STATE OF NEW MEXICO

ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:
Case No. 25875.

HEARING - DAY 4

DATE: Thursday, July 30, 2026
TIME: 9:00 a.m.
BEFORE: Hearing Examiner Felicia Orth
LOCATION: Wendell Chino Building
1220 South Saint Francis Drive
Pecos Hall
Santa Fe, NM 87505
REPORTED BY: Ryan Auten
JOB NO.: 8347078

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Dr. William Ampomah, Commissioner
Paige Czoski, Commissioner
Zachary Shandler, Commission Counsel
Sheila Apodaca, Commission Clerk
Dr. Gregory Schnarr, Principal Environmental Scientist
Matt Eales, CoolSky Energy Solutions
Jennifer Raney, Deputy Director of PRRC
Katherine Walton, WELC
Elvis Leunguen, EMNRD (by videoconference)
Caroline Wachtman, Attendee (by videoconference)
Allison Marks, Attendee (by videoconference)
Peter Kondrat, EMNRD (by videoconference)
Robert Mathes, Attendee (by videoconference)
Tiffany Wallace, Attendee (by videoconference)
Heath Lovell, Attendee (by videoconference)
Gerasimos Razatos, EMNRD (by videoconference)
Erin Ramaker, Attendee (by videoconference)
Le Teaisha Carter, Attendee (by videoconference)
Rosa Romero, EMNRD (by videoconference)
Mike Eisenfeld, SJCA (by videoconference)

A P P E A R A N C E S (Cont'd)

ALSO PRESENT:

Carl Chavez, EMNRD (by videoconference)

Peter Morgan, Attendee (by videoconference)

Mark Ballard, Attendee (by videoconference)

Benjamin Shelton, EMNRD (by videoconference)

Emmanuel Gyimah, Attendee (by videoconference)

Jordan Kessler, Attendee (by videoconference)

CH, Attendee (by videoconference)

Brittany Hall, EMNRD (by videoconference)

I N D E X

E X H I B I T S

NO.	DESCRIPTION	ID/EVD
Case No. 25875:		
CBD:		
Exhibit 1	Proposed Changes to Applicant’s Proposed 19.15.43 NMAC (Redline)	807/809
Exhibit 2	Curriculum Vitae of Catherine Helm-Clark, Ph.D.	805/809
Exhibit 3	Direct Testimony of Catherine Helm-Clark, Ph.D.	808/809
Exhibit 4	Oil Ejected to the Surface by Venting CO2	809/809
Exhibit 5	Selected Events at a Distance from Identifiable Point Source Injection Well Sites	809/809
Exhibit 6	Hall Plot Figure from Ohio Department of Natural Resources (ODNR) Report on Redbird No. 4	809/809
Exhibit 7	Ambient Noise Tomography Image of the Helium Gas Resource in Northeast Minnesota	809/809
Exhibit 8	Weatherford International Slimline Acoustic Imaging Log	809/809

P R O C E E D I N G S

THE HEARING EXAMINER: It's 9:00. Let's begin this morning. We are on day 4 of the hearing in OCC 25875 related to primacy for Class VI wells. We've come to our fourth public comment session. I don't see anyone in the room unaffiliated with a party.

Sheila, is there anyone on the platform who would like to offer non-technical public comment this morning?

THE CLERK: There is nobody who has signed up, but I don't see any hands raised.

THE HEARING EXAMINER: If you're on the platform, and you'd like to offer non-technical public comment, please raise your virtual hand or reach out through the chat. Public comment is accepted at 9 a.m. on all days that we continue through this hearing. The other possibility, which some folks have done, is to submit written public comment through Sheila Apodaca.

All right. Let's go back to the technical case then this morning. Ms. O'Grady? Oh, no. I'm sorry. Mr. Pavlik or Mr. Cox? You're sitting in front of me, so --

Mr. Pavlik, are you on the platform?

MR. PAVLIK: Yes, I am. Good morning. Thank you. I'll begin with my opening statement, and then I'll call Dr. Helm-Clark to testify on behalf of the Center Biological University.

THE HEARING EXAMINER: Thank you.

MR. PAVLIK: Good morning, Madam Hearing Officer and Commissioners. My name is Zach Pavlik, and I represent the Center of Biological Diversity. I want to start by thanking you for your significant engagement in the rule-making thus far and all the important questions that you've asked. I'm also grateful to the State's experts for the time they've dedicated to this hearing these past few days.

I'm going to begin by renewing our objection to the Commission's jurisdiction. Then I'll explain our substantive case. In short, the Division's proposal to largely adopt outdated federal regulations is inadequate to protect underground sources of drinking water in communities in New Mexico.

I'll outline the evidence and arguments that will be presented to the Commission for why and how the rule must be made more protective.

To begin, I'd like to renew the Center for Biological Diversity's objection that neither the

Commission nor the Division have the authority to promulgate this proposed rule, especially with its current scope.

We have discussed this in our motion to dismiss and summarized our position at the beginning of this hearing. In short, no statute gives either body the authority to promulgate the extensive language in the proposed rule.

The Oil and Gas Act pertains to matters outside of the scope of this proposed rule. The Stewardship Act only gives narrow authority to the Division concerning issues related to ongoing Class VI stewardship. The Commission's authority under the Stewardship Act is limited to establishing a fee structure for the Stewardship Conduct.

Despite this, the applicant has chosen to proceed without waiting for the legislature to grant it authority. In doing so, it has also invited this Commission to act outside its authority. This is but one manifestation of the rushed nature of this rule-making. Others were identified in Commissioner Czoski's motion yesterday.

Subject to these objections, we are participating in this rule-making to highlight the inadequacies of the federal regulations to protect New

Mexico's waters and people.

This in turn preserves all objections raised in its motion to dismiss along with all related bases for appeal of any rule promulgated, including lack of authority to enact all or part of this rule.

And now I want to turn to the reasons the Commission must promulgate a strong rule that does more than simply adopt the federal regulatory language. Through this rule-making, New Mexico seeks primary enforcement authority over the permitting and regulation of Class VI long-term CO2 injection laws.

This is a very technical program. And as we have heard, there are still significant outstanding questions and concerns. It requires substantial experience and capacity to adequately review project proposals and ultimately protect underground sources of drinking water.

The program will expose New Mexico to broaden financial liability because the state itself will accept ongoing responsibility for all Class VI wells in New Mexico. This could have huge impacts for the state that is already struggling with liability in the oil and gas context.

Class VI wells and infrastructure also pose deadly risks to communities. Notably, these can

only be mitigated, not eliminated. The upshot is that robust and protective regulatory language must be the cornerstone of this rule. This rule must go further than federal regulations.

As the Center's technical expert, Dr. Catherine Helm-Clark, will testify, the current federal framework is outdated. The Commission will hear testimony from Dr. Helm-Clark as to some of the inadequacies of the federal regulations.

The federal rule includes technical requirements and methodologies that are no longer best practice. The result is substantial risk, risk to underground sources of drinking water and risk to communities. The Commission must circumvent this risk with a strong and modernized rule. Dr. Helm-Clark will offer the Commission a suite of suggestions to assist the Commission in filling the gaps in the federal regime.

Importantly, the federal framework serves as the floor for this rule. Federal rules explicitly allow New Mexico to adopt more stringent protections, and the Commission must do so. It must do so to protect both New Mexico's underground sources of drinking water and its communities.

I urge the Commission to reject a rule

that merely adopts the federal framework. I encourage it to instead adopt the modern, scientifically backed amendments offered by Dr. Helm-Clark to protect the interest of the state, its resources, and its residents.

I'd now like to outline a few of the Center's proposed amendments. During this hearing, you will hear testimony on behalf of the Center from Dr. Helm-Clark.

Dr. Helm-Clark has a Ph.D. in geology. She has extensive experience working on geotechnical engineering and with industry on projects on Alaska's North Slope, the Niger Delta, and the Great Basin. Her recommendations strengthen the rule in important ways while remaining reasonable. She has offered measures informed by her industry background and her experience reviewing Class VI permits.

The amendments she suggests can be put into three general buckets. They include, one, additional protective provisions for Class VI projects; two, certain technical modifications; and, three, strengthening the rules, justice, and transparency for New Mexicans. All amendments respond to glaring shortcomings in the current proposed rule.

First, beginning with protective

provisions, you'll hear Dr. Helm-Clark speak to ensuring the safety of New Mexico's communities. This should not be overlooked in protecting underground sources of drinking water.

She recommends measures such as a 10-mile site characterization radius and half-mile setbacks. These measures are related to the protection of underground sources of drinking water. They prioritize preventative and corrective action based on risk to underground sources in drinking water that overlap with risks to communities near Class VI projects. They offer necessary protections for New Mexicans under the Class VI framework.

You'll also hear Dr. Helm-Clark suggest that adequate protection of underground sources of drinking water in communities will not be possible without accurate and comprehensive well identification. This must happen within the area of review and near certain public and residential zoned areas.

Dr. Helm-Clark notes that the monitoring of the injection zone through timely and responsive reevaluations of the area of review is vital for risk reduction.

Second, moving to technical provisions,

the Commission can expect to hear testimony from Dr. Helm-Clark recommending regulatory tools to provide OCD with necessary data, data to allow to effectively monitor Class VI injection operations. Those tools are based on science and her firsthand experience in the industry.

Dr. Helm-Clark suggests monitoring tools and methods that are already familiar in the industry. These recommendations are tailored to maximize the Division's access to information without being technically or economically prohibited.

For example, her suggestions include utilizing Hall lots in performing additional logging that are known and accessible industry tools. All data will be reported to the Division to leverage its decision-making.

Third, the Commission will hear proposed amendments to strengthen transparency and ensure communities have the capacity to respond to the catastrophic emergencies that can result from Class VI projects.

Dr. Helm-Clark has requested executive summaries of the reasoning behind their review delineation methodology. This would allow interested parties and notably the Division itself to save

significant time and resources reviewing an application and determining the appropriateness of an area of review.

Dr. Helm-Clark notes that emergency situations caused by Class VI projects can be deadly. She underscores the importance for communities to have the capacity to respond to these emergency situations. She suggests a solution.

Class VI project components should provide specific minimum training elements that involve minimal investment but supply maximum protection for communities at risk with these projects. Those should be set by OCD.

The minimums proposed by Dr. Helm-Clark present this Commission with straightforward, science-backed, and reasonable pathways for a more protective rule.

Lastly, I want to discuss the implications of this rule-making for New Mexico. The Commission is laying groundwork for a new industry in the state. That industry comes with many unique and considerable risks.

The growing abandoned oil crisis in the oil and gas space teaches us that meaningful regulation and enforcement are vital. This is the

only way to protect public interest. And the Class VI industry presents potentially far greater risks on a per-project basis than oil and gas wells.

This rule-making is a chance for the Commission to leverage these lessons learned. The Commission can promulgate a rule that avoids the pitfalls of other programs. It would be a mistake to begin from a point of under-regulation. Instead, we urge the Commission to adopt proactive and precautionary approach.

We urge you to hold all Class VI operators to the highest standard. This standard should have meaningful protection as its foundation. The Commission should avoid setting a bar that is too low by merely adopting the federal floor.

It should avoid hastening to pass a weak or incomplete rule. Doing so will result in New Mexico assuming unnecessary risk. It will also require future rule-makings to address shortcomings that we've already identified and know are present in today's rule.

In conclusion, the Center participates in this rule-making without waiving its objections to the Commission or Division authority that are outlined in its motion to dismiss.

The Class VI program is a complex technical program that has potentially irreversible consequences if not administered properly. These consequences are both on underground sources of drinking water in New Mexico's communities. The program must be properly administered and guided by strong regulation.

The rule the Commission adopts must be protected, one that mitigates the risks that cannot be eliminated. This rule must be more stringent than the aging and inadequate federal regulations that the Division's proposal largely adopts thus far.

I urge the Commission to critically examine each of the suggested amendments during this hearing using a straightforward lens. I invite you to compare the alleged cost of each amendment, whether that be to industry or the Division, to the real benefit it would have for New Mexicans.

At the end of the day, I believe the path forward will be clear. The Commission must make an assertive and protective approach in this rule- making its foundation. It must protect New Mexicans and their water above simple industry preference or administrative convenience. Thank you.

THE HEARING EXAMINER: Thank you,

Mr. Pavlik.

MR. PAVLIK: Thank you. And I would now like to call Dr. Catherine Helm-Clark forward. I believe she's on the platform.

Dr. Helm-Clark, are you there on the platform?

THE HEARING EXAMINER: I believe she can unmute herself if she's there.

DR. HELM-CLARK: Can you hear me now?

THE HEARING EXAMINER: Yes.

MR. PAVLIK: Oh, yes. We can.

DR. HELM-CLARK: And I don't know why my camera's not on. Come on, camera. Turn on. My camera's on from my end.

THE HEARING EXAMINER: Sheila?

THE CLERK: She has full presenter permissions on our end.

THE HEARING EXAMINER: All right. She has permissions, Mr. Pavlik.

MR. PAVLIK: Okay. Let's see here. Dr. Helm-Clark, are there any possible -- is there anything obstructing your camera's view by any chance? I don't know if there are any sliders or anything.

DR. HELM-CLARK: No. Actually, in -- in the preview, I can see myself just fine. More

video settings, webcam.

MR. PAVLIK: Another thing sometimes I know in the past it's helped to briefly log off and then rejoin the meeting. If the settings aren't behaving, that might help. You could try that.

DR. HELM-CLARK: Well, I had to do that yesterday, so I already know that I've been struggling with this. Let me log off and come back right on.

THE HEARING EXAMINER: Sheila, while we're waiting, is Chair Chang on the platform?

THE CLERK: Yes, he is.

THE HEARING EXAMINER: Okay. I meant to make note of that earlier.

Thank you, Commissioner Ampomah.

THE CHAIR: Yes. I'm available on the platform. And are people hearing me all right if I need to chime in?

MR. PAVLIK: Yes.

THE CHAIR: All right. Thank you.

DR. HELM-CLARK: There.

MR. PAVLIK: Oh, perfect.

DR. HELM-CLARK: That work?

MR. PAVLIK: Yes. I can see you. Can the commissioners also see Dr. Helm-Clark?

THE HEARING EXAMINER: Yes. Thank you

very much, Mr. Pavlik.

Dr. Helm-Clark, would you spell your first and last names, please?

DR. HELM-CLARK: My first name is Catherine, C-A-T-H-E-R-I-N-E. The last name is Helm-Clark. That's a hyphenated in the last name. H-E-L-M, hyphen, C-L-A-R-K.

WHEREUPON,

CATHERINE HELM-CLARK, PH.D.

called as a witness and having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

THE HEARING EXAMINER: Thank you very much.

Go ahead, Mr. Pavlik.

MR. PAVLIK: Thank you.

DIRECT EXAMINATION

BY MR. PAVLIK:

MR. PAVLIK: Good morning, Dr. Helm-Clark. Just going to begin with some preliminary questions that we kind of need to ask to begin this process, and then we'll go into the summary of your direct testimony. Have you previously provided testimony before this Commission?

DR. HELM-CLARK: I have not.

MR. PAVLIK: And did you supply a copy of your curriculum vitae for this hearing?

DR. HELM-CLARK: I did.

MR. PAVLIK: I'm going to share my screen here. Sorry -- let me just zoom out here. Okay. Okay. I'm sharing CBD Exhibit 2. Are you able to see that?

(CBD Exhibit 2 was marked for identification.)

DR. HELM-CLARK: Yes.

MR. PAVLIK: Is this a true and accurate copy of your curriculum vitae to the best of your knowledge?

DR. HELM-CLARK: Yes.

MR. PAVLIK: Thank you. Can you briefly describe your relevant educational and professional background regarding Class VI wells in this ruling?

DR. HELM-CLARK: My educational background, I have a B.A. from Northwestern University in geological science. I have a M.S. from Caltech in geophysics. I have a Ph.D. in geology from the University of California at Davis.

In terms of working in the oil patch, my -- my first experience working in the industry was

as a landman, working in -- in -- for -- for wildcatters in -- in New York State and Pennsylvania.

After that, I've --- I -- I need to look at my notes real quick. I've -- I've worked for Schlumberger writing proprietary well-logging software. And I've worked as a well log analyst in -- in doing fracture analysis, porosity analysis, reservoir analysis at Rozel Point, also in North Slope Alaska, in Niger Delta, Cameroon.

I've done work characterization and fracture analysis in -- in -- on -- on the Gulf Course -- Coast. And also, you can easily label me as a Great Basin geologist as I've done a lot of geology there.

So with respect -- oh, and -- and on top of that, I've -- I've been -- I've been consulting and doing permit review analysis for the last several year -- for the last couple of years but with Class VI wells, also Class I and Class II.

MR. PAVLIK: Okay. Thank you very much. Appreciate it. And have you been involved in Class VI permitting review in any other state or federal jurisdiction?

DR. HELM-CLARK: I've done most of my -- well, my -- my Class VI permit reviews have all

been in Louisiana to date.

MR. PAVLIK: Okay. Thank you. Okay. I'm sharing what's marked as CBD Exhibit 1 on the screen here. These are the -- it's titled Proposed Changes to Applicant's Proposed 19.15.43 NMAC Redline. Are your proposed amendments to the rule reflected in this document to the best of your knowledge?

(CBD Exhibit 1 was marked for identification.)

DR. HELM-CLARK: They are.

MR. PAVLIK: CBD Counsel has added this definition for Division along with some small spelling and formatting corrections. But other than that, are all of the redline changes in this document true and accurate representations of your suggested amendments to the rule, to the best of your knowledge?

DR. HELM-CLARK: They are.

MR. PAVLIK: And did you prepare direct testimony for this rule-making?

DR. HELM-CLARK: I did.

MR. PAVLIK: This is CBD Exhibit 3, marked CBD Exhibit 3, Direct Testimony of Dr. Catherine Helm-Clark, Ph.D. Is this a full and correct copy of your testimony?

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(CBD Exhibit 3 was marked for identification.)

DR. HELM-CLARK: Yes.

MR. PAVLIK: And are there any changes you'd like to make to it at this time?

DR. HELM-CLARK: There are not.

MR. PAVLIK: Are you prepared to adopt this testimony as your sworn testimony today?

DR. HELM-CLARK: That is correct.

MR. PAVLIK: Also, in your testimony, there are five exhibits that you have included in text. These are Exhibits 4, 3. I'm going to briefly hold each of those exhibits up on screen and then ask you a few questions about them collectively.

Okay. So this is marked Exhibit 4, CBD Exhibit 4, Oil Ejected to the Surface by Venting CO2. Here is Exhibit 5, Selected Events at a Distance from Identifiable Point Source Injection Well Sites. It's a table. Exhibit 6, Hall Plot Figure from Ohio Department of Natural Resources, Redbird No. 4. Exhibit 7, Ambient Noise Tomography Image of the Helium Gas Resource in Northeast Minnesota. And finally, Exhibit 8, Weatherford International Slimline Acoustic Imaging Log.

Do these exhibits all relate to your

testimony and your suggested amendments to the proposed rule?

(CBD Exhibit 4 through CBD Exhibit 8 were marked for identification.)

DR. HELM-CLARK: They do.

MR. PAVLIK: And do you have professional knowledge as to the subject matter of each exhibit?

DR. HELM-CLARK: Yes.

MR. PAVLIK: Were these exhibits chosen by you to illustrate the points that you make in your testimony?

DR. HELM-CLARK: They were.

MR. PAVLIK: And are these exhibits true and accurate copies of the underlying materials to the best of your knowledge?

DR. HELM-CLARK: Yes.

MR. PAVLIK: Madam Hearing Officer, I move to enter Exhibits 1 through 8, CBD Exhibits 1 through 8.

THE HEARING EXAMINER: I'll pause for a moment in the event there are objections from other parties. Exhibits 1 through 8 are admitted.

(CBC Exhibits 1 through 8 were received into evidence.)

MR. PAVLIK: Thank you.

And do you have the demonstrative PowerPoint, Dr. Helm-Clark-Clark, for summary of your direct testimony today?

DR. HELM-CLARK: Yes.

MR. PAVLIK: I'm going to share my screen once more. Let's continue with the summary of your direct testimony. Is this the PowerPoint that you created to summarize your testimony?

DR. HELM-CLARK: Yes, it is.

MR. PAVLIK: Okay. Great. So we will begin. We'll go through this. I'm happy to move through the slides to progress the slides for you. And we'll need to keep this to one hour. Start the slideshow. Let's use this -- okay. To begin, can you please briefly explain what your testimony is based upon and your approach to researching it?

DR. HELM-CLARK: All right. My testimony is built on three legs. The first is my personal experience working in geoscience overall. And I need to insert here that that -- that as well as working in the oil patch, I have significant CERCLA and RCRA experience.

I've been the field manager for a Superfund site. I have been OSHA HAZWOPER certified

for over 40 years. I was one of the first people in the United States to get the certification. And my -- my regulatory compliance and -- and environmental experience is -- is as significant as my oil patch significant and -- my oil patch experience. And I do draw in some of this into that experience. It did inform a lot of my commentary.

The -- the second leg is my experience in permit review. I've been through many permits now, and I've formed some definite opinions about the permit process, the regulations, and what I think should be in permits as opposed to what I'm seeing in permits that I review.

And the last is basically peer review quality research, which is to say when I -- when I have questions or when I feel that I have a lack of my own knowledge, I definitely go out, and I research deeply to answer the questions that I have and which I feel other people have.

My research approach basically was -- was I -- I was using two different points of view, the first of which is, as a permit reviewer, what would, you know, what do I like to see in permits? What do I think are missing in permits? And -- and I used that knowledge in my commentary.

And the second is, I kept asking myself, and -- and you have to ask this question, do these regulations actually protect what they should be protecting, which is to say underground sources of drinking water and the communities that are going to be near these Class VI projects. And that health and safety of those communities has definitely been in the forefront of my mind. Next slide.

You're going to see -- you're going to see -- yeah. You're going to see three of these slides. These -- these -- they're -- they're -- I -- I have I -- have three broad categories in my presentation, the first of which is I make two procedure -- recommendations for two procedural changes.

The second of which is that in this demonstration, I discussed seven additions to the proposed rule. And the last section is I -- I recommend or I highlight four changes I recommend to the proposed rule.

The first part is just two procedural changes. And these are an executive summary -- to include an executive summary in the permit application that discusses how the modeling is done. And I recommend that you change how -- or -- or you make an

addition to how you do your review of wells within an AOR and around sensitive areas like schools and residential units. Next slide, please.

The executive summary in AOR modeling, and this is -- this comes straight out of reviewing permits. And every permit I've seen, regardless if it's Class I or Class II or Class VI, what you get, what happens is that the -- the folks who are compiling these permits, especially with the -- with the Class VI, there's -- there's a -- there's a table, and I forget which -- which one of the 14 different EPA guidance documents this is in.

But there's a table that everybody uses, and they just go through the table and click off the things that the EPA wants in those permits. Or in the case of Louisiana or other states that have cut and pasted the federal regulations as the basis for their regulations, they have, you know, it -- it -- an equivalent. Everybody is using the same table of things that the EPA wants to put into the permit, and they all follow it.

What -- what this -- so you end up getting -- you end up getting a document that's got all of the pieces that are required in a permit, but we end up usually with a narrative that is

disorganized and hard to follow. And the place where it's really hard to follow is trying to get from the first data collection to what goes into that model.

Now, the models are always black boxes. And as a reviewer, what I'm looking at is I want to determine whether or not the data and -- and the information they've collected is adequate to actually do the job inside of the model.

Therefore, what I want, you know, and what I'm looking for is I'm testing whether or not this model is garbage in, garbage out. Because in general, these software packages are very robust. They're based on physics. They're very well written. The big commercial packages do great jobs.

So what you're -- what you're looking at as a permit reviewer is you're looking at the soundness of the data going into that model and whether or not they collected the right data in the right way and they're using it correctly.

This is what's missing from permit applications, is a road map from the first data collection point to what's coming out of the AOR model.

Now, there is in the AOR, corrective AOR and corrective action guidance document, there's a

table. It's Table 2-1. It actually lists what I'm talking about here. And if I were -- if I had this requirement that I'm suggesting, if I were writing a permit, what I would do is I'd go straight to that table, and I'd use it as the basis for providing a quick summary of what the data is, how it's getting used, and how it reflects to the model.

And -- and it'd be simple. It'd take probably, if I were doing this myself, and I had all of the data at my fingertips, I would say no more than two days to make a comprehensive table and in a couple of paragraphs to say, here's the road map. This is how we did it. So that -- that overview look is what's missing.

Will permits die and the world end if this is not in permit? Of course not. We're already evaluating permits without this information. But what it would do is it would save many, many hours of -- of people who will have to read these permits in trying to figure out how the permittee went from -- from point A to point B. That's what's missing. That's what I'm requesting. Next slide, please.

Two-stage well investigation. What's happening right now when I -- when -- in -- in permit reviews is that a lot of folks, they just pull up

the -- well, I should say the worst of the permit applications, they -- they pull up the state's oil and gas and water well databases, and they make a list. And then they submit that. And then they're done. That's the worst of them.

The best of them go out. They knock on doors. They talk to old -- they talk to drilling companies. They talk to regulators. They talk to towns. They knock on door -- they talk to landowners. And the best permit that -- that I think I have reviewed, after they did all of that ground search to -- to find potentially undocumented wells in their AOR, they flew an aeromagnetic survey. And they didn't do it just on top of the AOR.

They actually flew in several -- they actually -- they actually -- I think they had a five-mile radius. This is a very, very impressive survey. And -- and -- I'll -- I'll say that, you know, they -- I'm saying they went above and beyond. The reason they went above and beyond in this case is that they're proposing to put in four -- four injection wells. So they just did all of their big geophysics at once.

But they went -- they -- they did the extra step. They flew the aeromagnetic survey looking

for wells. Now, what I'm suggesting is a two-stage investigation. And if you think about it, this is just common sense, but it also reflects what the EPA is already doing in CERCLA and RCRA investigations.

And the -- the two-stage, you know, documentation and then physical on-the-ground, if necessary, geophysical investigation. This -- this two-step process has become so standard that it's now an ASTM standard.

So it's a common engineering practice. People are doing this. The reason I'm recommending it is that it works very well. And in one instance, I can think of one instance in Ohio, and I mentioned this incidence. It's the -- the Redbird No. 4 injection well happening.

If -- if the, you know, if Redbird 4 hadn't been -- had been a Class VI project, and they were following a two-stage investigation, as I'm recommending here, they would've gone out. They would've knocked on doors and interviewed, you know, landowners in the vicinity of -- of where -- where the project was -- was recommended because this would've been, I believe, within the AOR or just outside of it.

The -- the -- within a year of injections starting, an abandoned well, which was --

which was now underwater because they filled in a reservoir and covered over this well. They would've interviewed the landowner of the -- the landowner that formerly owned that property because it was still adjacent to the state park that now includes it.

And they would've -- they would've heard that their grandfather had brought in drillers and drilled a whole bunch of oil wells on their family farm. And they were never documented. And then they were abandoned, and they were never plugged.

And this unplugged, abandoned, undocumented well began discharging injectate into a tributary to Lake Veto, which is a lake and a state park in Ohio. If they had done a two-stage investigation, like my recommendation, chances are they would've known about these wells and would have known to be looking for them and to correct them prior to the injection project, if this had been a Class VI project.

This is why I recommend two-stage -- two-stage investigations. They're an industry standard, and they were. Next -- next slide.

MR. PAVLIK: And just a quick time reminder. I just wanted to give you a heads-up that you have roughly 45 minutes left.

DR. HELM-CLARK: Thank you. My highlights -- my -- my -- these are -- these are things that I am recommending you add to the rule. It's -- I'm -- I'm -- I -- I believe I have more than seven, but for the sake of remedy, we're best dealing with seven. Next slide.

In reviewing permits, I've noticed that in the remedial action -- in the remedial action response plans for Class VI, when I -- when I look at this section in permits, everybody is putting in a nice little list. And the lists vary. They have I -- I know I've seen one that had 12 items.

I'm recommending a minimum of five items for this. What the EPA wants is actually three items. We'll visit that in a second. But the reason I'm asking for this is because everybody's already doing it. This -- this tells me that the EPA is looking for this information. If -- if a detailed list isn't in that remedial response plan, they're going to be sending out a request for more information.

The permitting's got to, you know, spend an extra month or two months to -- to cough it back up to the EPA, which, of course, creates another delay. So in my mind, this is saying the EPA is

looking at this information. It's in every permit that I've been looking at. Therefore, if the EPA is requiring -- requiring, it's a requirement. If it's a requirement, it should be in the rule.

Therefore, I'm suggesting it needs to be in the rule. Everybody's already doing it. I would expect that New Mexico would be requiring this also. Why did I want a specific list? Well, I went through. I identified everything that everybody is including within the lists that comment, and I looked at what the EPA is asking for. Let's go to the next slide.

This is what the EPA wants. This is this is quote. They're looking for significant changes in site -- site operations, changes in the monitoring results, or anything else that -- that might, you know, be sufficient to trigger an -- a reevaluation of the AOR.

Two seconds. I need to get my -- my brain retooled here. The -- I -- I -- my -- my list of five things, I -- I broke -- I -- I broke one thing out. I -- I made it into two. And I added a -- a fifth item, which is -- where I put in a line about seismic activity, which is to say, if you've got enough seismic activity of a sufficient magnitude, you

should stop and -- and reevaluate your AOR real quick because you could have changed the conditions.

That is my only difference above and beyond this quick list that EPA provides what they're looking for. And so I -- I've gone -- I've expanded from this simple three to a simple five. It's certainly not as long as some of the lists that I've seen in permits.

Now, if we're talking about AOR reevaluation, AOR reevaluation has already -- has already, you know, Class VI is very young relatively in the UIC Programs. We have basically ten years' experience, and that's not a lot because there just haven't been a lot of permitted wells yet. And there have been a lot of stumbling, you know, a lot of little stumbles in the first couple of years, as we all know.

We have already hit our first, that I know of, AOR reevaluation that happened in 2020 at Archer Daniels Midland at the Decatur CO2 Sequestration Project. They're -- they -- they had anomalous pressure readings in one of their monitoring wells that was significantly deviated from what they were expecting, that they triggered the reevaluation of the AOR.

That reevaluation of the AOR was kind of startled because it showed that the pressure front was growing much larger and much faster than the model predicted. And they had to -- they had to revise their AOR because of this. And they did so.

Just to tell you how much that model was -- was off base, the pressure front that they -- that -- that they -- when they recalculated the pressure front, they -- they determined that that -- it was 160 percent larger than predicted for the time that -- that they made the measurement. That's actually quite a significant difference in the model. So next slide.

This is the one where I thoroughly expect to be explored in -- in cross-examination. I've examined it -- I've -- I've suggested an additional 10-mile radius characterization zone. In looking at permits and in looking what's happened with -- with injection wells and UIC in general, there is a class of accident that is not being addressed.

Now, when we started -- when we started Class VI, the EPA decided that the primary risk of Class VI wells was -- was mostly to sources of drinking water. As we have gained more experience with injection wells, this actually turns out not to

be the case.

We have more things to worry about than just drinking water. We have, of course, induced seismicity. And we have the -- the danger of surface release. And you're going to -- I -- I know -- I -- I know that there's been a lot of commentary in -- in the rebuttal documents that -- that the -- the focus -- the focus of the regulations should be towards drinking water. That's our core, you know, that's the core objective.

That -- that -- I -- I will -- I -- I have reasons to disagree with this. And they are -- they are both reasons that are based in the rule and reasons that are based in common sense. If you're not protecting communities, we've got a problem.

The class of accidents that I see is -- that's not addressed by a simple AOR determination, is we are propagating injectate fluids and -- and associated formation fluids along transmissive faults, large distances out of AORs to where they're doing damage miles away from AORs.

This has -- this has been -- everyone -- everyone knows that this is happening with induced seismicity. This is also happening with fluids being injected to the surface. The pathway is

transmissive faults many miles out of a AOR. And then that transmissive fault, either it induces seismicity or it finds an abandoned or -- or a poorly plugged well, and -- and it sends injectate to the surface.

And if it's sending injectate to the surface, it -- on its way, it's passing certainly USDWs. It's also passing layers that could be producing oil and gas layers. And we have seen accidents like this. Well, we've seen them in Ohio copiously. We've also seen them in the Permian Basin. Now, and -- and we see them not only in the United States. We see them all over the world. Could you please give me the next slide?

This is one of my exhibits. This is a table that I threw together. It is not -- it's not a comprehensive table. I -- I -- but it -- it is a demonstrative of what I'm talking about. This is a list of events that have happened miles outside of any AORs.

Now, of course, in the case of international projects, they're not doing AORs. But the point is -- is that, third column in, how far these incidences occurred. And you'll note that in the table, the furthest is 20 miles. Most of them are under ten.

If you -- if -- if you -- if you take the mean, the -- the mean, and -- and I will not argue and I will not state that this is a representative table of all incidences because that would take a lot more time than -- than, you know, that -- that's a research project for a graduate student.

The -- but -- but if you look at my table real quick, and you take an average, it's 8 miles. Why did I choose -- why did I choose 10 miles? Well, there's, first off, simply it -- it's an eyeball number. It's half the distance of the farthest events.

And I thought to myself, you know, if we were looking for faults within a -- a 20-mile radius, that's ridiculous. Nobody's going to do it. It'd be prohibitively expensive.

I thought, what's a reasonable distance? The half would be -- half would be reasonable. You could -- you could probably run seismic or -- or buy seismic data that cover most of the area you're looking at.

What you're looking for is you're trying to identify these unmapped, unknown, undocumented faults that seem to be at fault for these incidences, coupled with, you know, well fields where

you've got improperly plugged wells or abandoned wells or whatever. You know, it's -- it's a two-part problem. Transmissive faults to wells.

My approach to my -- I asked myself seriously, how do we stop this? How do we stop this? We look for those. We look for the faults. We try to identify these things and -- and avoid those sites where we find these undocumented faults.

You can't look just up. You've got to look down. You've got to have a confining layer underneath your injection layer because, especially if the induced seismicity, it's going down. And very often it's finding faults in the crystalline basement.

So that's my -- that's -- that's the -- just recap to facts, that's my thoughts. We have this class of accidents that we see happening now that the EPA was not aware of back in the 2005, when they started putting these regulations together, that this was going to turn into a major problem.

But now we know that it's a problem. It's faults to wells. My 10-mile approach is to basically, you know, we're looking for two things here. We're looking for the wells that -- that can provide pathways to USDWs on the surface. And we're looking for the faults that can feed those wells. And

we want to shut that down.

And that's why I suggested that we have an additional characterization zone where we specifically are trying to identify these transmissive faults that are responsible for the incidences that -- like the ones I put in my table. Next slide.

This is the other half of that, where I've suggested -- where we -- we make a zone where we specifically go fault hunting. The second part of this is that we want to make -- we want to ensure that our public facilities are protected from this class of accidents that we now know tend to do damage in UIC programs.

And I simply have -- and -- and when I asked myself, you know, we can't -- we can't -- trying to go out and find every single well that's in a 10-mile radius would be ridiculous. I have personally gone and found every single well, say, within a 2-mile radius of -- of a permit well, and it took me four weeks. It -- it just -- it's a huge amount of work. It's cost prohibitive. It would be terrible. You can't do it.

People would voluntarily not do carbon sequestration if this was a requirement. So what's a reasonable requirement? You want to armor schools,

hospitals, fire halls, city halls, and -- and densely -- and dense residential neighborhoods from Class VI activities.

So what I did is that I went to the Emergency Response Guidebook, which is the standard reference document for responding to hazardous materials, accidents in the United States, Mexico, and Canada.

And I looked up what the evacuation and isolation zone would be for a catastrophic CO2 release. And the answer is a half mile, or 800 meters. They -- they define it both ways because this is an international document. The -- so I made that my buffer zone because that is, in the event of an accident, what the authorities are going to do.

They're going to create a half-mile isolation or evacuation zone around a large release. So that became my protection zone around hospital, school, other public buildings, and densely -- densely populated neighborhoods. And why, you know, and -- and would this work? Well, let's go to the next slide.

This is the -- this is the Midwest Wyoming Public School. It's K through 12. And what you see in the foreground is an abandoned oil well.

That is quite literally in the backyard playground of the elementary school portion of the school.

This well was determined in 2016 to have -- to be responsible for the flooding of this school with -- with IDLH, that's immediately dangerous to life and health, quantities of CO2 and benzene.

This is a leaking underground well. The -- the -- this -- this well was drilled in the 1930s. I believe it was plugged in the 1950s. Yes, it was a plugged well. The school was -- the -- the school was closed in May, I believe, of 2016. It did not reopen until the -- the 2018-19 school year.

They had to bus the kids in Midwest Wyoming to a school in Casper, 40 miles away. They had to evacuate the neighborhood next door to the school. This is -- this is the poster child for how bad things can go wrong with CO2.

Why would I say CO2? Because this area was one of -- this area was a CO2 EOR injection site. They were injecting into the Salt Creek Reservoir CO2. Anadarko started the project, I believe, in around 2010. They sold it to a company named Fleur-de-Lis, who was the operator at the time of this accident.

This is what -- this is -- this -- this accident was what was in the forefront of my mind when

addressing -- when -- when coming up with this -- with this fault characterization plus half-mile well examination around public buildings speed. Next slide.

MR. PAVLIK: Just a quick time update. About 30 minutes left.

DR. HELM-CLARK: Got it. Keep going. That's -- you need to go back one. This is simple. I've recommended a five-day ramp up, a minimum five-day ramp up period at the initiation of pumping. The reason I'm -- the reason I suggest this is that I'm seeing it in all the -- I'm seeing it in the permits that I'm reviewing.

If I'm seeing it in every permit, it means the EPA is expecting them to see it. That makes it, in my mind, something the EPA is requiring or expecting to see. If -- if it's in there all of the time, it ought to be a requirement. Mandated. Put it in. That's my suggestion. Next slide.

I suggested -- I've suggested additional well logs. When you go to -- hold on. I need to look at my other computer screen. Well, not look at my other computer screen. We go to -- in the proposed rule, go to 19.15.43.9.H. I am referring to that because just to give you the number if you want

to go and look at it. It is the well logging requirements.

Those well logging requirements stipulate one set of logs before you set the surface casing and another set of logs before you set the intermediate -- the -- the intermediate or long casings.

To that list, I have suggested several other logs. I have discussed the technical details of these in the testimony, in my written testimony. I'm not going to go through all of these, but I'm going to quickly outline why I'm thinking this.

I want sonic for the entire borehole because it -- it provides you with -- with excellent data that you need for building an AOR model, which is to say the geomechanical properties. And you always need to have at least one decent sonic log so you can do your -- your time-to-distance correlations with your seismic sections.

I consider neutron porosity a -- a gross oversight at -- at the top of a well, along with resistivity because if you're -- if we're really concerned about identifying all of these USDWs, you need those logs in order to definitively identify aquifers.

And by not running both near the surface, which is where most of our aquifers are going to be located, you're depriving yourself of this information. What I'm seeing in permits is that very often you don't have the -- or they have not bothered to run these logs because they're not required.

And then the permittees have to go digging through the -- the -- usually the USGS literature on where the aquifers are to identify -- to -- to identify through a literature search, essentially, where their USDWs are. This is silly when you can do it definitively with geophysics, which should be.

Let us move on to ambient noise tomography, which is the next slide. I am recommending that you add ambient noise tomography as -- as a primary method for -- for investigating the subsurface because it -- it essentially -- you can do everything -- I don't say you can do everything you can do with traditional seismic with ambient noise tomography, but you can do almost everything.

There -- there are some frequency things that you can't do, but that's getting way too technical. The -- the reason that I prefer it over seismic, which I'm going to have to say you're going

to have to do on every single project because you just don't have any other good way to find faults.

Now, the problem with -- the problem with running seismic is that, at least in my mind, when I was thinking about New Mexico, is that New Mexico has significant -- significant basalt stratigraphy out there.

And when you're looking at -- when you're looking at -- basalts, which are the majority of the basalts that you've got in New Mexico, you've got rocks that are extremely resistant to giving you good seismic response.

In general, especially if you've got -- if you've got layers of basalt flows, what happens is that when you set off your, you know, your vibroseis truck, it sends its signal down, and it hits that basalt layer, and it hits a stack of basalt layers, and then it gets channeled, and it waits.

And what happens is that your seismic section gets flooded with overtones and noise. And it makes getting any sort of data out of a traditional seismic extremely difficult.

You don't have that problem with ambient noise tomography seismic sections. They are able to image basalts, which is -- which gives it a

leg up. You know, it -- it eliminates the problem with doing seismic in basalt. You can do seismic in basalt if you're using ambient noise tomography, which is why I recommend it.

Why do I say you're always going to be at least trying to do seismic? Because, you know, we're saying we're looking for -- for all of this stuff in the substance, you know, the structure, the stratigraphy, the faults, the whole package.

There are only -- there are only a couple of ways we can get this information, through -- through a surface -- through a surface survey, like seismic, through drilling holes and collecting core, or drilling -- drilling holes and collecting wireline logs. This is -- or -- or the equivalent.

This is -- this is all we have to investigate the subsurface. And everything else is, you know, solving the mathematical puzzle, what things are. But if you're not running seismic, what are you doing to find the faults? You've got to -- simply, you've got to be running something to find those faults.

Seismic is the obvious answer. You can't run seismic in basalt-rich areas. So what can you do? Well, the answer is ambient noise tomography.

It is now a mature technology. And as we go to the next slide, it has got the capability of seeing very fine detail with gas resources.

I've taken this from -- from the literature from Pulsar Helium. I -- I've been on the Pulsar Helium site several times and -- and have been all over their drilling operation. This is -- they own their own passive ambient -- they've built their -- their own ambient noise tomography network for analyzing the helium resource here in Minnesota.

It's a fabulous technology. And you can see the detail is -- is wonderful. It is very sensitive to changes of gas that makes this an excellent method worth tracking -- next slide, please.

I've recommended that -- that specifically in terms of emergency response, that the permittees are -- are providing information on training to -- to the -- to the local first responders who would have to respond to a CO2 accident.

And that also for a lot of these small rural -- especially these small rural fire departments that don't have a lot of money -- that -- that for ones that don't have sufficient equipment to respond to a CO2 accident, that -- that they provided or helped provide that equipment because SCBA units are

rather expensive.

And those are the sum, you know, just the sum response. It's -- there has been --

No, let's keep going. We'll get that in -- next one. I have four -- four suggested changes to the rule, the first of which is, I believe that -- that noise logs should be a mandatory log for doing the mechanical integrity testing. And I'm -- I'm justifying this basically on solely experience.

What's this sole experience? The sole experience is Archer Daniels Midland. As we all know, Archer Daniels Midland had both of their monitoring wells fail. And what identified the failure? What nailed the failure? The smoking gun was noise logs.

They had all of this -- they had all of this monitoring technology with soil gas. You know, they're monitoring pressure. They're monitoring, you know, they're doing their groundwater sampling. They've got their pressure gauges. By the way, their pressure gauges failed.

They have all kinds of monitoring techniques. Multiple, you know, multiple paths to -- to test integrity and -- and for leaks. And what nailed it? Out of all of these methods, give us the noise log. Noise logs work. Mandate it.

Soil gas monitoring. As you -- as you've probably read in my testimony, I am not a fan of the -- the -- making soil gas monitoring mandatory because I feel that there are instances where soil gas monitoring is not at all appropriate in -- for certain sites.

For example, if you are thinking of, as I mentioned in my testimony, converting a depleted oil and gas field into a carbon sequestration site, this is happening right now with TerraVault in California. And the -- it's -- it's a field that's been in production for 110 years and is now depleted, which is -- and -- and -- that -- that often you don't run into completely depleted fields, but they -- they considered this field outside Taft, California totally dead.

And then TerraVault is -- is turning it into a sequestration site. There's so much methane and so much other gas in the ground that distinguishing a CO2 signal from a potentially leaking CO2 sequestration at a reservoir 4,000 feet down and distinguishing that from all the other masses that have permeated through the stratigraphic column over a century of oil and gas operation is, frankly, probably impossible.

In -- in this case, you know, you can find a site where it's just not valid. There are other sites where the ground respires. You know, the -- the ground breathes, believe it or not. And if you've got relatively, you know, unconsolidated or very permeable strata on top, that strata will breathe.

You actually see this in Idaho. And there are water wells in Idaho. We can track barometric pressure changes because the ground is respiring that much. So you get places where your CO2 flux may actually be much, much greater than any CO2 that might be leaking up.

Now, these problems are known. There's been a great deal of research done at Rangely and at Rocky Mountain Arsenal using -- looking at CO2, looking at methane, looking at isotopes that we build gas isotopes, trying to figure out what's the best way to possibly monitoring leaking CO2.

There's also been a lot of research, and I depended on a lot on this coming out of Gulf Coast Carbon Center, which is -- which is part of the Texas Bureau of Economic Geology, which is also at the University of Texas at Austin.

They've -- they've done a great deal of

research on soil gas. And their determinations -- these are not mine, these are their determinations -- is that just going solely for CO2 flux is -- is not going to be adequate. And -- and the reason for this is because ground respires in places.

And there are places, like, say, if you're trying to convert a depleted oil gas field to sequestration site, where the -- where the -- the gas composition already in the soil is going to swamp any signal you see from any leaks.

And the solution to this is -- and -- and it seems clear looking at the -- the peer-reviewed literature in soil gas -- to use tracer isotopes, to use carbon isotopes that -- that you can -- you can -- that you can use carbon isotopes that are -- you can get the isotope signature of your -- your carbon screen so you can test for that signature coming up if it's leaking.

You can also use noble gas isotopes. These are inert noble gases that are -- that are present in reservoirs and will carry with leaking injectate, if it is leaking, these -- these have -- these have deep earth and mantle signatures. They are very different from the isotopic signatures you see in the atmospheric surface.

So you can say, ah, look, we've got noble gas isotopes that have a deep, you know, a -- a deep source signature, that that's -- that's a good signal that says, oh, yes, maybe -- maybe we are seeing a leak here in our soil gas.

That is why I am recommending that -- that you don't go with straight CO2 flux, which the folks at the University of Texas have -- have, at least to my satisfaction, shown is not -- is not a good path to go forward in the switch over to -- if you're going to mandate soil gas, mandate something that actually works, which is actually using isotopic signatures, which in the peer-reviewed literature has been shown to work.

Next one, Hall plot. I'm a huge fan of Hall pots because Hall plots work. And I'm suggesting that you add this into the reporting requirements. Adding it is -- if you look at this from a cost-benefit analysis, I don't think if you -- if you had a spreadsheet set up or if -- if you already had or -- or if you're using one of the big, you know, reservoir -- reservoir modeling software packages to build your AOR, like Schlumberger's ECLIPSE or CMG's [sic] GEM reservoir software model, they already -- they already have Hall plot modules built

in this software.

You just take the data, plug it in, get your Hall plot. Now, why do I like Hall plots? Because you are already requiring your permittee to collect the pressure and the flow information in real time. And what a Hall plot does is that it takes this information, it runs it -- it runs it through a -- it runs it through an interval and then plots -- plots, you know, time versus cumulative injectate on a simple, simple graph.

And when everything works, that line is straight. And when things break, for example, when -- when your injectate is escaping your reservoir within a deviation in the slope of that line. And also -- and then the Hall plots also can show you other failure conditions very quickly.

For example, if -- if you're -- if you're plugging up your porosity, say you're injecting your CO2, and -- and you start growing a whole bunch of minerals in the vicinity, you know, this could happen. It's -- it's not likely to happen, but it might. You could -- you could react that CO2 with something in the formation, create minerals, grow those minerals in place, reduce your porosity, increase your pressure, and -- and screw up your AOR

model and -- and your injection zone, your real injection zone underground. You can see that in a Hall pot. It would deviate the other line.

So why am I suggesting Hall plots? Because you're already collecting the data. They're quick to do. They're cheap. They're easy. You know, if -- if I -- if I had -- if I were a permittee, and I was doing my reporting requirements, I'd probably spend a day or two to set up the software or a -- a spreadsheet to create the plot.

And then I just submit it every month or every quarter or every half quarter, whatever the reporting requirement is in -- in -- like you're suggesting in New Mexico. I can't remember if -- if at this point -- I've looked at too many state's regulations, and I'm getting to the point in my life where I can't keep them straight in my head.

But it's quick, dirty, cheap, no time. And -- and if -- if you're -- if you're doing this very often, if -- if -- you can potentially spot a problem before other monitoring methods -- methods find it. Then let's go to the next slide, please.

What we have on top, this is a Hall plot of the Redbird No. 4 well, which is -- which is a -- a Class II well that egregiously leaked. This is

the -- the well that implicated -- when I mentioned earlier, the abandoned well that -- that discharged injectate to a tributary to -- to a public reservoir, the -- the abandoned well that -- that ejected the -- ejected to the public reservoir, this is -- this is that accident.

And I -- I do want to spend just a minute looking at this graph. The top graph is the Hall plot. And you can see the dotted lines are the straight lines that -- that would have -- that would have indicated normal injection without leaks.

But if you look at this, there are four places where -- where the well -- the -- the slope of the line is deviated to the right, which in Hall plots indicates that injectate is -- is escaping from your -- your reservoir.

And these four times, I don't know how well you can see it on your display, but there are four places on the bottom graph, which is the -- the pressure records that are -- that are circled on -- if you look at the red dots, you'll see sections and dots that are circled and highlighted in yellow.

Those four times correspond to the four circles on the Hall plot above. And they correlate to where -- to where injectate was -- was known to have

escaped the injection interval as shown on the Hall plot.

Now, if we go back to the maximum pressure, if maximum pressure, you know, the -- the pressure record plot on the bottom for Redbird No. 4, if we looked at the maximum allowed pressure, the 90 percent -- the 90 percent of the fractured gradient pressure was 840 PSI.

If you look at the -- the injection pressure graph on the right, where those -- those four yellow circle places, are places where they were running right at 90 degrees or exceeded it -- or exceeded it by just a bit.

They never got to 100 percent, I believe, in this well, but they were running at 90 percent and exceeded that 90 percent on four occasions. And those four occasions are well -- are where the -- are where they actually leaked the injectate out of the formation.

The consequences of leaking that injecting were not only the surface discharge at the abandoned well into tributary to Lake Veto, but it's also been indicated the infiltration of 28 producing gas wells. And those gas wells were producing from a layer higher than the injection layer. The injection

layer leaked big time. In -- in Ohio, we're no longer allowed to inject into that formation because of this accident.

And this is why I like Hall plots. If -- if this had been a Class VI project required to provide a Hall plot every month, every quarter, or every six months, someone would've picked this up and said, ah, you've got deviations on your Hall plot. Why aren't you investigating why you, you know, data that indicates that you're leaking out of your injection well?

You know, this is -- this is -- that's an accident. And it was caught on the Hall plot. Unfortunately, in this accident, they did the Hall plot after the accident happened, which is kind of like slamming the barn door after the horses have escaped the barn.

Injectivity testing. Next slide. I've recommended changes to the wording "injectivity testing." I -- I -- as -- as I said in my -- in my testimony, I found the way that the regulation was written, if you just read the rule, and you don't need the guidance, it's utterly confusing. I -- I recommended that the language be cleared up.

I also recommended that -- that a

certain type of injectivity test called an interference test not be allowed. And I'm basing this on what happened at Archer Daniels Midland.

And the thought that if you do an injectivity -- what happens with an injectivity test is you drill a well and you drill another well, they have to be close enough that you could conceivably communicate between the two wells if you're injecting or -- or pulling out the same layer.

And what you do in an interference test, you put one well, the instrument to instrument it, and then you start injecting in the other well. And you measure what's happened in the first well to get a better idea of the hydraulic conductivity and other geomechanical properties that exist in between the two wells.

And -- and it's a great test. It gives you -- it can give you really great information. And it gives you information that's actually, you know, along the line instead of a point source, which is the kind of information, pressure information we usually get when you're doing a single-valve injectivity test.

It's a great test. But the problem with it is that you're puncturing the confining, you know, you're puncturing the confining zone and going

into an injection zone in an AOR -- kind of test. In my mind, the fewer perforations you put into that injection zone, the -- the fewer, the better.

You don't want to -- you don't want to be drilling a well close enough to your injection well to do an injectivity test because then you've created another place that you could possibly leak.

Well, you know, you're going to say, okay, we build modern wells with modern well construction, modern materials, and they're not going to leak, and they shouldn't leak. Well, that's not what happened at ADM.

Both of the monitoring well -- but the -- not the injection wells, the monitoring wells -- both the monitoring wells at Archer Daniel Midland's leaked. The cause of the leak, corrosion. How was that leak -- those leaks found? They were found with noise logs.

Our extra perforations into the -- into the injection zone, i.e. these two monitoring wells, they both leak. It -- it -- even when you're doing everything right, you're doing state-of-the-art construction as far as you know, and -- and you're trying, you know, you can still get those wells leaking.

So my mind is, based on what's happened at ADM and -- and the revised permit, the revised permit for ADM after they fixed the two wells and resumed operation, basically said, okay, we're going to -- what they did is they pulled those monitoring wells out of the injection layer, and they plugged.

Those monitoring wells no longer go -- which I believe they only have one monitoring well left. That is not a well that's actually collecting any fluid. It's not a -- it's not a -- it doesn't have perforations. It's -- it's basically instrumented with geophysical instruments. It has no more open perforations to the injection layer.

It's still a perforation, you know, through confining zone into the injection. But there's -- there's no way that -- that fluids hopefully can break in and get in to a higher level.

That is why I have an objection to injectivity tests, to interference tests. All other injection tests, you know, if you look at the language, this is one place where the language, where the federal regulation language is kind of sloppy.

The -- the -- if -- if you look at it, if you look at how the statute is written for mechanical -- for the -- for the testing -- and

actually I'm going to look at the -- or maybe I'm not. The statute actually reads, and this is -- this is 19.15.43.9.H item number 6, "Upon completion of prior to operation, the owner or operator must conduct the following tests to verify hydrogeologic characteristics in the injection zone, a pressure fall-off test, and a pump test, or injectivity tests."

Now, the pair of a pressure fall-off test and a pump test, that's -- that's pretty -- it's -- it's -- the first time I ever read this, I -- I was really scratching my head because -- because pressure fall-off tests and pump tests are usually done on fuels and not gases.

If -- if you're doing gases, usually with -- with gas well testing, you're doing different types of injectivity tests, like step tests or drill stem tests or multiple step tests or interference tests, which I don't think are appropriate here.

And if you think about it, a pressure fall-out test is an injectivity test, is an injectivity test by definition. So in my mind, if -- if I had my druthers, I would rewrite this statute -- or, I'm sorry, I would rewrite this regulation and just say injectivity tests sufficient to determine the -- the hydrogeologic properties that are required for

building the AOR model, and I would leave it at that.

THE HEARING EXAMINER: Dr. Helm-Clark, would you please wrap up your testimony?

DR. HELM-CLARK: I am just about done because this is the last slide. And I think at this point, I am going to conclude. Those are my two procedural changes, seven -- seven recommended additions and four changes to the rule. And I am going to conclude with that.

THE HEARING EXAMINER: All right. Thank you very much, Doctor.

And, Mr. Pavlik, let's take a 15-minute break, come back at 10:40, and we'll begin the questioning.

(Off the record.)

THE HEARING EXAMINER: Thank you, Sheila. Let's come back from the break, please. Let's see. I don't see Mr. Pavlik. Can you pin Mr. Pavlik?

MR. PAVLIK: I think I'm here online. Can you hear me?

THE HEARING EXAMINER: Yeah. I can hear you. I just -- we had been able to see you earlier, so let's see if we can do that. There you are. All right. Great. Thank you, Mr. Pavlik. Go

ahead.

MR. PAVLIK: Thank you, Madam Hearing Examiner.

BY MR. PAVLIK:

MR. PAVLIK: Okay, Dr. Helm-Clark. As we go, we'll just go through some of the rebuttal testimony that you've reviewed just to respond to a few of those things. Give you an opportunity to share your thoughts on it. I would like to begin with your suggested 10-mile characterization radius and the half-mile corrective action suggestions within a half mile of certain structures.

THE HEARING EXAMINER: Mr. Pavlik, I'm sorry to interrupt. We're getting some serious interfering noise.

Sheila, do we know where that's coming from?

THE CLERK: I don't see any other microphones turned on -- I can't tell what's going on.

THE HEARING EXAMINER: Surely the rest of you can hear that.

MR. PAVLIK: Dr. Helm-Clark, is there anything -- is there -- it sounds like there might be a noise against the microphone. Is there anything on your end that might be making a, I don't know, like an

interference, almost like a -- not a vacuum, but some sort of a rubbing maybe? Okay. Is that better?

THE HEARING EXAMINER: Yes, that's better. Thank you so much.

DR. HELM-CLARK: Oh, okay. That's very odd. No, I had a prop underneath the -- the keyboard. I took the prop off.

THE HEARING EXAMINER: Thank you.

MR. PAVLIK: That solved it.

THE HEARING EXAMINER: Okay. Go ahead.

BY MR. PAVLIK:

MR. PAVLIK: Okay. So turning to the 10-mile characterization radius, in Mr. Eales' rebuttal testimony on page 4, he's noted that this 10-mile additional characterization radius that includes additional well identification within a half mile of some of these structures that you've noted, schools, hospitals, residential areas, is not necessary because well identification already -- and corrective action already must occur within the area of review. What is your response to that?

DR. HELM-CLARK: Well, he's correct in saying, yes, you've got to -- you've got to go and do your well hunt, you know, within your AOR. And -- and his point is that, you know, outside of the AOR,

you're not, by -- according to the proposed rule, required to go beyond that.

My suggestion, you know, my suggestion does go beyond that. And New Mexico has the option to be more restrictive than the federal regulations. So I have suggested that, you know, within -- within 10 miles of a well, wherever there are public buildings, densely -- densely populated residential neighborhoods, that -- that you put a half-mile buffer around these areas and look for, you know, wells within that half mile, you know, within that half-mile buffer zone and do corrective action on them.

Because we know, you know, with this growing database of accidents, that -- that we have an accident pathway of transmissive faults to -- to wells that are creating problems in both induced seismicity and the, you know, the escape of injecting fluid at distance outside of the AOR.

So within a reasonable distance of a Class VI project, you want to identify those areas that have public buildings, and you want to protect them. That's my point. You want to close down that pathway.

MR. PAVLIK: Thank you. And are there instances where your suggested corrective action then

would be occurring outside of the area of review of the project?

DR. HELM-CLARK: Yes. If -- if you're -- if -- if you're within my -- if you're inside my 10-mile zone, and you've got, say, an elementary school, like -- like the Midwest Wyoming Public School, you -- you draw a half mile around that that -- that school, and you search for all of the wells up around that school, and you take corrective action on the ones that require it.

You shut down at that pathway from -- from transmissive fault to -- and, you know, discharging injectate through -- throughout.

MR. PAVLIK: Thank you.

And, Mr. Eales -- so moving to the half-mile setback requirements, Mr. Eales refers to what he calls the primary considerations for the Class VI program. Namely, he refers to those as, one, the injection zone's suitability for injection; two, whether the injection zone will effectively contain the plume; and, three, endangerment of underground sources of drinking water.

He suggests that your recommended setback requirements don't have anything to do with those core considerations. Do you agree with that?

DR. HELM-CLARK: I disagree with that. And I -- I disagree with that on -- on two different points, the first of which is we have this -- we have this growing knowledge of this pathway, transmissive faults to wells that are creating incidences.

When you -- when you transmissive a fault, and -- and that -- and -- and that's injecting fluid, traveling along that fault and finding a well, most of the accidents that -- that we have documented, we have had injectate discharging to the surface.

But if you're discharging to the surface, you're passing other layers that are endangered, including production zones for oil and gas, if that's relevant, and aquifers. So if you're -- you're discharging to the surface, you've already potentially endangered more drinking water aquifer.

It's -- it's -- the pathway doesn't care. You know, the pathway exists, and it's going to pass aquifers. So they are endangered from this. That's -- that's the first part of my answer.

The second part of my answer is that I believe the rule, both the rule and the federal regulations and the federal -- and -- and even the state -- are to protect more than just USDWs. And I

will refer you now to -- this is -- I am looking at -- at OCD Exhibit 3, which is 19.15.43. I'm specifically looking at 19.15.43.9.G, subpart 1, Part A.

This reads, "The owner or operator must ensure that all Class VI wells are constructed and completed to prevent the movement of fluids into or between USDWs or any unauthorized zones."

What is the authorized zone? The authorized zone is the injection zone in the AOR. No other zone is authorized. Therefore, if you're discharging to the surface or if you've created a leak that's now putting injectate into a producing oil and gas reservoir, that's an unauthorized release.

That's sitting there in -- in my mind, though I'm not a lawyer, but in my mind, any -- any unauthorized zones is everything that's not the injection zone. That includes the surface. That includes catastrophic CO2 releases in the communities.

That includes forcing injectate through an abandoned well into a producing oil and gas reservoir like we've seen in Ohio. And we've actually -- I believe there's at least one case in Permian Basin. No, I know there are more cases in Permian Basin, but it's -- it doesn't happen very much in Permian Basin. It's happened an awful lot of

places like -- like Idaho where the -- where they shouldn't have been doing this in the first place, to answer that question.

MR. PAVLIK: Thank you. Thank you. Can you please elaborate on the connection, if any, between these considerations that you've just identified and protection of New Mexican communities?

DR. HELM-CLARK: Can you repeat the question, please.

MR. PAVLIK: Yeah. Can you elaborate on the connection, if any, between these considerations that you've identified that Mr. Eales has referred to in terms of protecting underground sources of drinking water and then the protection of New Mexico communities for surface risks?

DR. HELM-CLARK: Actually, I -- I think I just answered that. You know, we've got -- we've got a set of pathways by which we know we are leaking fluids, and -- and, you know, this transmissive fault to well field pathway. And if communities are -- if community facilities and neighborhoods are sited with -- with, you know, within a half mile of a well, that might possibly leak -- and it doesn't matter if it's going to a drinking water aquifer or if it's going to a production zone or if it's discharging to

the surface, that pathway doesn't change.

The physics of -- of forcing the injectate through pressure to -- to leave the AOR and travel to where it can be damaged, that -- that's -- it doesn't matter if it's a USDW if it -- it's --it's all unauthorized zone releases.

MR. PAVLIK: Thank you. Continuing, Mr. Eales, in his rebuttal testimony on page 3, notes that your suggestions concerning the two-stage review for well identification is not necessary within the regulatory language because the proposed rules need to be able to flexibly address tabulation of all wells on a case-by-case basis. What is your reaction to that?

DR. HELM-CLARK: Yeah. I'm kind of scratching my head where he got that. I -- I --

MR. PAVLIK: I guess --

DR. HELM-CLARK: It -- it's --

MR. PAVLIK: -- maybe another way to ask the -- oh, sorry. Go ahead.

DR. HELM-CLARK: Yeah. I was going to say you're -- you're already tabulating all the wells. What I'm suggesting is an industry standard tool that's known to work to improve and streamline that process and to make it as thorough as possible. I don't see where -- where it would change on a

case-by-case basis.

MR. PAVLIK: Okay. Thank you. And sort of along similar lines, on 8 seven of her rebuttal testimony, Mrs. Wachtman -- and I apologize. I hope I have the pronunciation correct there. But Mrs. Wachtman suggests that such a comprehensive well tabulation may be excessive, but it also may be highly costly for project developers. What is your response to that concern?

DR. HELM-CLARK: Phase, you know, it -- I -- I basically have -- have suggested that -- that you mandate using the phase 1, phase 2 process that the EPA has been using in CERCLA and RCRA for years. This is a streamlined, well-known process. And doing a phase 1 -- doing a phase 1 investigation, which is basically, you know, doing the -- the deep documentation, it doesn't take that much time.

You have to put some boots on the ground to -- to go out and interview drillers and landowners and other stakeholders. But other than that, it's no different than doing the regular tabulation. It's just not that much more work. I -- I don't know how many phase 1 investigations I've done in my lifetime. I've done a lot. They don't take that long.

MR. PAVLIK: Okay. Thank you. Okay. Dr. Khaniani has noted on page 4 of his rebuttal testimony that maintaining a 10 percent safety margin regarding the 90 percent fracture pressure for injection is commonly accepted in engineering practice. What is your reaction to that?

DR. HELM-CLARK: Well, you might say that it's -- it's common practice and it's written into the federal regulations for -- for all of UIC. That makes it -- that makes it a standard for UIC. It doesn't make it, in my mind, a generally accepted engineering practice.

If -- if -- you were going to suggest a factor of safety of -- of essentially -- I guess it would be 11 percent if we put it into safety factor calculations -- you wouldn't be able to do that in civil engineering, mining engineering, aeronautic engineering, mechanical engineering. In the traditional engineering fields, that's not acceptable engineering practice.

It might be a standard practice for UIC, but it's not standard engineering practice. Let's -- let's keep our disciplines safely divided.

MR. PAVLIK: And would you -- do you think -- well, I guess you've already summarized this

in your direct testimony. But briefly, do you think that even if it is standard in UIC, would you believe that it's protective enough in the Class VI context?

DR. HELM-CLARK: No, I do not. And that's why I suggested 80 percent. In California, they're already doing 80 percent. Well, you know, you're going to say, well, California, they do everything the most conservative, you know, of anybody anyway. But, you know, they've got a point.

And I am going to refer you back to that Hall plot that we just looked at from Redbird No. 4 in -- in Ohio, which was Class II well. And they were -- they were running at -- at their 90 percent. And you can see from their operating practice from the graph that I showed you, there were times where they exceeded that 90 percent.

So even if you're running at 90 percent and trying to keep it, you know, keep it below your 90 percent limit, a -- a -- an irresponsible operator, as we have already seen, has already violated that and got in the way with it and created an accident.

So no, I don't think 90 percent is adequate because it's not going to protect you from the irresponsible operators. And we already have an example of this happening. I'm sure if I look around,

I could find a few more.

The -- that's why I suggest 80 percent. And -- and for -- and because of accidents like this, this is why California has gone down the 80 percent road. I just think it's prudent. We've -- we've already had one injectate accident because we were running at 90 percent.

You know, the -- the whole idea of safety factors is to have a safety factor. And if your safety factor of 90 percent is allowing for an accident, it's not safer.

MR. PAVLIK: Okay. Thank you. Moving on to some of the additional logging, sampling, and testing that you've suggested, on page 4 of his rebuttal testimony, Mr. Eales notes that your recommendation to add sonic and porosity measurement before installation of the surface casing is "acceptable from a technical perspective" but that he has concerns about the phrase "best available technology" in the context of fracture finder logs, noting that that could lead to potential speculative technology. What was your intention when using the phrase "best available technology"?

DR. HELM-CLARK: Well, first of all, best available technology is a term of art. And it

basically just says you're -- you're going to use the best available state-of-the-art stuff you can -- you have at the time. That -- that's just simply what it means.

With -- with respect to fracture log logs, if you read -- well, when I read originally and still read the -- the rule as written, both federal and New Mexico's, because they're very parallel in this respect, the -- the fracture finder logs technically, if you want -- if you want to go by strict definitions, a dipmeter log is a fracture finder log.

And you can find fracture -- fracture logs with a dipmeter log. I would never run one and use it for finding fractures in any kind of well. It's -- it's more than a half a century old as a method, and it doesn't really do a great job in characterizing your fractures.

You should be using one of the modern fracture methods, which is to say, you know, your acoustic or your resistivity method -- methods of creating a fracture image of the borehole. And I provided an example of what these logs look like. I spent a couple of years doing fracture analysis with these kinds of log. They're what you want to use.

My intent was to prevent the use of old logging technology, which by my strict reading of the rule would be permitted. It -- but -- but you shouldn't ever be using it. So I wanted to cut off those old methods that are graphical only, that don't give you a good image, and -- and force people to using the modern imaging methods that give you these beautiful records like I showed in my exhibits.

MR. PAVLIK: Thank you. Just the last area I'd like to touch on is the emergency and remedial response, some of that rebuttal. So you have recommended a suite of amendments to strengthen the proposed rules, emergency response provisions.

Mr. Eales has noted on page 6 of his rebuttal testimony that your suggestions are too prescriptive. What is your reaction to this statement?

DR. HELM-CLARK: Well, when I was looking at the emergency response, I was asking myself, what would I be, you know, what would happen if you indeed had a catastrophic CO2 release? What happens is that at the beginning of the accident, someone's going to make a 9-1-1 call. They're going to dispatch a fire engine and a police car.

Those guys are going to come up.

They're going to see people on the ground. They're going to see, you know, people flailing and having the -- the asphyxiation symptoms of -- of, you know, CO2 poisoning. I shouldn't say poisoning because it's -- but anyway.

The -- and -- and they're going to stop. And they're going to ask, you know, what sort of accident is that? And -- and every single firefighter or policeman has had essentially the -- the equivalent of OSHA HAZWOPER training, which is defined in 29 C.F.R. 1910.120. They've either had the -- the whole 40-hour or the 24-hour certification.

And you have to renew these every single year with an eight-hour refresher every single year. And what happens with this training is -- and -- and I -- I've suffered through more than 20, you know, more than 40 years of this training. So I -- I think I have a little bit of basis upon which to state my opinion.

The -- what happens is the -- the OSHA has -- OSHA has a -- a list of things that they want you to -- to address in your annual training. And -- and one of them is they recommend that you have modules that run you through, you know, at least on paper, the scenarios of accidents that may be typical

of your area.

And this is -- this is what I envision. You know, if -- if you're putting in a -- a Class VI project, your -- your Class VI project manager goes off and then talks to the local police and the local fire department and say: "We're putting in a CO2 project. Allow us to provide you a lesson plan for your annual, you know, your annual HAZWOPER training that -- that describes CO2 accidents because we're building a CO2 project, and you might have to respond to this."

It -- it probably would happen anyway, but I would like to see it actually in the statute. And I found a place when you -- when you look at -- when you look at -- I'm looking at here on my computer screen, which is why I'm looking off to the -- to the left -- the OCD Exhibit 3, that's -- that's 19.15.43.9.0, there's -- there's a place where you could just simply insert the words -- here it is.

"The Emergency Remedial Response Plan must describe how the owner or operator will provide training for local emergency responders." And right there in that sentence, "emergency responders -- training for -- provide training for local emergency responders to respond to a CO2 release accident."

Put those words right in there, and -- and that would make me a happy camper because then you are obliging them to contact those first responders and say, "Hey, what can we do to make your training, you know, include a CO2 accident?" Then you leave it up to the first responders on how they're going to incorporate that into their training.

It -- it depends on the state. You know, it -- some -- some firefighters have formal academies. Some do it through the through the HAZWOPER process. There's an equivalent EPA process defined in 40 C.F.R., I believe, 311, that covers volunteer firemen because the -- the OSHA standard action doesn't cover volunteer first responders.

But anyway, yes. It -- just insert that there, and I'd be a happy camper. And also you've got, you know, New Mexico is a place with a lot of small rural communities. They may not have the resources to -- to keep up on having enough SCBAs to respond to an accident. The permittee should be helping them out with that cause. That's all.

MR. PAVLIK: Okay. Thank you. I'm going to just very briefly share my screen to just get confirmation on what you just noted. Okay. So here I have pulled up your direct testimony. And am I

understanding correctly that the language you just mentioned adding here into O, this is -- these are the specific minimums that you suggest adding. That language that you just noted could be added to O might be an alternative way to handle the situation --

DR. HELM-CLARK: Yeah. It could be. I -- I forgot that I put in this -- this detailed list, O.

MR. PAVLIK: No, that's okay. I just wanted to confirm. I think -- no -- like that's -- and as we heard yesterday, there are some concerns about being prescriptive and whether local communities may already be doing things and have needs.

So in your opinion, maybe one way to handle the local needs in the local communities may be to insert the language you just mentioned that would then allow them to have that agency over some of this training; is that right?

DR. HELM-CLARK: Yes.

MR. PAVLIK: Okay.

DR. HELM-CLARK: I just, you know, I wanted -- I wanted specific mention that the training would be for a CO2 release accident because there's absolutely no mention in the statute right now that they're going to train for -- for the accident.

MR. PAVLIK: Thank you. Appreciate it. And then lastly, last question is, in addition to training, you recommend that the project proponent provides certain technical equipment, such as self-contained breathing apparatuses, to local first responders in order to respond to CO2 emergencies. Can you please elaborate on why that might be necessary?

DR. HELM-CLARK: Well, in the event of a large, you know, a large catastrophic CO2 release, the primary hazard is asphyxiation. You need self-contained breathing apparatus that -- self-contained breathing apparatuses, or SCBAs is what they call them. They're the SCUBA tanks that you see all the firefighters wearing. And they provide oxygen in atmospheres where oxygen is lacking or where there are toxic concentrations of other constituents that would --

MR. PAVLIK: Okay. Great. Thank you. I think those are all of the questions I have. Is there anything that you want to add in terms of any of the rebuttal testimony that you've reviewed? No need. But, you know, this would be your opportunity before we turn to cross-examination.

DR. HELM-CLARK: You know, I'm sure

I'll think of something ten minutes into lunch, but off the top of my head, I think.

MR. PAVLIK: Okay. Sounds good. Thank you so much, Dr. Helm-Clark.

No further questions from me, Madam Hearing Officer. And I turn the witness over for cross-examination.

THE HEARING EXAMINER: Thank you, Mr. Pavlik.

Mr. Tucker, do you have questions of Dr. Helm-Clark on behalf of Oxy?

MR. TUCKER: Good morning. I do.

THE HEARING EXAMINER: All right.

CROSS EXAMINATION

BY MR. TUCKER:

MR. TUCKER: Hi, Dr. Helm-Clark. Aaron Tucker on behalf of Oxy. How are you?

DR. HELM-CLARK: Not too bad.

MR. TUCKER: Good. Dr. Helm-Clark, you currently work as a consulting geologist and geophysicist based in Minnesota; correct?

DR. HELM-CLARK: That is correct.

MR. TUCKER: Are you licensed as a professional geologist in Minnesota?

DR. HELM-CLARK: No, I am not.

MR. TUCKER: Do you hold any professional licenses?

DR. HELM-CLARK: Other than my HAZWOPER certification? No.

MR. TUCKER: All right. Thank you. I'd like to turn to your resume. Sorry. I'm getting a little bit of feedback here. I'd like to turn to your resume in Exhibit 2. It's Bates 0028. Can you please identify which of the listed consulting projects involved work in New Mexico?

DR. HELM-CLARK: I had no consulting jobs in New Mexico.

MR. TUCKER: Okay. Sticking with your resume, can you please identify which of the publications cited in your resume related to the geology in New Mexico?

DR. HELM-CLARK: I have no publications related to geology in New Mexico, I do not believe.

MR. TUCKER: Aside from this rule-making matter, what is your professional work experience in New Mexico?

DR. HELM-CLARK: I have no professional work experience in New Mexico.

MR. TUCKER: Okay. I'd like to turn to site characterization. Dr. Helm-Clark, in your

surrebuttal, you testified to your experience and the ease of conducting a phase 1 site assessment; correct?

DR. HELM-CLARK: That is correct.

MR. TUCKER: Is a geophysical evaluation for a Class VI well the same as a phase 1 site assessment?

DR. HELM-CLARK: No, it is not.

MR. TUCKER: The Center for Biological Diversity is recommending a mandatory site characterization area extending exactly 10 miles from every new Class VI well; correct?

DR. HELM-CLARK: That is correct.

MR. TUCKER: That 10-mile figure applies uniformly regardless of the site-specific geology; correct?

DR. HELM-CLARK: That is correct.

MR. TUCKER: The federal Class VI rules and the proposed rules here require site characterization across the area of review, but they don't dictate a specific distance; correct?

DR. HELM-CLARK: For Class VI, that is correct.

MR. TUCKER: And that's because the size of the area of review will vary depending on the project and the site-specific geology?

DR. HELM-CLARK: The AOR depends on the model extent of the CO2 plume and the pressure point.

MR. TUCKER: So the size of the area of review will vary depending on the project?

DR. HELM-CLARK: That is correct.

MR. TUCKER: In Exhibit 5 -- this is Bates 0120 -- you provide a list of wells in support of CBD's 10-mile site characterization proposal; correct?

DR. HELM-CLARK: Is that the table --

MR. TUCKER: That's the table?

DR. HELM-CLARK: Yes. Yes.

MR. TUCKER: Okay. None of these are class -- none of the wells listed on this table are Class VI wells?

DR. HELM-CLARK: Of course not, because we don't have a lot of experience with Class VI wells. Class VI wells are new. We've only been putting Class VI wells into the ground for ten years. And in over the -- over the history of Class VI, most of those permits have come up in the last two years. So we don't have a huge experience.

MR. TUCKER: So the list of wells in this are all Class II; is that true?

DR. HELM-CLARK: That is not correct.

MR. TUCKER: Can you class -- which of the wells on the list are not Class II?

DR. HELM-CLARK: I need to -- Fairview, Oklahoma, I could not identify if it was Class I or Class II. The same for Texas. Texas, that actually may have been class -- the -- the -- everyone that's actually identified as wastewater, I could not determine whether or not it was Class I or Class II.

In Stillwater, Oklahoma, it was Class II. In Aneth, it was Class II. In Cogdell, it was Class II. In -- in the Gulf of Valencia, Spain, that was a natural gas storage project. In Korea, that was geothermal injection. In -- in Ohio, those were all Class II.

Now, you're going to object that -- that these are all Class II, and we're doing Class VI. The problem is -- is that we don't -- one, we don't have a lot of experience with Class VI. Back in the 1990s and the 2000s, this was recognized immediately by the National Labs and the DOE, which was doing a lot of the original research into carbon sequestration.

And their approach was to find reasonable analogs since we don't have 50 years of experience running Class VI. Those analogs are

injection wells and CO2 projects and gas injection projects. That covers geothermal. It covers natural gas storage. It covers -- it covers drilling and exploring for natural CO2 resources. And it -- and it covers Class I, and it covers Class II.

It actually covers -- they looked at all of the UIC because, if you look at the physics, all injection -- I'm going to argue all injection wells are the same. You're putting a hole in the ground, and you're injecting the fluid.

And the things that drive whether or not you get failures are flow and pressure. And that -- and -- and that is the same, regardless of whether the fluid is CO2 or brine or wastewater or natural gas.

MR. TUCKER: Ms. Clark, I'm going to turn back to the exhibit. So just to repeat, none of the wells are Class II wells. Do the Class II rules impose the same site characterization requirements as the Class VI rules over the area of review?

DR. HELM-CLARK: No.

MR. TUCKER: Okay. Do the Class II rules define the area of review differently than the Class VI rules?

DR. HELM-CLARK: Oh, very.

MR. TUCKER: For instance, the Class II rules allow an area of review with a fixed radius?

DR. HELM-CLARK: That is correct.

MR. TUCKER: All right. Thank you. No further questions.

THE HEARING EXAMINER: Thank you, Mr. Tucker.

Is there anyone online to ask questions for NMOGA?

MS. GUTIERREZ: We are online, and we have no questions for Dr. Helm-Clark. Thank you.

THE HEARING EXAMINER: Thank you very much. Was that Ms. Gutierrez? Okay.

MS. GUTIERREZ: Yes. I'm sorry. For the record, Ms. Gutierrez on behalf of New Mexico Oil and Gas Association.

THE HEARING EXAMINER: Thank you very much.

Ms. O'Grady, do you have questions?

MS. O'GRADY: Conservation Groups have no questions. Thank you so much.

THE HEARING EXAMINER: Thank you.

Let's see. Is Ms. Ruscavage-Barz online?

MS. RUSCAVAGE-BARZ: Yes, Madam Hearing

Officer. WildEarth Guardians has no questions for this witness. Thank you.

THE HEARING EXAMINER: All right. Thank you.

Mr. Tremaine?

MR. TREMAINE: I do. Thank you.

CROSS EXAMINATION

BY MR. TREMAINE:

MR. TREMAINE: Good morning, Dr. Helm-Clark. My name is Jesse Tremaine. I am the legal director for the New Mexico Oil Conservation Division. Thank you for being here. And thank you for the obvious attention and effort you put into your presentation and your materials.

I would like to ask you about a couple specific things in your testimony. In your direct testimony on page 69, starting in line 16, you reference information that you gathered in personal communication with an individual named James Kundert of Atlas Technical; is that correct?

DR. HELM-CLARK: That is correct.

MR. TREMAINE: Okay. Could you please tell us about when -- I'm not trying to quiz you on the exact date, but the rough date and nature of that communication?

DR. HELM-CLARK: Oh, I don't think I can tell you an exact date because I talk to Jim every other week.

MR. TREMAINE: Okay. Was it recent? Was it five years ago?

DR. HELM-CLARK: Oh, it's maybe within the last year.

MR. TREMAINE: Okay. What --

DR. HELM-CLARK: And -- and we were talking specifically about the utility of soil gas at TerraVault.

MR. TREMAINE: Thank you. What is Mr. Kundert's educational and professional background?

DR. HELM-CLARK: James Kundert has -- James Kundert has worked in -- I -- I don't know if he's worked for Atlas all with his life. He's certainly worked for Atlas for over 20 years. Atlas is one of the -- one of the larger environmental engineering firms that practices in California.

He has a degree in geology from San Jose State University. And he's been doing -- he's been working for environmental engineering firms for all of his career. He specializes in soil gas. He is Atlas's California soil gas go-to guy.

MR. TREMAINE: And do you know roughly

when Mr. Kundert worked for Atlas specifically related to the Elk Hills CO2 sequestration project?

DR. HELM-CLARK: I'm not exactly sure when he was on the site. The project isn't that old, so it has to have been within the last three years.

MR. TREMAINE: Okay. And on that point, when did CO2 injection begin at Elk Hills?

DR. HELM-CLARK: I'm not sure.

MR. TREMAINE: Okay. Do you know what information, data, or analyses that Mr. Kundert relied upon in forming the opinions that you attributed to him?

DR. HELM-CLARK: Well, I actually -- I haven't seen the data. I know he was -- I -- I -- he -- he spent a couple of weeks out there on the TerraVault site sample.

MR. TREMAINE: Okay. Thank you.

DR. HELM-CLARK: So -- Atlas is one of the subcontractors doing the soil gas, so --

MR. TREMAINE: Thank you. Are you aware of whether CO2 soil gas monitoring is a component of EPA-approved monitoring, reporting, and verification or MRV plans?

DR. HELM-CLARK: It is my understanding that the EPA does not mandate it. And it is my

understanding that the proposed New Mexico rule does make it mandatory.

MR. TREMAINE: Okay. So it's your understanding that you're -- that New Mexico is proposing more stringent requirement for soil gas monitoring?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Okay. Thank you. I'd like to -- are you aware if EPA has, perhaps not required, but has improved MRV plans, which includes soil gas monitoring as a component? I can try to rephrase. I asked --

DR. HELM-CLARK: No, no, I -- I -- I'm -- I'm going through my -- I'm going through the permits, I believe, in my head, and I'm going to say I'm not sure.

MR. TREMAINE: Okay. Thank you. I want to ask you a few questions about the AOR and the 10-mile. I'll try not to duplicate Mr. Tucker's questions, but my understanding of the technical basis that you've outlined in your direct testimony and the -- and your responses to Mr. Tucker are primarily that this is a concern about the migration of injectate through transmissive faults; is that accurate?

DR. HELM-CLARK: That is accurate.

MR. TREMAINE: Okay. And I believe in all of the context you were referring, and you went over this with Mr. Tucker, again, so we talked about -- you referenced examples with Class I wells and primarily examples with Class II wells; is that correct?

DR. HELM-CLARK: That is correct.

MR. TREMAINE: Okay. What is the injectate in Class II wells that you are referring to?

DR. HELM-CLARK: Class II well -- injectate for Class II wells can -- can be water, it can be brine, or it can be CO2.

MR. TREMAINE: Thank you.

DR. HELM-CLARK: Class II is kind of like the catching -- the kitchen sink of the -- of the UIC program -- it's wide open --

MR. TREMAINE: You reference examples related to the Permian basis in your testimony. Which state are the examples that you referenced located? Those in New Mexico or Texas?

DR. HELM-CLARK: Did you say "Permian Basin"? I thought -- I thought you said "basis".

MR. TREMAINE: I probably had that wrong in my notes. Permian Basin. Thank you.

DR. HELM-CLARK: Most -- most of the wells -- the -- the examples that I cite in my testimony in the Permian Basin, I believe, are all in Texas.

MR. TREMAINE: Okay. And those examples in Texas, those relate to Class II wells; correct?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Okay. Are you familiar with the specific permitting and regulatory requirements for Class II wells in New Mexico versus Texas?

DR. HELM-CLARK: No, I am not.

MR. TREMAINE: Okay. Are you familiar with -- are you aware that historically the maximum injection pressure gradient for Class II wells in Texas has been 0.5 PSI per foot of depth?

DR. HELM-CLARK: No, I was not aware.

MR. TREMAINE: Okay. Are you aware that that same maximum injection pressure gradient for Class II wells in New Mexico has always been 0.2 PSI per foot?

DR. HELM-CLARK: No, I was not aware.

MR. TREMAINE: And you referenced another example in Ohio. In the Ohio example, were

those Class II wells?

DR. HELM-CLARK: I'm sorry? It's --

MR. TREMAINE: The Ohio reference in your testimony, were those wells Class II?

DR. HELM-CLARK: It was class -- it was a Class II well.

MR. TREMAINE: Class II wells. Okay. And are you aware of the -- that maximum injection pressure gradient for Class II wells in Ohio?

DR. HELM-CLARK: Yes, I am.

MR. TREMAINE: What is that?

DR. HELM-CLARK: I'd have to look it up.

MR. TREMAINE: Would it by any chance be 0.75 psi per foot of depth?

DR. HELM-CLARK: I cannot remember off the top of my head.

MR. TREMAINE: Okay.

DR. HELM-CLARK: They have it written -- they have it written into their -- into the Ohio Administrative Code, so --

MR. TREMAINE: Yes, I believe. Thank you. I'd like to ask you a question about the seismic activity. Are you aware that OCD has a seismic response protocol in place?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Okay. And are you aware that that seismic response protocol as written is applicable to all injection wells under OCD authority?

DR. HELM-CLARK: I was not aware that that -- it extended to all of UIC wells, but I would expect it to. I knew it extended to all of the Class II wells.

MR. TREMAINE: Okay. Are you aware that, depending on the magnitude and distance from the well to the epicenter of an observed seismic event, under that protocol, wells may be required to curtail or cease injection?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Okay. And bear with me based on your last answer. If you assume that that going forward applies to Class VI wells, would you agree that a seismic response protocol would actually be a very fast or immediate response to a seismic event?

DR. HELM-CLARK: Yes, it would be an immediate response.

MR. TREMAINE: Okay. And is that complimentary or more stringent than relying only upon an area of review reconsideration?

DR. HELM-CLARK: I would say that it's complimentary.

MR. TREMAINE: Thank you. I want to ask you a couple questions about the proposal to reduce the maximum operating pressure for Class VI wells from 90 percent to 80 percent fracture pressure. You reference in your testimony, California. To your knowledge, does California have EPA Class VI primacy? Or does EPA --

DR. HELM-CLARK: Not yet.

MR. TREMAINE: Not yet? Okay. So EPA regulates Class VI wells in California currently?

DR. HELM-CLARK: That is correct. Yes, that is correct.

MR. TREMAINE: Okay. So the 80 percent standard or maximum operating pressure that you referenced in California, would you agree that that is from a separate regulatory structure?

DR. HELM-CLARK: Yes, it is. It is not part of the Class VI structure.

MR. TREMAINE: Am I correct in understanding that that is related to the low carbon fuel standard?

DR. HELM-CLARK: Yes, it is.

MR. TREMAINE: Are you aware that the

program within the California Air Resources Board has approved exceptions to 90 percent maximum operating pressure?

DR. HELM-CLARK: Yes, I am aware.

MR. TREMAINE: Okay. Are you aware of any other jurisdiction which limits injection wells, specifically Class VI wells, to 80 percent of fracture pressure?

DR. HELM-CLARK: No.

MR. TREMAINE: Thank you. On page 10 of your direct testimony, you cite the Paradox Basin in Utah as an example of CO2 leakage affecting groundwater. Do you recall what I'm referring to?

DR. HELM-CLARK: Yes.

MR. TREMAINE: In that example, were the groundwater zones used as drinking water sources or otherwise meet the definition of a USDW were -- sorry. Let me repeat or restate. Were any groundwater zones that are used as drinking water sources or otherwise meeting the definition of a USDW impacted in that instance?

DR. HELM-CLARK: I do not know if they were formerly classified as USDWs.

MR. TREMAINE: Okay. You also referenced on page 14 of your testimony, Satartia,

Mississippi CO2 release. Dr. Helm-Clark, what was the source of the release CO2 in that incident?

DR. HELM-CLARK: That was a pipeline leak.

MR. TREMAINE: And do you have -- it is your understanding that Class VI regulations have regulatory authority over CO2 pipelines?

DR. HELM-CLARK: Repeat the question, please.

MR. TREMAINE: Are you aware of whether or not the Class VI regulations apply to CO2 pipelines?

DR. HELM-CLARK: Pipeline regulations are not Class VI.

MR. TREMAINE: Thank you. You also referenced on page 16 of your testimony CO2 leakage at the Salt Creek oil field in Wyoming. In what year did that event occur?

DR. HELM-CLARK: 2016.

MR. TREMAINE: And can you describe what actions the Wyoming regulators took in response to that event?

DR. HELM-CLARK: Initially, it wasn't Wyoming regulators. It was the county health department. And the -- and the county health

department, I believe, ended up being the -- agency.

MR. TREMAINE: Okay. Following that event, did Wyoming subsequently apply for and obtain Class VI primacy?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Does Wyoming's Class VI program require a default 10-mile characterization radius?

DR. HELM-CLARK: It does not.

MR. TREMAINE: Okay. I'd like to ask you now about the Lake Nyos event related to page 17 of your testimony. You discussed that event, but you also acknowledged that it is not analogous to an engineered CO2 storage; is that fair characterization?

DR. HELM-CLARK: That is a fair characterization.

MR. TREMAINE: And in the premise of my question, would you agree that that event occurred in 1986?

DR. HELM-CLARK: Yes. I believe it happened in 1986.

MR. TREMAINE: Okay. Sorry. Just restated -- I stated in my question, but were the Federal Class VI regulations promulgated before or after the Lake Nyos event?

DR. HELM-CLARK: Oh, after.

MR. TREMAINE: After. And as we discussed, the federal Class VI regulations attached do not require a default 10-mile site characterization; correct?

DR. HELM-CLARK: That is correct.

MR. TREMAINE: Okay. When you talk about the kind of setbacks question, you generally speak about leakage that can occur outside an area of review, but I don't see specific citations to incidents or -- let me rephrase.

When you're talking about your experience of leakage that can occur outside an area of review, specifically which UIC well classes are you referring to?

DR. HELM-CLARK: Repeat the question, please.

MR. TREMAINE: On page 22 of your testimony, you state that operational experience demonstrates that leakage can occur outside an area of review. When you state that, which UIC well classes are you referring to?

DR. HELM-CLARK: In this respect, I was referring to -- well, the Salt Creek incident, which was Class II.

MR. TREMAINE: Okay. And I think you already answered this. Area of reviews are determined for Class II well classes. So I'll move on. On page 29 of your testimony, you refer to the Southeastern Ohio Plum Run examples. Are you able to articulate or compare the completeness and historical coverage of Ohio and New Mexico well databases?

DR. HELM-CLARK: You want me to compare the -- the databases?

MR. TREMAINE: Well, are you familiar with the well databases for Ohio and New Mexico?

DR. HELM-CLARK: Yes. I'm familiar with both.

MR. TREMAINE: Okay. And are you able to are you able to characterize the relative completeness and historical coverage for those two databases?

DR. HELM-CLARK: For Ohio, I would say that it is lacking. Fr New Mexico, I do not have enough experience in New Mexico to make -- to -- to have formed an opinion.

MR. TREMAINE: Okay. Doctor, you referred to the -- well, you propose a setback, a half-mile setback, from specific structures. And you also indicated that you are not an attorney. So I

want to ask you if any witness that you are aware of with CBD will be able to present testimony describing the authority for OCD to impose setbacks for surface structures?

MR. PAVLIK: Objection. That's -- calls -- that's outside of the purview of her testimony. And she wouldn't be aware of other witnesses in any case.

THE HEARING EXAMINER: Mr. Termaine?

MR. TREMAINE: I just asked if she was aware. I think it's a simple yes or no question. And I can move on.

THE HEARING EXAMINER: Please.

BY MR. TREMAINE:

MR. TREMAINE: Dr. Helm-Clark, so do I understand your testimony to be then that the setback is a good idea from a technical perspective?

DR. HELM-CLARK: I'd say it's a good idea from a safety perspective.

MR. TREMAINE: Fair. Thank you. Were you aware of the fact that New Mexico actually sponsored a proposed bill to consider providing the OCD authority to impose setbacks from certain surface structures in a prior legislative session?

DR. HELM-CLARK: I was not aware.

MR. TREMAINE: And were you aware that the legislature declined to take up or pass --

MR. PAVLIK: Objection.

MR. TREMAINE: -- proposal?

MR. PAVLIK: I'm sorry. How is this related to the current Class VI rule-making? And I believe this also calls for legal testimony, which we've just heard that Dr. Helm-Clark can't provide.

MR. TREMAINE: It doesn't call for legal testimony. It asks for awareness, and I'm simply laying a foundation, which we all know both of us are going to address in closing.

THE HEARING EXAMINER: All right. Would you just rephrase the question?

MR. TREMAINE: Thank you.

BY MR. TREMAINE:

MR. TREMAINE: Dr. Helm-Clark, I think you just stated that you were not aware of the legislative proposal to provide setback authority for OCD. So my next question is, are you similarly unaware that the legislature declined to authorize that authority?

DR. HELM-CLARK: I am -- I am also unaware of that.

MR. TREMAINE: Okay. Thank you.

One moment, Madam Hearing Officer. I think I'm done.

Actually, I believe I have one more -- a couple questions, Dr. Helm-Clark. You proposed additional logs in your direct testimony. I'm referring generally to pages 93 through 108. But those include additional sonic density, porosity, fracture logs, noise logs, et cetera.

Would you agree that each of those technologies, if all of them were required, may be redundant or technically infeasible?

DR. HELM-CLARK: No, I don't agree with that.

MR. TREMAINE: Okay. Would you agree that new technologies that come out after the imposition or the promulgation of this rule, if that so happens, may outperform the listed tools that you've mentioned?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Would you agree that under the current regulatory structure, the director would have the authority during the permitting section of a Class VI application, the director has that authority to select the best site-specific suite of logging and measurement tools?

DR. HELM-CLARK: The way the proposed is -- the way the proposed rule is currently -- currently written, that is correct.

MR. TREMAINE: Okay. Thank you. Dr. Helm-Clark, at a high level, you are proposing physical inspection for wells within certain areas within an area of review; correct?

DR. HELM-CLARK: What do you mean by "physical"?

MR. TREMAINE: Perhaps "physical" is the wrong word. You propose additional analysis of wells within a certain distance of structures or locations; is that correct?

DR. HELM-CLARK: Yes.

MR. TREMAINE: Okay. If I misstated that, please correct me. I'm reading from my notes here. I'm not trying to misstate your testimony, so --

DR. HELM-CLARK: Okay. Yeah. I -- I'm -- I'm --

MR. TREMAINE: I'm trying to get to the proposition that you are proposing for certain specific areas, heightened scrutiny of additional wells.

DR. HELM-CLARK: Okay.

MR. TREMAINE: Okay. And then it is also your proposal that the Commission should require 3D seismic monitoring for the entire area of review; is that correct?

DR. HELM-CLARK: I didn't specifically say 3D seismic.

MR. TREMAINE: Okay. How would you clarify that? What is -- how would you clarify --

DR. HELM-CLARK: I -- I -- my -- my suggestion within the 10 miles is to go hunting for undocumented and unmapped faults.

MR. TREMAINE: Okay. Thank you for that clarification. I do not have any further questions.

THE HEARING EXAMINER: Thank you, Mr. Termaine.

Mr. Pavlik, do you have any redirect?

MR. PAVLIK: Yes. Thank you. Just a few questions here.

REDIRECT EXAMINATION

BY MR. PAVLIK:

MR. PAVLIK: Thank you, Dr. Helm-Clark. In terms of your work experience, you noted that you don't have any work experience in New Mexico, but is the work experience that you noted during your

presentation, does that -- is that transferable to projects that would be located in New Mexico?

DR. HELM-CLARK: Most certainly.

MR. PAVLIK: And do you know roughly how many or can you generally provide how many Class VI wells there are permitted currently in the United States?

DR. HELM-CLARK: It's under -- I -- I'm going to say 26, but please don't quote me on that. The real answer is to go to the EPA website and look at the permitting dashboard and count them up.

MR. PAVLIK: Thank you. And have you undertaken permit reviews of any of those current Class VI wells in the United States?

DR. HELM-CLARK: None of the permits that I have reviewed are currently injecting.

MR. PAVLIK: But you're familiar with the permitting process and you have looked into different aspects of that permitting process within wells that may not be injecting but are going through the process in the United States; is that correct?

DR. HELM-CLARK: That is -- that is correct.

MR. PAVLIK: And this being the case, are the wells that you have cited in your testimony,

are they reasonable analogs to Class VI wells concerning issues that come up in your testimony in your professional opinion?

DR. HELM-CLARK: I believe so. And this is not just my opinion. Looking at analogs and extrapolating them to Class VI has been the strategy and the tactics of the National Labs in their -- in their research initiative that started in the 1990s and followed through into the 2000s.

This is how the National Labs tackled the problem because we just don't have enough data on Class VI because we just don't have enough Class VI wells to study. So we have to use analogs, and therefore we have.

And it's justifiable because, you know, every injection well is the same. You drill a hole in the ground. You're forcing a fluid into a formation. The -- the physics that are relevant are pressure and flow.

MR. PAVLIK: Okay. And just to clarify, there were some questions about different regulatory structures in different jurisdictions, but your analysis is not based on any of the legal elements of those. You're looking specifically at the technical components of injection, whether that be

Class II or Class VI, in these wells?

DR. HELM-CLARK: Yes. I basically was looking at the physics and not the legal aspects.

MR. PAVLIK: And -- okay. Thank you. And there was a question about Satartia and different other incidents. Did the Satartia incident involve a CO2 emergency?

DR. HELM-CLARK: No, that was a CO2 emergency.

MR. PAVLIK: And so even though it was a pipeline, it was still the same substance that we would expect to be dealing with in the Class VI regime; is that correct?

DR. HELM-CLARK: Yes. And -- and there have been CO2 blowout incidences that have been -- that have -- that have approached the conditions that we saw in Mississippi at Satartia. I'm thinking specifically at Sheep Mountain in Colorado. That was a CO2 well blowout, which is -- is a slightly different accident, but it's -- it's still a massive release of CO2 that went on for about a week.

It -- it was ejecting softball-sized chunks of -- of frozen, you know, basically dry ice out of the well as it blew out. And there was enough CO2 that car engines in low-lying areas around the

blowing-out well stopped running.

So we're looking at putting enough CO2 in the low-lying areas around that -- that blowout well that -- that would've been IDLH. And I'll reiterate, immediately dangerous to life and health.

MR. PAVLIK: Thank you. And there was a question about the New Mexico well database. When you were preparing your direct testimony, did you include any review of wells that were on the OCD's NM Well database?

DR. HELM-CLARK: Yes, I did, because -- because of the issues of -- of age in terms of plugging wells, because before 1953, there was no standard for the proper plugging of the well. I wanted to see -- I -- I wanted to see in in the historic basins, which is to say the San Juan Basin and -- and the Permian Basin, how many wells, you know, the -- the age of wells, how dense they were, and what the plugging records looked like.

So I -- I did a -- I -- I spent a while diving into New Mexico's well database and reading well records.

MR. PAVLIK: Okay. Thank you. And though you can't speak to the comprehensiveness writ large of that database, did you notice any wells that

were missing plugging information or documents that you would have otherwise --

DR. HELM-CLARK: Oh, because there were plugging. In -- in general, wells -- wells that were -- I -- I noted in general, wells drilled before 1970 very often had inadequate or no plugging records.

MR. PAVLIK: Thank you. And I guess in your opinion -- actually, I think that's good. That's all I have. Thank you. Thank you, Dr. Helm-Clark. I really appreciate your time.

And Madam Hearing Officer, I'm done with redirect.

THE HEARING EXAMINER: All right. Thank you very much, Mr. Pavlik.

Let's come back after lunch for questioning by the commissioners. Let's come back at 1:00. Thank you.

(Off the record.)

THE HEARING EXAMINER: Yes. It's 1:00. Let's come back from lunch break, please. This is just an announcement for everyone in the room and on the platform and if you have not already been notified via e-mail by Sheila. We will be going through the questioning of Dr. Helm-Clark from now to 10 minutes of 3:00, that's 2:50. And then we're going to break

for the day and resume at 9 a.m. in the morning.

All right. Dr. Helm-Clark, you're okay? Dr. Helm-Clark, can you hear me? You can hear me?

MR. PAVLIK: Doctor?

Madam Hearing Officer, it appears that she cannot hear us. I just confirmed that with her. So maybe I can give her a quick call and see if we can --

THE HEARING EXAMINER: Thank you, Mr. Pavlik.

MR. PAVLIK: She's logged off and is attempting to rejoin, I believe.

THE HEARING EXAMINER: Thank you.

Dr. Helm-Clark, can you hear me?

DR. HELM-CLARK: I can hear you.

THE HEARING EXAMINER: Terrific.

DR. HELM-CLARK: They said they would make -- computers would make our lives easier.

THE HEARING EXAMINER: Reflect on that for a moment.

Commissioner Ampomah, would you like to begin the Commission questions?

COMMISSIONER AMPOMAH: Sure --

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EXAMINATION

BY COMMISSIONER AMPOMAH:

COMMISSIONER AMPOMAH: Dr. Helm-Clark, thanks so much for your testimony and also supporting this rule-making, or at least trying to make it much better. Appreciate your efforts.

So I do have a couple of questions. And we'll also go through the rule, you know, and also walk through some of the options that you are putting across. And then also I'll show, you similar to the yesterday panel, I do have some recommendations, and I'll show that to you to see if you have any concurrence on that or you have any issues with that.

Now, so in your testimony, at least today, you talked about our state is trying to build a new industry, that is, the UIC Class VI is new. Now, my question to you is that, is the industry not already here, because we do have at least one permit that is going through EPA review?

DR. HELM-CLARK: I'm not sure I understand the gist of your question.

COMMISSIONER AMPOMAH: So you're saying that the state is going to build a new industry; right? You got that correctly? In your statement, when you were presenting, you talked about the state

is building a new industry.

DR. HELM-CLARK: All right. I -- when I -- when I have said that Class VI wells are relatively new, and I believe I have said "relatively," I also stated that, you know, the -- the rules -- the rules started about ten years ago. So we have 10 years' worth of experience. However, initially, there weren't very many wells, and there still aren't a lot of wells, so our experience is still young.

COMMISSIONER AMPOMAH: Yeah. But the industry is still is already here because whether New Mexico has primacy or not, operator can go to EPA and still get the permission to bring that industry to New Mexico. Would you agree with that?

DR. HELM-CLARK: Oh, yes. Certainly.

COMMISSIONER AMPOMAH: Now, you also said that in -- some of your recommendations, you're saying that there has to be a summary for especially the AOR. You're talking about all the important things that the operators use so it would be quick review for the Division; is that correct?

DR. HELM-CLARK: Well, for anybody reading the permit.

COMMISSIONER AMPOMAH: But don't you

believe that there is a summary requirement in the current EPA rules or even the Class VI permits that you have reviewed?

DR. HELM-CLARK: To my knowledge, there is no requirement to include the summary that I have suggested.

COMMISSIONER AMPOMAH: Okay. But you also don't dispute that summaries for each of the grants are a requirement as part of the permit application to EPA?

DR. HELM-CLARK: I don't know off the top of my head. I'd have to look at the guidance.

COMMISSIONER AMPOMAH: Okay. Then I can tell you that for all the permits that I've seen or reviewed, there is a requirement. You know, you have to provide summary for each of the paths or the attachments that you submit to EPA.

Now, you talked about models are black box. You said models are always a black box. And then also you've reviewed some of these applications. So my question to you is that, as an expert, are you not able to distinguish between garbage in and garbage out type of models?

DR. HELM-CLARK: I'm not sure what your question is getting at.

COMMISSIONER AMPOMAH: I can repeat it again because I'm building on something.

DR. HELM-CLARK: No, no, no. I -- it -- it's -- when you're reviewing -- when you're reviewing a Class VI permit, and -- and the AOR is based on a model, you have to take it on faith that the modeling software is doing its job. As a reviewer, that leaves you looking at whether or not the inputs into the model are appropriate and adequate.

COMMISSIONER AMPOMAH: Now, so let me ask. So do you have extensive experience in Louisiana?

DR. HELM-CLARK: I have experience in Louisiana. Whether or not it's extensive is an argument about -- about adverbs.

COMMISSIONER AMPOMAH: But so you said you've reviewed some Class VI applications?

DR. HELM-CLARK: Yes. I've reviewed Class VI permits in Louisiana.

COMMISSIONER AMPOMAH: And I'm asking you, do you have extensive knowledge about the geology, let's say, the -- everything about Louisiana?

DR. HELM-CLARK: Well, I -- I -- I'm not God. I'm not "inimminent," so I don't know

everything. But I know a great deal about the -- the saline -- the saline formations along the Gulf Coast that they are using to -- that they -- they are proposing to build Class X wells -- Class VI wells in. I do have a -- I do have a -- a well-logging analyst experience on the Gulf Coast and in Gulf Coast data.

COMMISSIONER AMPOMAH: That is very good extension. So at least you do know the geology of Louisiana. So when you are reviewing these permits, that geology also comes into play. Your knowledge of that geology comes into play as you are reviewing models with garbage in and garbage out; would that be correct?

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: So then let me ask you. So if the conservation groups, they are saying that, let's say, New Mexico doesn't need to necessarily, you know, have primacy; right? Don't you believe that New Mexico having primacy will give them even the opportunity to use the local knowledge of their geology to make, in fact, decision to more or less protect human life?

DR. HELM-CLARK: I'm not sure what the question is here. Are you asking me to make a decision whether or not the -- the Division has

adequate technical expertise in New Mexico geology to evaluate its own programs? I hope so.

COMMISSIONER AMPOMAH: Yeah. But not necessarily. So, you know, I started building the premise of my question about you have geological experience in Louisiana. So at least based on that experience, you should be able to -- I mean, you are reviewing applications from Louisiana.

And your local knowledge is helping you to really make determinations whether the adequately presenting data represent the geology or not. So I'm not saying you don't you believe that it is also appropriate for the authorities that do know the geology of New Mexico to oversee the permitting process for Class VI in New Mexico?

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: Now, still on the review process, so as you go through the review, going through the review, you spot all these deficiencies in the permit. When you point those reviews out to -- those deficiencies out to EPA, can you explain to the Commission the next steps after your review?

DR. HELM-CLARK: Usually when I am doing a review, I go through, I -- I try to find the

deficiencies in the permit. I write them up, and I send them back to my client, who usually either is going to send in commentary on a permit during a, you know, during an acceptable commentary period, or they're taking my comments, and they're preparing them for a -- a filing for a civil suit to potentially stop a permit.

COMMISSIONER AMPOMAH: Oh, so you are not actually review for EPA or let's say the state of Louisiana?

DR. HELM-CLARK: My reviews have been for clients who are participating in the public commentary period.

COMMISSIONER AMPOMAH: Oh, thank you for the distinction then. I was -- to a rabbit hole here. Thank you. Then -- let me ask. So don't you believe that the current rule that OCD is putting forward here more or less cover fluid movement into unauthorized zones? There is a way for OCD to more or less ensure their compliance met in instances where fluid moves from the authorized zones to the --to an unauthorized zone?

DR. HELM-CLARK: I'm not sure what the question is.

COMMISSIONER AMPOMAH: Okay. So you

talked about the fact that the rule, the Class VI rule, should not just only be for the USDW, but it should be for others as well. So I'm asking you, is an operator not uncompliant if, let's say, their fluid moves from the authorized zone to any unauthorized zone, and is that not presented independent -- oh, in the application before us?

DR. HELM-CLARK: I feel like you're asking two different questions here.

COMMISSIONER AMPOMAH: Okay. I'm not, actually. But I'm asking, so is it true that your testimony was that the rule has to go beyond USDW; right?

DR. HELM-CLARK: Yes. That is my testimony.

COMMISSIONER AMPOMAH: And then I'm asking you. In the current rule that is before us today, don't you believe that in that rule, OCD is also saying that you cannot have your fluid moving out of the authorized zone to any unauthorized zone, either being a mineral zone or let's say a USDW zone?

DR. HELM-CLARK: I believe the regulation is -- is forbidding the motion of -- of fluids out of the injection zone, and -- and any movement of the fluid out of the injection zone should

be an unauthorized release.

COMMISSIONER AMPOMAH: So then you agree with me that the rule that we are promulgating today is not really actually just protecting only the USDW?

DR. HELM-CLARK: That is correct.

COMMISSIONER AMPOMAH: Thank you. Now, you talked about monitoring wells. Son you know, as an expert, I want to discuss this with you. Are you in favor of monitoring wells penetrating through injection zones?

DR. HELM-CLARK: Not really.

COMMISSIONER AMPOMAH: And based on your geophysical background, do you believe that there could be some tools in such a way that we do not necessarily penetrate through the injection zone, but we can still get the pressure data from the injection zone?

DR. HELM-CLARK: Well, you know, it -- it -- you're -- you're getting into some pretty technical questions. You can -- you can embed -- you can embed gauges in your injection well that will measure pressure, and it'll measure pressure down the hole during operation, that that pressure is -- is probably not going to really accurately reflect

what -- what the static case would be.

So I'm not sure where you're going with this. You -- there are gauges that can go down the hole. I'm not sure how great they are. At ADM, they all failed, so --

COMMISSIONER AMPOMAH: Okay. So I was thinking more of the -- as you said, I mean, if you have the gauge right within the injection zone, then you are not too sure whether there's a true representation of the pressure within the, let's say, the injection zone or not. But I was thinking about --

DR. HELM-CLARK: Well, what you're getting -- what you're getting is that, you know, if you've got a pressure -- if you've got a pressure gauge, it's right at the perforations where you're -- where you're injecting. You're going to get -- you're going to get a dynamic measurement. That's what I should have said. The -- the measurement's going dynamic. It's not going to be static.

COMMISSIONER AMPOMAH: It's not going to be static. Okay. So -- but I'm more interested in the static point. So assuming we are drilling a monitoring well, is there a way to drill the monitoring well in such a way that we do not

necessarily penetrate into the injection zone, but we can still somehow, based on geophysical advancement, get the static pressure that we're looking for?

DR. HELM-CLARK: I don't think so.

COMMISSIONER AMPOMAH: Okay. Now, don't you believe that if New Mexico decided that, okay, we are not going to allow monitoring wells to penetrate into the injection zone, from EPA, if you can put on EPA hat here, would they not say that New Mexico rules is less stringent than EPA's rules?

DR. HELM-CLARK: Well, you know, we're -- we're that's a problem, quite literally. You know, you -- you want as few as penetrations as possible, but you still have to measure that pressure. Even at ADM, they still have one well left that's not an injection well that is measuring pressure directly, but it has no perforations.

They've got a -- they -- they -- they've got a gauge, they've got a packer, and the rest of it's basically just a solid hole with a -- in it. That well could still leak.

COMMISSIONER AMPOMAH: Okay.

DR. HELM-CLARK: But they basically minimized all of their penetrations. They pulled their monitoring wells out. And part of the revised

permit demanded that they pull those monitoring wells out of the injection zone.

COMMISSIONER AMPOMAH: So do you believe that if the Commission decides that we are not going to mandate injection -- let's say monitoring well penetrating into the injection zone and leave that at a discretion of the operator -- no, of the director, where operator has to prove to the director how they are going to do the measurements to his satisfaction. Do you believe that would be appropriate?

DR. HELM-CLARK: I believe it would be workable.

COMMISSIONER AMPOMAH: Thank you. So you talked about the fact that we cannot have too many Class VI projects in a particular area. Do you remember that testimony?

DR. HELM-CLARK: Was that my testimony or someone else's?

COMMISSIONER AMPOMAH: No, your testimony, because you talked about the fact that we have too many wells -- we have too many wells and even specifically to Class VI. Let me see if I can find that. Give me a second, please. Okay. So on page 53 of your direct, a question was asked, "Does the

presence of multiple Class VI projects" -- are you on that page, page 53 of your direct?

DR. HELM-CLARK: The presence of multiple projects --

COMMISSIONER AMPOMAH: Are we on the same page?

DR. HELM-CLARK: We are on the same page.

COMMISSIONER AMPOMAH: Okay. So your testimony is about -- so there was a question asked you about the presence of multiple Class VI projects, and you made references to someone and then Permian Basin; is that correct?

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: Now, let me ask you. So based on your experience, how many projects, based on your experience, should be permitted in, let's say, San Juan and then in Permian to still make it a safe project?

DR. HELM-CLARK: That's not what I was writing about in this section.

COMMISSIONER AMPOMAH: No, you --

DR. HELM-CLARK: If you read the -- if you read the question, it reads, "Does the presence of multiple Class VI projects or other fossil fuel

exploration and production in the same geographic area?"

And what I was thinking was all of those oil and gas wells and injection wells are -- are those multiple wells. If you want to ask me how many Class VI projects you want to place in one area, I would say that should be dependent on your AOR -- your -- your AOR and permit.

COMMISSIONER AMPOMAH: So then it doesn't necessarily depend on how many penetrations we have but the AOR?

DR. HELM-CLARK: For citing multiple Class VI projects, you should be looking at those AORs.

COMMISSIONER AMPOMAH: Now, let me ask you. So do you know the potential injection zones in the San Juan Basin that could be suitable for CO2 injection for Class VI?

DR. HELM-CLARK: Not off the top of my head.

COMMISSIONER AMPOMAH: Do you know the potential injection zones in the Permian Basin that could be utilized for CO2 injection?

DR. HELM-CLARK: Not off the top of my head.

COMMISSIONER AMPOMAH: Do you know the number of penetrations in the San Juan Basin that goes through the potential injection zone that could be utilized for Class VI?

DR. HELM-CLARK: No, not off the top of my head.

COMMISSIONER AMPOMAH: Do you know the number of penetrations in the Permian Basin in the formations that could be targeted for Class VI injection?

DR. HELM-CLARK: What kind of penetrations? If you're talking injection wells --

COMMISSIONER AMPOMAH: Yes.

DR. HELM-CLARK: -- we're talking thousands. If you're talking oil and gas wells, we're talking tens of thousands.

COMMISSIONER AMPOMAH: So the fact is that you don't really have good knowledge about the potential injection zones that we are -- that could be targeted in New Mexico. So when you say there are -- of wells in there, I just want to understand the risk that we are looking at here so the Commission can make a determination as to whether then how should we make the corrective action provision more stringent? So that is why I'm asking you all those questions.

DR. HELM-CLARK: Well, with regards to the section that -- that you referred to, I was worried about a large number of penetrations in these -- in these historic oil and gas basins. When you're making a determination whether or not a -- a site is acceptable for Class VI, you should be looking at the conditions in the ARR.

In terms of multiple penetrations, what that really affects is your search for a, you know, your search for current abandoned plugged and orphaned wells. That's what it affects. And that's what I was trying to address in this question.

COMMISSIONER AMPOMAH: Thank you. Now, another issue that has come up with regards to, let's say, sited wells probably away from residential and then also from schools. Now, I thought your client is telling the Commission that we don't even have the authority to even -- these rules that we are looking at. Why should we make it more complex?

DR. HELM-CLARK: For the sake of safety.

COMMISSIONER AMPOMAH: But do you believe that we do have the authority to do that?

DR. HELM-CLARK: I don't know. I'm not a lawyer. I don't know -- I don't know what New

Mexico requires.

MR. PAVLIK: I'm sorry. I'm sorry. This is a legal -- I just I just need to briefly state that Dr. Helm-Clark really cannot speak to the authority of the Commission or OCD when it comes to what they can and cannot do in this program.

THE HEARING EXAMINER: And thank you very much, Mr. Pavlik.

And just a reminder to everyone to avoid talking on the end of someone else's sentence. It makes it hard to capture your words on the transcript.

Dr. Helm-Clark, it's a perfectly fine answer if you want to note that the question calls for a legal conclusion.

Go ahead, Commissioner.

BY COMMISSIONER AMPOMAH:

COMMISSIONER AMPOMAH: Okay. So let me ask. So from your Exhibit 5, you showed a table. And that table on there shows different places where there has been a lot of issues; is that correct?

DR. HELM-CLARK: That's correct.

COMMISSIONER AMPOMAH: Can you tell the Commission if any wells in there is in New Mexico?

DR. HELM-CLARK: Does this list include

any -- any wells in New Mexico?

COMMISSIONER AMPOMAH: Yes. So does that not tell you something in terms of how New Mexico is actually operating the existing classes of wells?

DR. HELM-CLARK: No, because it's acausal.

COMMISSIONER AMPOMAH: Now, you talked about the potential 80 percent, moving from 90 to 80 percent. Do you have any references, publications, engineering standards that really supports the 80 percent?

DR. HELM-CLARK: Well, as -- as it's already stated in my written testimony, I was working off of the California Low -- Low Fuel Standards, which do use 80 percent. And also I was basing it off of the Redbird No. 4 release -- release accident in Ohio.

COMMISSIONER AMPOMAH: And based on that release accident, did Ohio change their fracture pressure to 80 percent?

DR. HELM-CLARK: No. They lowered it even further for that particular well and -- and then they -- they did two different things. And they have now forbidden injection into the zone that was being used for injections. So they made two different remedial actions in response to this incident.

COMMISSIONER AMPOMAH: Yeah. So -- but I -- so I'm asking, did they make a general rule that all wells has to go probably 80 percent or lower?

DR. HELM-CLARK: No, they did not -- they did not make a general rule. They made a specific rule for Redbird No. 4. In other incidences in Ohio, they have made similar responses. Where -- where in Ohio, what's been happening when they get these incidents is either discharges out of wells or induced seismicity, Ohio's response has been to lower the pressure and the flow rate for the individual wells implicated in the accident.

COMMISSIONER AMPOMAH: So that one -- does that not imply that, in this case, the director will have the ability to do that?

DR. HELM-CLARK: Well, in Ohio the director had the ability to do that.

COMMISSIONER AMPOMAH: So even in New Mexico, the current rules that we're looking at, the director, would the director not also have the ability to more or less implement that same restrictions on a case-by-case basis, based on the current rule that we're looking at?

DR. HELM-CLARK: As the current rule is currently written, that provision is indeed included.

COMMISSIONER AMPOMAH: Thank you. So we don't necessarily have to go to 80 percent because the director do have the authority to go to 80 percent or even go below that if the situation were --

DR. HELM-CLARK: The way the rule is currently written, that is correct.

COMMISSIONER AMPOMAH: Now, somewhere in your testimony, so you said that -- you talked about the number of wells that are being permitted to Class VI. Do you recall that?

DR. HELM-CLARK: No.

COMMISSIONER AMPOMAH: Okay. Let's go to page 61.

DR. HELM-CLARK: Page 61.

COMMISSIONER AMPOMAH: Page 61, and I'm looking at question 13. And in there you're talking about -- so the question was, "Do you have any examples of what can happen when identification is not properly undertaken for a Class VI project?" So you are responding to that. And then you said, "As of May 1, 2026" --

DR. HELM-CLARK: Hold on. I'm not -- I'm not -- I've got two different page numbering schemes in my notebook. So I'm trying to find the correct page. I'm trying to find the correct page, 61

here.

COMMISSIONER AMPOMAH: In your direct testimony, that --

DR. HELM-CLARK: Right.

COMMISSIONER AMPOMAH: Yeah.

DR. HELM-CLARK: So you're referring to, "Do you have examples of what can happen when identification is not properly undertaken?"

COMMISSIONER AMPOMAH: Yeah. So -- and I'm reading through, "As of May 1, 2026, only 47 Class VI well construction permits have been approved in the U.S."?

DR. HELM-CLARK: That's correct.

COMMISSIONER AMPOMAH: Do you believe it's a lot or it's not a lot?

DR. HELM-CLARK: That's not a lot.

COMMISSIONER AMPOMAH: Now, don't you believe, that with that, the government is spending sufficient amount of time in reviewing these permits to make sure that whatever permits they sign off on protects the USDW, human health, and all the concerns that you may have?

DR. HELM-CLARK: If you're asking me whether or not I believe the EPA is doing an adequate job, I don't know.

COMMISSIONER AMPOMAH: Now, let's go to page 65, still on that same document. Now, so I'm looking at the last -- getting to the last bottom, the question there. Please, are you on page 65?

DR. HELM-CLARK: Page 65?

COMMISSIONER AMPOMAH: Yes. So you are discussing about some of the tools that you could recommend, you know, if, let's say to look for any hidden wells that could be within area of review.

Now, do you know the current strategy by OCD in reviewing even the -- the wells that are in AOR, area of review, for even, let's say, Class II wells? Are you familiar with the entire process, how they make sure that operators really identify all the wells within that particular AOR?

DR. HELM-CLARK: If you're asking me if I have knowledge about how OCD is managing its Class II, I do not know. I do not have specific experience in New Mexico.

COMMISSIONER AMPOMAH: So you do not unnecessarily have experience as to how OCD makes sure that when a permit application comes in, they've exhausted all the potential searches to identify wells that more or less need some kind of corrective action. Is that your testimony?

DR. HELM-CLARK: That is correct. I -- I do not have intimate knowledge of how OCD manages its programs and does its evaluation.

COMMISSIONER AMPOMAH: Now, so there was a discussion about you are requesting that we put in the rule a 10-mile radius from, let's say, a Class VI well to more or less take care of any potential faults that might not necessarily be discovered as part of the site characterization. Is that a good description of your testimony?

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: Now, you said you've reviewed some of these UIC Class VI permits. Now, let me ask you, do you agree with me that it is a requirement that you have to perform a regional site characterization and the local site characterization? Yes.

Do you believe that the original site characterization is even more than your 10-mile radius that you are requesting?

DR. HELM-CLARK: No.

COMMISSIONER AMPOMAH: Do you know, are you familiar with, let's say, can you give the Commission estimated radius from the injection well, proposed injection well, to the AOR? Do you know, do

you have a fair idea as to the typical distance, at least for the ones that you've reviewed?

DR. HELM-CLARK: For the ones that I would review, the -- the mean -- the mean distance is 8 miles. I did not -- I did not calculate the median or the mode because I didn't consider this an, you know, a -- an exhaustive list.

COMMISSIONER AMPOMAH: So the 8 miles, now, you also agree with me that AORs are determined after we've done the site characterization and we've built a model; is that correct?

DR. HELM-CLARK: That's correct.

COMMISSIONER AMPOMAH: So if I challenge your 10 mile and say that there's a high possibility that, if you consider the original analysis that an operator has to work on and the locale, it is going to be anything -- most of these models has to be more than what you are suggesting here because there is a possibility that the AOR could go beyond 10 miles.

DR. HELM-CLARK: I can't imagine any case where an AOR would go 10 miles.

COMMISSIONER AMPOMAH: You sure?

DR. HELM-CLARK: I'm pretty damn sure.

COMMISSIONER AMPOMAH: Then I would

tell you that in New Mexico it's possible.

DR. HELM-CLARK: Well, then you will prove me wrong.

COMMISSIONER AMPOMAH: Well, I'm not testifying. I was just --

DR. HELM-CLARK: So -- so -- but -- but, you know, in -- in all of the projects, you know, I -- I've not seen in AOR greater than 2 miles --

COMMISSIONER AMPOMAH: And what is the rate?

DR. HELM-CLARK: -- all of the permits that I've looked at.

COMMISSIONER AMPOMAH: And what is the rate of these wells that you looked at?

DR. HELM-CLARK: The rate?

COMMISSIONER AMPOMAH: Yeah. What is the permitted rate of these wells?

DR. HELM-CLARK: Well, it depends on whether or not it's a Class II or Class VI.

COMMISSIONER AMPOMAH: Oh, well, we're talking about Class VI.

DR. HELM-CLARK: Well, if we're talking about Class VI, I would have to look up the numbers on the permits that I have reviewed because I don't have them off the top of my head.

COMMISSIONER AMPOMAH: And I'm telling you that. I mean -- okay. So you've preparing for this. Definitely you've looked at. I mean, if I put OCD expert in chief, who has done multiple UIC Class VI permits, he will tell you, you know, if you just go to the EPA website and look at all the permits that are right now going through review, I thought probably you could have done that before you suggested the 10 miles. If you did not do that analysis, then justify the 10 miles to the Commission.

DR. HELM-CLARK: I picked the 10 miles based on the incidences that are actually happened and have happened. So I'm looking at evidence of -- of incidences that have done damage. And, you know, as I said previously, the -- the greatest -- the -- the greatest distance I put on that table was 20 miles.

There's actually two cases where it was 22 miles or 25 miles, but those were -- those were geophysical injections, and I rejected them as being -- analogous. But 20 miles is -- is -- seems to be the limit. Most of them seem to be falling in between -- in between 5 and 8 miles. We've got ones that are that are popping out at 12.

The damaging earthquakes in Oklahoma -- let me look at my table. The -- the -- we've got -- a

we've got a 5.1 in Oklahoma. That's 12 miles. So I picked 10 miles because it was half the -- half the farthest distance because 20 miles just seemed too extreme, so I halved it.

Now, if you look at New Mexico's seismic protocol, if you look at the -- the protocol kicks in, in a 10-mile zone from an epicenter. So by your own protocols, that seems to be reflected in it.

COMMISSIONER AMPOMAH: Yeah. So you are using Class II wells to more or less -- analogous for Class VI? Now, let me ask you. So for a typical commercial Class VI project, what is a typical rate are we talking about here?

DR. HELM-CLARK: The class -- Class VI, I can't -- I -- I don't have the rate, the pumping rates off, the top of my head. I would have to look at that up.

COMMISSIONER AMPOMAH: Now, you follow this industry for some time now. And even you reference DOE work here and there. How does DOE even classify a commercial CO2 project?

DR. HELM-CLARK: DOE doesn't classify.

COMMISSIONER AMPOMAH: So would you agree with me that DOE will see a project as commercial project if they can inject at least 50

million metric tons of CO2 for a period of at least 30 years? Will you dispute that?

DR. HELM-CLARK: Repeat the question, please.

COMMISSIONER AMPOMAH: You made reference to, let's say, DOE in your testimony about DOE looking for analogous and trying to build this type of characterization effort. Is that correct?

DR. HELM-CLARK: What the DOE was doing in the 1990s and the 2000s is that they were -- were directed that the -- national labs, certain national labs, not all of them, were directed to research the overall topic of carbon sequestration.

COMMISSIONER AMPOMAH: So since then, have you followed how DOE, at least in the business administration, put in an effort to really commercialize CO2 injection projects?

DR. HELM-CLARK: Yes. They -- they sponsored several, several, several projects. Wellington and ADM are included in them.

COMMISSIONER AMPOMAH: So with that, I'm telling you that the government sees the commercial CO2 injection project as being able to at least sequester 50 million metric tons of CO2 for a period of about 30 years. Will you agree with me on

that?

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: With that, I am telling you that with that kind of huge injection volume, your AOR is going to be more than even the 10 miles that you are proposing to the Commission.

DR. HELM-CLARK: As I said before, I have not seen any permits that have AORs that large.

COMMISSIONER AMPOMAH: You probably have to go search. So I'm trying to --

DR. HELM-CLARK: -- I will have to -- if -- I -- I'm not, you know, if you say that it's out there, and I haven't found it yet, then I haven't found it yet.

COMMISSIONER AMPOMAH: Okay. So for someone with experience in -- in this type of environment, I find it extremely difficult to believe that a 10-mile radius should be enacted in a rule. I mean, to me, it's too small.

And your concern -- the concerns that you are raising, what I'm saying is that, independent, there is a regional geology requirement. And then also there is a local geology requirement. So that satisfies more or less the concerns that you have. Will you agree with me on that?

DR. HELM-CLARK: Repeat the question, please.

THE HEARING EXAMINER: Would you slow down?

THE CHAIR: Yeah. Yeah, I'll also ask the commissioner to slow down for the rest of us on the platform.

COMMISSIONER AMPOMAH: Okay. It's a little bit -- okay. Okay. Thanks. Thanks for that. So what I'm saying is that the 10 miles that you want us to really put in the rule, I do have a little bit of concern with that.

Now, the concerns that you raised, I'm saying that the permit requires a regional geology, which would be more or less like a -- wide assessment of the regional geology.

So if there is any faults -- faults, any faults, any conduits that are within the regional spectrum, that needs to be captured as part of the original assessment. And then also there is the local assessment as well.

So I'm saying that your concerns that you have, it's more or less captured in the rule. And then also even it goes beyond, in most cases, the 10 miles that you are proposing. And I was asking if you

agree with me on that.

DR. HELM-CLARK: If you have an AOR that's truly that large, then having -- having -- then -- then adding an additional 10-mile site characterization requirement to search out undocumented faults would indeed be unnecessary.

COMMISSIONER AMPOMAH: Thank you. I appreciate that. So I'll run through quickly over the rules and some of the adjustments that you are requesting that I've not really touched on. I want to just touch on both -- some -- few -- some of them.

So I'm looking at page 6. And this one will be OCD's Exhibit 3. And in your case, it's going to be your Exhibit Number 1. So let me know when you are ready.

DR. HELM-CLARK: Okay. Exhibit Number 1, what page?

COMMISSIONER AMPOMAH: Page 6.

DR. HELM-CLARK: I'm there. I'm waiting.

COMMISSIONER AMPOMAH: Oh, okay. Thank you. So you are proposing at least some amendments to the rule that we're looking at. Now, so don't you believe that, I mean, at least the last paragraph that you highlighted, so to ensure all wells within the AOR

--area of review are identified, they will now -- test that and will take both a non-physical review. Can you explain to the Commission what you mean by non-physical review?

DR. HELM-CLARK: This is -- this is what I meant as -- as parallels to the phase 1, phase 2 investigation structure. It basically -- it -- I -- I'm recommending the moral equivalent of a phase 1 investigation to try to locate documentation of wells. It's purely a -- a -- it -- it -- it's -- it's purely a -- a document search and -- and an inquiry of people who may have knowledge about wells that may be in the ground that are undocumented.

COMMISSIONER AMPOMAH: But I thought you testified to the Commission that you do not have a fair idea as to the databases all in New Mexico data -- needs researched. Do you recall that testimony?

DR. HELM-CLARK: Could you repeat the question, please?

COMMISSIONER AMPOMAH: So in your testimony, or at least based on the discussions that we are having, you communicated to the Commission that you do not have a fair idea as to the databases that NMOCD may require and in order to look into, even for

the existing classes of wells?

DR. HELM-CLARK: I don't believe that that's what I said. I said that I was not deeply familiar with their database. When I say I'm not deeply familiar with the database, what I meant is that when you go into their database, different databases give you different arrays of information that you can query.

For example, when I go into New Mexico's database, I was actually able to get extremely detailed plugging records on -- on a lot of wells that have been -- that have been plugged, you know, since the 1970s.

Whereas if I go into, for example, Ohio's database, it's extremely difficult to get any plugging information or even to download any pressure reporting reports. I believe in New Mexico you can do so. But so the particulars, the loops and the jumps that you can make a database run through, that's what I'm referring to.

COMMISSIONER AMPOMAH: Yeah --

DR. HELM-CLARK: The data that you may get out of a particular database may not be complete. In Ohio, I would expect it not to be complete. In West Virginia, I would expect it not to be complete.

I'm not sure what kind of data exactly I'd be getting in -- in New Mexico.

For example, I don't know off the top of my head whether or not I can go into New Mexico's oil and gas database and start downloading LAS files to look at well logs. I know that in -- in West Virginia, I can do that. In Ohio, it's very difficult. So it just depends on where you are --

COMMISSIONER AMPOMAH: Exactly.

DR. HELM-CLARK: -- as to the capability of the database.

COMMISSIONER AMPOMAH: Exactly. So you are using Ohio and other places to more or less suggest some changes for New Mexico without actually looking deeper into how many databases do we have in New Mexico? Are they accurate or not? So I'm finding it difficult to justify this provision that you are recommending to the Commission.

DR. HELM-CLARK: I'm -- I'm a bit confused here because if I were putting together a permit, whether or not Ohio or whether or not any particular state's database is giving me all of the information I want is not as important as trying to be able to get the information.

I'm -- I'm, you know, the -- the

information you've got -- the -- the information you need to extract is the same regardless, based on the minimum federal standard. And whether or not your particular state's database can deliver all of that is -- is not germane to the rule. The rule says you've got to get this information however you get it.

COMMISSIONER AMPOMAH: Okay. I'll move on. So let's go to page 8. And I think we've talked about the 10-mile issues. And also, as I understand, you are not a lawyer, so I don't need to talk to you about the citing of the half mile away from schools and all of that. But I mean, it was your testimony.

Now, so Sheila, is it possible to bring up the suggested language that went through with OCD's witnesses yesterday? If you can pull that up on the screen so I can walk through that with Doctor? Okay. Yeah. So let's go to number 3. If you can scroll down number 3 and number 4, if possible for them to be -- okay.

BY COMMISSIONER AMPOMAH:

COMMISSIONER AMPOMAH: So, Doctor, I want you to -- so these are the suggested recommendation is that based on my review of the entire rules, I am putting across considering -- for the Commission's consideration.

So looking at number 3 and then number 4 on the screen and looking at what you are proposing on page 8, that would be E, section E. That is the area of review and corrective action. Would you agree with me on these suggested languages? If you could take some time to read through it? And then you can respond when you're ready.

DR. HELM-CLARK: Just numbers 3 and 4?

COMMISSIONER AMPOMAH: Yes. Number 3 and 4 at least for now, yes.

DR. HELM-CLARK: That's nice language. I like that.

COMMISSIONER AMPOMAH: So do you believe that if the Commission adopts what I'm showing you, the concerns that you have that you've raised under Section B will be more or less covered?

DR. HELM-CLARK: If you're referring to -- if Section B is referring to my suggestion for an executive summary, that would be correct.

COMMISSIONER AMPOMAH: Yeah. Okay. Okay -- yes.

DR. HELM-CLARK: If you -- if you use something like this instead of my suggestion, I'd be happy.

COMMISSIONER AMPOMAH: Okay. Thank

you.

DR. HELM-CLARK: I think this is perfectly accurate.

COMMISSIONER AMPOMAH: Thank you. Appreciate that. So let's go to page 9. Yeah, in page 9, I will not talk about the non-physical review and the physical review. I think we've gone through that. But I'm looking at C.

Now, the language that you are proposing, don't you believe that these are all -- this is a typical type of assessment that is actually done as part of the corrective action for UIC Class VI permit?

DR. HELM-CLARK: We're talking about C, determine which abandoned wells in the area of review, blah, blah, blah, blah?

COMMISSIONER AMPOMAH: Yes.

DR. HELM-CLARK: And the question is, is this not --

COMMISSIONER AMPOMAH: Yeah. Let me rephrase it and say that when I look at this, I do see typical Class VI permits more or less will cover this. So don't you believe that this will be much better to put in a guidance than in a rule?

DR. HELM-CLARK: Well, you know, that's

really up to you folks. I would like to actually see it in the rule because, you know, there -- the -- I -- I can -- I can see a scenario where somebody's just slacking together a tabulation of wells, and -- and they're unaware or -- or they're willfully ignorant of the -- the fact that well-plugging standards radically began to change in the 1950s.

That's why I suggested you go into the rule, and you have the capability to be more stringent if you choose. And that was my suggestion.

COMMISSIONER AMPOMAH: Yeah. And you mean -- so you suggested that -- so if I read the first line, you're saying, "Determine which abandoned wells in the area of review have been plugged," and then you put "not plugged." So would that also not be changing the intent of the original rule? Or does that at least supplement all the additional changes that you are making?

MR. PAVLIK: Sorry. If I can just interject briefly. I think that Dr. Helm-Clark could speak to the technical difference or lack thereof between determining whether a well has been plugged properly or not been plugged properly. But I don't think she can speak to the intent of the rule or any of the legal considerations of that. Thank you.

COMMISSIONER AMPOMAH: Thank you. I'll move on.

BY COMMISSIONER AMPOMAH:

COMMISSIONER AMPOMAH: So, Doctor, let's look at number 5, the number 5, the new number 5 that you've created, yeah. So as I read through that, my question to you is, does these wells need to be within the area of review, or it has to be outside or could be outside the area of review?

DR. HELM-CLARK: These -- this -- this is -- these -- this suggestion basically is covering wells outside of the area of review that would be within a half mile of a public facility or densely populated residential neighborhood that's within the 10 mile that I propose.

COMMISSIONER AMPOMAH: Okay. Now, so let me ask. We are trying to protect human health; right? So why should there -- why should it be across our board and just have to be for a particular area? I don't know if I'm -- I can repeat it if you want me to.

DR. HELM-CLARK: Well, when I -- when I -- was looking at incidences that have happened, that are happening, you know, that are happening outside the area of -- of an AOR, you know, basically

have traveled a fair distance from the injection well, my -- my thought was across the board, we want to protect public facilities like hospitals and schools.

And the way to do that is to look at, you know, is -- is the shutoff, the -- the second half of that pathway transmissive fault to wells? You know, if you build that buffer zone around those public facilities that's a half mile, then yes, that -- that should be across the board.

COMMISSIONER AMPOMAH: Okay. Now let's look at number 7. Now, the number 7, you are saying that the mandatory reevaluation of AOR shall occur upon any of the following. So you give pretty good points there. Let me ask, in the current rules that we're looking at, is that not -- would that not be at the discretion of the director to really -- or the director doesn't have the ability to more or less request these reevaluations?

DR. HELM-CLARK: The -- the rule as it's currently written is that the permittee is required to come up with their own list.

COMMISSIONER AMPOMAH: That the director will agree to?

DR. HELM-CLARK: And the -- yes . And the director must agree to it.

COMMISSIONER AMPOMAH: So the director do have the authority to either accept, modify, or change any of them?

DR. HELM-CLARK: Yes. As the rules permit.

COMMISSIONER AMPOMAH: Now, if I had to go through line by line on those, so if I look at B, for instance, so that would be on page 10, you're saying that a change in the carbon dioxide injection rate, volume, or pressure in the excess of the limits found in the injection permit or AOR. Now, so if I take the last portion, the pressure in excess of the limits, is that not in violation?

DR. HELM-CLARK: That is in violation.

COMMISSIONER AMPOMAH: And do you have some ideas with regards to how the Division -- I mean, the OCD deals with non-compliance?

DR. HELM-CLARK: I have no idea how OCD manages its enforcement of non-compliance.

COMMISSIONER AMPOMAH: But you and I agree that they are in violation; right?

DR. HELM-CLARK: I would consider that a violation.

COMMISSIONER AMPOMAH: And so if you've not really researched OCD rules to see how they deal

with non-compliance, I mean, how do we put that in the rule to make sure that --

DR. HELM-CLARK: This is --

COMMISSIONER AMPOMAH: Excuse me. So --

DR. HELM-CLARK: So this is to -- sorry.

COMMISSIONER AMPOMAH: Yeah. Excuse me. To make sure that, let's say, how they deal with their non-compliance is probably not sufficient. So then probably you can go on and support this rule.

DR. HELM-CLARK: I'm not sure what your -- what -- what you're asking here. The -- the -- whether or not this is a violation is -- is not germane as to whether or not it becomes a criteria or reevaluate the AOR. This is simply a list for conditions that trigger a reevaluation of the AOR.

COMMISSIONER AMPOMAH: Yeah. And I'm saying that once a party or, let's say, an operator violates their permit, there are other procedures that OCD normally goes through. So that is all I'm saying, that there would be -- or they're doing a crosscheck to make sure that they are in compliance with the other rules when, let's say, an operator become non-compliant.

DR. HELM-CLARK: I'm not sure if you are requiring a response here.

COMMISSIONER AMPOMAH: So let's look at even the D. Now for the C, even for the C, you're talking about change in composition of the injected or change in fluid production rates of the injection zone, overlying zone. The first question there, can you give out the threshold as to the compositional change?

DR. HELM-CLARK: Well, if the amount of moisture in your CO2 stream increases, you increase the corrosivity of the entire stream, and -- and that is going to change conditions in the well. And it's going to -- yeah, it's -- that -- that's going to change things.

And it's going to change how things react also when it -- when it hits the perforations and gets into the formation. So yeah, that's a condition where I believe you should be reevaluating the AOR.

COMMISSIONER AMPOMAH: Yeah. So don't you believe that that has to be in a guidance where there could be thresholds even negotiated as part of the permit conditions between the operator and the director?

DR. HELM-CLARK: Well, when I was looking at this in writing my commentary, I was -- I was looking at permits and not just the permits that that -- that I have reviewed. I was looking at other, you know, I looked at a wide -- and as many permits as I could probably find my hands on recently.

And -- and I would say there's probably six or seven permits I looked at and -- and put rules together. The -- I was basing it off of the remedial action plans that -- that permittees have been submitted.

And as I said prior and as I said before in -- in -- at the beginning of my testimony, if I see somebody doing something all the time, and the EPA wanting it and requiring, it looks like something that's being required. If it's the EPA is demanding it or Louisiana demanding it all of the time, that looks like a requirement to me.

If it's being required all the time, it should be in -- in the regulation. That's how I think. Whether or not you decide whether it belongs in the guidance is not up to me.

COMMISSIONER AMPOMAH: Thank you. Can we go to page 14?

DR. HELM-CLARK: Sweet.

COMMISSIONER AMPOMAH: Yeah. Okay. Yeah. So you are requesting some additional logs. Now, the sonic, you made a strong justification. Now, do you believe that if we are not obligating or mandating 3D seismic, do we need to mandate sonic?

DR. HELM-CLARK: Well, even if you're mandating the -- even if you're asking for 2D seismic, you should still have that sonic.

COMMISSIONER AMPOMAH: Okay. Now --

DR. HELM-CLARK: If you're doing any -- if you're doing any seismic, you really need that sonic. And, you know, and -- and to be -- and to be honest, you don't have to run that sonic log at the injection well. You can run that sonic log in your monitoring log because you just -- you need enough information to do the -- the time and the depth correlation. That's what you're really needing.

If you've already -- actually if there's a well in the neighborhood, and I'd say within two, three miles that's got a nice sonic log, go ahead and use it. Why -- why, you know, reinvent the wheel?

COMMISSIONER AMPOMAH: So then you will agree with me that any company that should 3D seismic, whether mandated or not mandated, will still go for sonic log; is that correct?

DR. HELM-CLARK: Yeah, I would say that's correct.

COMMISSIONER AMPOMAH: Okay. Now, let's look at the porosity logs. So you suggested porosity logs, and at the same time, you also suggested density logs. So can you explain the distinction between the two?

DR. HELM-CLARK: Well, neutron porosity is -- is -- you're -- you're shooting neutrons through a formation. And what you're doing is you're exciting -- you're exciting basically water -- sorry. I can't speak straight today. You're -- you're bombarding the formation with neutrons, and you're getting radiation back.

The amount of radiation you get back is actually in the neutron porosity log proportional to the amount of hydrogen that you've got within your area of interrogation site.

In -- the -- the assumption is in the neutron porosity log that you're, you know, that you're -- you -- that that hydrogen is living entirely in the pore spaces. And this gives you a porosity measurement, which then usually is corrected.

The density -- the density log, that is an active gamma tool. And you're radiating -- you're

radiating the borehole wall -- wall with -- with gamma rays. You're getting content radiation back. It is directly proportional to the density of your area of interrogation of the site. And that's the difference between the two logs.

COMMISSIONER AMPOMAH: Yeah. But here, I'm not seeing neutron porosity logs. I'm seeing porosity logs. So that is why I'm asking you that.

DR. HELM-CLARK: Usually in the -- in the -- in -- in well log analysis, when you say porosity log, it is assumed that you're talking about the neutron porosity log.

COMMISSIONER AMPOMAH: I thought that we do have at least two porosity logs, density and then the neutron. So --

DR. HELM-CLARK: Well, you can use a density log to get porosity, but it's not -- it's -- it's -- you can use -- you can use the density log to get a porosity measurement. It's not the same measurement as the neutron porosity log.

COMMISSIONER AMPOMAH: Now --

DR. HELM-CLARK: But you're making assumptions. You have to make assumptions and do a calculation to get that porosity measurement out of the active gamma log.

COMMISSIONER AMPOMAH: Thank you. So I will go to the last one here or the last sentence. So I'm close to the last sentence. So when you say that using best available technology, who determines this?

DR. HELM-CLARK: In -- in this case, it would have to be the Division reviewing the permit. You're the guys who were making the decision to grant the permit. You're the guys who made that decision.

COMMISSIONER AMPOMAH: Now --

DR. HELM-CLARK: I would hope that somebody -- I would hope that somebody came in and said, "Oh, we want to run a dipmeter log." I -- I would hope somebody would say: "Hey, you know, that's a 60-year-old log. Use something more modern."

COMMISSIONER AMPOMAH: Chair, do you want to say something?

THE CHAIR: May I? Yeah. It was just to follow-up on that. That language seems very reminiscent to a term used in the Clean Air Act. Are you envisioning the sort of same legal -- the same analysis when it comes to the best available control technology and air quality? And is that the basis, or am I misreading or reading in to your intent here?

DR. HELM-CLARK: Well, I want to -- I -- I wasn't -- I wasn't thinking specifically of

Clean Air Act. I was just thinking of -- of the best available technology as a term of art in general in the engineering field.

THE CHAIR: Got it. Okay. Perfect.

COMMISSIONER AMPOMAH: Thank you, Chair.

BY COMMISSIONER AMPOMAH:

COMMISSIONER AMPOMAH: So just to follow up on that, I thought as part of the testing, logging plan, and all of that, I thought operators will propose, and then the director will more or less have to sign off on those logging plans and then the testing plans. Is that not what is in the current rule?

DR. HELM-CLARK: The current rule? Yes. That's what is in the current rule.

COMMISSIONER AMPOMAH: So even without us using -- without us incorporating the using the best technology available, and you've also agreed that the director has to make that decision, then it sounds to me that the director will have the ability to sign off on the logs that the operator is proposing. Would you agree with me on that?

DR. HELM-CLARK: My purpose was to get the logs in there that I believe were missing.

Notably the logs that can nail the location of USDWs. And as the rules are currently written, those logs are missing. And that's why I'm suggesting they're included.

COMMISSIONER AMPOMAH: Now, if we go to page 15, right on the top, so you've highlighted -- and I'll give you a minute here. So you've highlighted, what, before the cement has cure. Is there not more, like, industry standard as to when -- yeah. Go ahead.

DR. HELM-CLARK: You know, they could -- I -- I -- at -- at this point, you know, I often see that one could drop into guidance, but it's not in the rule. And if you're just reading the rule, and you're not really familiar with cement, you know, with -- with logging to -- to test for the competency of -- of your cement bonding, you might not know this.

But the -- you want, you know, you -- you want to -- you want to set your cement. You want to run your log before it's cured because when cement sets, it's an exothermic reaction. If there are flaws -- if there are flaws in the cement as it sets up, and you've got microcracks and -- and faults that are forming in the cement as it sets, it's going to have a temperature peak in that temperature log

because of the exothermic reaction while it sets.

That's why you want to run it before it sets. If you're running it, you know, to -- to examine whether or not you've gotten, you know, a good cement line.

COMMISSIONER AMPOMAH: Thank you. So the second one, that would be C3, iii. Don't you believe that that description more or less belongs to a guidance than a rule?

DR. HELM-CLARK: I would prefer to see it in the rule to tell you the truth.

COMMISSIONER AMPOMAH: But don't you believe that is a best practice?

DR. HELM-CLARK: That's the way the log ought to be run. What I would -- what I consider -- what I would consider appropriate for guidance is how long you want the well to equilibrate. Because the requirements for equilibrating a well before running a temperature log vary by jurisdiction and by purpose.

COMMISSIONER AMPOMAH: Okay. Let me move on quickly here. Yeah. So let's go to page 17. Now, on page 17, you are requiring an actual type of tools. And in the -- my question is, should the rule not be more of what we are looking for? And then the operator will suggest how they want to get that

information for the director's review, other than we strictly, you know, showing the type of technology that needs to be used, knowing well that these technologies will be obsolete in ten years to come, specifically the repeated resistivity log and the --

DR. HELM-CLARK: No, I don't agree. I -- I don't agree with that. Twenty years ago -- 20 years ago, we couldn't do this kind of logging. Now, with the -- with the new resistivity through casing tools, we can't. And so we should, because the -- the peer review literature shows that it is a good way to detect changes in groundwater from infiltration by CO2.

COMMISSIONER AMPOMAH: Yeah. I agree with you. But what I was saying is that you agree with me that technology is going to evolve over time. So would this not necessarily be more suitable for a guidance than can be really put in the rule?

DR. HELM-CLARK: Well, as I said before, I -- I prefer to see things in the rule.

COMMISSIONER AMPOMAH: Let's go to page 18. So on top, right at 8, you are saying that the soil gas monitoring, that includes a minimum of one year of background sampling. Is there a literature that supports that if we do it six months, if we do it

two months, it's not going to be sufficient, and it has to be one year?

DR. HELM-CLARK: The -- the research that's come out of the University of Texas at Austin suggests one to three years, but one is a minimum. And I was relying very strongly on their research into CO2 gas fluxes in soil, specifically in the context of their -- they've been running -- they've been running research to see how good it is for actually detecting -- CO2 --

COMMISSIONER AMPOMAH: Thank you. Can we go to page 23? And I'm looking at O, emergency and remedial response. So you've highlighted what to be done when there is a new microseismic event. So my question is, did you reconcile this with a protocol that New Mexico OC already established whenever there is any microseismic events?

DR. HELM-CLARK: No, this was -- the -- the -- you're talking O. I did not address any -- I did not address seismicity. I was addressing catastrophic CO2 release accident.

COMMISSIONER AMPOMAH: Okay. So you're saying that this plan shall include procedures to temporarily cease injection and to inspect wells and well infrastructure --

DR. HELM-CLARK: Oh, I -- I'm sorry. I was -- I was looking at part 2, not part 1. I -- I apologize.

COMMISSIONER AMPOMAH: Okay. So can I -- do you want me to repeat the question one more time?

DR. HELM-CLARK: Please repeat the question. I thought we were in the paragraph below. My apologies.

COMMISSIONER AMPOMAH: No problem. So I'm asking, did you review the New Mexico OCD's protocol whenever there is any microseismic events happening at the injection site or production site? Do you reconcile --

DR. HELM-CLARK: At the time that I -- at -- at the time that I wrote this, I was not aware of OCD's protocol. Since I wrote this, I have become aware of OCD's protocol. And had I been aware of it, I might have changed this.

I actually like using the modified Mercalli scale because it -- it's -- it's an actual number of damage on the ground as opposed to a magnitude. It's as simple as that. It's a preference.

I -- I don't think OCD's size of the

protocol is unreasonable. Actually, I rather like it. And if you wanted to say, oh, yeah, let's defer to our already existing protocol, I certainly wouldn't argue with that. I didn't realize you had that when I wrote this.

COMMISSIONER AMPOMAH: Thank you. Now, so let's go to the paragraph 2 now. Let's go to the paragraph 2 now. So --

DR. HELM-CLARK: -- the one -- the one that I thought you were on.

COMMISSIONER AMPOMAH: Exactly. Exactly. So you're talking about re-mandating training and necessary equipment for local emergency responders shall be provided on annual basis unless a community request for it to be provided more frequent.

So my question to you is, how is that going to be coordinated when you have multiple operators operating in a particular setting?

DR. HELM-CLARK: Every single -- every single public -- every single police department and fire department is doing annual training already. It's a requirement either underneath -- it's a requirement either under OSHA 29 C.F.R. 1910.120, or it's a requirement under EPA 40 C.F.R. 311. The -- the statutes basically are identical.

It's just the EPA instituted it -- its own so that they could cover volunteer firemen. In that statute, you have -- you have to have a huge chunk of training upfront to -- to respond to hazardous materials emergencies. And you must every year retrain.

That's on top of the regular firefighting and -- and police annual training. So what you're doing in this -- but the section that I dropped in here is essentially what I use as a lesson plan. And I hand this to my fire department or my -- my hazmat crew or my police department and say, "Please include this in your annual hazardous materials refresher training."

And that should cover it because they're already training for these things every year anyway. Just drop it into what they're already doing. It'd probably be a 15-minute module. Take care of it. And then they're acquainted with the accident, and -- and they'll have the knowledge.

You know, what happened in Satartia -- Satartia, Mississippi, the -- the first responders had no idea what a CO2 large release accident looked like. When they approached the accident, they had no idea what they were looking at. They had no way to

evaluate it.

They -- and -- and I'm not even sure they were aware that they had a CO2 pipeline in the neighborhood when they were responding. You -- you have, you know, you basically, you've got to -- you've got to inform your -- your emergency first responders that these accidents can happen and then, you know, tell them it's there, give them materials, let them know they're training like usual. It -- it should be a no-brainer.

COMMISSIONER AMPOMAH: Yeah, it should not. But who is responsible for that?

DR. HELM-CLARK: I'm not sure -- So responsible for what? Who's responsible for -- every fire department, every police department, all first responders have to have this training by federal statute. This rule and the equivalent EPA Class VI rules say that -- that the operator or the owner will provide training to those local emergency response people. So you have --

COMMISSIONER AMPOMAH: Yeah. So I'm asking you --

DR. HELM-CLARK: -- operator responsible for providing the information to the first responders so that they can do the appropriate thing.

COMMISSIONER AMPOMAH: Exactly. So I'm asking you, in a particular area, you have multiple Class VI projects in that area. So I'm asking you, from what we have in the rule, how is that going to be coordinated and still be able to more or less meet this value?

DR. HELM-CLARK: Every owner and operator should be talking to their fire marshal and then their police department that they've got, you know, a Class VI project in the process and that these are the hazards that these projects can present to a community.

This actually happens all the time with almost every single industrial plant and -- and installation that I've run into. People are always talking to their fire marshal and say: "Hey, this is what we've got on site. These are our hazards."

COMMISSIONER AMPOMAH: Yeah. So some few additional questions for you. So it's not like you like the idea of third-party review; is that correct?

DR. HELM-CLARK: I like the what review?

COMMISSIONER AMPOMAH: The third party. Yeah. The third-party review on the applications.

Mostly departments that --

DR. HELM-CLARK: -- party review?

COMMISSIONER AMPOMAH: The permit application review. Do you support a third party review of, let's say, the models that would be submitted as part of the application? So I'm moving from the rule right now, and I'm asking you a different question.

DR. HELM-CLARK: Okay. Yeah. At what point during the review process?

COMMISSIONER AMPOMAH: So I'm asking you, are you in favor of, let's say, a third party reviewing the applications instead of, let's say, OCD reviewing the applications?

DR. HELM-CLARK: I believe there should be a public review of applications.

COMMISSIONER AMPOMAH: Public review of the application. At what point, considering confidential business information?

DR. HELM-CLARK: Are you asking me about who should be -- who should be allowed to view proprietary business information?

COMMISSIONER AMPOMAH: No. I think you directed the question though with the response. So I was asking you, are you in support of OCD using

independent third-party reviewers of the submitted applications?

DR. HELM-CLARK: Oh, to aid -- to aid OCD's own review of --

COMMISSIONER AMPOMAH: Exactly.

DR. HELM-CLARK: Yes.

COMMISSIONER AMPOMAH: Okay. Now, let me ask you. So in case there is, let's say, a conflict, disagreement between OCD's own internal review, EPA's, guidance or rule, and then the third-party reviewer, who makes the final decision?

DR. HELM-CLARK: It should be the Division. But, you know, that's -- that's a legal thing. That's up to you guys. If -- if --

COMMISSIONER AMPOMAH: Oh, please go ahead.

DR. HELM-CLARK: No, no, no, no. It would -- it was a tangential comment. Let's keep going.

COMMISSIONER AMPOMAH: Okay. Now, so you you've recommended several provisions that we went through as part of, let's say, the rule. You want us to implement this rule. Now, there are other states that do have primacy. Did you check to see if any of these primacy states incorporated any of these

provisions that you are suggesting to the Commission into their rule?

DR. HELM-CLARK: I'd have to look at my list.

COMMISSIONER AMPOMAH: Okay.

DR. HELM-CLARK: You know, I'm going to have to say right off the top of my head, I'd have to go back and look at all of the different rules. I know that there were some -- some significant deviations in -- in North Dakota's rules, but I'm going to say right -- right now, off the top of my head, I don't know.

COMMISSIONER AMPOMAH: Okay.

DR. HELM-CLARK: I'd have to go through --

COMMISSIONER AMPOMAH: Okay. Thank you. So my last question to you, so did you also have issues with OCD staffing levels?

DR. HELM-CLARK: No.

COMMISSIONER AMPOMAH: Okay. Then I'm going to end here. Thanks so much for your testimony, and I do appreciate that. Thank you.

THE HEARING EXAMINER: Thank you, Commissioner Ampomah.

DR. HELM-CLARK: Thank you.

THE HEARING EXAMINER: Commissioner Czoski, do you have questions of Dr. Helm-Clark?

COMMISSIONER CZOSKI: Yes, I do.

THE HEARING EXAMINER: Okay.

EXAMINATION

BY COMMISSIONER CZOSKI:

COMMISSIONER CZOSKI: Hello, Dr. Helm-Clark. Thank you for your time today. So I'm going to start off kind of going through your presentation and ask some questions built off that.

DR. HELM-CLARK: All righty.

COMMISSIONER CZOSKI: So I have a few questions about the executive summary. And when you say that applicant simply followed the EPA checklist, can you elaborate a little bit more on that, please?

DR. HELM-CLARK: Oh. No, I wish I could remember where this checklist comes from, but I -- I -- I've seen it in multiple applications. There's a checklist, and it's got -- it's a list of everything that the -- the EPA wants to see in a permit.

It may actually be based off of their forms that they like people to use, but it's -- it's the same list. I see it over and over again. And that's what I'm referring to.

And, I mean, basically, it's -- it's just a checklist. You know, we want to see, you know, we want to see your well logging. We want to see where you're going to collect for. We want to see, you know, if it's -- how you've done your -- your site characterization. It's basically just a list of requirements.

COMMISSIONER CZOSKI: Okay. Thank you. In your experience reviewing these Class VI permits, do applicants often need to go back and collect additional data in order to ensure that the permit can be approved?

DR. HELM-CLARK: I can't speak to that. I -- I -- I'm usually seeing the permit after the permit's been finalized and submitted. So if -- if a permittee has put a permit in, and they've got missing information, and -- and a -- a state or the EPA has said, "We want to see more information on this topic," that's completely okay.

COMMISSIONER CZOSKI: Okay. Thank you for that clarification. So I want to talk a little bit more about some of the well investigations. So would it surprise you to hear that there was recently a leak, a fluid leak, from a well in Southeastern New Mexico that was plugged sometime in the 1950s?

DR. HELM-CLARK: Would I be surprised if there was a leak out of a plugged well that was plugged in the 1950s? I wouldn't be surprised at all.

COMMISSIONER CZOSKI: Okay. Thank you. And if so, if you were looking at a permit, and there was -- let's say there was a well in your area of review similar to this, say, from the 1950s, and there's no other well plugging information of how it was plugged and where it was plugged, how would you deal with that concern when reviewing these permits?

DR. HELM-CLARK: I would target that well as being something that needed to be corrected.

COMMISSIONER CZOSKI: And how would you suggest that be corrected?

DR. HELM-CLARK: I would suggest the well be plugged.

COMMISSIONER CZOSKI: Is there any other log -- is there logging they could do to check the integrity of the well for permitting?

DR. HELM-CLARK: If it's an old well that's already been plugged, it -- it's going to have at -- at least, you know, it's going to -- it -- it's going to have a cement slug on the top, and who knows what's on the bottom. You -- you might have to actually drill out old drilling mud or whatever the

they stuff down the well to plug it in -- in order to plug, you know, that it -- it's -- it's not -- it's not a simple problem. There -- there's no -- there's no magic word here.

COMMISSIONER CZOSKI: Yeah. Thank you for that. So at what point in the permitting process, in your experience, would this need to occur?

DR. HELM-CLARK: You'd have to get all of these wells corrected. For the -- for the ones that you've identified for correction, they need to be fixed before you start again.

COMMISSIONER CZOSKI: Okay. And on your slide here, you said that there was contaminated -- there's contamination into a tributary. I was just wondering if you could go a little bit more into detail about that contamination.

DR. HELM-CLARK: Lake Veto didn't exist until, I believe, after World War II, when they filled it up. When they filled it up, they -- they used eminent domain to contaminate property -- property around the -- the lake that they formed.

Part of that -- part of that property that was taken by eminent domain was part of a farm belonging to a family that's owned that property for well over 100 years.

The -- in the 1930s, the farmer of that property, because it -- it was, you know, it was big -- big oil time in Appalachia, brought in -- brought in a drill rig and drilled -- and drilled, you know, a -- a series of wells on the farm, like everybody else was doing in the neighborhood.

I don't even know if any of those wells went into production. I believe they drilled four wells on that property. They -- they were all undocumented.

When -- when Redbird No. 4 went -- went live, and I believe it went live in -- I may be off by one or two years -- I believe it went live in 2017. In the next year, things started happening around that Class II well, one of which is gas wells completed in a production level, and I believe it was 2,000 feet higher than the injection level, started -- started getting destroyed by infiltration by -- by rock.

And at first, it was just a handful of wells and eventually became 28 wells. That -- the -- the disposition and the damages for those wells is -- is a court case that's currently going to the courts in Ohio.

The -- the well that was originally -- the -- the well that did the discharge of the

tributary is actually, when it was originally drilled, it was on dry land. When they filled the reservoir, it became a creek. So that abandoned well was actually in the bed of the creek.

And what was observed by people using the lake was -- was the contamination of the brine and -- and some -- and -- and petroleum products that were getting into this tributary and getting into the lake.

And that's how they actually discovered the -- the initial problems with that well or the releases from this abandoned, undocumented well. Would you like more details? There's -- there's actually -- there's actually two reports that are out on the Ohio DNR site that discuss this in great detail.

COMMISSIONER CZOSKI: Okay. Yeah. Thank you for elaborating on that. And so that well that was leaking inside of the lake, you said that there was no documentation of that and -- correct?

DR. HELM-CLARK: Yeah. There was no documentation of that in Ohio's oil and gas well database. They discovered that the family knew about it because when it started discharging -- I don't know if the DNR interviewed them or if they came up and

said, "Oh yeah, our grandfather drilled that well." But it was discovered that the land -- the original landowners had the knowledge that those wells had been drilled.

COMMISSIONER CZOSKI: Okay. Thank you. And do you have any idea how many undocumented wells could be in an area that has oil and gas development?

DR. HELM-CLARK: Your guess is as good as mine.

COMMISSIONER CZOSKI: Yeah.

DR. HELM-CLARK: Yeah. I -- I suspect that in the developed fields, we actually have a better idea, especially the ones that are still producing, even old fields that have not been -- that have not been subject to production for many years or places where people have just wildcatted, those are the ones I really worry about.

And of course, these really, really old wells that people drilled, like, in the '20s and '30s and never documented, they're -- they're a big problem.

COMMISSIONER CZOSKI: Yeah. U.S. has a long history of oil and gas development.

DR. HELM-CLARK: There'd have to be tens of thousands. I mean, I -- I forget what the

national estimate is, but it's very sobering. In a way, if you think about it, we don't have a -- with Class VI, we don't have an AOR problem or a fault problem. What we really have is an abandoned well problem.

COMMISSIONER CZOSKI: Thank you. So there was some discussion that AORs could be larger than 10 miles. And I was wondering if instead of maybe having a fixed radius, if there'd be some kind of additional buffer that you could suggest or in your expertise, so if it was -- if there was an AOR that was 10 miles, you know, how -- should there be an extra certain buffer put on whatever area the AOR is so it's not a complete fixed distance?

DR. HELM-CLARK: I don't know. I got -- I -- I -- I I'd really have to mull that one over. You know, the -- the largest AOR that I know of is 2 miles. And that's ADM's. And ADM has been running, what, since 2007. They ran, I believe, in 2007 and then 2014.

Then they took a -- then they took a break, and they -- and they started injecting again in 2017. I think in the United States, they're the ones who have injected the most CO2. And they're just 2 miles.

I think Sleipner is about four. But Sleipner is -- is injecting into a signal -- that -- that's Sleipner in Norway, if you're not familiar with the project. I believe Sleipner is around four. I think that's the largest one I've heard about it.

COMMISSIONER CZOSKI: Okay. Yeah. Thank you.

DR. HELM-CLARK: If it was 10 miles, I -- I just have -- if it was really as big as 10 miles, geez. I -- I think -- I think I would -- I -- I think I would -- I think I'd recommend that you look at schools and public buildings 10 miles from the periphery of -- of that AOR. It seems extreme, though. I mean, that -- that -- that's a huge area.

COMMISSIONER CZOSKI: Okay. Yeah. Thank you for that. So in the rule as it's written now, it mentions that only faults that could transect the confining zone need to be included in the AOR. And I was wondering if you agree with that or if you think that all faults dependent on where they are in relation to the injunction and confinement zone should be mapped?

DR. HELM-CLARK: I think all faults should be mapped.

COMMISSIONER CZOSKI: Okay. Thank you.

And, I guess, why do you think that?

DR. HELM-CLARK: Because I think we're missing details. We, you know, I -- as I said before, we -- we only have limited ways to map the subsurface. And even -- even if you do your single best job of trying to map all the faults in the subsurface, you could have missed something.

And -- and very often, especially with the induced seismicity, you're going down instead of up. And -- and you're exploiting faults in the crystalline basement that then communicate to, you know, could -- can communicate to other faults or to wells.

So I -- I think limiting it to the -- to the -- the confining zones and the injection zone is too narrow. I want to know where every single fault was because one of those faults actually could end up being a transmissive fault that leads to a discharge outside of the AOR.

COMMISSIONER CZOSKI: Okay. Thank you for sharing that. And have you ever in your experience reviewing Class VI permits, have you ever looked at one that didn't have 3D seismic?

DR. HELM-CLARK: Yes. And I screamed "Bloody hell" because I didn't like it.

COMMISSIONER CZOSKI: How did they --

DR. HELM-CLARK: That -- that was -- the last -- permit and -- and -- oh, don't get me started.

COMMISSIONER CZOSKI: How did they support that there were no faults in the area if they didn't have any mapping?

DR. HELM-CLARK: Well, maybe I shouldn't say they didn't have any mapping. What that permit had was pages and pages and pages of seismic sections that were totally blacked out.

They showed -- they showed three seismic sections to the west of the proposed injection site where there were no other wells, no well logs, no core, no nothing, just three 2D seismic lines. And they made their case that they, you know, had an area that was sufficiently unfaulted, that it wasn't a problem.

We screamed "bloody hell" in that permit review. I -- I think having three 2D seismic lines on the entire west side of an AOR is utterly inadequate. I called it a data desert. I don't -- I didn't think their permit was justifiable.

Oh, their stratigraphic well was 6 miles away from their injection well in -- in deltaic

in, you know, in a deltaic progressive environment. And -- and you know how quickly things can -- can shift laterally in those kinds of environment. Yet there stratigraphic well was 6 miles by any other direction to the east. I just -- oh, don't get me started. I'll stop.

COMMISSIONER CZOSKI: Thank you for sharing your experience with that. So do you think that 3D seismic should be required? And I know you went over some examples where that might not be the best tool, but --

DR. HELM-CLARK: I'm in favor of any geophysical method that can give you a really great picture. Usually that's 3D seismic. But as I said, if -- if we're getting into the Rio Grande Rift here, and we're looking at, you know, and -- and we're looking at trying to do seismic through those -- layers of basalt, you've got a problem.

COMMISSIONER CZOSKI: So do you think such, like, gravity surveys could maybe be used to help map structures?

DR. HELM-CLARK: Well, gravity -- gravity is kind of coarse, especially if you're trying to see details that are very deep. Gravity -- gravity isn't going to help you that much.

Neither is, you know, really, seismic is the go-to thing. And -- and if you can't do 3D seismic or you can't collect the five -- five billion 2D seismic lines, and then, you know, you're -- you're looking at going to a, well, ambient, you know, ambient noise tomography seismic methods instead.

You've got to be using some kind of seismic method. There's really no other way to find faults besides pincushioning the ground with a billion holes and -- and making a, you know, detailed stratigraphic section. You know, just -- seismic is the name of the game.

COMMISSIONER CZOSKI: So I have more questions about ambient noise tomography, but we can wait till tomorrow, you know. We you need to break soon, so --

DR. HELM-CLARK: Oh, wow. It's late. Sorry. Didn't mean to be -- didn't mean to be so long on the tooth in talking.

COMMISSIONER CZOSKI: No, I appreciate you sharing your experiences.

DR. HELM-CLARK: Okay.

THE HEARING EXAMINER: All right. Let's break for the afternoon. We'll resume at nine with public comment and then return to Dr.

Helm-Clark's questioning. Thank you.

MR. TUCKER: Madam Hearing Officer?

THE HEARING EXAMINER: Yes.

MR. TUCKER: Before we break, could we just discuss scheduling tomorrow real briefly?

THE HEARING EXAMINER: Yes. Go ahead.

MR. TUCKER: So discussing scheduling tomorrow with the other parties in the room, Oxy's witness, Caroline Wachtman, has traveled to Santa Fe from out of state to provide testimony in person.

We'd like to request a slight change to the order of presentation to allow Ms. Wachtman to testify tomorrow so she doesn't have to extend her travel or book a second flight.

I've spoken with the parties in the room, and they graciously agreed to change the order of presentation -- put the parties on the platform, so we need to give them a chance to weigh in.

But specifically, we'd like to have WELC's witness, Peter Morgan, go first as scheduled, and then have Oxy's panel go next, and then take up WELC's witness, Dr. Harvey, afterwards, if the hearing officer and Commission are amenable to that.

THE HEARING EXAMINER: All right. Let me pause for a moment in the event there's anyone on

the platform with an observation about that.

MR. PAVLIK: I think that's fine with us. As long as Dr. Helm-Clark can finish in the morning, that sounds great.

THE HEARING EXAMINER: All right. Anything else? All right.

Well, thank you very much, Mr. Tucker and Ms. O'Grady. We will proceed with the plan you described.

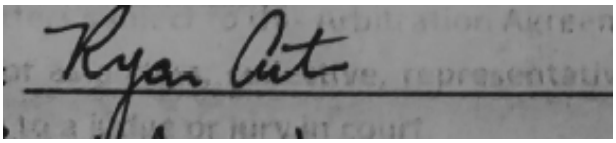
MR. TUCKER: Thank you very much.

THE HEARING EXAMINER: Thank you.

(Whereupon, at 2:49 p.m., the proceeding was concluded.)

CERTIFICATE

I, RYAN AUTEN, the officer before whom the foregoing proceedings were taken, do hereby certify that any witness(es) in the foregoing proceedings, prior to testifying, were duly sworn; that the proceedings were recorded by me and thereafter reduced to typewriting by a qualified transcriptionist; that said digital audio recording of said proceedings are a true and accurate record to the best of my knowledge, skills, and ability; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this was taken; and, further, that I am not a relative or employee of any counsel or attorney employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.



RYAN AUTEN
Notary Public in and for the
State of New Mexico

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KATHLEEN ALCORN

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