna and the root channels had been much better laid down, so infiltration was evidently a lot better.

And so, therefore, the response of the

forage crops was not as -- was not as tightly linked to runon and runoff effects, more tightly linked to the soil quality. And in effect you could say it was more tightly linked to the soil depth effect, which is a primary soil quality.

You see, these experiments in effect were large experiments -- large depth experiments and soil quality that showed why you have to study soils as a functional unit, meaning, say, the small fill slope unit.

Q. Well, this might be elementary for some of us, but you're using the term "soil quality." Can you give us an explanation of what is meant when a soil scientist uses that phrase?

A. Okay. Since ancient times agriculturalists have had the concept of soil fertility. Soil quality, often referred to as soil health, is a modern version of the basic soil fertility concept. But by soil quality we mean -- it's defined very, very simply involving the capacity of a soil to function, that is, the capacity of a soil to support plant growth, crops, the capacity of a soil to not be eroded, the capacity of a soil to act as a regulator of the hydrologic function, to receive rainwaters, store

the rainwaters and to release the rainwaters.

And we have evolved -- modern soil science has evolved specific notions, specific ideas about what the components of soil quality are, both the biological, the physical and the chemical, but there has been increasing emphasis on the biological components of soil quality, and understanding that the soil biota is what makes the soil a functioning living natural body, living natural system.

Q. Can you -- and I think you've done this to some extent, but can you explain how the thinking within the soil science community has changed from the time you were doing the Zap wedge experiments until today?

A. It's changed like so much in science. It's changed in radical ways since the era of the Zap wedge experiments -- that the wedge experiments were designed and the era that the -- of course, the era that the SMCRA law was generated. There has been a much greater emphasis on understanding soil not just as a substance in place, but as a system. Soil is a system, and understanding that soil is a living system and it has a soil quality or a health that depends upon -- it depends upon

the plants on the soil, in effect the plants that are feeding carbon into the soil are part of the soil system, and the microorganisms, the soil biota, of course, is the most important part of the soil. So, yes, there has been a tremendous change in the basic doctrine of soil science since those early days.

Q. So are there ways to measure not only the mechanical and chemical aspects of soil health, but ways to measure also the biological aspects of soil health?

A. Yes. Probably the quickest -- I would say that the three main determinants, the main methodologies we have for getting access to -- there are many, of course, but I'll list three, soil respiration, soil microbial biomass carbon, and the ability of a soil to -- to change the formula of nitrogen.

Q. So if we wanted to utilize these concepts in soil health during the reclamation process, do you have any specific recommendations for testing and how we could do that to get a fuller picture of soil health during that process?

A. Yes. Yes, I do. Yes, I do. I think, you know, soil as a system -- given that soil is a

system, that the land -- the floor of the land has to be stable, and the physical -- well, to make a long story short, I think right away there has to be a topographic reconnaissance, perhaps no more than one year -- it should be one year after the new soil is laid down, but before two seasons are out, and specifically examination of the soil floor, sinkholes and general physical ability of the land form and a penetrometer test, a soil strength test to detect compacted zones. That would be the first stage.

Then the general soil reconnaissance. There has to be a general soil reconnaissance at some point after reclamation and after revegetation has gone on. I would recommend four years after -- three to four years after. And that would consist of a resurvey of the land. You know, all of our lands in this country and all over the world are surveyed for the soil type, and that means examining the profile of the slope, and that means by a qualified soil surveyor, several pits, examining the profile structure of the soil and the corings to, I would recommend, a minimum depth of four feet.

And at that time the soil structure should

be examined, the degree of root penetration of a plant should be documented, also any compaction of the soil through a penetrometer survey and an early sampling, a grosser level of sampling for salinity problems, so-called electrical conductivity, acidity or -- through pH. And at the same time -- at the same time then a more detailed soil health examination of the upper foot of the soil, the several layers could be done. And as a minimum I would recommend these following tests: Soil organic carbon, microbial biomass carbon, infiltration, and soil aggregate stability, and soil respiration.

Q. Okay. Are there any additional items that you would suggest testing for to give a fuller picture of the soil's health?

A. Yes. What I've laid down is, I consider, just sort of a very basic minimal level. There are many other tests. Let's see. PMN, the ability -- okay, probably nitrogen content, the total nitrogen content, total process content. There are many enzymatic -- primary soil enzyme tests. There are some others, but --

MR. BRAATEN: Okay. I have no further questions right now.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No questions, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: I'd like permission for Assistant Director Dean Moos to ask, please.

JUDGE MANN: Any objection to that?

MR. BRAATEN: No.

JUDGE MANN: Go ahead.

EXAMINATION

BY MR. MOOS:

Q. Good morning, Steve. Dean Moos, Reclamation Division. What you're proposing, these studies, are you proposing that these would be done on all reclaimed land or as a research study? What exactly are you looking at or recommending?

A. I'll tell you what -- what I'm recommending is that I think this should be done, a study of the soil health and a viewing of what is the new soil, what is its health being done as a matter of course, because all of the more modern farmers in this country and around the world study their soil health as a matter of course. And so, therefore, I just think that mine land reclamation practice needs to be brought into a phase with modern soil science and as it is applied to modern

farming.

MR. MOOS: I guess no further questions.

THE WITNESS: Okay.

MS. JEFFCOAT-SACCO: I have one.

EXAMINATION

BY MS. JEFFCOAT-SACCO:

Q. I have a followup to that. This is Illona Jeffcoat-Sacco, counsel for the Commission.

A. Okay.

Q. And this just stems from my lack of knowledge about what really goes on out there at reclamation time. Are you saying that these tests that you have just recommended and this analysis of soil types should be got like as the company is respreading subsoil and topsoil at reclamation time, that that's when you would perform these tests to see just what that soil is that's going back down in one location or another, which seems to maybe be a moving target, but is that what you're recommending?

A. No. No, not at all.

Q. Sorry.

A. In fact, that would be -- that would not work.

Q. Right.

A. That would not work because, you know, an ordinary soil survey and the examination of soils -- these soils have been around for hundreds or thousands of years. Okay. So we are creating new soils. We are creating new soils and so, you know, to be examining them as they are created is not going to work. But I think some reasonable length of time that should not be too great a length of time, say -- I'm going to throw out four years, we'll say. There ought to be some sort of examination of these new soils, what do we have there. Certainly after four years of time.

And let me say that I realize that there are productivity standards equal to or better than before to see has the soil been returned to productivity by a yield test, and then in the case of grasslands -- that's in the case of croplands, but in the case of rangelands and grasslands, the test is productivity, cover, and the species diversity.

Well, yes, that does indicate that the soil has been restored to some productivity, but these tests are -- the yields vary so much from year to year and depending on how the management is, you're going to get different results,

especially with the forage standards, so there has to be something else from that.

Q. I'm glad you brought up productivity because I am trying to figure out now if you do these tests four years into -- after you've reclaimed and then four year into it you do these tests, would the objective be simply to provide the landowner, the surface user, with better information for farming going forward, because now you have the analysis, or would the objective be to change what you did despite -- the productivity records are over here on the other side, and we're going to be taking those for a number of years after reclamation, so would you -- once these soil tests are done at the four-year point, are you recommending that then something be revised, different soil go in depending on what the results are, or just produce useful information for use in going forward?

A. Okay. Yes, they would provide useful information, but they would also provide a public record of what kind of soil has been created, much more information than beyond just mere yield tests or examination of the vegetation. And, for example, if certain kinds of problems are seen with

a test -- with a soil health reconnaissance -- soil survey and soil health reconnaissance at, say, the three- or four-year stage, one might detect the effects of management.

How the plants are managed, how the soil is managed can have a great effect especially on new soil, how you disturb new soil that's evolving very fast. And so if certain kinds of problems are determined at, say, the three- or four-year stage, the management can be changed, and that would be very important so that the management could be made more soil-building management.

For example, if you have a piece of land and it's cropland and it's being put under -- this is the worst-case scenario, it's being put under spring wheat fallow -- spring wheat fallow, that means you've got a crop -- you've got plant life out there every three months out of two years, the soil carbon is guaranteed to go down; right? So, I mean, I bring that up as a worst-case example of this. But --

MS. JEFFCOAT-SACCO: Okay. Thank you. That completes our questioning.

JUDGE MANN: Commissioner Christmann?

EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. Is there perfectly healthy soil, or is -- are all these statistics pretty arbitrary?

A. Sir, I guess I don't quite understand what you're saying.

Q. During the first day of our hearing we had some dialogue about bond release and whether it occurs as quickly as it should or too quickly or at appropriate rates of speed. So with a lot of the things you've talked about and a lot more data development from one to four years after reclamation occurs, there's going to be a lot more things to debate whether it's appropriate or not.

A. Right.

Q. And so would you ever find soil then that everyone would agree is correct, or would your suggestion just take us to a level of data to where no matter what soil you were looking at, you could find something wrong with it?

A. I don't think so. I think it's how the information is used, how the scientific -- how the reconnaissance is used. If it's used -- and I don't think -- one of the chief problems, for example, would be soil could become compacted --

overcompaction of the soil. If, say, soil health reconnaissance turned up compaction effects, then deep tillage and certain kinds of crop plants that have deep roots could ameliorate that. But I don't see -- I don't see a soil reconnaissance being used as a way to change the whole bond release issue.

Q. So if I'm understanding you right then, this reconnaissance, your objective would be to early on in the reclamation process catch whatever concerns there are and alter the management practices in the subsequent years before bond release to correct them at least to a reasonable extent?

A. Right. Absolutely. That's why -- you know, I believe the bond release period is ten years in your state, and that's why the primary soil reconnaissance and soil health examination has to be done, you have to wait about at least two or three years for the soil to sort of settle in and see what the current stage of management is doing to the soils. But you shouldn't wait too long. I think waiting to, say, six or seven years is too long.

COMMISSIONER CHRISTMANN: I have no other questions, but thank you.

JUDGE MANN: Commissioner Kalk?

COMMISSIONER KALK: Thank you, Your Honor.

EXAMINATION

BY COMMISSIONER KALK:

Q. Thank you, Stephen, for your testimony. You're certainly an energetic soil scientist. I love to hear that.

Just a little background. So when you worked in Mandan, did you work with the soil conservation districts around the state as well?

A. Yes, we did work with them.

Q. So in your experience -- you know, I think we've got a pretty good data set of all the soil types around the state through the data sets, I think it's the soil conservation districts, all those different manuals. I mean, how accurate do you think our data set is of our soil types and depths in the state?

A. I think they're pretty well done. A lot depends upon what resources are brought to bear, and if you really want to know on a given piece of land, as is done in the mining industry, you have to have a really detailed soil survey, more detailed than the type of standard soil survey.

Q. Okay. Because one of the things that --

this is outside of this hearing, but just general thought, is we do so much work with putting the coal mines back to the way they were, but as a state we haven't delved into wind farm reclamation, we're working on pipeline reclamation. So I do appreciate your testimony today. It may help in a lot of different areas.

When you talk about soil health, I think I'm hearing you say soil health is different than productivity. Am I hearing that correctly or are they related, or how do you view that?

A. They are related. They are related. A soil high quality or high soil health, the terms are interchangeable, will be able to support crops year after year without -- without fertilizer, without a lot of fertilization. Now, I realize that we have to have fertilization. We can't feed seven billion people without fertilizer obviously. But at the same time, having said that, you have to realize that healthy soil is going to be able to -- to, you know, not erode, to support crop plants without a lot of inputs.

Q. So that's where I think we're agreeing or I interpret what you're saying is that us measuring the productivity is probably the best measure of

soil health that we have right now with the current system?

A. Yes and no. The trouble with a productivity test, with just measuring yield, is that -- you know, I guess, I'll put it in kind of a crude way, sir. I could take a parking lot -- take any parking lot covered with a foot of good topsoil, put in some pipes -- a pipe field to provide drainage between the soil and the asphalt surface, provide lots of fertilizer, micronutrients and you can produce a hundred bushels of corn. I mean, that is productivity.

I mean, I realize this is crude and I'm kind of overstating the point perhaps, but I think you have to have -- I think any viable system that moves forward is going to have to examine both crop yields, productivity, plant types, and the soil factors, soil health, the soil.

Q. Have you ever in your -- the research you've done submitted things to the national organizations or state organizations recommending changes in practices, or is this something you're just now getting involved in? Well, you've been involved in it a long time. Have you ever submitted it for changes anywhere, any bodies?

A. This is something that -- the kinds of thoughts I'm laying out for you right now in this hearing is something that just started to first occur to me in October of this year when I went to a meeting in Montana sponsored by the Western Organization of Resource Councils.

Q. Okay. Fair enough. And, I guess, just the last couple of questions, sir. What is the depth of crops -- I know you've got a lot of cropping research you've done. Give me your best guess of the root depth of alfalfa, maybe some other crops that are grown in the central part of North Dakota.

A. I don't have a lot of work with alfalfa, but I do have quite a bit of work specifically aimed at crop root growth, the details of that, and probably sunflower and safflower. Sunflower and safflower crops, even in glacial till soils such as found west of the river, can get down to six feet or more.

Q. And then finally you talked about the amount of rainfall was maybe the controlling factor in production. How does groundwater tie in to the soil health?

A. Groundwater ties in to it in the sense

that the cycles of groundwater have many different scales, and one of the -- at the smaller scale, the scale of, say, ten yards -- five yards or ten yards, the water that enters the soil, infiltrates into the soil and moves parallel to a surface and then waters the lower part of the profile, it's a species of groundwater but smaller scale, and that is a very important part of a functioning of a soil. And soil is not just, you know, just soil right in this square yard or that square yard. Soil has to be in a functioning unit. So, yes, the groundwater and the ability of the soil to infiltrate the water and to conduct the water in what we call subsurface flow is a very important part of a healthy soil.

COMMISSIONER KALK: Okay. Thank you, sir.

JUDGE MANN: Commissioner Fedorchak?

EXAMINATION

BY COMMISSIONER FEDORCHAK:

Q. Thank you, sir, for your testimony this morning. Despite being by phone you've been very engaging to listen to.

I'm curious about just following up on some of my colleagues' points and questions. What is, with your expertise, the best measurement of

soil health?

A. Active soil organic carbon. That is the holy grail of soil health.

Q. And how do you -- if you were to use that as a measuring tool for reclamation, how would you establish the standard to be met on any given soil or in soil in an entire mining permit?

A. Okay. I think -- I think the standard has to be a moving target. I don't want to be offensive to the whole -- what I call the magic numbers. The magic numbers thing has always bothered me. But I think that you want to establish some sort of a reasonable standard that the soil is moving towards, acquiring active organic carbon in a way so that it's becoming like the premining soils given -- you know, given the type of soil it is.

Q. So you'd measure the active organic carbon at premining and then you would have a postmining standard that was the same that you would have to reach at the ten-year bond release point? Is that what you're suggesting?

A. I'm not going to go so far as to say it has to be absolutely the same number. In fact, I think that would be a mistake. I think you need to

have -- you need to have set standards, but you need to write your standards in such a way so that you don't put yourselves into -- from functionality. And I don't want to comment on the current system of bond release, but you know what I'm saying here.

So I think -- so I think you have to -- because soils are really systems. They're either staying about the same, at a certain level, they are getting healthier, or they're going downhill. So I think you need to show that the soil in terms of its basic soil quality, soil health is moving in a substantial way towards the premining state. But I really -- I really don't think you want to get into absolute numbers standards.

And let me say this, that the SMCRA law and the state laws -- and we know the State of North Dakota was a leader in mine land reclamation, right, but that was a long time ago. We had a much different understanding of basic soil science and that this phrase "equal to or better than before," I think that's a wonderful goal, but I'm just saying there has to be some sort of flexibility in the writing of these -- of the code.

Q. And tell me how the -- you described as a

gold standard the presence of active carbon. Tell me, how does that show itself through the current standard which is productivity?

A. That it shows itself that the productivity is -- of course, all the other elements too. I mean, that is one of the principal elements of a healthy soil, but you can have a soil that has, you know, huge amounts of organic carbon -- active organic carbon, but if that soil has terrible -- has high -- high EC, high electrical conductivity, it's got acid problems. So you have to have -- you have to have a balance of all of the elements, physical, biological and chemical, elements of soil quality for the soil to be really productive soil.

Q. So if I understood what you were just saying, you said that -- did you say that you could have soil that had a lot of the active carbon but still wasn't productive because there's something else wrong with it?

A. Absolutely. Active -- active organic carbon is one element. In terms of modern soil science it's an element that is probably emphasized above others as a keystone, a keystone part, but it's only one of many. The soils are very, very complex bodies.

Q. Well, it sounds to me that what you're just suggesting is that perhaps the productivity is the way that you measure it to gauge all of those factors, it takes into consideration the chemical and the biological and all the factors, it's probably the one measurement that does capture all of those qualities of the soil, or did I misunderstand you?

A. Well, yeah, it can as the performance standards, but, again, you can have a -- you can have a very, very productive soil that you can have high yields in wetter years, but that soil can be an unstable soil, it can be a frazzled soil for various reasons. So I think you have to look at the totality of the elements of soil quality and soil health. And I don't think over the long run that just having a plant productivity standard as the totality is going to work. It's not going to work. It might work in the short run, but over the long run it's not.

Q. Do we have proof of that in looking at some of the mine lands that have been reclaimed and have been bond released? Do we have proof of that, that this isn't standing the test of time, the current standards?

A. Okay. You're getting outside of my range of expertise here quite a bit.

Q. It seems like that's exactly what you're saying, though, is that --

A. No.

Q. -- it might work at certain periods of time, but over the long haul it might not pay out, that we should be looking at more things to make sure that the long-term soil health is stable and strong.

A. You're right. You're absolutely right. I would agree with that, yes.

Q. So then if the current standards aren't proving that, then we should be able to look at mine lands that have been reclaimed years ago and see that the land isn't productive and isn't able to sustain crops or grazing. And so I'm wondering if we had that, I'd love to see that kind of data because I think it is important to look at that.

A. I would agree with that quite a bit.

Q. But you don't have any of that data yourself that you've seen or have access to?

A. No, I don't. No, I don't.

COMMISSIONER FEDORCHAK: Okay. Thank you, sir, for your time this morning. Appreciate it.

JUDGE MANN: Mr. Braaten, any followup?

MR. BRAATEN: Yeah.

FURTHER EXAMINATION

BY MR. BRAATEN:

Q. Just a couple questions to sort of recap, Mr. Merrill. My understanding is that what you're proposing specifically is a soil reconnaissance which would give us more holistic and better understanding of soil health. Is that a fair explanation of your testimony?

A. Yes, it is. Yes, it is.

Q. And do you believe, particularly in situations where they might be running into problems with the reclamation process, that gathering this information would allow them to identify specifically what those problems are and address them?

A. Yes, I do.

MR. BRAATEN: Okay. No further questions.

JUDGE MANN: Go ahead, Commissioner.

FURTHER EXAMINATION

BY COMMISSIONER FEDORCHAK:

Q. I had one other question I forgot to ask. Sir, is there anything that's -- so if the companies could -- would do this, do you think that

they would be able to achieve the productivity levels and get out of bond release sooner if they were doing this today -- these soil examinations that you're describing?

A. Yes, they would, but let me add a caveat to that answer. Yes, they would in terms of strictly soils issues. But soil is a system. You know, you have to look at the hill slope or even the water -- the small watershed in different scales and the hydrology of the soils.

Q. Sure.

A. Different scales. Just the hydrology over the water flowing into the soil, through the soil and out again in different scales is also part of the soil health. And any answer I give to you does not include any of that.

Q. Sure.

A. And I'm not a hydrologist, but I've heard enough and know enough, and I think we all know enough, that that is an issue that is connected with soil health, but it also can be viewed functionally as a separate issue.

Q. Is there anything that you're aware of that precludes the companies from doing what you're describing? Have you had any that have talked to

you about it and expressed interest in kind of pursuing this angle to improve their reclamation standards and their chances of meeting their ten-year bond release time period?

A. No, they haven't. Because I've only had this thought since October of this year, frankly.

Q. So this is really new kind of cutting edge concepts; is that right?

A. Well, for me it is. And I don't know if other people are -- I suspect that there are other -- I would say that there's quite a bit of research within the soil science community, I know, in examining these past mine lands, the new mine soils, but I've only recently started to access this line and to read this.

COMMISSIONER FEDORCHAK: Okay. Thank you, sir.

JUDGE MANN: Mr. Bjella, any further followup?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: Mr. Deutsch would like to ask one question.

JUDGE MANN: Okay. Go ahead.

EXAMINATION

BY MR. DEUTSCH:

Q. Steve, in your testimony earlier and some of the discussion, I guess, talking about changes over time, going back to when you went back and looked at those 1970 wedge plots at Indian Head and Glenharold, did you overall feel that there was an improvement or decline in soil health from when those studies were completed back in the late '70s?

A. Oh, I would say that there is evidence especially from the pattern of forage grass growth. That pattern -- overall pattern can be interpreted as a -- as a pretty large improvement in soil health. I should say that this is evidence, pretty strong evidence, in my view, that the soil structure -- you know, the ability of the soil to infiltrate the water and to carry it through the soil and not just have the water run off the soil has improved quite a bit. The establishment of wormholes, and there's all these other animals in the soil, the mesofauna that are digging holes in the soil and then the plants grow and their roots die so you have these holes, and that's very important, the physical elements of soil health. So I think we have evidence that that has improved

a great deal.

MR. DEUTSCH: Thank you.

JUDGE MANN: Commissioner Fedorchak.

FURTHER EXAMINATION

BY COMMISSIONER FEDORCHAK:

Q. I need to just -- I heard this earlier and I thought I misunderstood and I'm still wondering if I'm hearing this correctly.

The wedge study that was -- that you're referring to, Steve, is a before and after of a mined area; is that correct?

A. Let's see. Well, no, it was not a before and after. It was -- because the original wedge study was on reclaimed soils, but they were reclaimed in an experimental manner, different depths of soil and in different combinations of topsoil and subsoil laid over -- in the case of a standard wedge it was a fairly newly mined sodic mine spoil. In the case of the Zap wedge, it was an older mine spoil, pre-SMCRA mine spoil. So that was the original study conducted between '75 and about the '80 -- I think I quit working on that actively in about '81. And then the follow-on study 2003, 2004 was to reexamine these -- these experimental reclamation lands.

COMMISSIONER FEDORCHAK: Okay. Thank you.

JUDGE MANN: Commissioner Christmann, anything else?

COMMISSIONER CHRISTMANN: No.

JUDGE MANN: Commissioner Kalk? Mr. Braaten, is that it for the witness?

MR. BRAATEN: Yeah. Yeah. No further questions.

JUDGE MANN: Mr. Bjella, anything?

MR. BJELLA: No, Your Honor.

JUDGE MANN: All right. Mr. Merrill, you can disconnect. Thank you.

THE WITNESS: I would like to thank everybody in the PSC and everybody involved here for this great opportunity for me to -- because I think this has been a good day for soil science.

JUDGE MANN: Thank you.

I think at this time we'll take a break for lunch, start up again at one. So we can go off the record.

(Recess taken at 11:59 a.m. to 1:00 p.m.)

JUDGE MANN: We're back on the record. It's 1:00 p.m. And before we get going with testimony from Mr. Braaten's next witness, we'll just address any preliminary issues, comments.

Commissioner Kalk.

COMMISSIONER KALK: If I could, Your Honor, we had discussion the last time we met about a third day, and so there are a lot of emails with commissioners. We met for another item, we kind of gave it the range of dates, the 30th, 31st, and January 2nd. I know hearing back from Mr. Bjella and also from Derrick that it seemed like January 2nd was the date that everybody agreed to. Judge, you were available that date as well, our general counsel, Jim, you were available as well.

I guess what I would like to do is just to reaffirm the expectation that we've set the agenda today to go till about 3, and we've all got things that we need to wrap up before we go for Christmas break, and then we come back on January 2nd, start at 8:30, with the expectation that day we go until we're done. We'll do that, five o'clock at night, six o'clock, ten o'clock at night, even have a backup court reporter because, quite honestly, after sitting there for several hours, that's a lot to ask of anyone. So unless someone throws some big objections, I guess I would like to proceed with that expectation.

MR. BJELLA: We are just curious, Your

Honor -- Commissioner, if December 29 had not been discussed. Was that ruled out?

COMMISSIONER KALK: That was a Commission problem for the three of us. We gave the range of dates, the 30th, the 31st, and the 2nd is the only time we could get all three of our schedules together.

MR. BJELLA: Thank you.

JUDGE MANN: Commissioner Christmann, any comments or concerns with what Commissioner Kalk had said?

COMMISSIONER CHRISTMANN: Nothing to add.

JUDGE MANN: Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: Nothing to add.

JUDGE MANN: Anything else before we get going with testimony?

MR. BJELLA: Your Honor, what time would we start then on the 2nd?

JUDGE MANN: 8:30 a.m., I believe, again.

COMMISSIONER KALK: Then the expectation is we'll break for lunch at twelve and if we need to, we'll break for dinner at five o'clock, but we're going to finish that hearing that day.

COMMISSIONER CHRISTMANN: Maybe the one thing that should be added. The court reporter is

an essential element to what we do here and can only do so much. Do we need to have a backup, someone would be available to continue on?

THE REPORTER: We'll work it out.

JUDGE MANN: I think, Mr. Braaten, you may call your next witness.

MR. BRAATEN: We'll call Mark Anderson.

JUDGE MANN: And, Mr. Anderson, before you testify I'm required to give you an oath and advise you of the penalty for perjury in North Dakota. It's a Class C felony, punishable by a maximum fine of $10,000, maximum five years imprisonment, or both.

(Witness sworn.)

JUDGE MANN: Go ahead, Mr. Braaten.

MR. BRAATEN: And similar to Mr. Norris, I have handed you Mr. Anderson's resume and intend to cover it briefly, if possible, and hope we can just stipulate to his expertise rather than going through it in detail.

MARK A. ANDERSON,

being first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. BRAATEN:

Q. First, Mr. Anderson, will you state your name and business address, please?

A. Mark Anderson. Business address is 1102 South Washington Street. Mailing address is Post Office Box 1401, Bismarck, North Dakota 58503.

Q. Can you give us just sort of a brief background of your experience and your education?

A. I graduated from North Dakota State University with a degree called bachelor's of university studies, which is a program that I made myself of the courses that I wanted to. The courses that I concentrated on were agriculture and biological sciences, had a lot of credits in agronomy, range management, soils, and biological sciences.

Q. And after graduation, what has been your professional experience?

A. I worked for the Natural Resources Conservation Service for 35 years, I spent 15 of those years in field offices across the state as a district conservationist, assisting landowners with the installation of various conservation practices, notably grazing management systems, pasture and

hayland plantings, rangeland plantings, wildlife plantings, establishing tree planting plans. I was also heavily involved in the plant materials program where we collected native species, grasses, sedges, forbs for potential propagation for use in restoration of range sites. I was also involved in range -- or plant materials trials with specific plants on farms and ranches and following up with the results of those plantings.

Q. And I've handed out your resume which you supplied to us about a week ago. Is that an accurate representation in summary fashion of your education and experience?

A. Yes, it is.

MR. BRAATEN: And I'd offer the resume as an exhibit.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: In what area? Could you specify, please?

Q. (MR. BRAATEN CONTINUING) Can you give us just a very brief summary of what you consider to be your primary areas of expertise?

A. Plant materials and vegetation management, establishment of vegetation. I was involved in range plantings in Pierce County when I was a

district conservationist there for six years. I was involved in following up on success of those plantings, what worked, what didn't work.

Q. Do you have a background in soil science as well?

A. I was very close to having a minor in soils.

Q. And so I guess from me as a layman, to recapitulate I would say that it's in rangeland management and soils?

THE WITNESS: Yes.

MR. BJELLA: No objection, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: No objection.

JUDGE MANN: Voigt Exhibit No. 8 is admitted. You can continue.

Q. (MR. BRAATEN CONTINUING) Can you tell us briefly what you reviewed in preparation for your testimony today?

A. I looked through the mine permit application, specifically at revegetation plans and also at replacement plans for the earth material, both the surface and subsurface material.

Q. And did you look at any information or studies or anything outside of what was contained

in the mine permit application?

A. I referenced -- or also referred to information in the Natural Resources Conservation Service Technical Guide, which is used for establishment of vegetation practices and also some soil health analysis.

Q. Did you have any conversations with other soil scientists or rangeland conservationists about the materials you were reviewing?

A. Yes, I did.

Q. And in conducting this review, particularly with respect to the revegetation plan, were there any items or issues in there you noted that gave you concern about the potential success of reclamation on Mr. Voigt's land?

A. One of the concerns I noted was the percent of tame grass or introduced grasses that are allowed on the reclaimed land. It does allow in the standards for reclamation up to 35 percent of tame grasses, which are actually invasive species.

Q. And why is it a concern that up to 35 percent of the stand can be tame grasses?

A. It can result in substantially lower production and also degrade the seasonal

productivity of the land compared to the native range.

Q. And how does that happen?

A. The introduced species or the cool season grasses can start growing earlier in the season than the natives and they can utilize the moisture that's available first and gain an advantage over those native species and it can eventually crowd them out.

Another problem with the introduced species, one of them crested wheat grass, is it is very early to grow and to mature and it also is very early in the year to decline in nutritional value.

Q. And so in general would a higher percentage of the native grasses be beneficial for revegetation?

A. Definitely.

Q. And did you review any information with respect to the actual percentages of tame grasses on Mr. Voigt's land?

A. Yes, I did. In the permit application, Section 2.4.7.4, rangeland similarity index, there is an inventory data sheet for one of the inventory points that is on the Voigt ranch.

Q. And I wanted you to have a copy of what I just handed out. The document you're referring to is the document that I just handed you?

A. Yes.

Q. And what does this document tell us?

A. This is an inventory of the species that were found out there. It was dated August 19, 2012, on the Southeast Quarter of Section 1. It was an inventory on a range site identified as thin loamy. And the species are listed in column C by percentage of the plant community that was present, and there are about a dozen species roughly on that list, but most notably on that list is the fact that the only one that is an introduced species is Kentucky bluegrass, and the percentage of the Kentucky bluegrass is 3 percent. That indicates a very high quality range site to have only 3 percent introduced species or invasive species.

Q. And did you look at any other documentation of the introduced or invasive species?

A. Yes, I did.

Q. And what was that?

A. Okay. In Section 2.4.7.2 there is a table of acreages of the various range ecological sites,

and on this table I've highlighted those that are found on the Voigt ranch for which there was inventory data available. So the numbers highlighted yellow then are the acres of the ecological site, and the top row is the various ecological sites. Cp stands for claypan. Cy stands for clayey. CD stands for closed depression. Ly stands for loamy. Sa stands for sands. Sy stands for sandy. So it gives a picture of the diversity of range sites that are out there.

Q. Before we go on, let me just back up. I just handed you a document. I know you have copies of your own up there. The document you're referring to is identical to the document I just handed to you as well; right?

A. Yes.

Q. And I think you might have covered this, but I want to make sure we're all clear. There are some marks that are highlighted and some red pen circles and some numbers written in. Those were all written in by you; right?

A. Yes.

Q. And can you explain to us what each number means?

A. Okay. The original numbers in the table,

the typed-in numbers are the acres of that range site that was found on that legal description. So I went through the available range inventory sheets where I could find inventory data available, and then I circled those on this. So the red circles indicate the sites for which there is range inventory data available on the Voigt ranch.

The number that I inked in there is the percentage of invasive or non-native species. And if you look in the claypan column, there was 3 percent on one of the inventory points, none identified in another one.

On the loamy site there was no invasive species identified.

On the sands range sites there were two of those that were inventoried, no invasives on one of the sites, 7 percent on the other.

On one of the sandy range sites, 3 percent invasive or introduced species and only 1 percent on the other one.

Then there was two sites on the thin loamy ecological site, 3 percent invasive on one, none on the other.

The bottom line is here the Voigt ranch has an exceptionally low percentage of invasive

species on the unit.

Q. Okay. So do you have any specific recommendations with respect to how you can show production on the Voigt ranch and successfully reclaim that native grassland?

A. Could you repeat the question, please?

Q. Yeah. Do you have any specific recommendations as to what should be done in the reclamation process on Mr. Voigt's land to ensure that he's getting back the same productivity in the same land postmining?

A. Mr. Voigt will want the same quality of plant community back that he has now. He won't want any more invasive species out there than what he has currently.

Q. So your suggestion is that what he gets back is not at a 35 percent threshold but at the threshold shown on the rangeland index that you put together?

A. Yes. That's correct.

Q. Okay. And we've been talking about invasive tame grasses. Did you look at the issue of invasive noxious weeds at all?

A. Yes.

Q. And did you have any concerns with respect

to that?

A. The noxious weeds, I can remember from my time in field offices as a district conservationist you could really see the corridors where they'd installed pipelines or buried fiberoptic cable because the absinth wormwood showed those corridors show up for years. They were weed nurseries. And it's just a known fact that bare soil, disturbed soils are an open invitation for these invasive weeds to take over, get a foothold and be a real problem. Mr. Voigt does not currently have great problems with noxious weeds and he does not want them on his unit.

Q. And what do you suggest in terms of mitigating against that or ensuring that the noxious weeds don't take over?

A. In the mine permit application there is reference that spraying operations will be used to control the weeds. Sometimes it takes more than just spraying with big equipment. Sometimes it takes small equipment and actually spot spraying, and I believe it does refer to that in the mine application permit also.

In one of the range seedings that I assisted a producer with, I went out and looked at

it after it had started growing and discovered that the range seeding had a heavy stand of cheatgrass or Japanese brome grass, and the producer was not familiar with it as a weed and how much of a threat it posed to the stand, so I assisted him. We spent an afternoon and we pulled the weeds by hand because there's no way to spray those out. And we filled up a pickup box with those. If that had gone unchecked for another couple months, that seed would have matured and possibly ruined that seeding.

Q. Okay.

A. So it does take intensive management to control these weeds.

MR. BRAATEN: I just want to back up. I think there's going to be a discussion among the attorneys at some point about what constitutes the record, whether the docket is part of the record, and so forth. So one of these exhibits is already in the permit application. The other one, 2.4.7.2, is as well, but as Mr. Anderson has testified, he's marked this exhibit with some other information, so I would offer the one that is marked as an exhibit before we move on.

JUDGE MANN: You don't want to offer the

other as an exhibit?

MR. BRAATEN: Well --

JUDGE MANN: I understand that it's part of the application, but it's not that uncommon to make the application part of the record in the Public Service Commission's proceedings. So, I mean -- and it might be understood that it is part of the application, but it might be easier if we just go ahead and mark it as an exhibit. It doesn't hurt anything.

MR. BRAATEN: That's fine.

JUDGE MANN: Let's mark the first one, the Rangeland Similarity Index, that will be Voigt Exhibit No. 9, and then the second document that you passed out that Mr. Anderson had made notations on, that will be Voigt Exhibit No. 10.

Mr. Bjella, do you have objections to either of those documents?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: No. Thank you for including 9.

JUDGE MANN: Yes. Voigt Exhibits 9 and 10 are admitted and you can continue.

COMMISSIONER CHRISTMANN: Judge, can you

repeat which one was 9 and which was 10.

JUDGE MANN: Yes. This one is 9, the Rangeland Similarity Index.

Q. (MR. BRAATEN CONTINUING) We talked about the introduced cool season grasses or the tame grasses, and I think you've touched on this, but can you explain why it's undesirable to have them in a native grass seeding in a native pasture?

A. The introduced invasive species tend to take over the community -- the plant community. They tend to be shallow rooted, the Kentucky bluegrass, the smooth brome grass and, therefore, they have less ability to utilize the soil profile.

Cool season grasses grow by a different biochemical process, and it's less efficient than warm season grasses. They require more nitrogen and water to produce the same amount of biomass. Warm season grasses grow faster in warm weather compared to the cool season species, and those are important factors in semiarid areas like Coyote Creek.

Q. Okay. If we don't want the tame grasses introduced, do we still want to see a diversity of species in the native prairie, though?

A. Yes. Diversity in the plant community is

important, and it's a sign of a healthy plant community. I can remember in 1988 and 1989 when I worked in Pierce County, the drought there was extreme. One farmer told me he recorded four inches of rainfall for the entire year of 1988. In parts of the county there was only one grass that was visible to be growing at all that was green, and that was prairie sandreed. Prairie sandreed is on the list of species that is in the mine permit, but I do want to emphasize the point that diversity of species is important. Prairie sandreed is not only drought tolerant, but it's also grasshopper resistant. So it's these qualities of the diverse species that are important.

Blue grama is a grass that's noted for retaining its nutritional value for a long period. Most grasses decline to a very low nutritional level by the end of the growing season. But blue grama retains significantly higher nutritional level, protein level, even through the dormant period. So if you have a good growth of blue grama the previous year, it can be a useful grazing source, residual grazing the following spring.

Q. And so when we're talking about diversity, is it just the grasses with respect to what's

beneficial to have diversity of, or are there other things that you want mixed -- or other plants you want with the native grasses?

A. Yes. The forbs are also an important component of the rangeland. Forbs are the broadleaf plants. And there are a number of forbs inventoried on the Voigt ranch. And some of the native forbs are legumes, meaning they are plant-fixed nitrogen which serves as a fertilizer for the grasses. And it's -- the forbs are also utilized by wildlife, which Mr. Voigt considers part of the productivity of his ranch. So the forbs can be utilized by wildlife species, some of those also by his cattle, and he does not want to sacrifice the diversity of those species that he has present.

Q. So with respect to the plantings and the native grasses and forbs, do you have any specific recommendations as to how -- what proportions to use or any other recommendations to make sure this gets back to the same level of productivity that Mr. Voigt's land is at now?

A. I would recommend that the reclamation should attain or restore 95 percent of the native grass species -- or the desirable native grass species on his unit that he has now. And,

likewise, for forbs, I think 95 percent restoration would be a reasonable request.

Q. Okay. And you also mentioned forbs. Do you have any specific recommendations as far as the level of forb reseeding that should be done?

A. Seeding of forbs is tricky because there are so many seeds per ounce that reaching an optimum level is -- can be a little bit difficult. I would defer to the range management experts, the NRCS plant material specialists for actual recommendations on species and proportions and amounts per acre.

Q. Okay. I want to move on a little bit to -- we discussed a little bit the thickness of the suitable plant growth material. But before I move on, is there anything else with respect to the revegetation of the native grasses or desirable species that you want to add?

A. Yes. One of the big concerns is that the Standards For Evaluation of Revegetation Success states that -- and I'm quoting from the standards from the Public Service Commission -- for final bond release the permittee must demonstrate that at least five native grass species are present on the reclaimed tract and the native plant species

comprise at least 65 percent of the total composition by cover or weight.

So that -- of those five species, Mr. Voigt has at least 10 species or 12 species of grasses on his unit. He does not want to give up any of the diversity of those native grasses that he has now.

In looking further at the requirements for diversity and seasonality, it states that Kentucky bluegrass on the reclaimed tract may be counted towards meeting the 65 percent total native species composition requirement. That is not acceptable to Mr. Voigt.

He stands to lose substantially in production and quality forage if such a low standard is all that's met, because if he, first of all, has -- only 65 percent natives can be -- is sufficient, then of that 65 percent, one of those can be Kentucky bluegrass, that virtually leaves no native requirement except for where it states further that for the native grass species must contribute at least 3 percent relative live basal or at least 5 percent relative composition by weight during the year sampling data is used.

So while there are requirements to have 15

percent warm season grasses on the site, that's really about the only requirement that's in there. That and to have one native cool season grass.

Q. Okay.

A. That bar is set way too low. It would not come anywheres near meeting what Mr. Voigt has on his ranch at this time.

Q. And what I just mentioned was more of a soils issue, but I know that this ties in very closely to revegetation, and so did you look at the varying thicknesses of suitable plant growth material and how that might impact revegetation in your review?

A. I did.

Q. Okay. And what's your understanding of what's required right now for revegetation or for replacement of topsoil on Mr. Voigt's land?

A. The thicknesses are dependent on the suitability for the electrical conductivity and sodium adsorption ratio of the spoil material that is placed below it. It requires a maximum of 48 inches of total suitable plant growth material. Okay. So if the sodium adsorption ratio was less than 12, electrical conductivity is less than 8 on medium or finer textured material, respread

thickness is -- required is 24 inches.

If the sodium adsorption ratio is between 12 and 20, electrical conductivity is less than 8, the respread thickness requirement is 36 inches. And if the sodium adsorption ratio is greater than 20, regardless of texture, and if the electrical conductivity is greater than 8, then 48 inches of suitable plant growth material is required.

MR. BJELLA: Could we just clarify, what is he reading from there?

JUDGE MANN: Can you identify that document? Mr. Braaten, do you know what it is?

MR. BRAATEN: Yeah. I mean, I know where those numbers come from. It comes from the revegetation guide used by the PSC, and Mr. Deutsch probably can give a little more information on what exactly that document is, if that's all right.

JUDGE MANN: Go ahead.

MR. DEUTSCH: Actually I believe he's reading from our rules, the one option for respreading suitable plant growth material.

MR. BRAATEN: From the admin rules?

MR. DEUTSCH: Correct.

JUDGE MANN: Do you know -- can you identify what section or at least the chapter?

MS. JEFFCOAT-SACCO: He has them memorized.

COMMISSIONER KALK: Jim wrote them.

MR. DEUTSCH: It's that that are laid out in North Dakota Administrative Code Section 69-05.2-15-04.

JUDGE MANN: Okay.

MR. DEUTSCH: I believe that's what he's probably reading from.

JUDGE MANN: Thank you. Go ahead, Mr. Braaten.

Q. (MR. BRAATEN CONTINUING) Did you look at any other documents with respect to the actual depths of suitable plant growth material on the Voigt property?

A. Yes. I looked at Natural Resources Conservation Service information, in the ecological site descriptions, and it lists in there -- in the ecological site descriptions it lists ranges of the minimum depth and maximum depth to a restrictive layer.

COMMISSIONER FEDORCHAK: Are you going to pass these out to the rest? Sorry.

Q. (MR. BRAATEN CONTINUING) Okay. Continue.

A. On this Exhibit 2.4.7.3, ecosite

production summary, I've highlighted some figures in four columns. And these four columns are four of the range sites that the Voigt ranch has substantial acreage of. There's -- Cy stands for the clayey range site. Ly stands for the loamy range site. Sa stands for the sands range site. Sy stands for the sandy range site. The original numbers that are typed into this table are the pounds of forage that are produced on these various tracts -- or on the range ecological sites on those tracts of land, and it's expressed in pounds, the production.

So, for example, if you look at the first upper left number that's highlighted, it's 1,218, that's pounds of production on the clayey ecological site in the -- in a parcel on Section 6. So these ecological sites have ranges of depths to the restrictive layer.

Q. And how are you able to determine that these sites had varying depths to the restrictive layer?

A. Okay. It's listed in the ecological sites, and I believe those are part of the mine application.

Q. Okay. I would -- go ahead.

A. The depth range for the clayey ecological site is minimum depth of 20 inches, maximum depth of 72 inches to the restrictive layer. It's the same for the loamy and sandy range sites, minimum of 20-inch depth, maximum 72-inch depth. For the sands range site, the ecological site description says that the minimum depth to restrictive layer is 40 inches, maximum depth is 60 inches.

So the depth to that restrictive layer is an equivalent of suitable plant growth material thickness. So, in other words, if you have 72 inches to that restrictive layer, that means you have six feet of suitable plant growth material, material that plants can root into.

Q. And is that important for the health of native grasslands?

A. It is not so much a matter of the health of the rangeland, but it is absolutely a factor in the productivity of the rangeland. So if you look at these columns, in the production that he's obtaining from these various range sites in those columns highlighted, the production may be dependent on a lot of soils that are six feet deep.

Now, we don't know directly from the ecological sites what the depths of soils are on

Mr. Voigt's ranch. However, that information may be able to be extracted from the soil survey that was done on his unit.

So the bottom line is Mr. Voigt has a highly productive ranch, and it may be because he has a lot of relatively thick soils, soils that are substantially thicker or have a substantially deeper potential rooting zone than what the -- than what the guidelines require for reclamation.

Q. Okay. I've just handed you an image with the root zones of a number of plants, and I think that this illustrates to some extent what you're talking about, but can you talk about this exhibit a little bit and what it shows us?

A. The diagram is a chart. If you'll notice, it shows the rooting depth below the ground surface of the various plants, of the species identified up above. And on the left-hand side of the chart is a rooting depth expressed in feet. And if you will go over to the fifth species on there, for example, sideoats grama, it shows as having a rooting depth of about seven to eight feet. And there is definitely sideoats grama on the Voigt ranch.

Moving over further, I'll mention dotted gayfeather. Even though it didn't show up on any

of the inventory sites on the ranch, there's strong chance that there is dotted gayfeather on his ranch right now because it is a fairly common range plant. And you'll notice that the rooting depth of dotted gayfeather is greater than 14 feet.

And, again, native forbs have value to that unit either as livestock forage or to native wildlife species or to pollinators. And those pollinators are important in the state of North Dakota not only just for honey production for bees, but also to -- diversity of the plants that are out there.

Q. And if you had compacted mine spoil 48 inches below the surface, how would that affect the growth and viability of some of these deeper rooting plants?

A. It's highly likely that if the spoil material beneath is compacted, rooting will stop right there. Or if it's too high in sodium content or electrical conductivity, that's where plant growth will stop. And that's just addressing the spoil material underneath.

Another concern is the compaction. If the soils are compacted, even if the material is physically and chemically -- if it's chemically

acceptable for plant growth material, meaning it doesn't have too much salt, it still may be unavailable for the plants to root into it if it's compacted too hard.

Q. So with respect to the varying thicknesses of the suitable plant growth material, do you have any specific recommendations of what could be done at the Voigt ranch to ensure a healthy native grassland after reclamation?

A. First of all, for the material that will be replaced, Mr. Voigt will not want any less rooting depth than what he has currently. Now, understandably, there are different rooting depths on the soils on his ranch right now. Some of them are relatively shallow. Some are deep. Accumulatively he wants the same production potential that is available as a result of existing thickness of topsoil plus subsoil that is suitable for rooting or, in reclamation terms, suitable plant growth material.

Q. Okay. And you heard earlier Steve Merrill was testifying by phone and he was discussing a lot of issues more related to soils and soils in general, and I'd like to ask you about that generally, and I guess my first question would be,

as a person who has worked within the soil science field, are you familiar with these ideas of soil health and soil quality that were discussed by Mr. Merrill?

A. Yes, I am.

Q. Okay. And are there any aspects of soil health as he was discussing it that you feel he didn't cover, or is there anything you want to add to that testimony regarding the way soil scientists are looking at soil health nowadays?

A. I would really like to emphasize the compaction factor, because I think that's one of the reasons that -- or one of the greatest concerns out there for restoration. If those soils -- suitable plant growth material, if it's compacted too hard, it just will not be possible for those plants to root into it and to utilize the nutrients and moisture that should be stored in that soil profile.

Q. Do you have any specific recommendations, either in literature you've seen or elsewhere, on how you can deal with the issue of compaction?

A. I would like to refer to a document that was just handed out, Restoration and Reclamation Review from the University of Minnesota. It's

titled Soil factors affecting reclamation of abandoned coal mine land and methods of soil preparation.

This article goes on -- describes the disruption of soil that results from mining, disrupts the soil structure, soil microbe populations, and nutrient cycles that are crucial to sustaining a healthy ecosystem. Ecosystems function optimally as a process of recycling nutrients--a balance of growth rates and decomposition rates of plant and animal matter. Soil provides the foundation for this process, so its composition and density directly affect the future stability of the restored plant community.

Soil may be negatively affected by one or more events associated with coal mining: Initial removal of soil from the site as mining activities begin, storing or stockpiling soil, respreading soil upon completion of mining activities, and post-spreading conditions. Reclamation strategies must address soil structure, microbe populations and nutrient cycling in order to return the land as closely as possible to its predisturbance condition and continue as a self-sustaining ecosystem.

The first component addressed during

reclamation is the structure of the soil itself as it is replaced onto the reclamation site. Soil structure includes soil aggregation, or the way in which soil particles are held together, and the size of the particles comprising the layers at different depths.

Soil aggregation affects the degree to which oxygen, water, and nutrients flow through the soil and may reduce erosion potential. Aggregate structure breaks down as successive layers of soil are removed and stockpiled elsewhere on the site when mining begins. The resulting compaction reduces water holding capacity and aeration.

The degree to which soil is loosely constructed versus compacted can be altered during reclamation by the method of replacement used. Compaction can be minimized by using a mining wheel rather than scrapers to dig stored soil. Transporting soil from the stockpile to the reclamation site on a conveyor belt with trundling action improves soil structure by breaking up massive aggregates. As smaller aggregates continue to tumble, they tend to acquire an agglomerative skin of fine particles which promotes loose soil structure. Minimal use of bulldozers to level soil

at the reclamation site further reduces compaction.

Loosely constructed, or fritted, subsoil is very important to plant root systems. The extent of the root system determines a plant's ability to maximize its surface area and access a greater volume of water and soil nutrients. Plants grown in fritted subsoil have root patterns with extensive vertical and lateral penetration. Root patterns in compacted soils are limited to cracks occurring in the substrate and achieve little additional soil penetration.

Q. And beyond the compaction issue, with respect to some of the biological components of soil health discussed by Merrill earlier, do you have any specific concerns or things that you'd want to add regarding the importance of soil health in looking at reclamation success?

MR. BJELLA: Are we going to admit any --

JUDGE MANN: Yeah. We've gone -- there have been a number of exhibits, I've got them marked as 11, 12 and 13, with 11 being the table, Section 2.4.7.3, ecosite and production site summary that Mr. Anderson has marked up. I've got that identified as Exhibit No. -- Voigt Exhibit 11. Let's start with that first.

Mr. Bjella, did you have any objection to that exhibit?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: No, Your Honor.

JUDGE MANN: Okay. And then the next exhibit that was testified to was the root systems document that identifies the root depths of the various plants, and I've got that marked as Voigt Exhibit No. 12.

Mr. Bjella, any objection to that document being admitted?

MR. BJELLA: May I ask a few questions, Your Honor?

JUDGE MANN: Certainly.

MR. BJELLA: Now, where does this Exhibit 12 come from?

THE WITNESS: I don't know what the publication was. I obtained it from the Natural Resources Conservation Service state range conservationist Jeff Prince.

MR. BJELLA: So you have no idea where this comes from, what book or what reference source?

THE WITNESS: No, I do not.

MR. BJELLA: And also it is certainly not representative of what might occur on Mr. Voigt's soil either, is it, as to depths that the plant roots might grow? I mean, it's totally dependent upon the soil type and many other factors, isn't that true?

THE WITNESS: This does not correlate to the soils on his unit, but it is representative of some of the grass species that he has present on his unit, specifically sideoats grama and little bluestem and blue grama.

MR. BJELLA: Yeah, but you would just be speculating to say it represents how far the roots could grow into Mr. Voigt's soil compared to what's depicted on this map; isn't that true?

THE WITNESS: Yes, you are correct. I cannot make a conclusion or an assumption from this document the rooting depth on Mr. Voigt's ranch. However, that data is probably available and attainable from the soil survey that was done on the unit.

MR. BJELLA: I guess, Your Honor, we would object to this exhibit for lack of foundation. We have no basis to know where it came from or who printed it or who wrote it.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: We don't really have a position. If the party can produce the reference, it seems to me we can admit it.

THE WITNESS: I can't at this time.

MS. JEFFCOAT-SACCO: I don't mean the witness. I mean Mr. Braaten.

JUDGE MANN: Mr. Braaten, can you do that?

MR. BRAATEN: I probably could. I mean, it was intended as a demonstrative exhibit anyway, but if -- so I'm fine with it not being admitted. If we want it admitted, I'm sure that Mr. Anderson could track down the source if that's the only issue.

JUDGE MANN: Here's the thing. I'll admit it. You know, the Commission can address whatever weight, if any, that it wishes to give to this exhibit. Mr. Bjella, you've addressed some of the foundational issues that do exist and you can address those in cross-examination as well. I'll admit the Exhibit No. 12 subject to Mr. Braaten providing the source of the document as part of a late-filed exhibit, I guess.

And then with respect to the last document, the article that Mr. Anderson was reading

from, I've got that marked as Voigt Exhibit No. 13.

Mr. Bjella, any objection to that document being admitted?

MR. BJELLA: May I ask a few questions, Your Honor?

JUDGE MANN: Go ahead.

MR. BJELLA: Mr. Anderson, reviewing both the title of this document and also some of the substance in it, this appears to be entirely and solely related to reclamation of abandoned coal mines, which we will not have in the Coyote Creek situation; isn't that correct?

THE WITNESS: It will not be an abandoned coal mine, I suppose, but I believe the principles apply to the principles of mine reclamation.

MR. BJELLA: Abandoned coal mines are typically -- we used to have them in North Dakota. They would be huge spoil piles just sitting around, totally different from respread, recontoured, subsoil and topsoil respread land, wouldn't you agree?

THE WITNESS: Could you restate the question, please?

MR. BJELLA: Well, abandoned coal mines, when we used to have them in North Dakota, you

would see them around. They're huge spoil piles --

THE WITNESS: Yes.

MR. BJELLA: -- of basically overburden that have been left for whatever, 30, 40, 50 years. That will contrast dramatically and totally with what we'll have at Coyote Creek, which will be lands that will be recontoured to the original contours, subsoil respread, topsoil respread? It's an entirely different situation, isn't it?

THE WITNESS: No.

MR. BJELLA: How isn't it?

THE WITNESS: We're not arguing the recontouring of the land. The concerns here are the compaction, the replacement of the suitable plant growth material.

MR. BJELLA: But how can there be any correlation between an abandoned coal mine and land, as it says right in here, was unable to support healthy native plant communities? How can that at all correlate to a newly reclaimed coal mine done pursuant to modern methods?

THE WITNESS: Whether it's compacted a year ago or 50 years ago, if it's compacted, it's compacted. The plants won't care. They're not going to be able to root through it anyway if it's

compacted. The fact that you're dealing with immediate reclamation doesn't make compaction any less of a problem.

MR. BJELLA: Well, it says soil factors affecting reclamation of abandoned coal mines, and abandoned coal mines are a totally different scenario.

I guess I would object to this exhibit as being irrelevant and misleading because it deals with a situation which we do not have here. We do not have an abandoned coal mine.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: We don't have a position.

JUDGE MANN: And I think I'm going to do the same thing with respect to this exhibit. I'll allow it. I'll admit it as Voigt Exhibit No. 13 into evidence. Again, I'll note your objection and allow you to address the points that you brought up in cross-examination and through your witnesses. But I'll go ahead and admit it and the commissioners can give it whatever weight they feel is appropriate.

You can continue, Mr. Braaten.

Q. (MR. BRAATEN CONTINUING) Mr. Anderson,

the exhibit we've just been discussing, have you reviewed that article in full, the U of M article that's Exhibit Voigt 13?

A. Yes, I have.

Q. And there are a number of different issues discussed in here with respect to reclamation, including bacteria, soil pH, reestablishing nutrient cycles, carbon cycles. These issues and the suggestions and information contained in the article, is it your opinion that the principles and suggestions apply equally to reclaiming any mine land, whether abandoned or not?

A. Definitely, yes.

Q. And before we started discussing the exhibit in general, you had been talking about compaction, and I wanted to move on and just give you the opportunity again following Mr. Merrill's testimony to indicate if there are any other factors within the soil health concept that you thought maybe he didn't cover as fully or that are important to you and that you have suggestions regarding.

A. In this same publication, the University of Minnesota publication, it does mention mycorrhizal fungi. Mycorrhizal fungi are organisms

that have a symbiotic relation to plants. They create a halo around the roots of plants that enable the plants to extract more nutrients and moisture from the soil. And it's important to establish that biotic component in the soil for the plants to reach their potential productivity.

Q. Okay.

A. And techniques can be used in the reclamation process such as growing cover crops that are noted for improving or restoring mycorrhizal fungi, and that should be considered as a means of accelerating the restoration of the biotic component of the soil.

Q. And so in sum, can you tell us what your primary concerns are with respect to the success of revegetation at the Coyote Creek mine?

A. From the standpoint of the vegetation, the concerns are not just pounds of production but also quality of production. Mr. Voigt doesn't want to sacrifice the seasonal high-quality vegetation that he produces now, combination of warm season species and cool season species.

If the reclamation guidelines -- if the bare minimum was met where, for example, 60 percent of the stand could be Kentucky bluegrass, there's

no way that he would achieve that production potential. So he wants the same quality back in forage production. He wants the seasonal availability of it. He wants the same diversity that provides the health and resiliency to his rangeland community.

The production that he has on his ranch is also a product of the thickness of the topsoil and subsoil, is suitable for rooting on his ranch. He wants as many acres of the same depth back as what he has now. Recognizing that there are differences in the different soil map units on his land, he wants the same rooting potential back.

Q. Just one final question. From the perspective of a rangeland conservationist, if you end up with, for example, the possibility of 60 percent Kentucky bluegrass on his fields, will those fields be as productive as they were prior to mining?

A. No.

MR. BRAATEN: No further questions.

JUDGE MANN: Mr. Bjella.

MR. BJELLA: Yes, Your Honor.

EXAMINATION

BY MR. BJELLA:

Q. Mr. Anderson, what is your experience with reclaiming mine lands in North Dakota?

A. I have no direct experience in reclamation on rangelands in North Dakota or any other state.

Q. There was a lot of talk today about the 35 percent guideline, I guess we'll call it. That guideline -- or standard, I guess is probably a better word, comes from the Public Service Commission Standards For Evaluation of Revegetation Success; is that correct?

A. Yes.

Q. So if, for instance, Coyote Creek was to say our goal is to establish 65 percent, that would meet the required standards set by the Public Service Commission; is that correct?

A. That's correct.

Q. If you look at Exhibit No. 9, please.

A. Is that the thin loamy range inventory?

Q. Section 2.4.7.4.

A. Yes.

Q. Okay. As I read the data on this tract, this tract, which is on Mr. Voigt's land, would not meet the PSC standards even as they're written

today; is that correct?

A. I don't see why not.

Q. Well, because four species must contribute 5 percent by weight, and it doesn't do that, so it doesn't meet the standards as they currently exist today, and this is a piece of Mr. Voigt's land; isn't that correct?

A. Could you please repeat that, why it does not meet.

MR. STEFFEN: He quoted the rule.

MS. FLATH: It doesn't meet the diversity requirements.

JUDGE MANN: Only Mr. Bjella can question. Go ahead.

MR. BJELLA: If I might, Your Honor, could I have Ms. Flath ask this question because it's a portion I don't understand.

JUDGE MANN: Why don't you just take a minute and confer, that would be better, and then you can ask it.

(Short recess.)

Q. (MR. BJELLA CONTINUING) It's our understanding that under current regulations four species must contribute 5 percent by weight for native grasslands under the current standards.

There's only three here that do that. So this tract of land of Mr. Voigt's wouldn't meet that existing PSC standard.

A. Only three native species?

MR. STEFFEN: Three native grasses.

Q. (MR. BJELLA CONTINUING) Three native grass species, yes.

A. I count little bluestem as a native, needle-and-thread as a native, plains muhly is a native, porcupine grass is a native, sideoats grama is a native, threadleaf sedge is a native.

Q. But you must have all -- you must have four at least 5 percent?

A. I'll agree, there are not four species on there.

Q. And this is a parcel of Mr. Voigt's land as it currently exists today; right?

A. Yes.

Q. Also under the existing PSC standards two of these grasses must be warm season. You only have one here; isn't that correct?

A. No.

Q. 5 percent -- to meet the 5 percent guideline.

A. Yes, the little bluestem.

Q. So it fails on two points -- two factors to meet existing PSC standards?

A. Yes. It's a valid point. I think it calls for revisit of the current standards, because I think you could talk to any range conservationist -- unbiased range conservationist and they would describe this as an excellent quality range ecological site or plant community.

Q. Mr. Anderson, in your experience, is the trend for all native grass sites in North Dakota -- virtually all that introduced species composition is going up?

A. No, it's not a trend on all grasslands. No.

Q. I said virtually all.

A. No.

Q. On a great -- on a large extent of them composition is going up?

MR. BRAATEN: I'm going to object to the form of the question. It's vague.

JUDGE MANN: I'll overrule it. You can answer it if you're able.

THE WITNESS: I need more specific basis for -- what do you mean by a large extent?

Q. (MR. BJELLA CONTINUING) Well, in your

experience, have you seen that in native grasslands in North Dakota that introduced species composition has been going up?

A. I've seen a lot of it, yes.

Q. Given that there's at least a reasonable likelihood that if Mr. Voigt's land was never mined, his introduced species composition would likely increase; wouldn't that be true?

A. I don't believe so. There's -- to me the current status of this rangeland is excellent. He's told me he's using a twice-over grazing system and he is, to my understanding, an intensive -- intensively concerned about his vegetation management. I see no reason to expect the invasive to increase on Mr. Voigt's ranch.

Q. And did you review the soil depth information, Section 2.5, of the permit for Mr. Voigt's land?

A. No.

Q. And what was your source for saying there is compaction if you haven't been on a coal mine?

A. The concern raised by Mr. Voigt and his mention of other individuals that have actually worked on the mines, and the fact that I attended a Saltwater Conservation Society meeting back -- I

don't know what the year was -- back in the 1980s or 1990s when one of the researchers from the Mandan Agricultural Research Service -- I don't recall his last name, I believe his first name was Padom, he referred to the reclamation procedures as subsurface paving.

MR. BJELLA: I have no further questions.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: I believe Mr. Deutsch will have a couple questions, but before that I would like to get the revegetation success standards into evidence. They are not rules and they are not law. They are standards. But I think because there's been so much testimony about them, and maybe a little bit more with Mr. Deutsch's question, I would like to have the book. We will get one for the record --

JUDGE MANN: Okay.

MS. JEFFCOAT-SACCO: -- in the record.

JUDGE MANN: Okay.

MS. JEFFCOAT-SACCO: And I'll just give this to Jim.

EXAMINATION

BY MR. DEUTSCH:

Q. Mr. Anderson, with regard to your

testimony about allowing Kentucky bluegrass on the reclaimed tract that may count towards meeting that 65 percent of the total native composition requirement, I'm assuming that came from our revegetation guidelines.

A. Yes.

Q. Do you have a copy of that particular page with you right now?

A. No.

Q. Well, that statement that you made about that counting, there's -- that's qualified, and I'll read from it. It says, also up to its percent composition on the approved reference area, Kentucky bluegrass on the reclaimed tract may be counted towards meeting the 65 percent native species composition requirement. However, it cannot otherwise be counted as a native species for diversity standards. And I'm assuming you're familiar with what a reference area is.

A. Yes.

Q. Now, if a reference area is set up on Mr. Voigt's -- some undisturbed land that does not have Kentucky blue, then Kentucky blue couldn't be counted based on the way this is written; isn't that correct?

A. Well, if that's what it means, then Mr. Voigt is fine with that.

Q. Okay. That is the way that requirement is written, it can only be counted if it's present on the approved reference area, so --

A. Okay. Thank you.

MR. DEUTSCH: Thank you. That's all I have.

JUDGE MANN: Can I just have you identify like the section and maybe page, I guess.

MR. DEUTSCH: Yeah. That's in the native grassland portion. It's under requirements for diversity and seasonality, and it's on page -- the title at the top is native grassland. It's II-D-10.

JUDGE MANN: Okay. And, Illona, I guess, what document was that, what's it entitled, and maybe we can get that marked as Exhibit 14 and see if we can get that into the record.

MS. JEFFCOAT-SACCO: I'll take a minute to get one to be marked, but it is literally the Public Service Commission Reclamation Division Standards for Evaluation of Revegetation Success, and then it's a little longer, and Recommended Procedures for Pre- and Postmining Vegetation

Assessments. But I think the whole document needs to go in because, otherwise, these things are out of context.

JUDGE MANN: Sure. And I think once we get it, we'll mark it as Voigt Exhibit No. 14.

Mr. Braaten, do you have any objection as to admitting that into evidence?

MR. BRAATEN: No, I don't.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Okay. Once we get the copy of that, we'll mark that as Voigt Exhibit No. 14 and it will be admitted.

Do you have any other questions at this point, Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: No.

JUDGE MANN: Okay. Commissioner Christmann.

EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. In Exhibit No. 9, the list of the plant species, is Kentucky bluegrass the only one that you would consider invasive nonnative species of these that are listed?

A. Yes. On that sample site, yes.

Q. The rest you would all consider to be native?

A. Native, yes.

Q. And then on Exhibit No. 11, I'm not really understanding the exhibit very well. So I'm looking at the second column that's with highlighting, the top one that's highlighted, 166,656. So what does that mean as opposed to the state tract above it that's 363,000? I don't have any kind of a correlation.

A. That number is the pounds of production on that ecological site within that parcel of land. If you look at the --

Q. But these parcels are all different sizes; right?

A. Yes.

Q. So if the parcel above it is slightly more than twice as large, then they would be substantially equal in that category?

A. I'm not sure how that was calculated, but they may have factored in the productivity of the site based on actual clipping. So if his site was clipped with a higher yield, that may be different than on adjoining property.

Q. So maybe you can just take another stab at

explaining to me what I should take out of these numbers.

A. Okay. The important thing I want you to understand on this is that Mr. Voigt has substantial acreage of these range sites that I've underlined and highlighted. Even though these represent pounds of production, suffice it to say that they also represent substantial acreages of these range sites. And on those range sites the rooting depth for these range sites can be from 60 to 72 inches of maximum depth. The clayey, the loamy, and, I believe, the sandy site have maximum rooting potential of 72 inches -- it's either sandy or sands. I don't recall which right offhand.

Q. Is there something here that proves it is, though? I mean, could they be less than that too depending on just whatever Mother Nature has put there?

A. They could be closer to the minimum of 20 inches, but bottom line is Mr. Voigt is concerned that he gets back the same thickness of suitable plant growth material.

Q. And then on number 13, when this deals with abandoned mine land, weren't by definition the abandoned mine lands mined in such a way that

overburden and the subsoil and topsoil was all mixed together and so when it's getting respread in this study, there could be tens of feet of hard clay mixed in with the topsoil and such that would compact much more likely than what the subsoil or topsoil of modern mining practices would compact?

A. I don't think there's any way you can compare the two because from my understanding of the old abandoned mines, they just moved overburden and soil, and I don't think they separated or segregated anything and it was just thrown on there. It appears it was just side grasped by draglines. So that material might be compacted far less because there was no equipment run on it to level it out.

Q. That's my understanding too, but then if you would reclaim it, you would move it around, and so wouldn't that pack even worse than what our subsoil does, because you would have all that clay and stuff from far below with the overburden mixed in?

A. It may.

Q. Your description of the amount of Kentucky bluegrass that can be counted as native -- and then I'm anxious to see that exhibit, I guess, now and

read it more clearly and refresh myself personally. But you seemed surprised by Mr. Deutsch's description of the rest of that, so had you read that, or where did you get your information about that allowance if you hadn't read that?

A. I was reading a summary of the data, and that was one detail that I did not fully understand.

Q. But you're comfortable with the PSC requirement if it says as Mr. Deutsch stated it?

A. Yes.

Q. You said Mr. Voigt's ranch is 10 to 12 native species.

A. Yes.

Q. Is that -- in western North Dakota where there's areas that are substantially undisturbed, you know, larger tracts like that, is that common or is that extraordinary?

A. With as many different range sites as he has, I would say it would be fairly common -- fairly common and definitely commendable, the number of species that he has.

Q. And when these areas are studied, how big of an area do they look at, and do they take a square yard? Or how big an area do they study; do

you know?

A. I don't know what size the sample plot is.

Q. So I don't know if you'll know this then. When you say 10 or 12, is that 10 or 12 that cover all the spots that were studied over the whole extent of his ranch, or is that each study area averages 10 or 12 different species?

A. No. The 10 or 12 species that I mentioned was a count of the species that showed up on the inventory sheets for sampling that was done on his ranch.

Q. All of them.

A. So there may be other species that were not -- there may be other species present on his ranch, and probably are other species present on his ranch, that did not show up on the inventory sheets. I can count up the grasses that did appear that were native. There was little bluestem, needle-and-thread, plains muhly, porcupine, sideoats. Threadleaf sedge is a grasslike species. Western wheatgrass, inland saltgrass. Sun sedge is a grasslike species. And Wilcox panicum.

Q. Okay. And I think my last one, Your Honor, is with -- what do you call the -- what was the term you used for the subsoil suitable for

growing?

A. Suitable plant growth material.

Q. If that is two feet and -- let's say it was two feet on a third of the land that's going to be mined and four feet on a third and six feet on a third. Is it advantageous to have it reclaimed that way so there's some areas with extraordinary depths, but also some areas with not very good depths, or would it be over the whole ranch equal if that was reclaimed all at four feet?

A. I can't answer that. And that's one of the questions I had in my mind too. If we had more time, I think it would have -- I would have liked to have done some calculations based on the soil survey and see what the production potentials are for those soils and see if in fact he will get equal production back based on that average or if the variety of different thicknesses he has right now actually produces more. I would not rule out the possibility that he is better off with that range -- wider range in suitable plant growth material thicknesses that he has right now.

Q. Is that what -- I mean, you're here as an expert. Is that what you expect or --

A. I couldn't say. I would need to -- need

to do the work to determine that.

Q. Okay.

A. It is a recommendation that I would make to the Public Service -- to the Commission, is to consider -- consider that as a possibility or potential.

COMMISSIONER CHRISTMANN: Thank you.

JUDGE MANN: Commissioner Kalk.

COMMISSIONER KALK: Thank you, Your Honor.

EXAMINATION

BY COMMISSIONER KALK:

Q. Thank you, Mr. Anderson, for your testimony and your work in rangeland and being a Bison, of course, as well.

I will just jump right to Exhibit 13 and kind of follow on Commissioner Christmann's questions. I used to work in academia and it seemed like you could always find one report that liked something and one that didn't tell something.

So tell me again how you found this document, the one that -- restoration reclamation review.

A. By Internet search.

Q. Did you find any other in Internet search, or is this the only one that was out there?

A. That was definitely not the only one that was out there. I did find one that was quite similar and more detailed and it appeared to be a lot of the same language that is in this document.

Q. Would you agree, though, you could find something on the Internet that shows research that reclaimed coal land is better than when it started?

A. Pardon me?

Q. Would you agree that you could probably search the Internet and find a document that completely contradicts this document?

A. I don't know.

Q. Okay. And then do you know anything about the author's credentials? I don't see a master's of science, a Ph.D. or anything behind it.

A. No, I don't.

Q. And, like I said, this is not criticizing you at all. I'm just trying to figure out the document.

Then just a couple other ones. It sounds like you value the soil survey data that's available very highly in what you do in your range work.

A. Yes.

Q. And then when you talked about -- earlier

about reclamation that you've seen in pipelines or fiber optic cable installations, do you know if there's any standards that are available that those companies are held to right now?

A. I would guess that they're probably bound only by the state noxious weed law. And I would point out that the state noxious weed law offers very little help in a situation like this. The state noxious weed law, as I understand it, addresses efforts to control the weeds. It is not defined by results. Results are what matters to Mr. Voigt.

Q. Well, and I certainly agree with that. Do you have an understanding of -- in pipelines that if a pipeline is jurisdictional to the PSC, there's standards that we hold them to; if the pipeline is not jurisdictional, there's no standards for reclamation?

A. Okay. I'm not familiar with the current --

Q. Well, and I'm just walking down a road here that it seemed to me that in your testimony you were trying to compare what might happen at the coal mine that has very strict reclamation standards to what's happening out there in fiber

optics and pipelines, that the reclamation that you've seen for those that aren't jurisdictional to us would somehow relate to this stuff that is jurisdictional to us.

A. The point I would like to make is that bare ground is where invasive species show up and noxious weeds, sites that are disturbed. And until the grasses are firmly established on the reclaimed sites, they are -- those -- I consider those acres to be highly vulnerable to invasion by noxious weeds and other non-noxious weeds invasive species.

Q. And I would certainly agree with you on that. I think that we're trying to get to the same end here, we want the land to go back to better than it was if possible. So I just want to make clear that there is -- I see there's a large difference trying to compare what you'd see in a pipeline that's not jurisdictional or a power line to what you might see in something we have jurisdictional on.

Just a couple more, sir. You talked a lot about what is acceptable or not acceptable with Mr. Voigt. How do you know that? How did you go through all this data with him?

A. I didn't go through all the data with him,

but in the discussion I had with Mr. Voigt, he has expressed that he wants the same productivity and health that he has in his plant communities currently.

Q. Okay.

A. Both in terms of quantity and quality.

Q. And I always enjoy the discussion about native and non-native. Are pheasants native or not native to North Dakota?

A. They are introduced.

Q. People love them, don't they?

A. Yes.

Q. And I think that's the same discussion that range purists have with -- and it's not a bad thing, but you want to have the native grasslands back to the way they were, but I do appreciate the dialogue that took place on that.

How do you measure compaction?

A. There is an instrument called a penetrometer, that it measures -- it's a probe -- pointed probe you can push down into the soil and then read it in pounds of pressure required to push the probe into it. That's one technique that I'm familiar with.

Q. Because one of the discussions we've --

I've had about soils over the years is back when the glaciers were sitting on there, there was a certain level of compaction, but centuries later things evolve, soils break apart, so time is going to make better soil. I've always viewed reclamation the same way, that whatever compaction we have, we want to reduce it, but there's going to be some level but time will fix these things. Do you disagree with that?

A. I agree with you. I would also like to point out that the big question is time. How long is it going to take for those soils to loosen up by natural processes. If the roots can't get in there, that's one process that is stopped. Freeze-thaw is another action that typically loosens up soils somewhat. However, the deeper -- deeper materials we're talking about will not go through a lot of freeze-thaw cycles in one year. The deeper material will tend to freeze up, stay froze and then thaw out, so it's only going through one freeze-thaw cycle per year -- a lot of this material. And it's repeated freeze-thaw cycles that really helps with that aspect of the expansion-contraction.

Q. So the breaking up of -- no, it's not

better. Breaking up in the initial phases when it's exposed to that is much different than what would happen once you put the topsoil on?

A. Yes.

COMMISSIONER KALK: Okay. Thank you.

JUDGE MANN: Commissioner Fedorchak.

EXAMINATION

BY COMMISSIONER FEDORCHAK:

Q. Mr. Anderson, thanks for being here. Tell me -- judging by your resume, it looks to me like you were at the NRCS for about 36 years?

A. Yes.

Q. And just recently left there in the last year -- this year?

A. Yes.

Q. Tell me, one of the agencies that is communicated with during this whole process is the NRCS and apparently they have provided comments on this permit application. Have you read those comments?

A. No, I have not.

Q. Are you -- when you were with the NRCS, were you ever involved in the review process of these permits and the commenting -- or commenting on them?

A. No.

Q. So would you say that, you know, the NRCS comments -- why wouldn't you look for those, I guess? I mean, they seem like the one that has expertise that you are bringing to the table on an issue that you feel, you know, is important. Wouldn't their comments or lack thereof offer some additional authority or some outside third-party perspective on these issues that would be relevant to this discussion?

A. I would expect they will.

Q. So if we look at those comments and see what they've said and how that's been implemented, that can be something that myself as a commissioner trying to get to the bottom of the issues here should put some stake in, in the NRCS, what they're saying about this permit application?

A. Yes, I agree.

Q. Okay. Good. I haven't read them either, but I'm going to look for them.

You've mentioned a couple times that Mr. Voigt isn't just interested in the quantity of production but the quality. Tell me again what you mean by that.

A. From the standpoint of his livestock, he

wants a plant community that's capable of producing vegetation of a relatively high nutritional quality throughout the growing season for as long as possible through the grazing season. And right now he has that with the combination of warm season, cool season grasses.

Q. Okay. So in the reclamation process we secure that kind of quality that he wants to make sure he has long term by the mixture of the species in the reclamation; correct?

A. Pardon me?

Q. So if we reach that 65 percent process, we're getting at the quality as well as the quantity?

A. That starts to address it. There is also the concern of forbs. Right now I don't read anything in the standard referring to any requirements for forbs.

Q. Okay. So how do you measure? I mean, if the quantity is the production level, the forage on the end of the measurement of that that gets at the quantity -- at least I'm assuming that's how you get at the quantity. Then the quality, how do you measure that in terms of bond release?

A. Because you have to deal with other

variables like weather -- under real dry conditions it's going to be hard to determine whether or not the full potential of the sites have been restored. And that's why I think there needs to be a very heavy emphasis on the foundation for that plant production potential, and that's the soil. Do you have the thickness of suitable plant growth material? Does it have the physical characteristics necessary to allow rooting and to allow maximum growth -- does it have the biological components or microbiological components that enhance plant growth?

Q. I'm going to follow up with our experts on this when they get up there, but I have been on a few of the mine sites to observe the mining process and the reclamation process and I've seen the pillars. Have you been out there to see how they do this? We see the pillars -- I call them pillars. That's not the technical term. Maybe it's monuments or something like that. It shows the different layers of the earth and it shows -- you can really see where the topsoil is and the subsoil and the overburden or whatever the lowest level is.

My understanding is that they reclaim to

the depth of those pillars, but I want to confirm that. And if that's true, then I believe Mr. Voigt's subsoil and topsoil would be reclaimed similar to how it was before it was mined, but I will confirm that. If that's the case, does that get at that issue in terms of the active vegetation material, the depth of it?

A. I'm not familiar with this aspect of the reference points that you're describing.

Q. Okay.

A. My experience -- actual experience on mines has been evaluating wetlands, which is a whole different world.

COMMISSIONER FEDORCHAK: Okay. And I could be wrong that that's how it's done, but I guess that's from my tours and review of this, that's what I believe it to be, so I want to confirm that. Thank you.

JUDGE MANN: Mr. Braaten, do you have any followup?

MR. BRAATEN: Yeah, just a couple.

FURTHER EXAMINATION

BY MR. BRAATEN:

Q. Mr. Anderson, you were provided a number of documents and materials from the attorneys you

were working with; right?

A. Yes.

Q. And with respect to the Kentucky bluegrass issue that Mr. Deutsch brought up, the materials you were provided with were provided by the lawyers; right?

A. Yes.

Q. And the lawyers didn't provide you with the NRCS letter that was part of the record?

A. That's correct.

Q. And so the fact that you didn't have those is the lawyers' fault?

A. Yes.

Q. I do want to go back to the bluegrass issue, though. Putting aside the amount of Kentucky bluegrass we're discussing and let's just say there isn't any, do you think that a field that has 35 percent tame grasses is as productive as a field that is, for example, 5 percent tame grasses?

A. No.

Q. And we discussed a little bit the reclamation guide, which we are now putting into the record and had a discussion of that, and you obviously had reviewed that. Have you reviewed any of the specific statutes on performance standards

and reclamation that are used by the PSC?

A. Yes.

Q. Okay. And I'd like to get your opinion on one of these with respect to the reclamation plans at the Coyote Creek mine.

MR. BRAATEN: And for the record and the lawyers, I'm reading from North Dakota Century Code 38-14.1-24, Subsection 17.

Q. And the standard in the statute is, "For those lands which are to be rehabilitated to native grasslands, a diverse, effective, and permanent vegetative cover must be established of the same seasonal variety native to the area to be affected and capable of self-regeneration, plant succession, and at least equal in extent of cover and productivity to the natural vegetation of the area."

In your opinion, based on what you have looked at in the application permit, does it appear that that is going -- that Coyote Creek is going to be able to successfully meet that standard?

A. No.

MR. BRAATEN: I have no further questions.

JUDGE MANN: Mr. Bjella?

FURTHER EXAMINATION

BY MR. BJELLA:

Q. Following up with that last question, as there has been no mining at Coyote Creek, there's been no reclamation, you're purely speculating as to what the end result is going to be; isn't that correct?

A. No.

Q. How can you not be speculating? There's nothing to evaluate.

A. I evaluated the reclamation plan and I looked at the depths of the soil that are going to be placed back, and I looked at, for example, the revegetation seeding plan and I counted fewer species on there than what Mr. Voigt has on his ranch currently. So I believe I based the opinion on the evidence at hand.

Q. So you're essentially saying that the North Dakota reclamation program is dead wrong and that all these mines that are being reclaimed around the state are being reclaimed to the wrong standards? That's essentially what you're saying; isn't that correct?

A. No, I'm not saying it's all wrong. I'm saying there is room for improvement.

Q. Now, you had testified earlier, I think it had to do with a question from Commissioner Christmann, about a summary you were provided. Is this summary you were provided, is that what Mr. Braaten just referred to?

A. Yes.

Q. Now, you're here as an expert witness and you're supposed to testify as to your own knowledge and belief and based on your own investigations, and yet you're telling us that you're basing at least part of your opinion on material which you hadn't reviewed and was prepared by your attorney -- by the attorney; is that correct?

A. Yes.

MR. BJELLA: I have no further questions.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: We have no questions.

JUDGE MANN: Commissioner Christmann?

FURTHER EXAMINATION

BY COMMISSIONER CHRISTMANN:

Q. When I asked you about whether you thought that averaging the soil suitable for plant growth was substantially equal to having more in some places and less in some places like nature has it, you just couldn't say for sure. Would it be the

same answer as far as topsoil? I'm assuming that in --

A. Yes.

Q. -- in pastures a lot of times on the hilltops the topsoil is pretty thin and in the valleys it might be a little thicker. Could you --

A. I --

Q. No opinion as far as what averaging it would do?

A. That's correct.

COMMISSIONER CHRISTMANN: Okay. Thank you.

JUDGE MANN: Commissioner Kalk?

COMMISSIONER KALK: No, Your Honor.

JUDGE MANN: Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: No.

JUDGE MANN: Anything further, Mr. Braaten?

MR. BRAATEN: No, Your Honor.

JUDGE MANN: You can step down. Thank you.

Do you have other witnesses?

MR. BRAATEN: We don't have any other witnesses and we'll rest.

JUDGE MANN: Okay. Are there any members

of the public who didn't have the opportunity to testify last Friday that would like to offer testimony relevant to this proceeding? None.

Mr. Bjella, it's our intention to adjourn at 3:00. Did you want to try to call any witnesses before that point, or would you prefer to wait until the 2nd?

MR. BJELLA: I think we might as well wait, Your Honor, because it will take me at least 15 minutes for our first witness just on my direct, so at least we wouldn't finish with him by 3.

JUDGE MANN: Yeah.

MR. BJELLA: So I guess we --

JUDGE MANN: I think that's probably the best approach. I guess before we adjourn today, are there any other issues we should address at this point?

COMMISSIONER KALK: Your Honor, if I could throw something out.

JUDGE MANN: Go ahead, Commissioner Kalk.

COMMISSIONER KALK: There has been a lot of discussion about what's in the record, what's not in the record. If the attorneys could get all that sorted out and get it all submitted prior to January 2nd, then all of us can review stuff,

because we'll spend a lot of time reviewing the documents up to this point, and then it's nice to get this stuff in as soon as possible.

JUDGE MANN: Mr. Braaten, anything before we adjourn?

MR. BRAATEN: No Your Honor.

JUDGE MANN: Mr. Bjella?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco?

MS. JEFFCOAT-SACCO: I think we can get this vegetation success standard document marked. I don't have all of them, but I have one to mark.

JUDGE MANN: Okay. I think I already asked, but there was no objection from counsel for admitting that as Voigt Exhibit 14?

MR. BJELLA: No, Your Honor.

JUDGE MANN: Ms. Jeffcoat-Sacco, anything else before we adjourn? Did you have anything?

MS. JEFFCOAT-SACCO: Nothing further. Thanks.

JUDGE MANN: Commissioner Christmann?

COMMISSIONER CHRISTMANN: No other comments.

JUDGE MANN: Commissioner Kalk? Commissioner Fedorchak?

COMMISSIONER FEDORCHAK: No.

JUDGE MANN: All right. Thank you. We will adjourn and we will return at 8:30 on January 2nd for the continuation of the formal hearing. Thank you.

(Adjourned at 2:46 p.m., Tuesday, December 23, 2014.)

CERTIFICATE OF COURT REPORTER

I, Denise M. Andahl, a Registered Professional Reporter,

DO HEREBY CERTIFY that I recorded in shorthand the foregoing proceedings had and made of record at the time and place hereinbefore indicated.

I DO HEREBY FURTHER CERTIFY that the foregoing typewritten pages contain an accurate transcript of my shorthand notes then and there taken.

Bismarck, North Dakota, this 9th day of February, 2015.

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Denise M. Andahl
Registered Professional Reporter

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