

OCD Exhibit 22

**STATE OF NEW MEXICO
NEW MEXICO OIL CONSERVATION DIVISION**

**APPLICATION OF OIL CONSERVATION DIVISION
TO ADOPT 19.15.41, 19.15.42, AND 19.15.43 NMAC**

No. 25875

**REBUTTAL TESTIMONY OF DR. GREGORY SCHNAAR
ON BEHALF OF THE OIL CONSERVATION DIVISION**

JULY 13, 2026

Q. DID YOU PROVIDE DIRECT WRITTEN TESTIMONY IN THIS MATTER AND HAVE YOU PROVIDED A COPY OF YOUR RESUME/CV AS AN EXHIBIT?

A. Yes, my direct written testimony was submitted as OCD Exhibit 6 and my resume summarizing my qualifications and experience was provided as OCD Exhibit 7.

Q. HAVE YOU REVIEWED THE DIRECT WRITTEN TESTIMONY AND ASSOCIATED EXHIBITS OF THE CENTER FOR BIOLOGICAL DIVERSITY (“CBD”) AND OXY USA INC. (“OXY”) TO PREPARE THIS WRITTEN REBUTTAL TESTIMONY?

A. Yes.

Q. HAVE YOU REVIEWED THE DIRECT WRITTEN TESTIMONY AND ASSOCIATED EXHIBITS FOR DINE C.A.R.E., EARTHWORKS, SAN JUAN CITIZENS ALLIANCE, SIERRA CLUB RIO GRANDE CHAPTER, TO NIZHONI ANI AND WESTERN ENVIRONMENTAL LAW CENTER’S (COLLECTIVELY CONSERVATION GROUPS) TO PREPARE THIS WRITTEN REBUTTAL TESTIMONY?

A. Yes.

Center for Biological Diversity Rebuttal

Q. CBD PROPOSES A CHANGE TO THE MINIMUM CRITERIA FOR SITING, PROPOSING A 10-MILE RADIUS FOR SITE CHARACTERIZATION.¹ WHAT IS YOUR RESPONSE?

A. I do not agree that a fixed 10-mile radius should be established as the minimum area for site characterization. The U.S. Environmental Protection Agency (EPA) Class VI framework adopted by New Mexico Oil Conservation Division (OCD) was intentionally designed to use a site-specific approach rather than an arbitrary distance criterion.

EPA's Class VI Well Site Characterization Guidance explains that site characterization is conducted to develop the geologic conceptual model and provide the information necessary to evaluate storage capacity, confinement, and potential risks to underground sources of drinking water (USDWs).² That information is then used in computational modeling to delineate the Area of Review (AoR)—the area where USDWs may be endangered by injection activities. The guidance states that the AoR is delineated using computational modeling that accounts for the physical and chemical properties of the injected CO₂ stream, displaced fluids, and site-specific geologic and operational conditions.³

As a result, the Class VI program does not assume that risks extend a predetermined distance from the injection well. Instead, the extent of the area requiring detailed evaluation is determined by the projected migration of the CO₂ plume and pressure front based on

¹ CBD Exhibit 1 at 8

² OCD Exhibit 26

³ *Id.*

site-specific modeling. EPA guidance emphasizes that site characterization data are collected to build the conceptual model that supports AoR modeling and risk assessment, and that AoR delineation is a fundamental component of the Class VI permitting process.

Accordingly, I believe EPA's approach is more scientifically defensible. The focus of site characterization should be on collecting the information necessary to develop a robust geologic conceptual model and delineate the AoR through computational modeling. The area warranting the greatest scrutiny is the area defined by the modeled plume and pressure front and the associated risk to USDWs—not an arbitrary 10-mile radius.

Q. CBD PROPOSES CHANGES TO THE AOR REQUIREMENTS, INCLUDING REQUIRING A SHORT SUMMARY OF THE REASONS FOR SELECTING THE AOR DELINEATION METHODOLOGY.⁴ WHAT IS YOUR RESPONSE TO THIS PROPOSED CHANGE AND ITS CONSISTENCY WITH THE CLASS VI FRAMEWORK FOR COMPUTATIONAL MODELING AND RISK-BASED AOR DELINEATION?

A. I agree that applicants should provide a clear explanation of the AoR delineation methodology and the basis for selecting that methodology. This information is important for permit reviewers to evaluate whether the computational modeling appropriately characterizes the projected extent of the CO₂ plume and pressure front and is consistent with the Class VI framework for risk-based AoR delineation. EPA's *AoR and Corrective Action Guidance* recommends that applicants provide sufficient information regarding the

⁴ CBD Exhibit 1 at 8

conceptual model, modeling approach, assumptions, and input parameters to support regulatory review.⁵

However, I do not believe this level of specificity is appropriate for regulatory text. While the proposed requirement may be useful during permit review, it is better addressed through guidance and application instructions rather than codified in regulation. OCD intends to rely on EPA's Class VI guidance, which already recommends the information regulators should evaluate for AoR delineation and modeling results.⁶

Overly prescriptive regulatory language can reduce regulatory flexibility and create unnecessary costs without improving protection of USDWs. Once detailed procedural requirements are incorporated into regulation, regulators are required to apply them as written, even where site-specific circumstances may warrant a different but equally protective approach. This can shift the focus from achieving the regulatory objective to satisfying procedural requirements. Performance-based regulations, supplemented by guidance, allow regulators to obtain the information needed for a rigorous technical review while retaining the flexibility necessary to address differences in geology, project design, and evolving technical practices.

Q. CBD PROPOSES REVISIONS TO THE CORRECTIVE ACTION REQUIREMENTS THAT WOULD REQUIRE AN INITIAL NON-PHYSICAL

⁵ OCD Exhibit 27

⁶ *Id.*

REVIEW OF HISTORICAL, REGULATORY, AND LAND-USE RECORDS AND INTERVIEWS WITH KNOWLEDGEABLE PERSONNEL TO IDENTIFY WELLS AND OTHER POTENTIAL CONDUITS WITHIN THE AOR, WITH PHYSICAL INVESTIGATIONS REQUIRED WHERE THE RECORDS REVIEW INDICATES THE POSSIBLE PRESENCE OF UNIDENTIFIED WELLS.⁷ WHAT IS YOUR RESPONSE?

- A. I generally agree that the approach proposed by CBD is reasonable and consistent with common practices used to identify wells and other potential conduits within the AoR. An initial review of available historical, regulatory, land-use, and other records can be an effective means of identifying known wells and assessing where additional investigation may be warranted. Likewise, where records reviews indicate the possible presence of unidentified wells or other potential pathways for fluid movement, targeted field investigations may be appropriate to confirm their existence and evaluate potential risks to USDWs. This general approach is consistent with EPA's *AoR Evaluation and Corrective Action Guidance*, which contemplates the use of multiple information sources to identify wells and potential conduits that may require corrective action.⁸

However, I do not believe the proposed language should be incorporated into the regulations as written because it is overly prescriptive and addresses implementation details that are more appropriately covered through guidance and project specific OCD application review. The EPA's *AoR Evaluation and Corrective Action Guidance* already provides

⁷ CBD Exhibit 1 at 9

⁸ OCD Exhibit 27

detailed recommendations regarding well searches, records reviews, field investigations, and the evaluation of potential conduits within the AoR.⁹ OCD intends to rely on this guidance, together with its own experience conducting and reviewing well searches, when evaluating permit applications and corrective action plans.

Q. CBD PROPOSES SPECIFIC CRITERIA FOR A MANDATORY REEVALUATION OF THE AOR.¹⁰ WHAT IS YOUR RESPONSE?

A. I do not agree that this level of specificity should be incorporated into the regulatory text. While I agree that periodic reevaluation of the AoR is an important component of the Class VI program, the proposed criteria are overly prescriptive and do not adequately account for the project-specific nature of AoR modeling and corrective action evaluations.

A particular concern is that the proposed CBD language would require reevaluation whenever there is a "change in the carbon dioxide injection rate" or composition, without defining what constitutes a material or meaningful change. As written, the language could be interpreted to require reevaluation for minor operational adjustments that have no meaningful effect on plume migration, pressure propagation, or risk to USDWs. Such determinations are inherently site-specific and depend on factors including reservoir characteristics, project design, injection history, and the results of ongoing monitoring. These issues cannot be effectively addressed through a one-size-fits-all regulatory trigger.

⁹ *Id.*

¹⁰ CBD Exhibit 1 at 9-10

For this reason, I believe the specific criteria and thresholds for AoR reevaluation are better addressed through guidance and permit conditions rather than regulation. Consistent with the EPA Class VI framework, the appropriate reevaluation criteria will vary among projects and will be established through the applicant's AoR and Corrective Action Plan, which will be reviewed and approved by OCD as part of the permitting process. This approach preserves the flexibility needed to account for project-specific conditions while ensuring that AoR reevaluations occur when warranted to protect USDWs.

Q. CBD PROPOSES A CHANGE TO STATE “NO OPERATOR SHALL USE INTERFERENCE TESTS OR ANY OTHER INJECTIVITY TEST THAT REQUIRES MORE THAN ONE BOREHOLE TO PENETRATE THE INJECTION ZONE.”¹¹ WHAT IS YOUR RESPONSE?

A. I do not support this proposed change. CBD’s rationale is based on the assertion that a Class VI injection well should be the only well penetrating the injection zone within the AoR and that interference testing creates an unnecessary leakage pathway. In her testimony, Dr. Helm-Clark argues that interference tests should be prohibited because they require two neighboring wells to penetrate the injection zone.¹²

However, that premise is inconsistent with the EPA Class VI regulatory framework. EPA’s Class VI Rule requires the use of direct methods for tracking the presence or absence of elevated pressure (i.e., the pressure front) within the injection zone [40 CFR 146.90(g)(1)],

¹¹ *Id.* at 15

¹² CBD Exhibit 3 at 96

which will commonly be achieved through injection-zone monitoring wells. EPA's Class VI regulations and *Testing and Monitoring Guidance* recognize that monitoring wells may be installed where necessary to evaluate subsurface conditions, verify model predictions, and monitor injection-zone performance.¹³ The Class VI program does not prohibit additional boreholes penetrating the injection zone; rather, it requires that such wells be properly constructed, monitored, and managed to protect USDWs. Accordingly, the existence of more than one borehole penetrating the injection zone—including multiple injection wells or injection-zone monitoring wells—is not inconsistent with the Class VI framework.

More fundamentally, the proposed language is overly prescriptive and would prohibit an entire category of testing without regard to project-specific conditions, technical objectives, or advances in monitoring technology. Whether interference testing or other injectivity tests are appropriate should be evaluated on a case-by-case basis by OCD through permit review and consideration of the applicant's testing, monitoring, and AoR analyses. A blanket prohibition is not necessary to protect USDWs and could unnecessarily limit the ability of operators and regulators to obtain useful reservoir characterization and performance data.

As with several other CBD proposals, this issue is more appropriately addressed through project-specific technical evaluation rather than prescriptive regulatory language.

¹³ OCD Exhibit 27 and 28

Q. CBD PROPOSES THAT A MANDATORY ONE YEAR OF BACKGROUND SOIL GAS MONITORING BE REQUIRED INCLUDING ISOTOPIC MONITORING.¹⁴. WHAT IS YOUR RESPONSE?

A. I agree that establishing baseline soil gas conditions can be a useful component of a monitoring program and that isotopic analyses may provide valuable information in certain circumstances. However, I do not support a regulatory requirement mandating one year of background soil gas monitoring, including isotopic monitoring, for all projects.

The proposed requirement by CBD is overly prescriptive and does not account for differences among projects, site conditions, monitoring objectives, or risk profiles. Requiring a full year of baseline monitoring before permit issuance or project implementation could add significant cost and potentially delay project development by a year, even where existing data, site conditions, or alternative approaches provide sufficient information to establish background conditions.

In addition, a mandatory one-year isotopic monitoring program may not be necessary for all projects. Alternative approaches may be equally effective depending on site-specific conditions. For example, soil gas data collected within the AoR can be compared to data collected outside the AoR to establish background conditions and identify anomalies. Similarly, isotopic analyses may be most useful as a targeted investigation tool when monitoring results indicate a potential leak or unexpected soil gas conditions. Operators may also use gas-ratio monitoring, such as carbon dioxide-to-methane ratios, as an

¹⁴ *Id.* at 18

indicator of potential CO₂ migration either in place of, or in conjunction with, isotopic techniques.

The proposed requirement could also unintentionally limit the use of certain soil gas monitoring technologies. For example, commonly used flux-chamber methods are designed to measure surface CO₂ flux and may not readily support the collection of isotopic samples. Requiring isotopic monitoring in all cases could therefore constrain the selection of monitoring methods without a clear technical justification.

As with several other CBD proposals, this issue is better addressed through project-specific monitoring plans reviewed and approved by OCD rather than through prescriptive regulatory requirements.

Conservation Groups Rebuttal

Q. THE CONSERVATION GROUPS PROPOSE A CHANGE TO THE DEFINITION OF AOR, REMOVING REFERENCE TO AREA PERMITS.¹⁵ WHAT IS YOUR RESPONSE?

A. I agree that the Class VI AoR definition at proposed section 19.15.41.7.A.(4) and proposed section 19.15.42.7.A.(3) should be revised to be consistent with the definition at 19.15.43.9.B.(1): “Area of Review” means the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity. The Area of Review is delineated using computational modeling that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and displaced fluids,

¹⁵ Conservation Group Exhibit 1-A at 1; Exhibit 1-B at 1

and is based on available site characterization, monitoring, and operational data as set forth in Subsection I of 19.15.43.9.

Q. THE CONSERVATION GROUPS PROPOSE TO REQUIRE THIRD-PARTY VERIFICATION OF MODELING, INCLUDING AS PART OF THE PUBLIC NOTICE OF PERMIT ACTIONS.¹⁶ WHAT IS YOUR RESPONSE?

A. I do not support the proposed requirement for third-party verification of modeling results. The OCD Director and technical staff are responsible for reviewing permit applications, including all modeling inputs, assumptions, methodologies, and results submitted by applicants. Evaluating the adequacy of technical analyses is a core regulatory function, and OCD possesses the expertise necessary to conduct those reviews. Where additional specialized expertise is warranted, OCD already has the ability to retain or consult independent technical experts to assist in evaluating complex modeling issues.

Requiring third-party verification for all projects would add significant cost and administrative burden without a corresponding increase in protection of USDWs. It would also create uncertainty regarding the qualifications, independence, and scope of responsibility of the third-party reviewer, potentially leading to a duplicative review processes. Ultimately, the responsibility for determining whether a permit application satisfies regulatory requirements should remain with OCD.

¹⁶ Conservation Group Exhibit 1-A at 9

Q. THE CONSERVATION GROUPS PROPOSE A CHANGE TO TRANSITIONING FROM CLASS II TO CLASS VI WELLS AT 19.15.42.8.F(1) THAT WOULD REMOVE THE EXISTING STANDARD ALLOWING FOR THE DIRECTOR TO DETERMINE WHETHER CO₂ INJECTION INTO AN OIL AND GAS RESERVOIR PRESENTS AN INCREASED RISK TO USDWs COMPARED TO CLASS II OPERATIONS BEFORE REQUIRING A CLASS VI PERMIT.¹⁷ WHAT IS YOUR RESPONSE?

A. I do not support this proposed change. The existing federal framework is appropriate because it preserves the risk-based evaluation established by EPA for determining when a Class II operation should transition to a Class VI geologic sequestration permit. The current regulatory language at 40 CFR 144.19 recognizes that not all CO₂ injection into oil and gas reservoirs warrants Class VI regulation. Rather, a Class VI permit is required when there is an increased risk to USDWs compared to Class II operations, allowing the Director to evaluate project-specific conditions and determine whether transition is necessary.

EPA guidance specifically emphasizes that geologic storage of CO₂ can continue to occur under the Class II program, that the use of anthropogenic CO₂ in Class II operations does not automatically require a Class VI permit, and that Class II projects focused on oil and gas production should continue to be managed under the Class II program.¹⁸ EPA further explains that the key factor in determining whether a transition may be necessary is whether

¹⁷ Exhibit 1-B at 17

¹⁸ OCD Exhibit 29

there is an increased risk to USDWs associated with significant CO₂ storage that cannot be adequately managed using the regulatory tools available under the Class II program.¹⁹

By removing the existing standard and replacing it with a categorical requirement, the proposed amendment would eliminate the flexibility intentionally built into the federal framework and could require Class VI permitting even where USDW risks remain adequately managed under the Class II program. OCD should retain the authority and discretion to evaluate the facts of individual projects and determine whether a Class VI permit is warranted based on site-specific risks and operating conditions. Consistent with EPA's guidance, the current framework appropriately balances protection of USDWs with the need for a technically sound, risk-based regulatory approach.

Q. THE CONSERVATION GROUPS PROPOSE A CHANGE TO TRANSITIONING FROM CLASS II TO CLASS VI WELLS REGARDING AN ADDITION FOR THE DIRECTOR TO CONSIDER THE INTEGRITY OF THE CAPROCK SEAL FOR LONG-TERM CONTAINMENT.²⁰ WHAT IS YOUR RESPONSE?

A. I agree with the recommended addition at 19.15.42.8.F.(2). Long-term containment of injected CO₂ depends on the ability of the confining system to effectively prevent upward migration of fluids and pressure, making long-term caprock integrity a key factor in evaluating the potential risk to USDWs. Adding explicit consideration of caprock integrity

¹⁹ *Id.*

²⁰ Exhibit 1-B at 18

is consistent with the risk-based framework for evaluating the transition from Class II to Class VI.

Q. THE CONSERVATION GROUPS PROPOSE TWO NEW DEFINITIONS: “INTENSIVE CORRECTIVE ACTION AREA” AND “PLUME STABILIZATION.”²¹ WHAT IS YOUR RESPONSE?

A. I do not agree with either of these proposed definitions. While the concepts of an “Intensive Corrective Action Area” and “Plume Stabilization” may have relevance in certain technical or project-specific contexts, I do not believe they are necessary additions to the regulations.

The existing EPA Class VI framework already contains well-established requirements for AoR evaluation, corrective action, monitoring, site closure, and post-injection site care (PISC). These requirements are performance-based and allow regulators to evaluate site-specific conditions using project data, monitoring results, and modeling analyses. Introducing new regulatory definitions risks creating ambiguity regarding how these terms relate to existing Class VI requirements and whether they establish new regulatory thresholds, obligations, or decision criteria.

Q. THE CONSERVATION GROUPS PROPOSE A CHANGE TO THE REQUIRED CLASS VI PERMIT INFORMATION REQUIRING FAULT LEAKAGE AND

²¹ Exhibit 1-C at 31

INDUCED SEISMICITY ASSESSMENT UNDER ANTICIPATED CHANGES IN PRESSURE ASSOCIATED WITH INJECTION.²² WHAT IS YOUR RESPONSE?

- A. I do not support this proposed change because it is unnecessary. The existing proposed rule already requires characterization of known or suspected faults and fractures as part of site characterization and AoR modeling that will consider project-specific pressure.

Q. THE CONSERVATION GROUPS PROPOSE MULTIPLE CHANGES TO THE AOR MODELING INCLUDING REQUIRING MODELING BE CONDUCTED BY A “QUALIFIED PROFESSIONAL EXPERT”, USING “PEER-REVIEWED OR COMMERCIALY-AVAILABLE” CODES, SPECIFIC PARAMETER SENSITIVITY ANALYSES, REACTIVE TRANSPORT MODELING, 3D SEISMIC CHARACTERIZATION, AND CONSIDERATION OF OTHER NEARBY INJECTION PROJECTS.²³ WHAT IS YOUR RESPONSE?

- A. I do not support these proposed changes. While several of the concepts identified by the Conservation Groups may be appropriate considerations, the proposed requirements are overly prescriptive and attempt to codify detailed technical methodologies that are better addressed through permit review, guidance, and project-specific evaluation rather than regulation.

The EPA Class VI program is intentionally performance-based. The regulations require applicants to demonstrate that the AoR has been appropriately delineated and that risks to

²² *Id.* at 32

²³ *Id.* at 34-35

USDWs are adequately evaluated and managed. The specific tools, datasets, analyses, and modeling approaches necessary to achieve those objectives will vary considerably based on geology, reservoir characteristics, project size, data availability, and site-specific risks.

For example, requiring reactive transport modeling for all projects is neither practical nor necessary. Reactive transport modeling at the reservoir scale is computationally intensive, requires substantial assumptions regarding geochemical reaction kinetics, and often introduces significant uncertainty. Equilibrium geochemical modeling can provide sufficient information regarding anticipated geochemical conditions while avoiding the complexity and uncertainty associated with full reactive transport simulations. The appropriate level of geochemical analysis should be determined based on project-specific circumstances rather than mandated by regulation.

Similarly, requirements for specific sensitivity analyses, mandatory 3D seismic characterization, and use of particular software classifications imposes procedural requirements without recognizing that the appropriate technical approach will vary among projects. In some cases, these analyses may be necessary and appropriate; in others, they may be infeasible or provide little additional value while significantly increasing project costs and permitting timelines.

The requirement for modeling to be conducted by a “qualified professional expert” is vague. The proposed language does not establish what qualifications, credentials, experience, certifications, or areas of expertise would be necessary to satisfy this

requirement. As a result, it provides little practical guidance to applicants or regulators and could create uncertainty and inconsistency in implementation. Different stakeholders may reasonably interpret the term differently, leading to disputes over whether a particular individual is qualified regardless of the technical quality of the work performed.

Consistent with the EPA Class VI framework, the regulations should establish the performance objectives for AoR delineation and risk evaluation, while allowing OCD to determine, on a project-specific basis, what modeling approaches, characterization methods, sensitivity analyses, and supporting information are necessary to demonstrate protection of USDWs. For these reasons, I do not support incorporating these detailed technical requirements into the regulations.

Q. SIMILAR TO CBD, THE CONSERVATION GROUPS PROPOSE REQUIRING SPECIFIC WELL-SEARCH DATABASES AND POTENTIAL PHYSICAL WELL SEARCHES FOR CORRECTIVE ACTION ASSESSMENT.²⁴ WHAT IS YOUR RESPONSE?

A. My response is similar to my comments regarding CBD's proposal. I generally agree that records reviews and physical investigations, where warranted, are reasonable components of a corrective action assessment. However, I do not support incorporating specific database requirements or prescribed well-search procedures into the regulations.

²⁴ *Id.* at 34

EPA's *AoR Evaluation and Corrective Action Guidance* already provides recommendations regarding the use of historical records, regulatory databases, land-use information, and field investigations to identify wells and other potential conduits within the AoR.²⁵ Specific search methods are therefore more appropriately addressed through guidance and project-specific review rather than regulation.

The appropriate scope of a well search will vary depending on site conditions, data availability, historical development, and the results of prior investigations. Requiring the use of specific databases or mandatory search procedures could impose unnecessary costs while limiting regulatory flexibility. Consistent with the EPA Class VI framework, the regulations should establish the objective of identifying wells and potential conduits, while allowing OCD to determine what records reviews and physical investigations are necessary on a project-specific basis.

Q. SIMILAR TO CBD, THE CONSERVATION GROUPS PROPOSE SPECIFIC TRIGGERS FOR AOR REEVALUATION INCLUDING REFERENCE TO A SPECIFIC NUMERIC THRESHOLD OF EITHER 20 PERCENT OF THE MODELED INCREASE OR 50 KILOPASCALS DIFFERENCE BETWEEN MODELED AND MEASURED PRESSURE.²⁶ WHAT IS YOUR RESPONSE?

A. My response is similar to my comments regarding CBD's proposed AoR reevaluation triggers. While I agree that significant deviations between modeled and observed

²⁵ OCD Exhibit 27

²⁶ Exhibit 1-C at 35

conditions may warrant further evaluation, I do not support incorporating specific numerical triggers, such as a 50 kilopascal difference between modeled and measured pressure, into the regulations.

The appropriateness of any reevaluation threshold is project-specific and depends on factors such as reservoir properties, monitoring locations, model uncertainty, operational conditions, and the objectives of the monitoring program. A single numerical threshold may be appropriate for some projects but overly conservative or insufficiently sensitive for others. As a result, a one-size-fits-all regulatory trigger could require unnecessary reevaluations or, conversely, fail to identify conditions that warrant additional review.

Consistent with EPA's *AoR Evaluation and Corrective Action Guidance*, the need for AoR reevaluation should be based on site-specific conditions, monitoring results, and professional judgment.²⁷ Appropriate reevaluation criteria are better established through the applicant's AoR and Corrective Action Plan and incorporated into permit conditions reviewed and approved by OCD. This approach preserves regulatory flexibility while ensuring that meaningful deviations between predicted and observed performance are evaluated when necessary to protect USDWs.

²⁷ OCD Exhibit 27

Q. THE CONSERVATION GROUPS PROPOSE ADDING MONITORING WELLS TO WELL CONSTRUCTION REQUIREMENTS TO PREVENT USDW ENDANGERMENT.²⁸ WHAT IS YOUR RESPONSE?

A. I generally agree with the intent of this proposed change. Monitoring wells, like injection wells, should be designed, constructed, operated, and maintained in a manner that protects USDWs. Explicitly recognizing that monitoring wells must be constructed to prevent fluid movement that could endanger USDWs is consistent with the overall objectives of the Class VI program.

However, I do not support requirements that would mandate tubing-and-packer completions or similar construction features for all monitoring wells. Monitoring wells serve a variety of purposes and may be completed at different depths depending on project-specific monitoring objectives. Some monitoring wells may be relatively shallow and may not penetrate the confining zone or injection zone.

Accordingly, I support clarifying that monitoring wells must be constructed in a manner protective of USDWs, but I do not support blanket requirements that prescribe specific completion methods for all monitoring wells. My proposed edits below **in red** are therefore targeted toward injection wells and monitoring wells that penetrate the confining zone or injection zone rather than all monitoring wells regardless of their function or depth.

²⁸ Exhibit 1-C at 39

19.15.43.8

...

G. Injection and monitoring well construction requirements.

(1) General. The owner or operator must ensure that ~~all~~ Class VI injection and monitoring wells are constructed and completed to:

- (a)** Prevent the movement of fluids into or between USDWs or into any unauthorized zones;
- (b)** Permit the use of appropriate testing devices and workover tools; and
- (c)** Permit continuous monitoring of the annulus space between the injection well injection tubing and long string casing.

(2) Casing and cementing of Class VI wells.

(a) Casing and cement or other materials used in the construction of ~~each~~ Class VI injection and monitoring wells must have sufficient structural strength and be designed for the life of the geologic sequestration project. All well materials must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials and well type by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the director. The casing and cementing program must be designed to prevent the movement of fluids into or between USDWs. In order to allow the Director to determine and specify casing and cementing requirements, the owner or operator must provide the following information:

- (i)** depth to the injection zone(s);
- (ii)** injection pressure, external pressure, internal pressure, and axial loading for injection wells;
- (iii)** hole size;

- (iv) size and grade of all casing strings (wall thickness, external diameter, nominal weight, length, joint specification, and construction material);
 - (v) corrosiveness of the carbon dioxide stream and formation fluids;
 - (vi) down-hole temperatures;
 - (vii) lithology of injection and confining zone(s) for those wells that will penetrate the confining zone, injection zone, or both;
 - (viii) specified cement type or grade, including all proposed additives, as well as the anticipated slurry density (lb/gal) and volumetric yield (cu ft/sack); and
 - (ix) quantity, chemical composition, and temperature of the carbon dioxide stream.
- (b) Surface casing for all Class VI injection wells and monitoring wells that penetrate the confining zone shall be set and cemented through the base of the deepest known USDW and must extend into an underlying confining unit, such as a competent shale formation. The casing must be cemented with a volume sufficient to achieve full cement return from the casing shoe to the surface.
- (c) At least one long string casing, using a sufficient number of centralizers, must extend to the injection zone and must be cemented by circulating cement to the surface in one or more stages for injection wells and monitoring wells that penetrate the confining zone.
- (d) Circulation of cement may be accomplished by staging. The director may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface, provided the owner or operator can demonstrate by using logs that the cement does not allow fluid movement behind the well bore.
- (e) For injection wells and monitoring wells that penetrate the confining zone, cement and cement additives must be compatible with the carbon dioxide stream and formation fluids and of

sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The integrity and location of the cement shall be verified using technology capable of evaluating cement quality radially and identifying the location of channels to ensure that USDWs are not endangered.

(3) Injection well tubing and packer.

- (a)** Tubing and packer materials used in the construction of each Class VI injection well must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the director.
- (b)** All owners or operators of Class VI wells must inject fluids through tubing with a packer set at a depth opposite a cemented interval at the location approved by the director.
- (c)** In order for the director to determine and specify requirements for tubing and packer, the owner or operator must submit the following information:

 - (i)** depth of setting;
 - (ii)** characteristics of the carbon dioxide stream (chemical content, corrosiveness, temperature, and density) and formation fluids;
 - (iii)** maximum proposed injection pressure;
 - (iv)** maximum proposed annular pressure;
 - (v)** proposed injection rate (intermittent or continuous) and volume and/or mass of the carbon dioxide stream;
 - (vi)** size of tubing and casing; and
 - (vii)** tubing tensile, burst, and collapse strengths.

Q. THE CONSERVATION GROUPS PROPOSE ADDING DETAILED PRESCRIPTIVE REQUIREMENTS TO THE TESTING AND MONITORING PLAN, INCLUDING SPECIFIC REQUIREMENTS FOR GROUNDWATER MONITORING DESIGN, STATISTICAL METHODS, BACKGROUND CHARACTERIZATION, SAMPLE SIZES, AND DATA EVALUATION PROCEDURES (19.15.43.9.K).²⁹ WHAT IS YOUR RESPONSE TO THESE PROPOSED CHANGES?

A. I do not support these proposed changes. While I agree that groundwater monitoring programs should be scientifically robust and capable of detecting potential changes in groundwater quality, the proposed amendments are overly prescriptive and incorporate a level of technical detail that is not appropriate for regulatory text.

The proposed language goes far beyond establishing monitoring objectives and instead prescribes specific elements of monitoring program design, background characterization, sample size considerations, statistical analyses, treatment of non-detect data, and procedures for addressing temporal and spatial variability. These issues are highly dependent on site-specific conditions, monitoring objectives, data availability, geologic complexity, and the characteristics of the monitored parameters.

Incorporating these detailed technical requirements into regulation would reduce regulatory flexibility and could require the use of approaches that are unnecessary or

²⁹ *Id.* at 42-43

inappropriate for a particular project. It could also make future updates to monitoring methodologies difficult, requiring regulatory amendments to accommodate advances in statistical methods and industry practices.

Consistent with the performance-based structure of the Class VI program, the regulations should establish the objective of designing and implementing an effective groundwater monitoring program, while allowing OCD to determine, through permit review, whether the proposed monitoring approach, background characterization methods, and data evaluation procedures are appropriate for a given project. The detailed technical elements proposed by the Conservation Groups are better addressed through guidance documents, permit conditions, and project-specific monitoring plans rather than codified regulatory requirements.

For these reasons, I do not support the proposed revisions. The existing framework provides sufficient flexibility for OCD to require technically appropriate groundwater monitoring while avoiding unnecessary regulatory complexity and preserving the ability to adapt monitoring approaches to site-specific conditions and evolving best practices.

Q. THE CONSERVATION GROUPS PROPOSE TO ADD A MINIMUM OF FOUR MONITORING WELLS AND MONITORING WELL PLACEMENT BASED ON SPECIFIC MODELING SCENARIOS.³⁰ WHAT IS YOUR RESPONSE?

³⁰ *Id.* at 43

- A. I do not support this proposed change. While monitoring wells are an important component of a Class VI monitoring program, the appropriate number and placement of monitoring wells are inherently project-specific. Factors such as reservoir geometry, geologic complexity, injection volumes, plume behavior, and site-specific risks will influence the design of an effective monitoring network. For example, a project with small injection volumes over a short timeframe may require fewer monitoring wells than a longer-duration injection project with greater volumes.

Requiring a minimum of four monitoring wells and prescribing placement based on specific modeling scenarios is overly prescriptive and may result in unnecessary costs for some projects while being insufficient for others. The EPA Class VI framework is performance-based and focuses on achieving monitoring objectives rather than mandating a specific number or configuration of wells.

The regulations should establish the objective of collecting sufficient monitoring data to verify model predictions and protect USDWs, while allowing OCD to evaluate and approve the appropriate monitoring network on a project-specific basis. For these reasons, I do not support incorporating minimum monitoring well counts or prescribed placement requirements into the regulations.

- Q. THE CONSERVATION GROUPS PROPOSE TO ADD CONTINUOUS MONITORING FOR PLUME AND PRESSURE FRONT TRACKING AND**

REFERENCE TO “CALCULATING THE ABSOLUTE AND EXCESS PRESSURE DIVIDED BY HYDROSTATIC PRESSURE.”³¹ WHAT IS YOUR RESPONSE?

- A.** I do not support this proposed change. While pressure monitoring is an important component of the EPA Class VI framework, continuous monitoring of plume behavior is not necessarily feasible or appropriate for all projects. Plume tracking methods are highly site-specific and may rely on periodic monitoring techniques such as geophysical surveys, fluid sampling, or other indirect measurements that are not capable of providing continuous plume-position data. The EPA regulations appropriately allow monitoring programs to be tailored to the characteristics and risks of a given site rather than requiring a single approach for all projects.

More broadly, these proposed additions are overly prescriptive. The regulations should establish the objective of monitoring plume and pressure-front behavior and verifying model performance, while allowing OCD to determine the appropriate monitoring technologies, frequency, and analytical methods through permit review. These technical implementation details are better addressed on a project-specific basis rather than codified in regulation.

Q. THE CONSERVATION GROUPS PROPOSE REQUIRING SURFACE AIR MONITORING.³² WHAT IS YOUR RESPONSE?

³¹ *Id.*

³² *Id.*

A. I do not support this proposed change. I am familiar with the use of surface air monitoring at carbon capture and storage (CCS) projects and have installed atmospheric monitoring towers and related monitoring systems. Surface air monitoring can be a useful tool in certain settings and may be appropriate where site-specific conditions indicate an elevated potential for surface expression of CO₂. However, I do not believe it should be required for all CCS projects and is not a federal minimum Class VI requirement.

Q. THE CONSERVATION GROUPS PROPOSE TO INCORPORATE ANY FUTURE EPA STANDARDS REGARDING MATERIAL COMPATIBILITY FOR WELL INFRASTRUCTURE INTO THE TESTING AND MONITORING PLAN REQUIREMENTS.³³ WHAT IS YOUR RESPONSE?

A. I do not support this proposed change. The reference to future “EPA standards” is too vague and undefined to be incorporated directly into regulatory requirements. EPA publishes a wide range of materials, including formal regulations, national guidance documents, regional guidance, technical recommendations, policy memoranda, permit-specific conditions, and project-specific review comments. As written, it is unclear which of these would constitute an “EPA standard” and therefore trigger modifications to a testing and monitoring plan.

I am also concerned that the proposal would effectively incorporate future EPA actions by reference without a defined process for evaluating their applicability to New Mexico's Class VI program. If EPA were to revise the federal Class VI regulations in the future,

³³ *Id.* at 44

there is already an established process through EPA's primacy oversight and program review framework to determine whether state regulations remain consistent with federal requirements. Where necessary, the state can evaluate whether rule revisions are warranted through a public rulemaking process.

Q. THE CONSERVATION GROUPS PROPOSE TO REMOVE THE ABILITY FOR THE OCD DIRECTOR TO APPROVE AN ALTERNATIVE POST-INJECTION SITE CARE TIME FRAME DURING THE PERMITTING PROCESS.³⁴ WHAT IS YOUR RESPONSE?

A. I do not support this proposed change. The ability for the OCD Director to approve an alternative PISC timeframe is an important component of the Class VI framework. The PISC timeframe should be based on site-specific conditions, including the duration and volume of injection, reservoir characteristics, pressure dissipation, plume stabilization, monitoring results, and the degree of confidence that the project no longer poses a risk to USDWs.

A fixed post-injection site care period may be appropriate as a default, but it should not be treated as the only acceptable approach. For example, a project that injects for five years may have a substantially different plume extent, pressure footprint, and monitoring record than a project that injects for fifty years. If modeling and monitoring demonstrate that pressure has dissipated, the plume is stable, and USDWs are not endangered, an alternative PISC timeframe may be technically justified. The appropriate timeframe should be

³⁴ *Id.* at 47

determined based on the technical record, not by eliminating the Director's discretion at the permitting stage.

Maintaining the ability to approve an alternative PISC timeframe during the permitting process does not reduce protection of USDWs. Rather, it allows OCD to evaluate the applicant's demonstration, impose appropriate monitoring and reporting conditions, and require continued monitoring where the technical evidence supports it.

Oxy Rebuttal

Q. OXY PROPOSES TO REMOVE THE REQUIREMENT FOR AOR REEVALUATION 2 YEARS AFTER INJECTION BEGINS AND NO LONGER THAN EVERY FOUR YEARS, AND REPLACE WITH THE FEDERAL MINIMUM REQUIREMENT OF ONCE EVERY FIVE YEARS.³⁵ WHAT IS YOUR RESPONSE?

A. I do not agree with this proposed change. New Mexico deliberately adopted a more frequent AoR reevaluation schedule than the federal minimum to ensure that predictive models are periodically compared against actual monitoring and operational data. The initial reevaluation two years after injection begins is particularly important because it provides the first meaningful opportunity to validate permit-stage plume and pressure-front predictions using observed field data.

While Oxy proposes adopting the federal minimum reevaluation frequency of once every five years, citing the cost and effort associated with updating models, the purpose of AoR

³⁵ Oxy Exhibit 1-A at 7; Oxy Exhibit 1-C at 7-8

reevaluations is to confirm that models remain representative of actual site conditions and that USDWs continue to be protected.

Two years after injection begins is a reasonable point at which sufficient pressure, injection, and monitoring data should be available to "ground truth" the modeling assumptions used during permitting. Early identification of discrepancies between predicted and observed conditions improves model reliability and provides greater confidence that the delineated AoR remains appropriate. For these reasons, I support retaining the proposed requirement for an initial reevaluation after two years and subsequent reevaluations at intervals not exceeding four years.

Q. OXY PROPOSES TO REMOVE THE QUARTERLY GROUNDWATER QUALITY MONITORING REQUIREMENT LEAVING THE MONITORING FREQUENCY UNSPECIFIED.³⁶ WHAT IS YOUR RESPONSE?

A. I do not agree with this proposed change. OCD intentionally selected quarterly groundwater monitoring to ensure that groundwater quality and geochemical data are collected frequently enough to identify potential migration of CO₂ or formation fluids and detect conditions that could indicate endangerment of USDWs before impacts become significant. Quarterly monitoring provides a consistent dataset for evaluating trends, validating model predictions, and supporting timely regulatory response if anomalous conditions are observed. Quarterly monitoring is also a common frequency used at CCS injection projects across the United States.

³⁶ Oxy Exhibit 1-C at 15

Q. OXY PROPOSES A “CATCH ALL” CATEGORY TO THE MINOR MODIFICATIONS OF PERMITS.³⁷ WHAT IS YOUR RESPONSE?

A. Oxy proposes to add a catch-all category at Subsection J(8) of 19.15.42.11 for “non-material, non-substantive permit modifications that do not increase risk to USDWs.” In my opinion, the existing list of minor permit modifications already provides sufficient flexibility to address routine administrative and technical changes.³⁸ In particular, the rule already allows the Director to amend testing and monitoring plans, plugging plans, post-injection site care and site closure plans, and emergency and remedial response plans where the modifications merely clarify or correct the plan, as determined by the Director.³⁹

I do not believe the proposed catch-all provision proposed by Oxy is necessary. The terms “non-material” and “non-substantive” are inherently subjective and may create uncertainty regarding which permit changes qualify as minor modifications versus those that warrant additional review. A broadly worded catch-all provision could also reduce regulatory clarity and consistency in permit administration. The current proposed rule already provides the Director with adequate discretion while maintaining clear boundaries around the types of changes that may be processed as minor modifications. For these reasons, I do not agree with Oxy’s proposed change.

³⁷ Oxy Exhibit 1-B at 12; Oxy Exhibit 3 at 7-8.

³⁸ OCD Exhibit 2 at 12

³⁹ *Id.*

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.