

**BEFORE THE ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.**

In re:	)	
	)	
Marquis Carbon Injection, LLC	)	UIC Appeal No. 26-1
Marquis Biocarbon Project	)	
Putnam County, Illinois	)	
	)	
Class VI UIC Permit No.	)	
IL-155-6A-0001	)	
	)	

EPA REGION 5 RESPONSE TO PETITION FOR REVIEW

I. TABLE OF CONTENTS

I.	TABLE OF CONTENTS	2
II.	TABLE OF AUTHORITIES.....	5
III.	STATEMENT OF COMPLIANCE WITH WORD LIMITATION	10
IV.	STATEMENT REGARDING ORAL ARGUMENT	11
V.	INTRODUCTION	12
VI.	STATUTORY AND REGULATORY FRAMEWORK	13
VII.	ISSUANCE OF THE PERMIT AND THE APPEAL.....	14
VIII.	STANDARD OF REVIEW	15
IX.	ARGUMENT	18
Issue 1 – The Area of Review is Based on Appropriate Modeling Requirements and Covers the WPL-1 Plume Area.		18
A. The Region met all technical requirements for the development of the AoR as set forth in 40 C.F.R. § 146.84.		19
B. The WPL-1 plume is not predicted to migrate beyond the boundary of the AoR and all penetrations within the AoR were reviewed to ensure proper containment. .		26
C. AoR delineation is a highly technical endeavor, and the Board should not second guess the Region’s reasoned technical judgment.		28
D. The Permit fully meets the criteria of 40 C.F.R. § 144.12.		29
Issue 2 – The Region Properly Relied on Marquis’ Site-Specific Computational Modeling and Consideration of Heterogeneities.		30
A. Marquis’ computational modeling used to delineate its AoR and the CO ₂ plume is appropriately based on project- and site-specific information and properly accounted for heterogeneities.		31
B. Uncertainty is inherent in all computational modeling but will diminish as Marquis collects operating and post-injection data consistent with the regulations. 39		
C. A remand on Issue 2 would not provide Petitioner with its requested relief. ...		41
Issue 3 – The Region Properly Issued a Permit with an Alternative PISC Period.....		42
Issue 4 – The Well Construction Provisions of the Permit Meet the Regulatory Requirements.		45
A. Petitioner failed to preserve Issue 4 because no comments were raised concerning well construction requirements being affected by the potential for EPA to extend the post-injection monitoring period.		45
B. Issue 4 is improperly raised before the Board because it misreads the Class VI Rule and seeks to challenge the validity of the Class VI Rule itself.		46

C. Marquis’ carbon injection well design meets the casing and cementing requirements of 40 C.F.R. § 146.86(b).....	47
Issue 5 – The Permit’s Monitoring Well Network Requirements Meets Regulatory Requirements.	49
Issue 6 – No Corrective Action is Needed at the WPL-1 Well.	53
A. The Region determined WPL-1 and its associated groundwater monitoring well were plugged in a manner that prevents the movement of carbon dioxide or other fluids that may endanger USDWs based on its review of Illinois EPA’s determination that the wells were plugged and abandoned according to state requirements.	54
B. Petitioner fails to support its assertion that the Region must specifically evaluate pressure effects from the Class VI project on WPL-1.	56
C. Petitioner fails to provide a legal basis for its requested relief of a federal-state coordination program concerning corrective action on abandoned wells.	57
Issue 7 – The 3D Seismic and Microseismic Monitoring Provisions of the Permit Meet the Class VI Rule’s Indirect Monitoring Requirements.....	58
Issue 8 – The Region Appropriately Determined That Seismicity Will Not Interfere with Containment of CO ₂	64
A. Petitioner failed to preserve several of its arguments in Issue 8 because no comments were raised concerning Petitioner’s “buffer” arguments, “cumulative seismic risk” argument, and the Argenta Formation.	65
B. Information in the record demonstrates that faults, fractures, and seismicity will not interfere with containment.	65
C. Petitioner has not met its burden in showing that the Region erred in concluding that seismicity will not interfere with containment.	70
D. Information from the IBDP site does not demonstrate that the Region erred in making a determination using site-specific information from the Marquis project. .	72
E. The Marquis Permit’s Emergency and Remedial Response Plan’s seismic event response actions are consistent with 40 C.F.R. § 146.94.	74
F. Petitioner’s remaining arguments in support of Issue 8 are merely opinions that the Region should have required additional or different technical considerations. ..	75
Issue 9 – The Region Appropriately Determined that Shale within the Confining Zone is Sufficient to Contain Injected CO ₂	76
A. Site-specific data supports the Region’s characterization of confining zone lithology.....	77
B. The Region’s reliance on Marquis site-specific data was appropriate and does not conflict with regional information.....	78
C. The Region adequately responded to public comment regarding the lithology of the confining zone area related geochemical interactions.....	83

Issue 10 – The Region Appropriately Exercised Discretion to Issue the Final Permit Without Additional Public Comment.	84
Issue 11- The Permit Application Was Available for Review During the Public Comment Period.....	88
A. The Region met all requirements for public notice under 40 C.F.R. § 124.10.	89
B. Petitioner asks the Board to act outside its jurisdiction under a permit appeal by issuing guidance.	91
X. IMPORTANT POLICY CONSIDERATIONS	92
XI. CONCLUSION.....	94

II. TABLE OF AUTHORITIES

Federal Court Decisions

<i>Am. Radio Relay League, Inc. v. FCC</i> , 524 F.3d 227 (D.C. Cir 2008)	90
<i>Gerber v. Norton</i> , 294 F.3d 173 (D.C. Cir 2002)	90
<i>Penn Fuel Gas, Inc., v. EPA</i> , 185 F.3d 862 (3d Cir. 1999)	17

EAB Decisions

<i>In re Amoco Oil Co.</i> , 4 E.A.D. 954 (EAB 1993)	86
<i>In re Archer Daniels Midland</i> , 17 E.A.D. 380 (EAB 2017)	16
<i>In re City of Keene</i> , 18 E.A.D. 720 (EAB 2022)	passim
<i>In re City of Lowell</i> , 18 E.A.D. 115 (EAB 2020)	16
<i>In re City of Port St. Joe & Fla. Coast Paper Co.</i> , 7 E.A.D. 275 (EAB 1997)	17
<i>In re DC Water & Sewer Auth.</i> , 13 E.A.D. 714 (EAB 2008)	87
<i>In re Dominion Energy Brayton Point, LLC</i> , 13 E.A.D. 407 (EAB 2007)	86
<i>In re EcoElectrica, L.P.</i> , 7 E.A.D. 56 (EAB 1997)	15
<i>In re Env'tl. Disposal Sys., Inc.</i> , 12 E.A.D. 254 (EAB 2005)	17, 42, 71, 76
<i>In re Ford Motor Co.</i> , 3 E.A.D. 677 (EAB 1991)	17
<i>In re FutureGen Indus. Alliance, Inc.</i> , 16 E.A.D. 717 (EAB 2015)	passim
<i>In re Kawaihae Cogeneration Project</i> , 7 E.A.D. 107 (EAB 1997)	15
<i>In re Knaug Fiber Glass, GMBH</i> , 9 E.A.D. 1 (EAB 2000)	91
<i>In re NE Hub Partners L.P.</i> , 7 E.A.D. 561 (EAB 1998)	16, 17
<i>In re Ocean Era, Inc.</i> , 18 E.A.D. 678 (EAB 2022)	15
<i>In re Panoche Energy Ctr., LLC</i> , 18. E.A.D. 818 (EAB 2023)	15

<i>In re Peabody W. Coal Co.</i> , 15. E.A.D. 757 (EAB 2013).....	17, 47
<i>In re Penneco Env't Sols., LLC</i> , 17 E.A.D. 604 (EAB 2018)	15
<i>In re Phelps Dodge Corp.</i> , 10 E.A.D. 460 (EAB 2002)	92
<i>In re Seneca Res. Corp.</i> , 16 E.A.D. 411 (EAB 2014).....	15
<i>In re Steel Dynamics, Inc.</i> , 9 E.A.D. 165, (EAB 2000)	15
<i>In re Town of Concord Public Works</i> , 6 E.A.D. 514 (EAB 2014)	86
<i>In re W. Bay Exploration Co., Haystead #9 SWD</i> , UIC Appeal 18-01 (EAB May 31, 2018)	91
<i>In re Wabash Carbon Services, LLC</i> , 19 E.A.D. 128 (EAB 2025).....	passim
<i>In re Windfall Oil & Gas, Inc.</i> , 16. E.A.D. 769 (Jun 12, 2015)	71
<i>In the Matter of Atlas Envtl. Servs.</i> 4. E.A.D. 6 (EAB 1992)	92

Federal Statutes

2 U.S.C. § 300h-1(c).....	13
42 U.S.C. § 300h.....	12
42 U.S.C. § 300h(a)(2).....	93
42 U.S.C. § 300h(b)(1)	13
42 U.S.C. §§ 300h to 300h-8	13
5 U.S.C. § 553.....	93
5 U.S.C. § 706.....	90

Federal Regulations

40 C.F.R § 146.84(c)(1)(i)	32
40 C.F.R § 146.84(c)(2) and (d).....	56
40 C.F.R. § 124.10	88

40 C.F.R. § 124.10(d)(1)	90
40 C.F.R. § 124.10(d)(1)(vi)	89
40 C.F.R. § 124.14	84, 88
40 C.F.R. § 124.14(b).....	87
40 C.F.R. § 124.17(a)(2)	41, 73, 83
40 C.F.R. § 124.19	15
40 C.F.R. § 124.19(a)(4)(i)(B)	92
40 C.F.R. § 124.19(a)(4)(ii)	15, 65
40 C.F.R. § 124.19(d)(1)(iv)	10
40 C.F.R. § 124.19(d)(3)	10
40 C.F.R. § 124.86(b)(1)	46
40 C.F.R. § 144.12	29
40 C.F.R. § 144.5	89
40 C.F.R. § 144.6(f)	13
40 C.F.R. § 146.82(a)(3)	65, 71, 73
40 C.F.R. § 146.82(a)(3)(ii)	66
40 C.F.R. § 146.82(A)(3)(ii)	67
40 C.F.R. § 146.82(a)(3)(iii)	77
40 C.F.R. § 146.82(a)(3)(v).....	passim
40 C.F.R. § 146.84	19, 43
40 C.F.R. § 146.84(a).....	20, 29
40 C.F.R. § 146.84(c).....	37
40 C.F.R. § 146.84(c) and (d)	53

40 C.F.R. § 146.84(c)(1)	20, 25, 31, 56
40 C.F.R. § 146.84(c)(1)(i)	21
40 C.F.R. § 146.84(c)(1)(i)-(xi)	44
40 C.F.R. § 146.84(c)(1)(ii)	30, 33, 34, 38
40 C.F.R. § 146.84(c)(2)	27, 54
40 C.F.R. § 146.84(c)(3) and (d).....	20
40 C.F.R. § 146.84(e).....	25, 40
40 C.F.R. § 146.86	49
40 C.F.R. § 146.86(b).....	45
40 C.F.R. § 146.86(b)(1).....	46, 48
40 C.F.R. § 146.86(b)(1)(i)-(x)	48
40 C.F.R. § 146.90	50
40 C.F.R. § 146.90(d).....	49
40 C.F.R. § 146.90(g)(1).....	59
40 C.F.R. § 146.90(g)(2)	passim
40 C.F.R. § 146.93	43
40 C.F.R. § 146.93(a).....	42
40 C.F.R. § 146.93(b).....	42
40 C.F.R. § 146.93(b)(4).....	47
40 C.F.R. § 146.93(c).....	42
40 C.F.R. § 146.93(c) and (b)(4).....	46
40 C.F.R. § 146.93(c)(1)(i)-(viii)	43
40 C.F.R. § 146.93(c)(1)(i)-(xi)	43

40 C.F.R. § 146.94	74, 75
40 C.F.R. § 146.94(a).....	74
40 C.F.R. § 146.94(b).....	74
40 C.F.R. § 147.700	55
40 C.F.R. §§ 124.10(d) and 124.13.....	52
40 C.F.R. §§ 146.81-95	13
40 C.F.R. §124.19(a)(4)(i)(A)-(B)	16
40 C.F.R. §146.82(a)(3)(iv)	67
40 C.F.R. §146.84(d).....	54
40 C.F.R. 146.84(c)(1)(iii)	33

Illinois Regulations

35 Ill. Adm. Code 704.101-702.264	55
35 Ill. Adm. Code 730.101-114.....	55
35 Ill. Adm. Code 730.110(a)	55

III. STATEMENT OF COMPLIANCE WITH WORD LIMITATION

On June 3, 2026, the Board granted the Region’s request for an extension of the 14,000-word limitation found at 40 C.F.R. § 124.19(d)(3). Consistent with 40 C.F.R. § 124.19(d)(3), “[t]he table of contents, table of authorities, table of attachments (if any), statement requesting oral argument (if any), statement of compliance with the word limitation, and any attachments do not count toward the word limitation.” This brief complies with the Board’s extension order of 28,000 words. *See* 40 C.F.R. § 124.19(d)(1)(iv). Given the complexity of the technical issues discussed in this brief and within the voluminous administrative record, the Region is willing to provide supplementary briefing on any topic as requested to support the Board’s review of the Petition.

IV. STATEMENT REGARDING ORAL ARGUMENT

The Region believes that the issues raised in the Petition can be resolved through review of the record and the legal arguments set forth in the filings in this matter. The Region has put extensive effort into this response to ensure that it addresses the relevant issues. Additionally, as put forth in this brief, the majority of the issues raised by Petitioner are highly technical in nature and ask the Board to second guess the Region's technical expertise. Accordingly, the Region respectfully requests the Board deny the Petitioner's request to permit oral arguments or to limit oral arguments to specific legal issues.

V. INTRODUCTION

Class VI wells are used to inject carbon dioxide (CO₂) into deep rock formations. This long-term underground storage is called geologic sequestration. Geologic sequestration, as part of carbon capture and storage, is a technology that can be used to reduce CO₂ emissions to the atmosphere. The U.S. Environmental Protection Agency, (“EPA” or “Agency”), is authorized by Congress through the Safe Drinking Water Act (SDWA) to develop requirements for an Underground Injection Control (UIC) Program, including for geologic sequestration wells, known as “Class VI” injection wells. 42 U.S.C. § 300h. The main goal of EPA’s UIC Program is the protection of underground sources of drinking water (USDWs). EPA regulates this lawful activity through the issuance of enforceable permits that implement construction, location, and monitoring requirements.

Region 5 of the EPA (“Region”) issued Permit No. IL-155-6A-0001 (“Permit”) to Marquis Carbon Injection LLC (“Marquis”) on April 10, 2026, for the construction and operation of a Class VI well. On May 8, 2026, Eco-Justice Collaborative (“Petitioner”) filed its Petition for Review with the Environmental Appeals Board (EAB or “Board”). The Parties are aligned in their concern over the protection of USDWs. However, Petitioner’s arguments are premised on its view that “the Class VI program is empirically immature” (Pet. at 26) and other disputes pertaining to the Region’s review of the documentation in the record. Petitioner may disagree with the Region’s decision to issue the Permit, or even with the general concept of carbon sequestration, but this does not provide the Board with a sufficient legal basis to remand the Permit. The administrative record demonstrates that the Region thoroughly developed the Permit in accordance with all regulatory requirements designed to ensure protection of USDWs. The Region respectfully requests the Board deny the Petition because it fails to demonstrate that the

Region's decision to issue the Permit is clearly erroneous or involves an important policy consideration that merits Board review.

VI. STATUTORY AND REGULATORY FRAMEWORK

Congress enacted SDWA in 1974 to ensure that the nation's sources of drinking water are protected against contamination and "to prevent underground injection which endangers drinking water sources." 42 U.S.C. § 300h(b)(1). Part C of SDWA, 42 U.S.C. §§ 300h to 300h-8, is designed to protect USDWs from contamination caused by the underground injection of fluids. Among other things, Part C of SDWA directed EPA to promulgate regulations establishing minimum requirements for UIC programs to prevent underground injection from endangering USDWs. 42 U.S.C. § 300h.

EPA's regulations implementing the UIC Program are found in 40 C.F.R. Parts 144-48. Part 144 establishes the regulatory framework, including permitting requirements, for EPA-administered UIC programs. Part 146 sets out technical criteria and standards that must be met in permits. General procedural requirements for issuing UIC permits are found in Part 124. The UIC program regulates underground injection by six classes of wells. 40 C.F.R. § 144.1(g). This appeal concerns a permit for a Class VI well. Class VI wells are wells into which CO₂ is injected for geologic sequestration. 40 C.F.R. § 144.6(f). EPA published regulations for UIC Class VI wells in 2010, with technical criteria and standards codified at 40 C.F.R. §§ 146.81-95. *See Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Well*, 75 Fed. Reg. 77,230 (Dec. 10, 2010). The final regulations are hereinafter referred to as the "Class VI Rule." The Region is the permitting authority for Class VI wells in Illinois. *See* 42 U.S.C. § 300h-1(c).

VII. ISSUANCE OF THE PERMIT AND THE APPEAL

In 2022, the Region received an application from Marquis for the construction of a single Class VI well known as MCI CCS 3 for injection of CO₂ in Putnam County, Illinois. Between 2022 and 2025, Marquis submitted several revisions to its application in response to EPA's requests for supplemental information.

On September 8, 2025, the Region released the draft permit for public comment in accordance with 40 C.F.R. § 124.10. An availability session was held on October 15, 2025, and a public hearing was held on October 29, 2025. The comment period closed on November 3, 2025.

On April 10, 2026, the Region issued the Permit to Marquis for the construction and operation of MCI CCS 3. On the same date, the Region released its response to the comments received during the public comment period. A.R. #2015, Response to Comments ("Resp. to Com.")

On May 8, 2026, Petitioner filed its Petition. The Petition is separated into 11 alleged issues with some overlap. Many of the issues raised by Petitioner ask the Board to overrule the technical expertise of the Region, despite the availability of supporting information in the administrative record and well-reasoned explanations provided in its response to comments document. These issues relate to computational modeling requirements, well construction and design, indirect monitoring, and geological suitability, among others. Technical expertise is required to analyze permit applications and issue permits that are protective of USDWs. As outlined below, the final Permit reflects the Region's technical judgment and expertise, and Petitioner has not met its burden of demonstrating that any provisions of the Permit are clearly erroneous.

VIII. STANDARD OF REVIEW

Issue Preservation

40 C.F.R. § 124.19(a)(4)(ii) requires that Petitioner demonstrate that each issue being raised in the Petition was raised during the public comment period. In considering an appeal, the Board first evaluates whether the petitioner has met threshold procedural requirements, including, among other things, whether an issue has been preserved for Board review. *See* 40 C.F.R. §§ 124.13, 124.19(a)(2)-(4); *see also In re Wabash Carbon Services, LLC*, 19 E.A.D. 128, 135 (EAB 2025); *In re Penneco Env't Sols., LLC*, 17 E.A.D. 604, 617-18 (EAB 2018); *In re Seneca Res. Corp.*, 16 E.A.D. 411, 412 (EAB 2014).

Review of Permit Terms

40 C.F.R. § 124.19 governs the Board's review of a UIC permit. Under these rules, the Board has discretion to grant or deny review of a permit decision. *In re Panoche Energy Ctr., LLC*, 18 E.A.D. 818, 820 (EAB 2023). "In considering whether to grant or deny review of a permit decision," the Board is guided by EPA's statement in promulgating these regulations, that the Board's power to grant review of a permit decision "should be only sparingly exercised," emphasizing that "most permit conditions should be finally determined at the [permit issuer's] level." *In re Ocean Era, Inc.*, 18 E.A.D. 678, 691, 696 (EAB 2022) (quoting *Consolidated Permit Regulations*, 45 Fed. Reg. 33,290, 33,412 (May 19, 1980)).

The burden of demonstrating that review is warranted rests with petitioner. *In re Kawaihae Cogeneration Project*, 7 E.A.D. 107, 114 (EAB 1997); *In re EcoElectrica, L.P.*, 7 E.A.D. 56, 60-61 (EAB 1997). *See also In re Steel Dynamics, Inc.*, 9 E.A.D. 165, 194-195 (EAB 2000) (finding that the petitioner correctly identified permit issuing agency's own burden to

justify its permit decision but failed to carry its own burden of establishing that the permit issuer clearly erred or abused its discretion in its analysis).

The petitioner must demonstrate that the permit decision is based on a clearly erroneous finding of fact or conclusion of law or involves an exercise of discretion that warrants review under the law. 40 C.F.R. §124.19(a)(4)(i)(A)-(B); *see, e.g. Wabash*, 19 E.A.D. at 135. “The Board ordinarily denies review of a permit decision (and thus does not remand it) unless the petitioner demonstrates that the permit decision is based on a clearly erroneous finding of fact or conclusion of law, or involves a matter of policy or exercise of discretion that warrants review.” *In re Archer Daniels Midland*, 17 E.A.D. 380, 382-83 (EAB 2017).

“When evaluating a challenged permit decision for clear error, the Board examines the administrative record that serves as the basis for the permit to determine whether the permit issuer exercised his or her ‘considered judgment.’” *Wabash*, 19 E.A.D. at 135 (citing *In re City of Lowell*, 18 E.A.D. 115, 132 (EAB 2020)). “When the Board is presented with technical issues,” the Board seeks to “determine whether the record demonstrates that the Region duly considered the issues raised in the comments and whether the approach ultimately adopted by the Region is rational in light of all the information in the record.” *Id.* (citing *In re NE Hub Partners L.P.*, 7 E.A.D. 561, 568 (EAB 1998)). If the Board is “satisfied that the Region gave due consideration to comments received and adopted an approach in the final permit decision that is logical and supportable, [the Board] typically will defer to the Region’s position.” *NE Hub Partners*, 7 E.A.B. at 568.

“On matters that are fundamentally technical or scientific in nature, the Board typically defers to a permit issuer’s ... expertise ... as long as the permit issuer adequately explains its rationale and supports its reasoning in the administrative record.” *In re City of Keene*, 18 E.A.D.

720, 724 (EAB 2022). A petitioner bears a particularly heavy burden when they have challenged an issue that involves technical judgment, such as UIC technical determinations. *See In re FutureGen Indus. Alliance, Inc.*, 16 E.A.D. 717, 733-37 (EAB 2015) (denying review of UIC permit and deferring to the region’s technical judgment regarding the plume boundary and area of review); *see also Panoche Energy Ctr.*, 18 E.A.D. at 847 (denying review of UIC permit and deferring to the region’s technical judgment regarding ambient monitoring program and testing for pressure and water quality); *NE Hub Partners*, 7 E.A.D. at 570 (declining to review the region’s “quintessentially technical” determinations regarding the required construction techniques for proposed Class III UIC wells), *review denied sub nom. Penn Fuel Gas, Inc., v. EPA*, 185 F.3d 862 (3d Cir. 1999). Petitioner must present “sufficiently specific or compelling evidence or argument that would cast doubt on the thoroughness or rationality of the Region’s technical evaluations and conclusions.” *In re Envtl. Disposal Sys., Inc.*, 12 E.A.D. 254, 292 (EAB 2005).

The regulations that govern the Board’s review of permits authorize the Board to review the conditions of the permit, not the statutes or regulations that are the predicates for such conditions. *In re Peabody W. Coal Co.*, 15. E.A.D. 757, 767 (EAB 2013). This fundamental rule has governed the Agency’s permit appeal proceedings since prior to the establishment of the board. *Id.*, *citing In re Ford Motor Co.*, 3 E.A.D. 677, 682 n.2 (EAB 1991). A permit appeal proceeding is not the appropriate forum in which to challenge either the validity of Agency regulations or the policy judgments that underlie them. *In re City of Port St. Joe & Fla. Coast Paper Co.*, 7 E.A.D. 275, 286-7 (EAB 1997).

IX. ARGUMENT

The Class VI Rule identifies the information that must be included in permit applications, the factors that EPA must consider in acting on the applications, and the conditions that must be included in Class VI permits. The record establishes that the Region met those standards in issuing the final Permit to Marquis. Petitioner identified several areas where it seeks to substitute its technical preferences for the Region's decisions and conclusions, but Petitioner has not identified any clearly erroneous findings of fact or conclusions of law, or any exercises of discretion, that would require review.

Issue 1 – The Area of Review is Based on Appropriate Modeling Requirements and Covers the WPL-1 Plume Area.

In Issue 1, Petitioner asks the Board to review the Region's approval of Marquis' Area of Review ("AoR") associated with the carbon sequestration project. The purpose of delineating an AoR is to identify a project's boundaries, within which the owner must determine whether any preexisting wells or other conduits may require corrective action. The Petition disregards the fact that the Region approved the AoR boundaries consistent with regulatory requirements. Instead, Petitioner asks the Board to specify unwritten requirements in the Class VI Rule regarding AoR delineation. Specifically, Petitioner asks the Board to require Marquis to include as an "initial condition" in its AoR modeling the waste pickle liquor (hereafter referred to as the WPL-1 plume)¹ from former operations of a hazardous waste injection well that is located 1.5 miles from the Marquis project. The Class VI Rule does not specify modeling parameters such as "initial conditions" input into a model, and review of the modeling that supports the delineation

¹ The WPL-1 well, referenced throughout this Response, is also referred to as the "J&L well" in documents in the record. The Petition also refers to the plume as the "K062 plume." For simplicity, the Region refers to this well as "WPL-1" and the plume as the "WPL-1 plume" in this Response.

of the AoR should be left to EPA's technical judgment. Moreover, because the set boundary of the AoR is significantly further than any predicted effects from the WPL-1 plume, additional modeling at this stage of the project would not ultimately result in any modifications to the project's AoR.

The Board should decline to review the AoR for three reasons: (1) the record demonstrates that the Region met all technical requirements in its review of the AoR as set forth in 40 C.F.R. § 146.84; (2) the WPL-1 plume is not predicted to migrate beyond the boundary of the AoR and all penetrations within the AoR were reviewed to ensure proper containment; and (3) AoR delineation is a highly technical endeavor, and the Board should not second guess the Region's reasoned technical judgment.

A. The Region met all technical requirements for the development of the AoR as set forth in 40 C.F.R. § 146.84.

1) *The 14.5-mile radius AoR is based on the predicted pressure front from the Marquis project.*

The purpose of AoR modeling is to ensure that CO₂ and formation fluids do not move outside the intended injection zone through abandoned wells or other conduits in the area of the geologic sequestration project. The AoR process requires that the project owner delineate the AoR by considering computational modeling that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream. 40 C.F.R. § 146.84(a). The AoR represents the horizontal and vertical extent to which project owners must, subsequently, identify the need for corrective action of existing wells in that area, subject to approval by the Region. Corrective action, such as plugging or repair, ensures that abandoned or poorly constructed wells within the AoR will not become a conduit for movement of CO₂ or other fluids into unpermitted zones. The record demonstrates that the Marquis AoR achieves the requirement to fully delineate

the expected horizontal and vertical extent of the project, and the Petition fails to demonstrate otherwise.

The requirements for delineating the AoR are found in 40 C.F.R. § 146.84 (“Area of Review and Corrective Action”). 40 C.F.R. § 146.84(a) defines the AoR as “the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity.” 40 C.F.R. §§ 146.84(a) and 146.81(d). Within the AoR, the project owner must evaluate and perform corrective actions on abandoned wells, as needed. 40 C.F.R. § 146.84(c)(3) and (d). Under the regulations, as reflected in the Permit, Marquis will regularly monitor and reevaluate the AoR over the lifetime of the project to assure that USDWs are not endangered. *See* Permit Section G. AoR modeling and reevaluation are important components of the overall strategy to track the CO₂ plume and pressure front associated with the project through an iterative, multi-faced process of site characterization, modeling, and monitoring at geologic sequestration sites. This approach addresses the unique and complex movement of CO₂ at geologic sequestration projects. 75 Fed. Reg. 77230, 77238 (Dec. 10, 2010).

40 C.F.R. § 146.84(c)(1) affords discretion regarding how to incorporate and evaluate data to establish the AoR. The project owner must: “Predict, using existing site characterization data, the projected lateral and vertical migration of the carbon dioxide plume and formation fluids in the subsurface from the commencement of the injection activities until the plume movement ceases, until the pressure differentials sufficient to cause the movement of injected fluids or formation fluids into a USDW are no longer present, or until the end of a fixed time period as determined by the director.” *Id.* This analysis must be “based on detailed geologic data collected to characterize the injection zone(s), confining zone(s) and any additional zone, and

any anticipated operating data, including injection pressures, rates, and total volumes over the proposed life of the geologic sequestration project.” 40 C.F.R. § 146.84(c)(1)(i).

The Class VI Rule does not specify the technical requirements (such as modeling inputs) for this analysis. However, EPA has highly detailed guidance to help support project owners and EPA delineate AoRs. *See generally* A.R. #1762, “Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance (2013) (“AoR Guidance”). The AoR Guidance, a 96-page treatise, explains that numerical/computational models are an approximate representation of highly complex real systems, and so exhibit some degree of uncertainty. The AoR is primarily developed based on two key parameters: site hydrogeology (i.e. showing where fluids are expected to travel) and operational data (i.e. project operations, including injection pressures, rates, and total volumes). *See* A.R. #1762 at 31-33. These general parameters allow EPA to project where all fluids, including project-related or otherwise, may migrate and potentially threaten USDWs.

The purpose of delineating an AoR is to understand not only where the injected CO₂ is expected to travel, but also the potential movement for other formation fluids caused by pressure impacts associated with the project. Accordingly, the Class VI Rule provides that the AoR must account not only for the injected plume of CO₂, but also pressure differentials caused by injection. 40 C.F.R. § 146.84(c)(1). The AoR guidance confirms this approach:

The boundaries of the AoR are based on simulated predictions of the extent of the separate-phase (i.e., supercritical, liquid, or gaseous) plume and pressure front. As such *EPA recommends that the AoR encompass the maximum extent of the separate-phase plume or pressure front over the lifetime of the project* and entire timeframe of the model simulations.”

(emphasis added). A.R. #1762 at 38; *see also* A.R. #1762 at 46 (“The AoR is delineated by drawing the contour line that encompasses the maximum extent of the separate-phase plume or

pressure front...”). The AoR should extend to the pressure front because it may impact fluids surrounding the project and push them into a larger geographic area.

During the iterative permit application process, the Region issued a request for additional information² and informed Marquis that it must fully account for the pressure front when delineating the AoR. A.R. #357 (RAI_NOD.031423) at 4. Marquis updated the AoR modeling in response to the Region’s request and provided information concerning the use of the pressure front to delineate the AoR. *See* A.R. #964 (2.0 AoR and Corrective Action Plan). This information included a variety of modeling scenarios. The extent of the pressure front associated with CO₂ injection was assessed within the AoR model. *Id.* at 169. The AoR boundary of the Marquis project represents the maximum extent of the pressure front during injection and the post-injection period, and extends radially from the injection well at an approximate distance of 14.5 miles in all directions. *Id.* at 169-70. The boundary of the AoR now encompasses the predicted pressure front associated with the Marquis project. As explained further below, the AoR represents the outermost boundary of the expected impacts from the project, and would not change with the modeling sought by Petitioner.

2) *The 14.5-mile radius AoR is based on the predicted pressure front from the Marquis project.*

The Petition makes much of the “initial conditions”—a feature of computational modeling but not a specified aspect of the Class VI Rule—and asks the Board to mandate additional ones as modeling parameters to assist in the development of the AoR. Pet. at 17, 19. Petitioner does not explain how selecting specific parameters as “initial conditions” of a model is mandated by regulation nor does it provide any detail of the purpose or scope of modifying the

² *See* 40.C.F.R. § 124.3(c).

initial conditions for modeling the Marquis project. Summarily, the requested relief asks the Board to supersede Region's technical judgment and direct the Region to "develop AoR computational modeling that incorporates the residual WPL-1 plume as an initial condition..." Pet. at 19. The Petition does not show how the Region acted erroneously in its review of the AoR regarding the selected initial conditions and because the Region acted reasonably and consistent with the Class VI Rule the Board should deny review of the Region's issuance of the Permit that incorporates the AoR as delineated.

Petitioner takes issue with the omission of the WPL-1 plume as an "initial condition," but this assertion represents a lack of understanding of modeling parameters. The Class VI Rule does not set forth the required "initial conditions" in AoR modeling, thus leaving review of modeling parameters to EPA's technical expertise. The AoR Guidance is instructive on this topic. It identifies initial conditions as the fluid pressures and/or flow rates of the CO₂ stream within the domain at the beginning of the model run. A.R. #1762 at 13. This information is obtained through pre-injection site characterization data. *Id.* Initial conditions are baseline numerical figures for modeling the area for two key AoR parameters: site hydrogeology (i.e. showing where fluids are expected to travel) and operational data (i.e. project operations, including injection pressures, rates, and total volumes). *See* A.R. #1762 at 31-33.

The AoR Guidance acknowledges that "computational models are an approximate representation of reality, and thus predictions exhibit some degree of uncertainty," and "in most cases, these models assume homogenous aquifers (i.e. no variability in physical structure, porosity, or intrinsic permeability). For most formations this is an unrealistic assumption." A.R. #1762 at 22. Significant uncertainty exists in modeling predictions of geologic sequestration due to the difficulty in determining the geological formation structure and permeability field

throughout the extensive area likely to be impacted by proposed large injection volumes, a relative lack of data on the behavior of CO₂ in the subsurface, the drastic changes in transport behavior of CO₂ caused by changes in pressure and temperature, and the buoyant nature of CO₂ relative to native formation groundwater A.R. #1762 at 23. Simply put, the AoR Guidance acknowledges that modeling is simply part of the delineation of the AoR process due to the uncertainties.

The input of initial conditions into modeling is a preliminary step in performing modeling; additional analysis to account for variability in the AoR, including the presence of the WPL-1 plume, was performed by Marquis and reviewed by the Region. As part of its permit application, Marquis submitted to the Region its initial conditions for the models. A.R. #964 (2.0.AoR Correct Action Plan (August 2024)) at 41-42. The initial conditions consisted of only four parameters, including: temperature, pore pressure gradient, fluid density, and salinity. *Id.* at Table 2-7. Marquis addressed modeling uncertainties in its permit application materials relating to AoR delineation through the creation and simulation of alternative scenarios. A.R. #964 at 63-154. Additionally, the selected initial conditions for the model, provided in Table 2-7 of the permit application materials relating to the AoR, is a list of area-wide parameters associated with the project and does not represent the entirety of the delineation of the AoR. In summary, there are plenty of ways by which EPA ensures that a permittee accounts for uncertainty in AoR modeling, but specific “initial conditions” for modeling are not mandated by regulation and review of the modeling and its application to the development of the AoR are subject to agency expertise.

Moreover, the Class VI Rule does not require the initial conditions in AoR modeling to consider the “characteristics of all displaced fluids.” The Petitioner selects its preferred words

that are present in the regulation (such as “fluids” and “characterization”) and combines them to suggest a legal requirement that does not actually exist. Pet. at 17. Accordingly, Petitioner’s assertion that the Region was clearly erroneous in failing to consider the characteristics of all displaced fluids is based on a non-existent requirement. Petitioner has therefore not demonstrated that the Region was clearly erroneous when it “[p]redict[ed], using existing site characterization, monitoring and operational data, the projected lateral and vertical migration of the carbon dioxide plume and formation fluids in the subsurface.” 40 C.F.R. § 146.84(c)(1).

There is no regulatory requirement nor technical need to incorporate the hazardous waste plume as an initial condition particularly because the Region accounted for the plume in other ways when reviewing the AoR. The initial conditions do not represent the entirety of the AoR analysis. The Region considered matters pertaining to the WPL-1 plume, as described more fully under Issue 1.B, below, outside the context of “initial conditions” in modeling. In summary, Petitioner has not cited any portion of the Class VI Rule that requires AoR modeling to include the residual spent pickle liquor as an “initial condition” or to consider “characteristics of all displaced fluids.” The Petition thus fails to demonstrate that the Region acted erroneously in approving the delineated AoR.

3) The AoR Will Be Reevaluated Periodically and As Needed Which Will Allow Detection of Pressure Impacts on the WPL-1 Plume.

Although the AoR delineation is complete, it will be periodically reevaluated to ensure the AoR is consistent with data resulting from project activities. 40 C.F.R. § 146.84(e) requires that the AoR be reevaluated at set periods not to exceed five years or when monitoring and operational conditions warrant. This requirement has been incorporated into the Permit. Permit Section G.2. This means that Marquis will be required to analyze any changes involving the

WPL-1 plume and increase the AoR, if needed, during the lifetime of the project and post-project monitoring. The assertion that the WPL-1 plume should be an “initial condition” in modeling discounts the ongoing review and analysis that will occur to ensure USDWs are protected

B. The WPL-1 plume is not predicted to migrate beyond the boundary of the AoR and all penetrations within the AoR were reviewed to ensure proper containment.

The Region fully evaluated the presence of the WPL-1 plume as part of the AoR delineation process. The waste pickle liquor was injected pursuant to a permit issued by the Illinois Environmental Protection Agency (“Illinois EPA” or “IEPA”). Injection at WPL-1, located approximately 1.5 miles from the location of the Marquis CO₂ injection well, ceased in 2009. As detailed in this section, the record shows that the WPL-1 plume is not predicted to migrate outside the AoR boundaries. The development of the AoR is a delineation process, and Marquis already determined the AoR boundaries will far exceed any expected migration of WPL1 plume. Additional evaluation of the anticipated pressure effects from the carbon sequestration project on the WPL-1 plume will not result in modifications to that delineation.

The Region made a technical determination that the presence of the WPL-1 plume will not impact the geographic extent of the AoR because the pressure front boundary for the CO₂ plume far exceeds the expected migration of the WPL-1 plume. During the permitting process, although not input as an “initial condition”, as explained above, Marquis did incorporate the WPL-1 plume into its AoR analysis. Among other materials, Marquis relied on a 2007 No Migration Petition (NMP) modeling, which demonstrated the relative stability of the plume. A.R. #2125 through #2130. The plume was modeled to have a maximum extent of dispersion after 10,000 years of 5.266 miles to the southeast, corresponding to a movement rate of 2.78 feet per year, which will result in the movement 139 feet (0.026 miles) southeast 50 years after the

cessation of injection at Marquis. *Id.*, and Resp. to Com. at 37. The Region considered Marquis' analysis of the WPL-1 well plume in approving the AoR and addressed comments about its impacts on the AoR delineation in its response to comments document. Resp. to Com. at 35-41. The Region discussed, at length, its determination that the CO₂ plume will not reach the WPL-1 injection well, let alone the boundary of the AoR which is nearly 15 miles away.

The Region also examined hazardous waste plume data from WPL-1 specifically to confirm that the hazardous waste plume would not be pushed out beyond the AoR. A.R. #1969, Lawrence Berkley National Laboratory, "Re-Review of R05-IL-006 (Marquis Carbon Injection)" (2025). To perform this review, an EPA contractor estimated the effect of CO₂ injection on the hazardous waste plume by considering piston flow: i.e., how the hazardous waste plume is pushed outwards by the CO₂ plume. This review concluded that, even when considering the pressure effects and displacement associated with the CO₂ injection project, the hazardous waste plume will remain "*well within* the AoR." *Id.* at 5 (emphasis added).³ Given this extensive analysis of the WPL-1 plume and the determination that it will not interact with the Marquis CO₂ project, including the WPL-1 plume as an initial condition was unnecessary.

Further, Marquis analyzed all penetrations in the AoR as required by 40 C.F.R. § 146.84(c)(2). In addition to WPL-1, 11 other wells within the AoR were identified. Marquis reviewed well logs for each of these wells to determine if they could present possible leakage pathways to USDW sources. A.R. #964 at 170. These wells do not penetrate the confining zone where liquefied CO₂ will be stored and where the WPL-1 plume is presently located. *Id.* Each well terminates between 20' and 56' from the top of the Eau Claire formation, which has more

³ In addition to arguing that the Region was clearly erroneous, Petitioner also argues, in seven of the 11 issues, that the same matter raises an "important policy consideration." For brevity, the Region discusses the standard for raising an important policy consideration, and demonstrates that Petitioner fails to meet this standard, in Section X, below.

than 300' thickness throughout the AoR. *Id.* Thus, the confining layer is still intact at the location of these wells and they do not pose a possible leakage pathway to USDW sources.

C. AoR delineation is a highly technical endeavor, and the Board should not second guess the Region's reasoned technical judgment.

In a previous UIC Class VI permit appeal, the Board declined to review the AoR because “the delineation of the area of review under the regulations is very site- and project-specific, leaving much to the discretion of the permitting authority.” *FutureGen*, 16 E.A.D. at 726. The exact same analysis applies here.

The *FutureGen* petitioners cited concerns that the plume boundary was underestimated for purposes of setting the AoR. The Board noted, however, that the petitioners did not actually allege that the underestimation of the plume boundary resulted in an insufficient, pressure front-based AoR. *FutureGen*, 16 E.A.D. at 731. This is because the pressure front captures a much broader geological area for purposes of establishing the AoR. “Thus, even if the Board were to accept as true Petitioners’ assertions of technical inaccuracies with the margins of the modeled plume.... Petitioners do not articulate any clear error with respect to the Region’s approval of the delineation of the area of review, as required by the part 124 regulations governing petitions for review.” *Id.* Similarly, “Petitioners assert only that incorporating more conservative model parameters ‘*may*’ increase the size of the delineated pressure front. Petitioners do not at any point suggest that the area of review, as delineated by the pressure front, fails to meet the regulatory obligation to comprise ‘the region surrounding the geologic sequestration project where [underground sources of drinking water] may be endangered by the injection activity.’ *Id.* at 732 (emphasis original). The Board accordingly declined review of the AoR in that case.

In *FutureGen*, as in Marquis, the Region determined that to be conservative and fully protective, the AoR should be defined by the maximum extent of the pressure front over the lifetime of the project. *FutureGen* 16 E.A.D. at 729-30; A.R. #357. In *FutureGen*, as in Marquis, the AoR was based on the pressure front, and cast a wide parameter around the predicted plume. *FutureGen* at 730; Permit Attachment B. At both projects, this ensured that the AoR encompassed the entire area where any underground source of drinking water may be endangered by the injection activity, as required by the Class VI regulations. 40 C.F.R. § 146.84(a).

Petitioner makes much of modeling parameters that it wishes were incorporated to develop the boundaries of the AoR, but does not properly allege that the Region failed to satisfy any regulations regarding the AoR delineation in issuing the Permit. Petitioner therefore fails, just as the petitioners did in *FutureGen*, to articulate any clear error warranting review by the Board. The Board should find that Petitioner failed to demonstrate that the permit decision was based on a clearly erroneous finding of fact or conclusion of law.

D. The Permit fully meets the criteria of 40 C.F.R. § 144.12.

Petitioner separately argues that “the non-endangerment determination under 40 C.F.R. § 144.12 must be supported by the administrative record at the time of issuance.” Pet. at 17. 40 C.F.R. § 144.12(a) is part of the broader UIC regulations that encompass Class VI permitting requirements. Specifically, this provision requires that no owner or operator shall engage in injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water standard or may otherwise adversely affect the health of persons.

Id. Additionally, “The applicant for a permit shall have the burden of showing the requirements of this paragraph are met.” *Id.*

Petitioner fails to allege any facts demonstrating that a violation of 40 C.F.R. § 144.12 has occurred. Because the Class VI Rule directly addresses the requirements for Class VI permitting, Petitioner’s citation to 40 C.F.R. § 144.12 is merely a repackaging of its claims regarding the permitting requirements. Petitioner has not identified any specific deficiency with respect to this rule and, as shown by the record and explained in this Response, the Permit fully meets the criteria of 40 C.F.R. § 144.12(a).

Issue 2 – The Region Properly Relied on Marquis’ Site-Specific Computational Modeling and Consideration of Heterogeneities.

Petitioner’s Issue 2 asks the Board to find that (1) the Region erroneously approved the computational modeling used by Marquis to delineate its AoR and CO₂ plume because the model excluded information related to a different UIC Class VI well, referred to here as the “Illinois Basin-Decatur Project” or “IBDP,” and (2) the Region erroneously approved the computational modeling despite the model’s failure to properly account for geologic heterogeneities under 40 C.F.R. § 146.84(c)(1)(ii). Petitioner has not met its burden in demonstrating the Region’s approval of Marquis’ computational modeling was erroneous.

The Region’s approval of Marquis’ site-specific computational modeling used to delineate its AoR and predict movement of the CO₂ plume is consistent with the Class VI Rule, EPA’s AoR guidance, and supported by the record. Further, because the Marquis project’s AoR delineation is “very site- and project-specific,” review and approval of the delineation should “leav[e] much to the discretion of the permitting authority.” *FutureGen*, 16 E.A.D. 717 at 726-731. Petitioner’s arguments regarding Marquis’ computational modeling and geologic

heterogeneities fail to articulate an erroneous finding of fact or conclusion of law. Instead, Petitioner offers its opinions that the Region should have required Marquis to consider additional, non-site specific information in its computational modeling or required a different methodology to account for heterogeneities. Neither opinion demonstrates that the Region erroneously approved the computational modeling's site-specific information or methodology. Because Petitioner has not met its burden to demonstrate that the Region clearly erred, the Board should defer to the Region's technical judgment and expertise on Issue 2. *See id.* at 733-737; *Keene*, 18 E.A.D. at 724.

A. Marquis' computational modeling used to delineate its AoR and the CO₂ plume is appropriately based on project- and site-specific information and properly accounted for heterogeneities.

Specific to Issue 2, Petitioner argues that the Region's approval of Marquis' computational modeling used to delineate its AoR and plume is erroneous because Marquis failed to consider information from a different Class VI injection site and failed to account for heterogeneities. Petitioner cites 40 C.F.R. § 146.84(c) in support of its argument. 40 C.F.R. § 146.84(c)(1) states that to delineate the area of review, permit applicants must "[p]redict, using existing site characterization, monitoring and operational data, and computational modeling, the projected lateral and vertical migration of the carbon dioxide plume" 40 C.F.R. § 146.84(c)(1) requires that the model must:

- (i) Be based on detailed geologic data collected to characterized the injection zone(s), confining zone(s) and any additional zones; and anticipated operating data, including injection pressures, rates, and total volumes over the proposed life of the geologic sequestration project;
- (ii) Take into account any geologic heterogeneities, other discontinuities, data quality, and their possible impact on model predictions; and
- (iii) Consider potential migration through faults, fractures, and artificial penetrations.

1) Marquis used site-specific computational modeling inputs.

As contemplated by 40 C.F.R. § 146.84(c)(1), Marquis performed computational modeling using site-specific information to both delineate its AoR and to predict the projected lateral and vertical migration of the CO₂ plume over time. As defined by the AoR Guidance, a computational model is a “mathematical representation of the injection project and relevant features, including injection wells, site geology, and fluids present. For a [geological sequestration] project, site specific geologic information is used as input to a computational code, creating a computational model that provides predictions of subsurface conditions, fluid flow, and carbon dioxide plume and pressure front movement at that site.” A.R. #1762 (AoR Guidance) at *xi*.

Marquis collected site-specific information for its model using a stratigraphic test well, MCI MW 1, located approximately 1.2 miles from its injection well. A.R. #1829 (1. Project Narrative (02.05.25)) at 24-25, 30-31. Marquis used MCI MW 1 to collect multiple sample types for analysis and testing to determine the specific qualities of the Mt. Simon and Eau Claire formations at its project site. *Id.* at 30-31. This included 8 whole cores, 29 sidewall cores, well logs, and eight dynamic formation tests with fluid samples. *Id.*

Consistent with 40 C.F.R § 146.84(c)(1)(i) Marquis used geologic data collected from its MCI MW 1 well as the initial conditions in its computational modeling. This included a range of temperatures collected from the top of the confining layer, the top of the injection zone, and the base of the injection zone; pore pressure gradient, collected from drill stem testing from the MCI MW 1 well; fluid density, generated using the CMG Reservoir Simulator Calculation; and salinity, collected using drill stem testing at MCI MW 1. A.R. #964 (2. AoR.Correct Action Plan

(August 2024)) at 41-42. Marquis calibrated its modeling using the well logs and cores from MCI MW 1 to determine geological parameters, such as porosity and permeability. *Id.*

Marquis' model also included site-specific information on faults, fractures, and artificial penetrations consistent with 40 C.F.R. § 146.84(c)(1)(iii). A.R. #1829 at 25. Marquis collected information on faults, fractures, and artificial penetrations through a 2021 2D seismic program, a 2022 3D seismic survey, well cross sections, MCI MW 1 well core samples, and publicly available information. *Id.* at 25; A.R. #964 at 25; A.R. #237 (App.--C.--2D--Seismic--Review--Marquis); A.R. #238 (App.--D.--3D--Seismic-processing-report--Marquis); A.R. #245 (App.--J.--Additional--2D--and--3D--seismic). Based on this information, Marquis concluded there is no evidence of faulting, folding, and fracturing structures in the vicinity of the plume model or within the AoR. A.R. #1829 at 24-25.

Consistent with the final requirement under 40 C.F.R. § 146.84(c)(1), Marquis' computational modeling accounted for site-specific geologic heterogeneities and discontinuities. *See* 40 C.F.R. § 146.84(c)(1)(ii). Marquis accounted for heterogeneities, including porosity and permeability, by incorporating object-based "environments of deposition" (EODs), or more simply, layers representing historic sediment deposits, into its computational modeling. A.R. #964 at 31-32. The EODs were determined using paleogeographic information, existing well analyses, and core samples from Marquis' MCI MW 1 well. *Id.* Marquis' geostatistical model framework for the injection site includes ten modeled zones from the top of the Eau Claire Shale (confining zone) to the Precambrian Basement. *Id.* Using the modeled zones, Marquis defined EODs on a zone-by-zone basis and incorporated the EODs into the model as objects representing geologic channels and deposits. *Id.* The objects allow the model to constrain categorical or discrete variables including: geologic facies, or bodies of rock with similar sediment depositions;

lithologies, units of rock with the same physical characteristics; and other rock types throughout the model. *Id.* Marquis' approach resulted in a range of results. *Id.* Observed and modeled results were then compared against regional geologic maps and other well logs to confirm heterogeneity. *Id.* at 32-33.

Marquis' methodology for accounting for geologic heterogeneities is consistent both with the requirements in 40 C.F.R. § 146.84(c)(1)(ii) and EPA's AoR Guidance, which recommends that computational models account for geologic heterogeneities by incorporating layered distribution and by employing geostatistical and stochastic methods to create a statistical ensemble of possible porosity and permeability distributions. *See* A.R. #1762 at 15; A.R. #964 at 31-32.

Marquis validated its plume model using sensitivity analyses with dynamic simulations. Sensitivity analyses refer to "the study of how the output of a model varies based in changes to an input variable or model parameter over a specified range of values. The results of a sensitivity analysis determine [] which input variable and model parameter variability have the greatest effect on the model results." A.R. #1762 at xi. Sensitivity analyses, like the one used by Marquis, address subsurface uncertainty through the creation and simulation of alternative scenarios. A.R.#964 at 63.

Marquis' sensitivity analyses tested four sets of sensitivity cases to evaluate the effects of changing porosity and permeability relationships on the projected plume, and to take into account impacts on the model resulting from heterogeneities, discontinuities, and data quality. These included (1) high porosity, low permeability, (2) high porosity, high permeability, (3) low porosity, high permeability, and (4) low porosity, low permeability. The sensitivity analyses also evaluated changes to the vertical to horizontal permeability ratio: high side vertical permeability,

and low side vertical permeability, and tested the effects of changing CO₂ injection rate and wellhead temperature. As part of its sensitivity analysis of the model, Marquis' ran ten different test cases with differing input parameters and model realizations. *Id.* at 63-64; Resp. to Com. at 7-8. The results of the sensitivity analysis validated Marquis' computational modeling by demonstrating that the plume model results do not differ significantly from the base case. A.R. #964 at 63-154; A.R. # 1829 at 39-40.

The Region reviewed Marquis' computational modeling in support of its AoR delineation and CO₂ plume prediction and determined that the modeling was consistent with the regulations. Resp. to Com. at 14-16. The Region also concluded that the predictive model, techniques, inputs, and assumptions were accurate and performed in accordance with established quality assurance standards, and that the model was calibrated to site-specific conditions and data collected from MCI MW 1. *Id.* at 7-8.

2) *The Region correctly concluded that Marquis' computational modeling is appropriately based on site-specific information.*

In its Petition, Petitioner argues that the computational modeling used to delineate the AoR and predict plume movement is “clearly erroneous in light of peer-reviewed empirical evidence that this modeling approach failed at the Illinois Basin-Decatur Project.” Pet. at 23. In support, Petitioner argues that the Region failed to address information and analysis contained in “Carbon dioxide Migration Along Faults at the Illinois Basin-Decatur Project,” Bukar et al. (2025) (hereinafter, “Bukar et al. (2025)”). According to Petitioner, Bukar et al. (2025) applied a deterministic pre-injection model to predict the carbon dioxide plume associated with the IBDP. Petitioner argues that model was deficient because subsequent data showed the CO₂ plume migrated inconsistent with the predictive modeling. Petitioner posits that deterministic modeling,

like that used in support of the Marquis Permit, is inappropriate. However, Petitioner's argument fails to demonstrate that the Marquis computational modeling was clearly erroneous.

At the outset, because AoR delineations are highly technical, and site-specific determinations, much is left to the discretion of the permitting authority. *See FutureGen*, 16 E.A.D. at 726. The Board has previously declined to review a challenge on the appropriate computational modeling methodologies where Petitioner "ha[s] not met "[its] burden to show that the Region's technical determination regarding the modeling of the plume warrant review." *Id.* at 733. The Board explained the basis for its conclusion by stating: "Evaluating and comparing inputs and assumptions with site characterization data and the proposed operational information in conjunction with computational modeling involves precisely the kind of technical judgment to which the Board typically defers to the Region's expertise." *Id.* Further, a petitioner's disagreement with the Agency's technical review and approval of an applicant's computational modeling alone is insufficient to demonstrate clear error:

While Petitioners may disagree with the Region's approach to predicting the plume (and its approval of the modeling of the plume), and may believe that their suggested approach would more appropriately and conservatively model the plume, that disagreement does not overcome the deference the Board typically affords the Region.

Id. at 735.

The same rationale is directly applicable here. Petitioner offers its opinion that Bukar et al. (2025) supports using non-deterministic modeling but fails to articulate how the modeling, methodology, and site-specific information used by Marquis, and approved by the Region, warrants review. *See id.* at 733, 735. Furthermore, because of the highly-technical nature of the Region's review, and the model's site-specific inputs, the Board should defer to the Region's technical judgment on this issue. *See id.*

Petitioner's Issue 2 appears to imply that there is a requirement to use a particular type of modeling under 40 C.F.R. § 146.84(c). However, there is no prescriptive regulatory requirement that obligates a particular form of computational modeling under 40 C.F.R. § 146.84(c). The regulations leave much to the discretion of the Agency by providing only that the AoR and plume must be delineated "using existing site characterization, monitoring and operational data, and computational modeling." 40 C.F.R. § 146.84(c). This point is highlighted by the existence of EPA's 96-page AoR Guidance, the purpose of which is to help identify appropriate methods for delineating the AoR.⁴ *See* A.R. #1762, AoR Guidance at 1.

Next, the Petition argues that Marquis' computational model should have included certain information or modeling methodologies based on the IBDP site because both sites use the same geologic formation for injection. This argument ignores the purpose of 40 C.F.R. § 146.84(c), which directs applicants to utilize site- and project-specific information including monitoring and operating data, geology, and geologic heterogeneities information. The argument also ignores the Agency's discretion to exercise its considered judgment and approve computational modeling consistent with the regulation.

IBDP is a different site, located over 100 miles away, with different site-specific information. Additionally, the Mt. Simon Sandstone is an expansive formation spanning multiple Midwestern states, and as Petitioner points out, contains heterogeneities. Pet. at 25-26. The fact

⁴ The Region also notes that in Petitioner's attempt to minimize the technical considerations and evaluations that support Marquis' computational modeling, Petitioner mischaracterizes Marquis' modeling as solely "deterministic" despite Marquis' use of stochastic methods to account for heterogeneities in its model. *See* A.R. #1762, AoR Evaluation and Corrective Action Guidance at 15 (defining "stochastic methods" as the "use of probability statistical methods in development of one or more possible realizations of the spatial patterns of the value(s) of a given set of model parameters"); A.R. #964, 2. AoR Correct Action Plan (August 2024) at 31 (describing the stochastic methods and the range of results used in the model to account for heterogeneities).

that both the IBDP and Marquis sites use the Mt. Simon Sandstone as an injection formation is not a compelling justification to use IBDP data in place of the site specific data collected by Marquis through its MCI MW 1 well. Petitioner's overemphasis on Bukar et al. (2025) and the IBDP site appears to disregard the site-specific information used by Marquis in support of its computational modeling. *See generally* A.R. #964. Additionally, Petitioner's argument that it prefers different computational modeling based on information from the IBDP site fails to articulate how the Region's highly-technical determination, based on its review of Marquis' site-specific data and modeling methodologies, is inconsistent with the regulations or the record. Petitioner fails to meet its burden to demonstrate that the Region's technical determination warrants review. *See FutureGen*, 16 E.A.D. at 733. The Board should therefore defer to the Region's technical judgment on this issue. *See id.*

3) *The Region did not err in concluding that Marquis' computational modeling accounted for heterogeneities under 40 C.F.R. § 146.84(c)(1)(ii).*

Petitioner asserts that the Region erred in approving Marquis' sensitivity analyses without requiring that the analyses account for heterogeneities in the Mt. Simon Sandstone under 40 C.F.R. § 146.84(c)(1)(ii). Petitioner mischaracterizes the methods used to account for heterogeneities in Marquis' computational modeling and otherwise fails show that the Region's technical determination warrants review. *See FutureGen*, 16 E.A.D. at 733.

As detailed above, Marquis appropriately accounted for geologic heterogeneities in its computational modeling as required under 40 C.F.R. § 146.84(c)(1)(ii). *See* A.R. #964 at 31-32; A.R. #1762 at 15. Marquis then validated its modeling and its consideration of heterogeneities, using sensitivity analyses that tested four sets of sensitivity cases to evaluate the effects of changing porosity and permeability. *See* A.R. #964 at 63. Marquis utilized additional sensitivity

analyses to account for rate and wellhead temperature. *See id.* The Region reviewed Marquis’ computational model, its consideration of heterogeneities, and the sensitivity analyses, and determined each was sufficient. *See Resp. to Com.* at 9, 14-16.

Petitioner’s argument incorrectly minimizes the extent of the model’s consideration of heterogeneities by stating that Marquis used only four bracketed sensitivity cases. Petitioner’s characterization ignores substantial record information including the computational model’s evaluation and modeling of EODs and utilization of layered distribution. *See A.R. #964* at 31-32, 63. While Marquis did validate modeling results using sensitivity analyses, including the four bracketed cases identified by Petitioner, the four sensitivity cases are only a part of the model’s larger consideration of heterogeneities. *See id.* at 63.

Moreover, Petitioner’s argument offers that instead of approving the sensitivity analyses performed by Marquis in support of its modeling, the Region should have required different or additional analyses. But mere disagreement with a technical determination “does not overcome the deference the Board typically affords the Region” and does not demonstrate that the Region erred. *See FutureGen*, 16 E.A.D. at 735. Petitioner has not met its “heavy burden” on this technical issue. *See id.* at 733-37. Accordingly, the Board should defer to the Region’s expertise on this issue and deny Petitioner’s request for relief. *See id.*; *Keene*, 18 E.A.D. at 724.

B. Uncertainty is inherent in all computational modeling but will diminish as Marquis collects operating and post-injection data consistent with the regulations.

Petitioner’s Issue 2 presents an overarching concern with uncertainty in Marquis’ computational modeling. However, uncertainty is inherent in any type of predictive modeling. “[C]omputational models are an approximate representation of reality, and thus predictions exhibit some degree of uncertainty.” A.R. #1762 at 22.

The Class VI Rule accounts for the likelihood that modeling predictions shift as additional site-specific information becomes available over the life of the geologic sequestration project. Under 40 C.F.R. § 146.84(e), at a minimum fixed frequency, not to exceed five years, or when monitoring and operational conditions warrant, the permittee must reevaluate the area of review and submit an amended AoR and corrective action plan, as appropriate.

As the Region previously stated in its response to comments, “Modeling uncertainty diminishes as operational and post-injection monitoring data is collected and the model is validated. Specific measures and permit conditions designed to reduce uncertainty overtime include: a robust testing and monitoring approach during injection and post-injection . . . ; reevaluation of the AoR at least every five years to integrate new, site-specific information into the model to improve predictions of system behavior; and, the AoR and corrective action plan reevaluation requirements [Permit Attachment B] under 40 C.F.R. § 146.84(e) and Section G.2 of the Permit.” Resp. to Com. at 15.

Consistent with the regulations, Marquis will periodically re-evaluate the AoR and CO₂ plume. Permit Section G and Attachment B contain conditions that require Marquis to collect operational and post-injection monitoring data for the purpose of validating the model and reducing uncertainty over time. *See* 40 C.F.R. § 146.84(e). Marquis will evaluate project data and reevaluate the AoR and plume during the injection and post-injection phases at least every five years.

Additionally, monitoring results may trigger reevaluation prior to the next five year cycle. These include: unexpected changes in pressure outside three standard deviations from the average, differences between the observed arrival time of the pressure front and the modeled projections, changes in pressure front not seen in the monitoring wells, potential interaction of

AoRs from different wells, unexpected changes in temperature outside three standard deviations from the average, increases in carbon dioxide saturation that indicate movement of CO₂ into or above the confining zone, unexpected changes in fluid constituent concentrations that indicated movement of CO₂ or brines into or above the confining zone, pressure in the injection or monitoring wells exceeding 90 percent of the geologic formation fracture pressure at the point of measurement, exceedances of the baseline hydrochemical/physical parameter patterns, and any compromise in the injection well's mechanical integrity. Permit Attachment B at 9-11.

As contemplated by the regulations, the iterative reevaluation process is designed to reduce uncertainty over time. *See* 75 Fed. Reg. at 77248. Should operating and post-injection data support a revised AoR delineation or updated CO₂ plume movement predictions, Marquis will make those revisions consistent with its Permit.

C. A remand on Issue 2 would not provide Petitioner with its requested relief.

Petitioner requests that the Board remand the Permit with directions that the Region (1) respond to several named technical reports and how they relate to the “predictive reliability of the AoR computational model,” (2) require revisions to the AoR computational modeling to account for geologic heterogeneities consistent with EPA’s AoR Guidance, (3) articulate in the record the methods required to account for heterogeneities, and (4) re-public notice a revised draft permit. Pet. at 27.

Petitioner’s procedural argument in Issue 2 and first request for relief misconstrues what is required under 40 C.F.R. § 124.17(a)(2). Section 124.17(a)(2) directs EPA to “[b]riefly describe and respond to all significant comments raised during the public comment period.” The Region did that here. In its response to comments, the Region addressed comments about “the uncertainty surrounding computational modeling of the plume and possibility of plume

movement, accuracy of the three-dimensional computational model, site-specific data used for the model, and its use in determining the Area of Review.” Resp. to Com. at 14. The academic papers referred to by Petitioner fell within this category of comments and the Region considered these papers and responded to these comments consistent with the regulatory requirement. Resp. to Com. at 14-15. The regulations do not require that the Region do more.

Additionally, as described above, Marquis’ computational modeling properly accounted for heterogeneities consistent with the Class VI Rule. A remand on this issue would not provide Petitioner with its requested relief. The Board should deny Petitioner’s request for relief on Issue 2 in full.

Issue 3 – The Region Properly Issued a Permit with an Alternative PISC Period.

Petitioner’s Issue 3 argues that the Region erred in approving Marquis’ alternative Post-Injection Site Care (PISC) demonstration and timeline under 40 C.F.R. § 146.93(c). Like other arguments in the Petition, the basis of Petitioner’s alternative PISC argument appears to be that Petitioner disfavors the determination reached by the Region. Without more, this is insufficient to demonstrate that Region’s alternative PISC determination was clearly erroneous. *See Envtl. Disposal Sys.*, 12 E.A.D. at 292.

Under the Class VI Rule, permittees must “prepare, maintain, and comply with a plan for post-injection site care and closure.” 40 C.F.R. § 146.93(a). 40 C.F.R. § 146.93(b) provides a default PISC monitoring timeframe of 50 years, or authorizes EPA to approve an alternative timeframe if an applicant can demonstrate an alternative PISC is “appropriate and ensures non-endangerment of USDWs.” 40 C.F.R. § 146.93(c). An applicant’s demonstration “must be based on significant, site-specific data” and “must contain substantial evidence that the geologic sequestration project will no longer pose a risk of endangerment to USDWs at the end of the

alternative [PISC] timeframe.” *Id.* An alternative PISC demonstration includes consideration and documentation of ten elements, 40 C.F.R. § 146.93(c)(1)(i)-(xi) and the submitted information must meet seven criteria, 40 C.F.R. § 146.93(c)(1)(i)-(viii).

Marquis submitted a 12-year alternative PISC demonstration for the Region’s review consistent with the requirements in 40 C.F.R. § 146.93. *See* A.R. #1535 (9. PISC Site Clos.Plan (02.05.2025)). The Region reviewed Marquis’ submittal against the ten elements and seven criteria required by the regulations and concluded that Marquis’ alternative PISC demonstration was (1) based on significant site-specific data and (2) contained substantial evidence that at the end of the 12-year PISC timeframe, the project will no longer pose a risk of endangerment to USDWs. *See* A.R. #1698 (Memo to File: Alt-PISC); Resp. to Com. at 3-10. Permit Attachment E contains the 12-year alternative PISC period.

Petitioner’s main argument in support of Issue 3 is predicated on the same arguments raised in Issues 1 and 2: that Marquis’ computational modeling was flawed. However, as discussed above, Petitioner failed to demonstrate that the Region’s decision making related to these two issues was clearly erroneous. The Region reasonably concluded that WPL-1 did not require different “initial condition” modeling and Marquis’ site-specific computational model satisfied 40 C.F.R. § 146.84. The Petition therefore fails to establish a basis for the Board to determine that the Region’s decision to issue the Permit with the alternative PISC timeframe was clearly erroneous.

Petitioner’s other two arguments under Issue 3 likewise raise issues already addressed in this Response. Petitioner first argues that information from the IBDP site demonstrates that the Region’s alternative PISC determination is clearly erroneous. However, as discussed under Issue 2 above, information from the IBDP site is not a replacement for the site- and project-specific

information used to support Marquis' Permit. Alternative PISC demonstrations "must be based on significant site-specific data and information and the siting criteria." Resp. to Com. at 4; *See* 40 C.F.R. § 146.84(c)(1)(i)-(xi). Site specific or empirical information from a different UIC Class VI site does not invalidate Marquis' highly-specific alternative PISC demonstration. Further, the well failures referenced in the comment period related to failures that occurred during the active injection period, not during the PISC period, and are therefore distinguishable from the matters raised under Issue 3. *See* A.R. #2032.

Second, Petitioner argues that the Region erroneously concluded that pressure is predicted to decrease to less than 0.01% above pre-injection pressures because the AoR delineation portion of alternative PISC demonstration did not consider pressure associated with an existing waste plume (WPL-1). *See* Resp. to Com. at 4; A.R. #1698 at 16-21. However, as discussed in response to Issue 1 above, there is no requirement to consider WPL-1 as an initial condition when modeling the AoR. Petitioner's disagreement with model inputs does not demonstrate that the Region's alternative PISC determination was clearly erroneous.

Additionally, for purposes of approving the alternative PISC, the Region independently considered model results including: pressure decline below critical pressure, return toward pre-injection pressure, and cessation of plume migration. Resp. to Com. at 4–5. The Region found that pressure in the injection zone decreases below the pressure needed to force fluids up a hypothetical or potential pathway before the end of the 12-year PISC period, and, as cited by Petitioner, that by year 12 the storage-zone pressure differential is predicted to be less than 0.01% above pre-injection pressures. Resp. to Com. at 4. The Region also found that the CO₂ plume will become vertically and horizontally stable by 12 years post-injection. RTC at 4–5.

These findings are consistent with 40 C.F.R. § 146.93(c)(1)(ii). Accordingly, the Region's issuance of the Permit that includes a 12-year PISC meets the regulatory requirements.

Issue 4 – The Well Construction Provisions of the Permit Meet the Regulatory Requirements.

The Board should decline to review the Permit under Issue 4, which asks the Board to reconsider the Region's determination of construction requirements for MCI CCS 3, for three reasons: (1) the matter was not properly preserved for review during the public comment period; (2) the Petitioner misreads the requirements of the Class VI rule and seeks to challenge the Class VI Rule itself which is improper under permit appeal proceedings; and (3) the injection well design approved by the Permit meets all construction requirements set forth in the Class VI Rule.

- A. Petitioner failed to preserve Issue 4 because no comments were raised concerning well construction requirements being affected by the potential for EPA to extend the post-injection monitoring period.

Petitioner did not preserve Issue 4 which concerns the Class VI Rule's injection well construction requirements. Petitioner's argument narrowly rests on a clause contained in 40 C.F.R. § 146.86(b), which states: "Casing and cement ... must ... be designed for the life of the geologic sequestration project." Pet. at 28. Aside from this citation, Petitioner did not allege any concerns regarding the detailed technical specifications set forth in 40 C.F.R. § 146.86(b) that flesh out this requirement, nor did it take issue with any of the construction design aspects of the injection well required by the Permit. Petitioner only argues that "[w]ells designed for only 18 years cannot satisfy § 146.86(b)(1) when the project's life may be extended by regulation, by the Director's reservation, or both." Pet. at 28. None of the comments cited by Petitioner raise this timing issue. Petitioner instead identifies comments regarding well failures at another site, (A.R. #2031, Comment 0069), that EPA's Class VI program was only implemented in 2011, (A.R.

#2085, Comment 0106), a commenter’s request for a 50-year PISC (A.R. #1975, Comment 0020), and a request for independent mechanical-integrity testing and re-logging of legacy wells (A.R. #2090, Comment 0111). Pet at 27-28. None of these comments support the assertion that the Permit does not satisfy 40 C.F.R. § 146.86(b)(1) because the life of the project could be extended for additional monitoring. For this reason, Issue 4 was not preserved and should not be considered by the Board.

B. Issue 4 is improperly raised before the Board because it misreads the Class VI Rule and seeks to challenge the validity of the Class VI Rule itself.

In addition to failing on preservation, this argument wrongfully asks the Board to weigh in on the validity of the Class VI Rule itself. Petitioner implies that the Class VI Rule itself is an “internal contradiction” because EPA may extend the monitoring period beyond the 12 years required by the Permit if circumstances require. Pet. at 28.⁵ “Wells designed for only 18 years cannot satisfy 40 C.F.R. § 124.86(b)(1) when the project’s life may be extended by regulation, the Director’s reservation, or both.” *Id.* Petitioner cites to the existence of the flexible timing requirements in 40 C.F.R. § 146.93(c) and (b)(4) (authorizing approval of a post-injection site care timeframe that differs from the 50-year default, and the continuation of post-injection site care until a demonstration that no additional monitoring is needed can be made, respectively), and in the Permit (section P.6(d), which implements 40 C.F.R. § 146.93(b)(4)). Under the Petitioner’s circuitous logic, EPA can *never* determine with specificity the life of a project because the post-injection monitoring period may be extended.

⁵ Petitioner cites to the Region’s response to comments document, which states that “the life of the injection well would otherwise last beyond the proposed 18-year project timeframe.” Pet. at 28. In the ensuing sentence, the Petition states that the Region “admits the ‘well life ‘would otherwise last beyond’ 18 years.” *Id.* The Petitioner’s reliance on this statement to support its implication that the Class VI Rule is internally inconsistent fails. The Region’s statement shows that the well construction requirements in the Permit *exceed* regulatory requirements.

Petitioner's recitation of this rule misreads its requirements. EPA determines that a well will last for the life of a project by applying the technical specifications that ensue under the Rule. Section C, below, discusses those requirements and how the Region ensured they were met.

Further, the Petitioner's request that the Board review the Class VI Rule for consistency is not appropriate to raise under a permit appeal. 40 C.F.R. § 124.19, which governs this appeal, authorizes the review of contested permit conditions and is not a method for entertaining challenges to the validity of the applicable regulations. *Peabody Coal*, 15. E.A.D. at 767. Petitioner's reliance on 40 C.F.R. § 146.93(b)(4) and Permit section P.6(d) (the provisions that allow for monitoring extensions) does not support its argument that the Region should, without any regulatory authority or facts pertaining to the well itself, require an arbitrary 50-year design for the Marquis injection well or "recharacterize the design ceiling" to account for a potential monitoring extension.⁶ Petitioner is seeking review of 40 C.F.R. § 146.86(b)(1) itself. Petitioner's assertion that the Class VI Rule is invalid cannot be raised under these appeal proceedings.

C. Marquis' carbon injection well design meets the casing and cementing requirements of 40 C.F.R. § 146.86(b).

The Board should decline to review the Permit because Petitioner has not alleged any facts demonstrating that the Region was clearly erroneous in issuing the Permit's casing and

⁶ Petitioner's reliance on 40 C.F.R. § 146.93(c) is also misplaced. This regulation authorizes the Region to approve a PISC timeframe during the application process that deviates from the 50-year default at each individual project. Once an alternative PISC timeframe has been accepted and the permit has been issued, this regulation does not provide for additional changes in the monitoring period. Modifications to the PISC after permit issuance are addressed by the other regulations discussed in this Response. 40 C.F.R. § 146.93(c) is therefore irrelevant to Petitioner's argument relating to post-permit issuance modifications to the PISC timeframe.

cementing requirements. Petitioner's reliance on the clause that states injection wells be constructed for the "life of the geologic sequestration project," 40 C.F.R. § 146.86(b)(1), selectively disregards the detailed specifications for casing and cementing that are enumerated by that regulation. These specifications require that 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 by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director. In order for EPA to determine and specify casing and cementing requirements, the owner must provide site-specific information that includes: depth to the injection zone; injection pressure, external pressure, internal pressure, and axial loading; hole size; size and grade of all casing strings; corrosiveness of the CO₂ stream and formation fluids; down-hole temperatures; lithology of injection and confining zone; type of grade and cement additives; and quantity, chemical composition, and temperature of the CO₂ stream. 40 C.F.R. § 146.86(b)(1)(i)-(x). Compliance with these requirements is how EPA determines that a well meets construction requirements including that the materials have sufficient structural strength and are designed for the life of the project.

In its permit application, Marquis submitted the required information including casing and cementing plans. *See* A.R. #1892 (4.0 Injection Well Construction Plan). The Region used this information to develop and incorporate specific casing and cementing requirements into the Permit. The record contains information explaining the Region's determination. A.R. #1682 (Memo to file: Well Construction) ("Summarizing Casing Material Discussions with Marquis Regarding 13 Chrome and Findings that Proposed Construction Material Meets Regulatory Criteria," August 24, 2025.) Marquis will use "Super 25Cr" casing and tubing corrosion resistant material to provide increased pitting and corrosion resistance to formation fluids combined with

CO₂. A.R. #501 at 8. Marquis also provided detailed cementing plans for the project. *Id.* at 13-15. The Region discussed well construction requirements contained in the Permit in its response to comments document. *See* Resp. to Com at 28-30. The requirements are incorporated into Section I (“Well Construction”) and Attachment H (“Well Construction Details”) of the Permit. The Region determined that the construction requirements in 40 C.F.R. § 146.86 have been met. The Petition does not challenge any of these findings.

Since Petitioner failed to preserve the matter raised in Issue 4, improperly sought to challenge the regulation on appeal, and because, substantively, the Region has demonstrated in the record that the casing and cementing requirements contained in the Permit comport with 40 C.F.R. § 146.86(b), the Board should deny Petitioner’s request for relief under Issue 4.

Issue 5 – The Permit’s Monitoring Well Network Requirements Meets Regulatory Requirements.

Petitioner next asks the Board to find that the Region erred in approving Marquis’ monitoring well network because the network fails to meet the monitoring requirements contained in 40 C.F.R. § 146.90(d). Petitioner characterizes Section 146.90(d) as “requir[ing] monitoring ‘to track the position of the carbon dioxide plume and the presence or absence of elevated pressure’” and argues that the Permit must require a deep injection-zone monitoring well in the modeled CO₂ plume path and between CCS 3, Marquis’ injection well, and WPL-1.⁷ Pet. at 33-34. For the reasons set forth below, the Board should reject Petitioner’s argument in support of Issue 5.

Specific to the Class VI Rule’s monitoring well requirements, the Board previously acknowledged in *FutureGen*, “As would be expected in any regulation involving site-specific

⁷ Additional discussion on WPL-1 is provided in response to Issue 1.

technical requirements, the regulations confer considerable discretion to the permitting authority to review and approve the testing and monitoring plan, including the number and placement of testing and monitoring wells.” 16 E.A.D. at 739. Further, “[b]ecause the number and placement of monitoring wells necessarily requires the Region’s exercise of discretion, the Board applies an abuse of discretion standard.” *Id.* The placement of testing and monitoring wells involves “highly technical judgment and expertise,” accordingly the Board has stated that it “typically defers to the permitting authority, as long as the administrative record adequately reflects and supports the permit issuer’s decision.” *Id.* Petitioner has not met the burden set forth in *FutureGen*.

As an initial matter, Petitioner’s argument appears to conflate the requirements in 40 C.F.R. § 146.90 subsection (g) with subsection (d); although Petitioner cites to subsection (d), Petitioner’s argument paraphrases the language from subsection (g). Subsection (g) directs applicants to prepare, for EPA approval, a testing and monitoring plan to “track the extent of the carbon dioxide plume and the presence of elevated pressure (e.g., the pressure front) by using: (1) Direct methods in the injection zone(s); and, (2) Indirect methods.”

Consistent with subsection (g) Marquis’ application proposed direct and indirect testing and monitoring methods to track the CO₂ plume and pressure front. *See* A.R. #1912 (7. TestingMonit. Plan (02.05.25)) at 46-55. The Region reviewed Marquis’ proposed direct and indirect monitoring methods for tracking the CO₂ plume, including the monitoring wells used for this purpose. *Resp. to Com.* at 18-19, 34. Specific to Marquis’ monitoring well locations, the Region found that the “location, number, and monitoring frequency of monitoring wells is based on specific information about the Marquis project” and the locations were strategically selected to “track the migration of the plume and pressure front while minimizing the number of wells, which themselves could potentially serve as conduits for fluid movement.” *Resp. to Com.* at 18.

The Region incorporated Marquis' direct and indirect monitoring methods for tracking the CO₂ plume as permit conditions in Permit Attachment C. Attachment C requires direct plume monitoring using fluid sampling and isotope analysis at Marquis' MCI MW 2, a deep injection-zone monitoring well. Permit Attachment C at 17, Table 7. The Permit requires indirect plume monitoring using 3D seismic monitoring at the surface, and PNC logging at Marquis' MCI MW 2 well and MCI ACZ, an above-confining zone well. *Id.*

Petitioner's Issue 5 asserts that under the Class VI Rule the Permit should require injection-zone monitoring wells at specific locations including between the existing WPL-1 and Marquis' CCS 3 or in a particular location within the plume path. However, Petitioner's argument is premised upon incorrect legal and factual assumptions. First, Petitioner's argument incorrectly reads 40 C.F.R. § 146.90(g) as obligating the Agency to require injection-zone monitoring wells in specific locations. However, Subsection (g) does not contain prescriptive monitoring well siting requirements. Subsection (g) broadly requires applicants to propose, for EPA review and approval, direct and indirect methods for monitoring the plume extent and the presence of elevated pressure. Marquis did that here. *See* A.R. #1912 at 46-55. The Region then reviewed and rendered its technical determination that Marquis' proposed appropriate plume monitoring methods. *See* Resp. to Com. at 18-19, 34; Permit Attachment C at 17, Table 7. Petitioner's Issue 5 does not articulate how the Regions' review and approval of Marquis direct and indirect methods are inconsistent with the Class VI Rule or otherwise an abuse of discretion. *See FutureGen*, 16 E.A.D at 739.

Second, Petitioner's assertion that there is no deep injection-zone monitoring well within the predicted CO₂ plume is also factually incorrect. As referenced above, Marquis' monitoring well network includes an injection-zone monitoring well, MCI MW 2, sited east of CCS 3. MCI

MW 2 is located within the predicted plume extent.⁸ A.R. # 1829 at 23, Fig. 1-4; Pet. at 33, Fig. 4. The Permit requires Marquis to utilize MCI MW 2 to provide both direct and indirect plume monitoring during injection and post-injection periods. Permit Attachment C at 17, Table 7; Permit Attachment E at 4, Table 4.

Petitioner's 40 C.F.R. § 146.90(g) argument fails to offer support demonstrating that the Region failed to use considered judgment based on the administrative record or abused its discretion in approving Marquis' proposed direct and indirect methods for tracking the extent of the CO₂ plume.⁹ See *FutureGen* 16 E.A.D. at 739. Moreover, a remand on this issue will not provide Petitioner its requested relief. Petitioner requests that the Board grant relief by remanding the Permit with instruction to require additional monitoring wells between existing well, WPL-1, and Marquis' CCS 3. For the reasons stated above, there is no basis to require an injection zone monitoring well between an existing well and an injection well or within the plume path if the plume movement is otherwise appropriately monitored. The Board should deny Petitioner's request for relief under this issue in its entirety.

Separately, Petitioner's Issue 5 also raises a procedural argument with respect to the Region's typographical correction to the locations of MCI MW 2 and MCI ACZ 1 in Permit Attachment C. Petitioner cites to 40 C.F.R. §§ 124.10(d) and 124.13 to argue that the "public commented on the wrong configuration" and the Region's correction constituted "a procedural

⁸ The Petition, citing to Figure 2 from Permit Attachment B, states that the red box within Figure 2 "depicts the modeled 50-year CO₂ plume." Pet. at 32-33. Regretfully, this is a typographical error in the Permit. The roughly round, orange boundary in Figure 2 represents the plume extent 50 years post-injection. The red box represents the approximate location of the GW 5 Shallow Monitoring Well.

⁹ The Region also notes that should Petitioner have intended to make an argument based on the monitoring requirement 40 C.F.R. § 146.90(d), such an argument would likewise be unsuccessful. Petitioner challenges the Region's determination not to require a specific deep injection-zone monitoring well, 40 C.F.R. § 146.90(d) applies to periodic monitoring "above the confining zone."

defect compounding the substantive defect.” A minor typographical error inadvertently reversing the words “west” and “east,” however, does not constitute a failure to provide information during the public comment period under Part 124. Additionally, the correct information, contained in Figure 7A-2 in the draft and final Permits (Figure 1-4 from the Permit Application’s Project Narrative), was available for public review and comment. Figure 7A-2 provides an accurate aerial representation of MW 2 and ACZ 1. A.R. #1671 (Draft Permit #IL-115-6A-0001, Marquis Biocarbon Project, Attachment B) at 3. Moreover, despite its argument that it lacked the appropriate information, Petitioner seemingly relied on the locations of the monitoring wells contained in Figure 7A-2 to draft its public comment related to Issue 5. *See* A.R. #2095 (EPA-R05-OW-2025-1612-DRAFT-0115-AI). For these reasons, the Board should disregard this argument.¹⁰

Issue 6 – No Corrective Action is Needed at the WPL-1 Well.

In Issue 6, Petitioner asks the Board to substitute its technical judgment for that of the Region’s and require additional unnecessary analysis on WPL-1 to determine whether corrective action must be taken. The Class VI Rule requires project owners to identify and address any abandoned wells within the AoR that require corrective action. 40 C.F.R. § 146.84(c) and (d). This helps ensure that the project’s CO₂ stream and displaced injection zone formation fluids do not enter USDWs. The Region determined that Marquis sufficiently completed this analysis and determined that no further corrective action was required on the WPL-1 well. The Region’s decision was based on the Region’s review of Illinois EPA’s determination in 2015 that the permitted Class I UIC well was properly plugged and abandoned in accordance with well

¹⁰ Additional discussion on the Region’s decision not to reopen public comment is provided in the Region’s response to Issue 10.

abandonment plans incorporated into state permitting requirements. Nonetheless, Petitioner asks the Board to revisit the Region's technical judgment and require, without legal basis, a federal and state coordination program that is not contemplated under SDWA. The Board should deny the requested relief under Issue 6 because the Region's determination that no corrective action at WPL-1 is needed was appropriately based on the record.

- A. The Region determined WPL-1 and its associated groundwater monitoring well were plugged in a manner that prevents the movement of carbon dioxide or other fluids that may endanger USDWs based on its review of Illinois EPA's determination that the wells were plugged and abandoned according to state requirements.

The Class VI Rule directs project owners to evaluate and repair preexisting wells located within the AoR. Specifically, 40 C.F.R. § 146.84(c)(2) requires owners to “identify all penetrations, including active and abandoned wells and underground mines, in the area of review that may penetrate the confining zone...” In turn, 40 C.F.R. §146.84(d) requires owners of Class VI wells to “perform corrective action on all wells in the area of review *that are determined to need corrective action*, using methods designed to prevent the movement of fluid into or between USDWs, including use of materials compatible with the carbon dioxide stream, where appropriate.” (emphasis added). The Class VI Rule does not require any specific methods for evaluating wells for corrective action, nor for implementing corrective action where needed.

Helpfully, the AoR Guidance explains the process owners should undertake when evaluating whether an abandoned well within the AoR requires corrective action. Section 4.3.1, “Abandoned Well Plugging Record Review,” indicates that a records review may be sufficient for determining corrective action. A.R. #1762 at 57. The guidance informs that records of wells that have recently been abandoned, are cased holes, and have plugs and cement situated to isolate the injection zone from other fluid containing zones may be relied upon when determining

whether corrective action is required. *Id.* Elements in existing reports that can help in determining the “adequacy of abandonment procedures for identified wells within the AoR” include well depth and completion, well abandonment date, open hole or cased hole, location of plus, casing and cementing records, and records of mechanical tests (MITs) or logs performed. *Id.*

The Class VI Rule and supporting guidance account for the possibility that project owners will encounter abandoned wells in the AoR of unknown origin and in various stages of disrepair. However, much is known and documented regarding WPL-1, located in the Marquis project AoR. WPL-1 was a SDWA Class I injection well that was used to inject hazardous waste. 40 C.F.R. § 144.6(a). Illinois enacted its own implementing regulations for Class I wells (*see* 35 Ill. Adm. Code 730.101-1140) and EPA approved the Illinois EPA as the primacy authority to administer the Class I program under SDWA in Illinois. 40 C.F.R. § 147.700. After injection ceases, Class I wells must “be plugged with cement in a manner that will not allow the movement of fluids either into or between underground sources of drinking water.” 35 Ill. Adm. Code 730.110(a). Illinois EPA implements the Class I requirements at individual injection wells through the state’s permitting program. *See* 35 Ill. Adm. Code 704.101-702.264.

Illinois EPA issued a Class I UIC permit to the operators of WPL-1 for the injection of waste pickle liquor. Injection ceased in 2009 and, over time, Illinois EPA oversaw and approved the plugging and abandonment of WPL-1 and an associated groundwater monitoring well. *See* A.R. #942, Modified UIC Permit, March 11, 2015, at 7. In 2015, Illinois EPA determined that the operator had met the plugging requirements. *Id.* (“This permit (Log No. UIC-58R-M-3) approves a report demonstrating that ArcelorMittal has properly plugged and abandoned these wells.”). As the Region summarized in the response to comment document:

EPA has concluded that corrective action is not required on the WPL-1 well. During its technical review, EPA determined that WPL-1 was properly plugged in 2013 using cement suitable for contact with brine and acid. A groundwater monitoring well, Galesville Monitor Well (GMW), was installed near well WPL-1 to monitor the quality and pressure of groundwater within the Galesville Formation, the first permeable zone above the Eau Claire Shale confining zone. No evidence of groundwater contamination above the confining zone was observed at the GMW. Mechanical integrity tests, cement bond, multi-finger caliper, and temperature logs were acquired before abandonment and showed good well integrity. Epoxy resin cement plugs were then set and squeezed into several zones to ensure zonal isolation. Latex cement and Class A cement plugs were also set. Multi-finger caliper and cement bond logs confirmed the absence of anomalies and verified a good cement bond over both the 4 ½” and 5 ½” liners, showing that there was a good mechanical barrier between the casing and corrosive formation fluids. After reviewing the plugging documentation for the WPL-1 well, EPA determined that corrective action is not needed to re-plug the well.

Resp. to Com. at 36. The Region’s review of this information confirms that no corrective action is required at WPL-1.

B. Petitioner fails to support its assertion that the Region must specifically evaluate pressure effects from the Class VI project on WPL-1.

40 C.F.R. § 146.84(c)(2) and (d) set forth the requirements to identify abandoned wells and determine which of those may need corrective action. While 40 C.F.R. § 146.84(c)(1) requires an analysis of pressure that could cause movement of injected fluids or formation fluids, this is part of the process of delineating the extent of the AoR, and not part of determining how to perform corrective action on a well within the AoR. The Petition therefore conflates the requirements for AoR delineation and the requirements for determining which wells may need corrective action. There is no specified regulatory requirement that EPA analyze pressure effects on wells within the AoR for purposes of determining whether they require corrective action.

As explained above, EPA’s AoR Guidance details how an applicant should evaluate whether wells within the AoR require corrective action. The AoR Guidance provides that to prevent fluid movement, abandoned wells should include a cement plug through the primary

confining zone, and/or across the injection zone/confining zone contact, with sufficient integrity to contain separate-phase carbon dioxide and elevated pressures. A.R. #1762 at 57. “A well requires plugging if records indicate that an abandoned well was not plugged, was plugged and abandoned improperly, or has not been plugged in a manner that prevents movement of carbon dioxide or other fluids that may endanger USDWs.” *Id.* at 65. Acceptable forms of corrective action on improperly abandoned wells include well plugging/and or remedial cementing of the improperly abandoned well. *Id.* at 63.

The Region has reviewed the exact information identified by the AoR Guidance with respect to WPL-1. The Region reviewed Illinois EPA’s determination and the associated documentation and found that the well was plugged properly and has been cemented, thereby meeting EPA guidelines. Petitioner has therefore not provided the Board with a legal or technical basis to justify its request in Issue 6.

C. Petitioner fails to provide a legal basis for its requested relief of a federal-state coordination program concerning corrective action on abandoned wells.

Petitioner, unpersuaded by Illinois EPA’s thorough determination that WPL-1 was properly closed in accordance with state UIC requirements, paradoxically asserts that EPA should obtain “quantitative re-evaluation of corrective action in consultation with IEPA” concerning WPL-1, and asks for “Board review and consideration of measures to ensure coordinated federal Class VI and Class I well administration.” Pet. at 33. Petitioner offers that the Region “should defer to state determination of whether the proposed Class VI well poses a risk to WPL-1 and any mitigation measures needed to ensure the continued integrity of WPL-1.” *Id.* Petitioner has not identified any legal justification for its request. Moreover, the Petition does

not identify any terms in the Permit or actions by the Region that interfered with “state jurisdiction.”¹¹

In a permit appeal, the Board has authority to review whether EPA’s determination was clearly erroneous; not to proscribe an extra-regulatory process by which EPA must abide in the future. There is no mechanism by which this Board can require EPA and third-party state agencies, that are not subject to the Board’s jurisdiction under this action, to develop and implement a coordination program that is not provided for by statute or regulation. The Region has demonstrated that its determination that no corrective action is required is based on the record and sound technical judgment.

Issue 7 – The 3D Seismic and Microseismic Monitoring Provisions of the Permit Meet the Class VI Rule’s Indirect Monitoring Requirements.

The matters raised under Issue 7 are clerical. At issue is how the final Permit clarified, based on errors identified during the public comment period, the area that will be covered by indirect monitoring methods in the Testing and Monitoring Plan. In the Permit, the Region established 3D seismic and microseismic monitoring requirements to help track the extent of the CO₂ plume and the pressure front caused by the project. Permit Attachment C, Tables 7 and 9. 3D seismic and microseismic monitoring are two forms of “indirect monitoring” contemplated – though not required – by 40 C.F.R. § 146.90(g)(2). In its public comment, Marquis identified errors in the draft permit concerning the scope of these indirect monitoring requirements. A.R. #1972 at 4-5. The Region updated the final Permit in accordance with the comment and explained these changes in its response to comments document. Resp. to Com. at 49-50. As the

¹¹ The Region also notes that Illinois EPA, in its comment submitted to the Region during the public comment period, did not raise any concerns over the need to evaluate potential corrective action on WPL-1, nor any so-called failure to respect its jurisdiction; nor did it appeal the final Permit.

Region explained, the final Permit incorporates the monitoring requirements the Region had intended to impose at the draft permit stage, and the indirect monitoring provisions of the Class VI Rule are satisfied. *Id.*

Nonetheless, in Issue 7, Petitioner falsely asserts that the Region made “cost-driven reductions in monitoring coverage.” Pet. at 34. Petitioner does not allege any facts showing the Region considered costs as a reason for revising the indirect monitoring terms in the Permit. Petitioner therefore has not demonstrated under Issue 7 that the Region’s actions to modify the monitoring requirements in the final Permit were erroneous.

40 C.F.R. § 146.90(g) requires the owner of a Class VI well to perform testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front). 40 C.F.R. § 146.90(g)(1) requires use of direct methods in the injection zone, while 40 C.F.R. § 146.90(g)(2) provides for the use of: “Indirect methods (e.g. seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools), unless the Director determines, based on site-specific geology, that such methods are not appropriate”. The regulation does not dictate any specific indirect monitoring methods and explicitly affords the Regions deference.

Though they serve different functions, two separate indirect monitoring requirements are raised in Issue 7: (1) 3D seismic monitoring, and (2) microseismic monitoring. 3D seismic monitoring uses acoustic energy to create a 3D image of the earth’s interior and identify locations of subsurface liquids. At carbon sequestration projects, profiles are used to image the developing carbon dioxide plume for indirect monitoring. The Permit requires Marquis to perform time-lapse 3D seismic monitoring every five years during injection, immediately preceding the cessation of injection and prior to the post-injection control period, and 5 and 10 years after the

cessation of injection. Permit Attachment C at 17. 3D seismic monitoring is one of the indirect monitoring methods required by the Permit to meet 40 C.F.R. § 146.90(g)(2) (indirect monitoring of the CO₂ plume).

Microseismic monitoring is a different geophysical monitoring technique that records tiny, low-magnitude earthquakes caused by subsurface industrial activities. Under the Permit, Marquis must record microseismic data from a near surface-based network of sensors on a continuous basis to support predictive modeling and expected rate of change in the formation conditions. Permit Attachment C at 19. This monitoring provides information regarding the potential for movement of the pressure front due to seismic activity in the project area. Microseismic monitoring is also required by the Permit to meet 40 C.F.R. § 146.90(g)(2) (indirect monitoring of the pressure front).

In its application, Marquis initially submitted a plan for 3D seismic monitoring to qualitatively monitor the CO₂ plume development. A.R. #2 (7.0 Testing and Monitoring Plan) at 36-38. Marquis proposed time-lapse 3D surface seismic monitoring as the primary indirect technique to monitor the development of the CO₂ plume during and after injection. *Id.* at 36. The proposed 3D monitoring area was based on Marquis' 2022 pre-injection baseline survey area, which is a 3.72 mi² area that Marquis developed to model the projected plume during the life of the project. *Id.* at 37 (map depicting seismic baseline outline); *see also* Permit Attachment B, Figure 2.

As a part of the permit review process, on April 12, 2023, the Region issued to Marquis one of several requests for additional information (RAI) with questions pertaining to the delineation of the AoR. A.R. #357 at 4. This RAI informed Marquis that defining the AoR as consisting of only the modeled expected plume area was improper and that “[t]he AoR should be

delineated based on the maximum extent of both the CO₂ plume and critical pressure front over the entire lifetime of the project.” *Id.* As a result, the AoR was ultimately increased to a 14.5-mile radius circled area to account for the predicted area of the pressure front. Permit Attachment B, Figure 1. The projected plume area was not affected.

The Region always intended for the Permit to require 3D seismic monitoring only over the projected plume area, and not the much larger 14.5-mile radius area, because this type of monitoring provides imaging of the plume. It does not detect pressure. Extending the 3D seismic monitoring far beyond the scope of the modeled plume would be pointless. In error, the Region published the draft permit stating that the “Spatial Coverage” for time-lapse 3D seismic monitoring was “Over project AoR” – a holdover from the 2022 permit application. A.R. #1671 18, Table 7.

In its public comment, Marquis identified that the Region expanded the intended area for future seismic surveys to the AoR. A.R. #1972 at 4-5. Marquis, presumably concerned that EPA had exponentially expanded the spatial coverage for 3D monitoring, focused on the sufficiency of the Permit’s indirect monitoring requirements as well as the practical infeasibility of 3D seismic monitoring across the entirety of the AoR. *Id.* Marquis stated that:

“Conducting a seismic survey would involve acquisition of the land, right-of-way agreements, extensive survey studies (e.g., threatened and endangered species and cultural resources) due to the placement of the survey equipment, agreements with counties being crossed, power and communication connections, resource crossings, agricultural mitigation agreements, and potential cessation of truck traffic and/or operations at other commercial/industrial facilities due to noise interference.”

Marquis also noted that future 3D seismic surveys will be acquired and compared to the baseline survey which allows Marquis to track fluid movement and geological structural

integrity. Accordingly, Marquis commented that the final Permit should require 3D seismic monitoring in the 2022 pre-injection baseline survey area. *Id.*

In the final Permit, the Region corrected the references to spatial coverage where 3D seismic monitoring would be performed back to the 3.72 mi² pre-2022 baseline survey area (Permit Attachment C at 18, Table 7) and depicted the changes in its response to comments document. Resp. to Com. at 48-49. Although the Region referenced the infeasibility issue in its response to comments, it revised the spatial area for 3D seismic monitoring because monitoring beyond the extent of the CO₂ plume serves no technical purpose. The revised monitoring meets 40 C.F.R. § 146.90(g)(2), reflects the scope of the project, and represents the Region's technical judgment based on the record.

Microseismic monitoring is also included in the Permit as an indirect pressure-front monitoring method. Permit Attachment C, Page 19, Table 9. The purpose of microseismic monitoring at the Marquis project is to determine whether there is induced seismic activity, monitor the spatial extent of the pressure front from the distribution of seismic events, and identify any activity that may indicate failure of the confining zone and possible containment loss. A.R. #2 at 11. The microseismic monitoring network consists of five surface monitoring stations surrounding the area of the Project. Permit Attachment C at 20, Figure 1 ("Pressure-front monitoring activities"). Generally, the microseismic monitors are expected to detect seismic activity within the AoR. However, it is not appropriate to require an enforceable geographic radial limit for microseismic monitoring, as the information the monitors collect depends on the location and strength of the seismic events. The Region determined that this monitoring network, in conjunction with other indirect monitoring methods, is sufficient for monitoring the pressure front associated with the project. Through clerical error, the draft permit identified the "spatial

coverage” of the microseismic monitoring as being the “AoR (See Figure 1, below).” The draft permit language was inaccurate in that “AoR” is a geographic area, while Figure 1 of Attachment C represents an approved network of static monitoring locations.

Marquis, again presumably concerned that Region had issued a draft permit specifying an inapplicable geographic area for the microseismic monitoring network sensor locations, addressed the sufficiency of the microseismic monitoring network as follows:

“Marquis believes the reliance on the established 3D seismic survey baseline area, network of surface seismological stations around the project site, and as required in Section 10.4.6 of Attachment F (Emergency and Remedial Response Plan), the subscription to the USGS Earthquake Notification Service to receive notification of seismic events (both natural and induced) within 100 kilometers (62.14 miles) from the well provides the seismic data necessary to monitor potential seismic activity within the AOR that may indicate failure of the confining zone and possible containment loss.”

A.R. #1972 at 5. The Region agreed and, accordingly, modified the Permit to clarify that the physical location of these monitoring stations are located “~1 mile radius from MCI CCS 3 well.” This did not represent any substantive change to the monitoring plan. The Region’s decision to clarify the spatial area for microseismic monitoring reflects the purpose of the monitoring, the scope of the project, and represents the Regions’ technical judgment based on the record.

Petitioner ignores the error-correcting efforts the Region undertook and asserts that the Region made a “cost-based” determination as a headline in its Petition. No citations to the record referencing costs are provided. Neither Marquis in its public comment nor the Region in its response to comments document referenced the costs of these monitoring requirements.¹²

¹² The Region acknowledges that Petitioner’s reference to Marquis’ concerns regarding acquisition of land, right-of-way agreements, and extensive survey studies possibly relate to cost concerns; however, there is no reference to costs in the record, the decision was not made based on costs, and, regardless, there is no legal argument provided to support Petitioner’s assertion that monitoring requirements cannot take applicant cost or practical convenience into account.

Further, Petitioner’s only legal argument under Issue 7 is that “...costs [are] not among the regulatory factors enumerated in § 146.90(g).” Pet. at 34. This argument is perplexing: there are no “factors” listed in the regulation. As explained above, 40 C.F.R. § 146.90(g)(2) is a non-exhaustive list of indirect methods available to track the CO₂ plume and pressure front, the inclusion of which are subject to EPA’s discretion.

Having failed to provide any facts or law in support of the assertion that the Region made an improper determination as to the scope of 3D seismic and microseismic monitoring, Petitioner has not met the requirements of 40 C.F.R. § 124.19(a). The record demonstrates that the Permit meets the requirements of 40 C.F.R. § 146.90(g)(2), and the Region exercised sound technical judgment in establishing the 3D seismic and microseismic monitoring requirements in the Permit. The Board should deny the requested relief under Issue 7.

Issue 8 – The Region Appropriately Determined That Seismicity Will Not Interfere with Containment of CO₂.

Petitioner’s Issue 8 argues that Board should find that the Region erroneously concluded that seismicity will not interfere with CO₂ containment as required under 40 C.F.R.

§ 146.82(a)(3). Petitioner offers eight arguments in support of its position that the Region clearly erred. None of these arguments demonstrate that the Region failed to exercise considered judgment based on the record or that the Region is otherwise not entitled to deference on the technical determination at issue here. *See Keene*, 18 E.A.D. at 724; *Wabash*, 19 E.A.D. at 135. Petitioner also fails to provide a legal basis for its requested relief. The Board should therefore defer to the Region’s expertise on this issue and deny Petitioner’s requested relief for Issue 8. *See FutureGen*, 16 E.A.D. at 733-37.

- A. Petitioner failed to preserve several of its arguments in Issue 8 because no comments were raised concerning Petitioner’s “buffer” arguments, “cumulative seismic risk” argument, and the Argenta Formation.

As an initial matter, Petitioner failed to properly preserve several of its arguments under Issue 8, pursuant to 40 C.F.R. § 124.19(a)(4)(ii). Petitioner cites comment EPA-R05-OW-2025-1612-0114 as preserving Issue 8 for appeal. The comment cited to by the Petition discusses seismicity and containment, but it does not specifically discuss Issue 8’s “buffer” arguments, “cumulative seismic risk” argument, and arguments related to the Argenta Formation. Therefore, these specific issues were not properly preserved for appeal. *See* 40 C.F.R. § 124.19(a)(4)(ii); *Wabash*, 19 E.A.D. at 135; Pet. at 38-42.

- B. Information in the record demonstrates that faults, fractures, and seismicity will not interfere with containment.

Under the Class VI Rule, permit applicants submit information to EPA on “geologic structure and hydrogeologic properties of the proposed storage site and overlying formations.” 40 C.F.R. § 146.82(a)(3). This includes, among other things, the “location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the area of review and a determination that they would not interfere with containment” under 40 C.F.R. § 146.82(a)(3)(ii); “[g]eomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone” under 40 C.F.R. § 146.82(a)(3)(iv); and “[i]nformation on the seismic history including the presence and depth of seismic sources and a determination that the seismicity would not interfere with containment” under 40 C.F.R. § 146.82(a)(3)(v). This information is considered by EPA prior to authorizing a Class VI well. 40 C.F.R. § 146.82.

EPA's *Underground Injection Control (UIC) Program Class VI Well Site*

Characterization Guidance (2013) ("Site Characterization Guidance")¹³ contemplates that to meet the requirement in 40 C.F.R. § 146.82(a)(3)(v), applicants should consult with seismic and other records including those from the United States Geologic Survey (USGS). *Site Characterization Guidance* at 28–29. Per the guidance, an applicant provides sufficient information under 40 C.F.R. § 146.82(a)(3)(v) if it can demonstrate (1) a reasonable expectation that no seismic events will occur during the life of a geologic sequestration project or, (2) if information suggests a substantial likelihood of seismic activity, the applicant provides additional information, such as geomechanical data, depth to confining zones, and fault stability analysis to demonstrate seismic activity will not compromise subsurface containment. *Id.* Additionally, any demonstration that seismic activity will not interfere with containment should support a demonstration that the confining zone(s) will not be compromised by generation of new faults or reactivation of existing faults. *Id.*

Consistent with the requirement in 40 C.F.R. § 146.82(a)(3)(ii), Marquis submitted information on the location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the area of review and a determination that they would not interfere with containment. *See* A.R. #1829 (1. Project Narrative (02.05.25)) at 24-25. Marquis identified that while there are numerous regional, structural features around the Illinois Basin, the AoR is free of known faults and fractures and there is no structural faulting expected to impact the injection or confining zones within the AoR. *Id.* This conclusion is supported by a 2021 2D seismic program used by Marquis to assess large scale faulting in the

¹³ Available at <https://www.epa.gov/sites/default/files/2015-07/documents/epa816r13004.pdf>.

area, a 2022 3D seismic survey, geologic core sampling from the MCI MW 1 well, well logs, well cross sections, and regional data and literature. *Id.* at 25; A.R. #964 (2. AoR. Correct Action Plan (August 2024)) at 25; A.R. #237 (App.--C.--2D--Seismic--Review—Marquis); A.R. #238 (App.--D.--3D--Seismic-processing-report--Marquis); A.R. #245 (App.--J.--Additional--2D--and--3D--seismic); Resp. to Com. at 17.

Marquis submitted additional information on regional geologic structures for the Region's review in its permit application. This included information on the Peru Monocline, a 65-mile-long drape fold that intersects the eastern edge of the AoR, 11 miles from the edge of the CO₂ plume. A.R. #1829 at 20, 41; A.R. #1683 (Memo to file: Geology) at 12. Marquis' application determined that the monocline will not interfere with containment based on the lateral distance and depth separation between the CO₂ plume and the monocline, the minimal increase in pressure in the injection zone beneath the monocline, and the fact there is no evidence of faulting or fracturing within the AoR. A.R. #964 at 25-26, 166 Fig. 2-12; A.R. #1829 at 23-25; A.R. #1683 at 12, 15. Additionally, based on 2D and 3D seismic data, Marquis' application also confirmed that, like other geologic structures, the monocline “do[es] not appear to have a significant impact on the confining zone and saline storage reservoir.” A.R. #1829 at 20. Further, the “low pressure buildup in the area and the [injection zone] separation from the underlying Precambrian rocks, any seismic impact from injection is highly unlikely.” A.R. #1829 at 41.

Based on the above record information, Marquis determined that faults and fractures in the AoR, that may transect the confining zone, will not interfere with containment. *See* 40 C.F.R. § 146.82(A)(3)(ii); A.R. #1829 at 24-25. The Region reviewed and agreed with Marquis' determination. A.R. #1683 (Memo to file: Geology) at 12.

Marquis also provided site-specific geomechanical data, as contemplated in 40 C.F.R. § 146.82(a)(3)(iv) and EPA's Site Characterization Guidance. This information demonstrated that the proposed injection well will operate below pressures that could create or propagate fractures. Marquis conducted minifrac testing in both the Mt. Simon injection zone and the Eau Claire confining zone to measure formation-breakdown pressure, fracture-propagation pressure, instantaneous shut-in pressure, and fracture-closure pressure. A.R. #1829 at 40. Marquis then used the collected data to determine the overall fracture propagation pressure of the Mt. Simon and Eau Claire caprock. *Id.* The Permit limits injection pressure in the injection zone to 2,206 psi, which is just under 90% of the fracture pressure. Permit Attachment A at 1. In doing so, Marquis' well operations will prevent new fracturing in the injection zone.

Consistent with 40 C.F.R. § 146.82(a)(3)(v) and the Site Characterization Guidance, Marquis also submitted USGS historic seismic records to the Region including the presence and depth of seismic sources to support its determination that seismic activity will not compromise subsurface containment, and that "the confining zone[] will not be compromised by generation of new faults or reactivation of existing faults." Site Characterization Guidance at 29; A.R. #1829 at 41-43; A.R. #964 at 173.

The information submitted by Marquis on seismicity demonstrates that seismic events at the Project site are infrequent. The Marquis project site, located in northern Illinois, is a low-risk area for earthquake hazards. A.R. #1683 at 9, Map 3. The area encompassing the AoR has been characterized by USGS as having a "2% probability that the level of horizontal shaking, or peak ground acceleration (PGA), due to seismic activity will exceed 8-10% of the acceleration due to gravity within 50 years." A.R. #1829 at 41, 43, Fig. 1-22. Peak ground acceleration is the maximum acceleration of the surface of the earth at a given location in either a horizontal or

vertical motion. A higher PGA, expressed as a percentage of acceleration due to gravity, corresponds to more ground shaking and damage. USGS uses nine categories to characterize PGA. These categories provide a range of “perceived shaking” (i.e., “not felt” to “extreme”) and “potential damage” (i.e., “none” to “very heavy”). Using USGS’s characterization, 8-10% of acceleration due to gravity correlates to “moderate” perceived shaking and “very light” potential for damage. Given the Marquis project site’s 2% probability that PGA will exceed 8-10% in the next 50 years, the site has a low seismic risk. Resp. to Com. at 21. USGS’s National Seismic Hazard Model further provides that there is between a 5-25% probability that an earthquake will occur at that Marquis project site in the next 100 years that will cause slight damage or greater. A.R. #1683 at 9, Map 3.

Marquis submitted additional information on the injection site’s seismic history in support of its containment determination. Marquis’ application identified recorded seismic events that occurred near its proposed injection site. The Moment Magnitude of these earthquakes range between 3.1 and 4.6. A.R. #1829 at 41. Recorded depths of the earthquakes near the Marquis injection site are 3 miles or deeper and are within the impermeable, Precambrian basement rock. A.R. #1683 at 9-11; A.R. #1829 at 41; A.R. #964 at 11. Together, the historic seismic events and the low risk associated with future seismic events support Marquis’ determination under 40 C.F.R. § 146.82(a)(3)(v). The Region reviewed the information submitted by Marquis on seismic history and risk and agreed with Marquis’ determination that seismicity will not interfere with containment. A.R. #1683 at 9-11; Resp. to Com. at 21-23.

C. Petitioner has not met its burden in showing that the Region erred in concluding that seismicity will not interfere with containment.

The first argument in support of Petitioner's Issue 8 appears to be that the Marquis site should not be characterized as "seismically stable." Pet. at 38-39. "Seismically stable" was a term used by the Region in its Response to Comments. Seismic stability is not a legally defined term nor is it a requirement to demonstrate that seismicity will not interfere with containment. 40 C.F.R. § 146.82(a)(3)(v). Petitioner attempts to disprove this characterization without offering a basis for its argument that the Region's permitting decision is unsupported by the record or otherwise clearly erroneous. *See Keene*, 18 E.A.D. at 724; *Wabash*, 19 E.A.D. at 135.

The Region's review and approval of the determination reached under 40 C.F.R. § 146.82(a)(3)(v) was not based on its characterization of the region as seismically stable. Instead, the Region reviewed the totality of the seismic information submitted by Marquis, and contained in the record, pursuant to 40 C.F.R. § 146.82(a)(3)(v). *See* A.R. #1683 at 9, Map 3; A.R. #1683 at 9-11; A.R. #1829 at 41, 43, Fig. 1-22; A.R. #964 at 11, 173. Using this information, the Region concluded that Marquis properly demonstrated that the Project site is a "low-risk region for an occurrence of a site-specific earthquake" and seismicity will not interfere with containment. Resp. to Com. at 22. Consistent with EPA's Guidance, the information submitted by Marquis supports the Region's conclusion that there is not "a substantial likelihood of seismic activity" in the Project area. *See* Site Characterization Guidance at 29.

The Petition expresses concern with historic seismic events located near the Peru Monocline. According to Petitioner, four historic seismic events are "associated" with the monocline and are evidence that seismicity will interfere with containment. Pet. at 38-39. However, historic seismic events were considered by the Region in reaching its determination

that seismicity will not interfere with containment. A.R. #1683 at 6-12. And besides pointing to these seismic events, Petitioner offers no specific argument that the portions of the record that support the Region's determination that seismicity will not interfere with containment are erroneous.¹⁴ *See Env'tl. Disposal Sys.*, 12 E.A.D at 292; *See e.g.*, A.R. #964 at 25-26, 166 Fig. 2-12; A.R. #1829 at 23-25; A.R. #1683 at 12, 15.

The Board has previously upheld EPA's seismicity determination for a UIC Class II permit where petitioners raised only generalized concerns about seismic activity "without confronting the Region's thorough explanation of why the proposed well does not pose a risk [due to] seismic activity." *In re Windfall Oil & Gas, Inc.*, 16. E.A.D. 769, 799 (Jun 12, 2015). Similarly here, while seismic events have occurred near the Peru Monocline, the record supports the Region's conclusion that the monocline will not interfere with containment. The Petition does not confront the Region's evaluation of these seismic events, the depth of seismic sources, and review of faults and fractures transecting the confining zone in the AoR, as required to show that the Region erred. *See* 40 C.F.R. § 146.82(a)(3); *Env'tl. Disposal Sys.*, 12 E.A.D at 292.

The mere existence of seismic events near an injection site does not prevent an applicant or the Agency from reaching a determination that seismicity will not interfere with CO₂ containment under 40 C.F.R. § 146.82(a)(3)(v). As stated in the Site Characterization Guidance, a permit applicant is not required to demonstrate the absence of seismic activities, instead, applicants must evaluate seismic activity and other geologic information to determine whether seismic activity will compromise subsurface containment. *See* Site Characterization Guidance at

¹⁴ As in other places in its Petition, Petitioner cites generally to several academic papers including Larson (2002), Zoback and Gorelick (2012), Carpenter (2011) Bondarenko et al. (2025), Silva et al. (2024), Williams-Stroud et al. (2020), Leetaru & Freiburg (2014), and Zoback and Hennings (2025). Besides providing a generalized statement about these papers, Petitioner does not explain how findings and conclusions in these papers support Petitioner's argument or undercut the Region's permitting decision.

28-29. For these reasons, there is no basis for the Board to depart from its standard level of deference applied the Agency's technical decision making on this issue. *See Keene*, 18 E.A.D. at 724.

Petitioner's related argument, that the monocline "may be reactivated," is a falsehood. The Site Characterization Guidance states that a demonstration that seismicity will not interfere with containment "should support a demonstration that the confining zone(s) will not be compromised by generation of new faults or reactivation of existing faults." Site Characterization Guidance at 29. As stated above, the Peru Monocline is a geologic fold. *See A.R. #1829* at 20. The monocline is not a fault. Moreover, there is no evidence of faulting or fracturing within the AoR - including the portion of the AoR containing the monocline. *See A.R. #964* at 25-26. Even so, due to the lateral distance and depth separation between the CO₂ plume and monocline, the monocline will not interfere with containment. *See A.R. #964* at 25-26, 166 Fig. 2-12; *A.R. #1683* at 12, 15. And, as a general matter, the Permit limits injection pressure in the injection zone to under 90% of the fracture pressure, thereby preventing new fracturing from forming. *See Permit Attachment A* at 1. Petitioner has not met its burden to show that the Region's determination on this issue was clearly erroneous.

D. Information from the IBDP site does not demonstrate that the Region erred in making a determination using site-specific information from the Marquis project.

Petitioner raises additional arguments, based on information from the IBDP site, to support its argument that the Region's approval of Marquis' confinement determination under 40 C.F.R. § 146.82(a)(3)(v) is erroneous. Similar to Issue 2, Petitioner does not articulate how the site-specific information provided in Marquis' application, and considered by the Region, is erroneous but instead points to geologic information from IBDP to argue that the geology at the

Marquis site does not support containment. Petitioner’s argument, however, is inconsistent with the regulations which require applicants to submit “information on the geologic structure and hydrogeologic properties *of the proposed storage site and overlying formations.*” 40 C.F.R. § 146.82(a)(3) (emphasis added). As previously explained, information from a different Class VI site does not supersede site-specific information under the Class VI Rule.

Similarly, Petitioner points to Bukar et al. (2025)’s analysis of the IBDP site to argue that the Region cannot rely on 3D seismic data to support its “no large-scale faults” conclusion. Petitioner asserts that “faults” like those observed at the IBDP site are “below conventional 3D-seismic resolution.” Pet. at 41. Petitioner’s argument overlooks the additional information used by Marquis and reviewed by the Region in support of the “no large-scale faults” conclusion. Marquis also submitted publicly available information, well core samples, geologic maps, cross sections, information from a 2D seismic program and information from a 3D seismic program in support of its conclusion. *See* A.R. #2105, Resp. to Com. at 17. Even if Petitioner is correct in its argument that 3D seismic data could not observe similar geologic features at the Marquis site, Petitioner has not articulated how the other methodologies utilized to support the no large-scale faults conclusion are insufficient or resulted in an erroneous determination.

Petitioner also raises a procedural argument under 40 C.F.R. § 124.17(a)(2), stating that the Region failed to respond to comments referencing Bukar et al. (2025) and other academic papers. Contrary to Petitioner’s argument, the Region responded to public comments “regarding seismic activity in the area and its possible impacts on the project.” Resp. to Com. at 20-23. The Region’s response to these comments included the relevant academic papers cited in Issue 8. The Region’s response was consistent with 40 C.F.R. § 124.17(a)(2) which requires only that EPA “[b]riefly describe and respond to all significant comments raised during the public comment

period.” Once EPA has met this obligation, the Agency is not required to name technical studies or respond to specific points already captured in its larger response.

E. The Marquis Permit’s Emergency and Remedial Response Plan’s seismic event response actions are consistent with 40 C.F.R. § 146.94.

In its final argument in support of Issue 8, Petitioner argues that Marquis’ Emergency and Remedial Response Plan (ERRP) contained in Permit Attachment F “must” include certain actions should seismic events occur. Petitioner’s argument asks the Board to read prescriptive requirements into 40 C.F.R. § 146.94 that do not exist. Consequently, there is no basis for providing the relief requested by Petitioner and the Board should deny relief on this issue.

40 C.F.R. § 146.94(a) directs permit applicants to create an ERRP, for EPA review and approval, that “describes actions the owner or operator must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods.” The requirement to maintain and implement an approved ERRP is enforceable. *Id.* If the owner or operator obtains evidence that an injected carbon dioxide stream or pressure front may cause an endangerment to a USDW, the permittee must “(1) [i]mmediately cease injection; (2) [t]ake all steps reasonably necessary to identify and characterize any release; (3) [n]otify the Director within 24 hours; and (4) [i]mplement the emergency and remedial response plan approved by the Director.” 40 C.F.R. § 146.94(b).

Marquis submitted, and the Region approved, an ERRP to address potential risk scenarios to USDWs including seismic events. The Marquis ERRP contains tiered response actions based on the severity of seismic events. Permit Attachment F at 20-24. The ERRP provides response actions for seismic events greater than a Moment Magnitude of 1.5 within a 14.5-mile radius (the Marquis AoR). *Id.* at 22. Permit Attachment E requires Marquis to monitor seismic activity,

including Moment Magnitude, using microseismic stations around the injection site.

Additionally, the ERRP requires that upon issuance of the Permit, Marquis must subscribe to the USGS Earthquake Notification Service to receive notification of seismic events within 100 kilometers of the injection well. Should Marquis become aware of seismic activities above the threshold contained in the Permit, Marquis must take a corresponding response action. Moreover, should Marquis obtain any evidence that injection activities may cause endangerment of a USDW, Marquis must initiate its shutdown plan for its injection well, including immediately ceasing injection. *Id.* at 5.

The ERRP and the seismic response activities contained in the ERRP are sufficient to ensure protection of USDWs consistent with 40 C.F.R. § 146.94. Despite Petitioner's argument that the ERRP must contain certain seismic response actions, Petitioner fails to articulate how the existing seismic response activities contained in the ERRP are inconsistent with the regulation or that the response activities are inadequate to prevent endangerment to USDWs. There is no basis in the regulations for requiring the seismic response actions sought by Petitioner. Accordingly, the Board should deny Petitioner's request for relief.

F. Petitioner's remaining arguments in support of Issue 8 are merely opinions that the Region should have required additional or different technical considerations.

Other substantive arguments offered by Petitioner in support of Issue 8 imply that the Region should have required Marquis to provide additional technical analysis under 40 C.F.R. §146.82(a)(3)(v) or should have required additional or different permit conditions. Petitioner does not explain a legal basis for requiring these additional considerations. Nor do Petitioner's opinions about additional or different technical considerations or permit conditions demonstrate that the Region failed to exercise its considered judgment based on the record. *See*

Keene, 18 E.A.D. at 724; *Wabash*, 19 E.A.D. at 135. Petitioner must show that the Region’s findings of facts or conclusions of law are clearly erroneous, not merely technical determinations Petitioner disfavors. Petitioner has not met the heavy burden on this issue required by the Board prior to the Board’s reevaluation of the Region’s technical determination. *See FutureGen*, 16 E.A.D. at 733-737. Accordingly, the Board should defer to the Region’s expertise related to seismicity and CO₂ containment. *See id.*

Issue 9 – The Region Appropriately Determined that Shale within the Confining Zone is Sufficient to Contain Injected CO₂.

The Class VI Rule 40 C.F.R. § 186.83(a)(2) requires an injection well owner or operator to demonstrate that the well will be sited in an area with a suitable geologic system, including a confining zone “of sufficient areal extent and integrity to contain the injected carbon dioxide stream and displaced formation fluid.” *Id.* Pursuant to this requirement, the Region determined that Marqui’s application shows that shale within the designated confining zone was sufficient to contain injected CO₂ and displaced formation fluids. A.R. #1683 at 1. Petitioner argues that the Region’s determination was erroneous because it relied on site-specific data that contradicted a regional characterization of the Eau Claire Formation (the geological formation that includes the confining zone) as sandstone-dominant. Pet. at 40. However, as explained below, the Region’s determination is rational in light of the information in the record, including both substantial site-specific data that was appropriately considered under the Class VI Rule and guidance, as well as the regional information Petitioner raises—which does not actually conflict with the Region’s assessment. The information Petitioner raises is insufficient to “cast doubt on the thoroughness or rationality of the Region’s technical evaluations and conclusions,” and therefore the Board

should defer to the Region and deny review. *Envtl. Disposal Sys., Inc.*, 12 E.A.D. at 292.; *see Wabash*, 19 E.A.D at 135

A. Site-specific data supports the Region’s characterization of confining zone lithology.

The Class VI Rule at 40 C.F.R. § 146.82(a)(3)(iii) requires permit applicants to provide data on the depth, thickness, porosity and permeability of the injection and confining zone, including field data which “may include geologic cores, outcrop data, seismic surveys, well logs, and names and lithologic descriptions.” *Id.* Accordingly, in its application, Marquis provided field data including well logs, 18 whole core samples and 29 sidewall core samples collected from an on-site stratigraphic test well MCI MW 1. *See* A.R. #1829 at 30.

The site-specific data from MCI MW 1, depicted in stratigraphic columns in Marquis’ permit application, shows significant shale lithology in the designated confining zone between 2,690 and 3,038 ft measured depth (MD), as indicated by high gamma ray readings. *See* A.R. #1829 at 19, 29, 31. High gamma ray readings indicate the presence of clay, a typical component of shale, while sandstones do not typically contain clay and therefore produce lower gamma readings.¹⁵ Marquis used an elemental neutron log and vClay log to determine the specific lithologies present at MCI MW 1, including intervals of shale and sandstone, and cross-

¹⁵ *See, e.g.*, United States Geological Survey, “Geophysical logs – Gamma logs,” *available at* <https://www.usgs.gov/media/images/geophysical-logs-gamma-logs> (“Gamma logs record the amount of natural gamma radiation emitted by the rocks surrounding the borehole. The most significant naturally occurring sources of gamma radiation are potassium-40 and daughter products of the uranium- and thorium-decay series. Clay- and shale-bearing rocks commonly emit relatively high gamma radiation because they include weathering products of potassium feldspar and mica and tend to concentrate uranium and thorium by ion absorption and exchange.”); U.S. EPA, “Natural Gamma and Spectral Borehole Logging,” *available at* <https://www.epa.gov/environmental-geophysics/natural-gamma-and-spectral-gamma-borehole-logging> (“The most radioactive of the common sediments are shales and the natural-gamma log was initially used to produce ‘shale logs’ that identified shaley layers. Generally, shales/clays, sands, and gravels/hard rocks respectively produce high, intermediate, and low total-gamma counts.” (citations omitted)).

checked the results with whole and sidewall core samples and XRD (X-ray diffraction) and XRF (X-ray fluorescence) data. A.R. #1829 at 30. To determine porosity and permeability, which are essential characteristics of the confining zone because they determine whether fluid can easily move through rock, Marquis used nuclear magnetic resonance (NMR) well logging and modeling, and cross-checked results against values measured in core samples. *Id.* at 32-33. Lab-measured permeability values were less than 0.01 mD in several core samples from within the Eau Claire. *Id.* at 47. Stratigraphic columns in the Marquis application show correlations between the clay-dominant confining zone lithology and low permeability as measured in core samples and well logs. A.R.# 64 at 35. Based on this data, Marquis concluded that “confining shale intervals” within the Eau Claire formation met site suitability requirements of 40 C.F.R. 140 C.F.R. § 186.83(a)(2). A.R.#1829 at 47. The Region agreed that the low-permeability shale layers within the confining zone rendered it of sufficient composition to meet required geologic siting criteria. *See* A.R. #1683 at 1 (noting that “impervious layers of shale” provided adequate containment for injected CO₂); *id.* at 5 (referring to low measured porosity and permeability values for the confining zone).

B. The Region’s reliance on Marquis site-specific data was appropriate and does not conflict with regional information.

Notably, Petitioner does not claim that the site-specific data collected from MCI MW 1 is inaccurate, does not reflect the presence of low-permeability shale within the confining zone, or otherwise indicates a geologic composition that is insufficient to contain injected CO₂. Instead, Petitioner argues that the Region improperly allowed Marquis to use the MCI MW 1 data to characterize the confining zone across the entire AoR in the face of purportedly contradictory regional geological information. Pet. at 41. But, as further explained below, Marquis’ site-

specific data does not actually contradict the regional geologic information Petitioner raises. To the contrary, the site-specific data and regional information are consistent, and the latter was appropriately considered by Marquis and the Region when assessing confining zone lithology.

Petitioner points to the 1975 Illinois State Geological Survey (ISGS) Handbook of Illinois Stratigraphy (“ISGS Bulletin 95”), which characterizes the Eau Claire Formation in northern and western Illinois as “dominantly dolomitic sandstone,” A.R. #1761 at 42, as a source of information in conflict with the Region’s determination.¹⁶ The ISGS Bulletin generally depicts the boundary between the Eau Claire Formation’s sandstone-dominated and siltstone- and shale-dominated areas as passing through Putnam County, where the Marquis project is located, with the project site barely on the sandstone-dominated side. *Id.* at 43.

However, there is no contradiction between ISGS Bulletin 95’s characterization of the Eau Claire Formation as sandstone-dominated and the determination that the confining zone contains significant shale. First of all, the confining zone and the Eau Claire Formation are not one and the same. Critically, the confining zone specifically excludes a portion of the Elmhurst Sandstone, which ISGS Bulletin 95 describes as the sandstone-dominant sublayer at the base of the larger Eau Claire Formation. *See* A.R. #1761 at 42; A.R. #1829 at 47 (“[T]he lower Elmhurst is not included in the confining interval”); A.R. #964 at 35 (depicting the “seal,” or confining zone, excluding the lower Elmhurst). Marquis proposed this exclusion for the very reason that the sandstone of the lower Elmhurst might not act as a suitable confining layer. A.R. #1829 at 26

¹⁶ Petitioner also points to Neufelder et al., “Lithologic, mineralogical, and petrophysical characteristics of the Eau Claire Formation: Complexities of a carbon storage system seal,” 19 *Envl. Geosciences* 102 (2012), as a source of information that the Region’s analysis contradicts or fails to consider. This was not raised to the Region in the public comment. *See* A.R.# 2086. As the Region did not previously have the opportunity to review or respond to the information within the Neufelder article, Petitioner’s specific arguments based upon the contents of the article have not been preserved for Board review, and the Region does not address them here. *See* 40 C.F.R. § 124.19(a)(4); *Wabash*, 19 E.A.D. at 147.

(“Within the study area, it is unclear if the Mt. Simon sands and lower Elmhurst sands are hydraulically connected from the base of the intra-Elmhurst shale down.... For this reason, the injection well is being designed so the lower portion of the Elmhurst is not included in the sealing layers....”). A.R. #1683 at 5 (describing the confining zone as “[t]he top of the Eau Claire through a 11-ft thick shale section of the upper Elmhurst” and citing the ISGS Bulletin. The confining zone is thus limited to the more shale-dominant upper portion of the Eau Claire Formation. *See* A.R. #1829 at 47 (“The Eau Claire formation at the Marquis Biocarbon Project site has several confining shale intervals in the upper Elmhurst Submember and above.”); *id.* at 26 (“The confining zone is defined by the top of the Eau Claire. . . through an 11-foot-thick shale within the upper Elmhurst”); A.R. #964 at 29. Nothing in ISGS Bulletin 95 establishes that, without the lower Elmhurst, the confining zone itself is sandstone-dominated contrary to the Region’s assessment.

Furthermore, the presence of shale-rich lithology in the upper Elmhurst and above, reflected in Marquis’ site-specific stratigraphic data and characterizations, are entirely consistent with ISGS Bulletin 95. ISGS Bulletin 95 describes two shale-containing submembers of the Eau Claire Formation above the Elmhurst, which is itself described as a “fine to medium grained sandstone with interbedded siltstones and gray shale.” A.R. #1761 at 42 (describing the Lombard Dolomite, a “partly sandy dolomite containing beds of greenish gray shale” and the overlying Proviso Siltstone, a “siltstone that commonly contains beds of greenish gray, pink, or red shale”). Marquis, in general accord with this characterization, describes the Eau Claire Formation as consisting of “interbedded shales, siltstones, sandstones, and minor dolomites” plus “a basal Eau Claire sandstone member, the Elmhurst” comprised of “fine to medium grained sandstone with interbedded siltstones and gray shales.” A.R. #1829 at 26. Marquis also distinguishes two Eau

Claire sublayers above the Elmhurst that generally track the ISGS descriptions of other two Eau Claire members: the “Eau Claire Sand,” which includes sandstone and shale, and the “Eau Claire” or “Eau Claire Shale” which includes shale and siltstone. *Id.* at 26, 34.

As Marquis’ site-specific data aligns with the ISGS Bulletin and regional information regarding Eau Claire thickness and depositional environment, *see* A.R. #1829 at 16, it was not improper to utilize it to characterize the confining zone across the AoR, as Marquis did in its Static Earth Model (SEM). While Petitioner criticizes reliance on data from a “single” on-site well, the regulatory standard and Class VI site characterization guidance do not require a permit applicant to drill a test well or provide well logs or core samples with the permit application *at all*. *See* 40 C.F.R. § 146.82(a)(3)(iii) (field data in the permit application “may include” geologic cores and well logs); Site Characterization Guidance at 3 (a stratigraphic well “may need to be drilled” to meet the requirements of 40 C.F.R. § 146.82(a)(3)(iii)); *id.* at 18 (an application may include “well log data (when it is available), with injection and confining zones highlighted (if well logs are used for this demonstration)”). Rather, the regulatory scheme allows detailed site-specific data to be collected later, during injection well construction, as a part of pre-operational testing required before final authorization to inject CO₂ can be granted under 40 C.F.R. § 146.82(c)(7). *Id.*; 40 C.F.R. § 146.87 (requiring well logging and core sampling as a part of pre-operational testing); *see* Class VI Implementation Manual for UIC Program Directors (2018) (“Implementation Manual”) at 4-9 (“It is likely that core samples may not be taken and analyzed until after construction is authorized”); Site Characterization Guidance at 1 (“Final site characterization data will be collected as the injection well is drilled, core samples are taken and analyzed, and logs and tests are performed.”).

Furthermore, contrary to Petitioner's argument, Marquis' computational modeling accounted for potential geologic heterogeneity as required by regulation. *See supra* at Issue 2.A. Marquis modeled the confining zone to include three different compositional layers, reflecting the presence of varying amounts of both sandstone and shale: the sandstone-dominated Elmhurst, the relatively sandy Eau Claire Sands zone, and a shale-dominated layer. A.R. #964 at 31. While a single average porosity and permeability value was calculated for the entire confining zone, this average accounted for lithological differences these three layers, and was therefore a conservative value compared to the actual measured values of shale layers, which were as low as 0.01 mD. *See* A.R. #1829 at 34, 47.

As contemplated by the regulatory framework and guidance establishing site characterization as an iterative process as described above, Marquis will collect additional site-specific information to further confirm site characterization during pre-operational testing. *See* Permit Attachment G at 1, 5; 40 C.F.R. § 146.87; Site Characterization Guidance at 2 ("Site characterization is an iterative process."). It is entirely appropriate under applicable guidance to use the pre-operational testing process to confirm site characterization across a larger area. *See* Implementation Manual at 4-7 (pre-operational testing may be used to ensure application data is geographically representative); *id.* at 4-13 (pre-operational testing may be used to address uncertainties regarding confining zone). But the Region's reliance on the extensive available site-specific data at the pre-construction phase is not clear error or an abuse of discretion when, contrary to Petitioner's assertion, nothing indicates that the data conflicts with regional characterizations or is otherwise not geographically representative of the larger AoR.

C. The Region adequately responded to public comment regarding the lithology of the confining zone area related geochemical interactions.

Petitioner asserts that the Region committed procedural error by failing to respond to the comment of state geologist Rod Allen. That comment, in relevant part, referred to ISGS Bulletin 95's regional characterization of the Eau Claire Formation in northern and western Illinois as dominated by dolomitic sandstone and stated that "dolomitic sandstone is a poor confining layer" because it both "lacks low hydraulic conductivity" and "might react in detrimental ways with the CO₂ -rich fluids." A.R. #2086.

As stated previously, 40 C.F.R. § 124.17(a)(2) requires EPA to "[b]riefly describe and respond to all significant comments raised during the public comment period." The Region met that standard here.

The Region described comments such as Allen's as "comments regarding suitability of the Eau Claire Formation as the confining zone," and addressed them as Comment Group 7. Resp. to Com. at 16. The Region's response stated that the Region considered both regional information, including information from ISGS, as well as site-specific information, and that "Site-specific data shows that the Eau Claire Formation consists of shale, siltstone, sandstone, and minor dolomite, as well as a basal member, the Elmhurst Sandstone which also has shale and sandstone layers. The upper portion of the Eau Claire Formation acts as a thick, confining layer for the underlying sandstones." *Id.* at 17. The Region further explained the confining layer "is of appropriate thickness, permeability, and integrity to impede fluid." This response addressed Allen's stated concern that the confining zone is comprised of dolomitic sandstone and therefore lacks low hydraulic conductivity. *Id.*

In Comment Group 19, the Region addressed comments regarding impacts on the caprock (i.e., confining layer) from the CO₂ plume, encompassing Allen's concern regarding reactions between injected CO₂ and the confining zone. The Region's response explained that the confining zone was dominated by shale and sandstone with a silicastic composition, rather than dolomitic rock with a carbonate composition, that silicastic rocks are less susceptible to chemical degradation from CO₂, and therefore that the chemical degradation was not a primary concern for confining zone integrity. *Id.* at 39-40.

The Region's responses met the standard at 40 C.F.R. § 124.17(a)(2) to "[b]riefly describe and respond to all significant comments raised during the public comment period."

Petitioner's arguments under Issue 9 fail to establish that the Region clearly erred or abused its discretion in assessing the lithology of the confining zone. The Region's determination that the confining zone had shale-dominant lithology adequate to confine injected CO₂ was appropriately based on site-specific data that was consistent with regional geology. Petitioner's reference to a broad regional characterization of the larger Eau Claire Formation is insufficient to cast doubt on that determination. *See Env'tl. Disposal Sys., Inc.*, 12 E.A.D. at 292. Therefore, the Board should deny review.

Issue 10 – The Region Appropriately Exercised Discretion to Issue the Final Permit Without Additional Public Comment.

In Issue 10, Petitioner endeavors to challenge the Region's discretion to reopen the public comment period where it has determined that additional comment is not appropriate. 40 C.F.R. § 124.14 grants discretion to the Regional Administrator to reopen public comment where it would expedite the decision or where information submitted during the first comment period raises substantial new questions concerning a permit. As explained below, all changes to the

draft permit that were included in the final version were not significant enough to merit a new round of public comment and were based on information already available in the record. Accordingly, the Region determined that reopening the public comment period would not expedite the decision-making process and no information raised during the public comment period raised substantial new questions. Nonetheless, Petitioner requests that the Board “remand with instruction to issue a new draft permit incorporating the five substantive changes, reopen the public comment period, and reconsider in light of any further comment received.” Pet. at 44. The Petition fails to establish that the changes to the permit raise substantial new questions requiring a new comment period under 40 C.F.R. § 124.14. Because the Petition fails to provide legal basis warranting the Board to overrule the Region’s discretion and require it to reopen public comment, the Board should deny the relief requested under Issue 10.

During the public comment period, Marquis submitted written comments requesting changes to the draft permit. A.R. #1972. Marquis supported its request for each change with references to documents already contained within the record at the time of release of the draft permit. In response to this request, based on the Region’s technical judgment and EPA guidance, the Region made adjustments in the final Permit based on the following comments:

- 1) **Purity of CO₂**: Marquis requested that the operating parameter for carbon dioxide purity listed in Table 1 of the Permit and the System Monitoring Details Section in Attachment C be revised from 99.86% CO₂ purity to 99% CO₂ purity.
- 2) **Analysis of Constituents in CO₂ Stream to Injection Well**: Marquis requested that the constituents listed in Table 1 of Attachment C be modified to remove carbon monoxide (CO) and nitrogen oxide (NO_x).
- 3) **Injection Well Monitoring at Injection Interval (Pressure and Temperature)**: Marquis requested clarification to Section N.3 of the Permit concerning the location of continuous recording devices used to monitor downhole temperature and pressure. Marquis requested clarification that monitors will be placed immediately above the packer.
- 4) **Plume Monitoring – Continuous Pulse Neutron (PNC) Logging in ACZ-1 and MW-2**: Marquis requested that the Pulse Neutron Capture logging in Attachment C, Table 7 be

revised to an annual requirement because continuous PNC logging cannot practically be done. PNC logging requires shutdown of the well and deployment of logging tool into the well.

- 5) **3D Seismic Survey:** Marquis requested that the 3D seismic surveys/microseismic surface monitoring network in Permit be limited to the 2022 pre-injection baseline survey area detailed in permit application. Revisions requested to Permit include: Attachment C, Tables 7 and 9; Attachment E, Tables 4 and 6; and Attachment K, Table 7A-15.
- 6) **Typographic Error - Location of Above Confining Zone and Deep Monitoring Wells:** Marquis noted a typo in the Carbon Dioxide Plume and Pressure Front Tracking section of Attachment C (p. 16). Marquis requested that the text should be changed from “MW2 is west of MCI CCS3, and ACZ1 is east of MCI CCS3” to “MW2 is *east* of MCI CCS3 and ACZ1 is *west* of MCI CCS3.”

Reopening public comment is discretionary. Regulations governing procedures for decision making in EPA’s water programs, which includes SDWA Class VI permitting, are codified at 40 C.F.R. Part 124. 40 C.F.R. § 124.14, entitled “Reopening of the public comment period,” addresses the reopening of the public comment period prior to issuance of a final decision. 40 C.F.R. § 124.14(a)(1) states: “The Regional Administrator *may* order the public comment period reopened if the procedures of this paragraph could expedite the decision-making process.” (emphasis added). Likewise, 40 C.F.R. § 124.14(b)(3) states: “If any data information or argument submitted during the public comment period, including information or arguments required under § 124.13, appear to raise substantial new questions concerning a permit, the Regional Administrator *may* take one of more of the following actions: ... Reopen or extend the comment period under § 124.10 to give interest persons an opportunity to comment on the information or arguments submitted.” (emphasis added).

The Board has affirmed that reopening of the public comment period is at the discretion of the Regional Administrator. “The Region is correct that the regulations contemplate the possibility that permit terms will be added or revised in response to comments on the final draft permit. The determination of whether or not the comment period should be reopened in such a

case is generally left to the sound discretion of the Region.” *In re Amoco Oil Co.*, 4 E.A.D. 954, 980 (EAB 1993). The EAB thus reviews a permit issuer’s decision not to reopen the public comment period under an “abuse of discretion” standard and affords the permit issuer “substantial deference.” *In re Dominion Energy Brayton Point, LLC*, 13 E.A.D. 407, 416 (EAB 2007) (*Dominion II*). The EAB has applied *Dominion II* to support the explicit discretion afforded by the regulation. For example, in *In re Town of Concord Public Works*, 6 E.A.D. 514, 532 (EAB 2014), the Board held that EPA does not abuse its discretion in deciding not to reopen public comments where the permit was modified from the draft so long as those changes were explained in EPA’s response to comments.

In contrast, the Board has held that EPA abused its discretion where the Region “pulled a surprise switcheroo” and completely reversed course on a proposed permit condition without even trying to explain why in its response to public comments. *In re DC Water & Sewer Auth.*, 13 E.A.D. 714 (EAB 2008).

The changes in the Permit are supported by the record, explained in the response to comments document, and are not tantamount to a “surprise switcheroo.” In fact, the Petition is silent regarding the Region’s exercise of the discretion provided in 40 C.F.R. § 124.14(b) and provides no legal argument to support review. Petitioner even admits that Region “addresses each change” in its response to comments document. Pet. at 43.

Petitioner did not raise any substantive legal arguments concerning any of the individual changes from the draft to final permit. Instead, the Petition alleges that the changes to the Permit, collectively, are “qualitatively different from any one change in isolation.” Pet. at 43. Petitioner alludes to its belief that the Region was required to “address whether the cumulative reduction warrants re-noticing” in the response to comments, but does not provide any legal authority for

that, either. *Id.* The Petition does not explain its concerns regarding the so-called “cumulative impact” of the changes in any substantive way. The Petition also alludes to “due process notice requirements” without any explanation or legal citation that could allow the Region to respond or the Board to consider this alleged concern.

Most importantly, since the information supporting the final Permit is contained within the record, and the changes were thoroughly explained in the response to comments document, Petitioner could have mounted a challenge of the final terms based on available information, but declined to do so under Issue 10.¹⁷

It is codified by 40 C.F.R. § 124.14 and well-settled by the Board that re-notice is not required unless the Region has abused its discretion in deciding not to reopen public comment, which only occurs when there is a “surprise switcheroo” in the permit terms with no explanation in the response to comments. The Petition fails to allege any such surprise in the Permit arising from the public comment period. The Board should therefore deny the relief requested under Issue 10.

Issue 11- The Permit Application Was Available for Review During the Public Comment Period.

Finally, Petitioner asks that “the Board grant review and issue guidance establishing, under 40 C.F.R. §§ 124.10 and 124.18, the minimum standard of public availability and timing required when an applicant asserts comprehensive confidential business information (CBI) claims under 40 C.F.R. § 144.5 over the geologic, modeling, and site-characterization materials

¹⁷ Petitioner appealed several of modifications in the final Permit, including 3D seismic and microseismic monitoring requirements, which are challenged under Issue 7, and correction to the locations of MW 2 and ACZ 1 in Attachment C, which are challenged in Issue 5. The fact that the Petitioner raised these concerns demonstrates the possibility of mounting an appeal based on the available information, and how reopening public comment was unnecessary.

that form the technical basis for the § 144.12 non-endangerment determination ...” Pet. at 45. The Board should deny the requested relief because it seeks guidance outside the scope of the process for permit appeals and because the Petition fails to demonstrate that the Region acted erroneously.

A. The Region met all requirements for public notice under 40 C.F.R. § 124.10.

40 C.F.R. § 124.10 governs the Region’s procedures for notifying the public of a draft permit. It requires public notice to include “the location of the administrative record . . . the times at which the record will be open for public inspection, and a statement that all data submitted by the applicant is available as part of the administrative record.” 40 C.F.R. § 124.10(d)(1)(vi). Petitioner complains that because portions of the administrative record were redacted during the public comment period, the Region committed a flaw in the permitting process. This is both factually and legally inaccurate.

On September 8, 2025, the Region issued public notice in this matter and closed the public comment period on November 3, 2025. Included with the public notice was information about the administrative record. “For additional information, *to request review of the Administrative Record files including all data submitted by the applicant . . .* please contact [permit writer] at [permit writer’s phone number] or [permit writer’s email address].” (emphasis added).¹⁸

Rather than challenging this portion of the process, Petitioner points to the Region’s earlier posting—before the public comment period—of redacted versions of permit application material on the agency’s website. This is immaterial because the posting of permit applications,

¹⁸ The notice of public comment is not included in the administrative record but was distributed online and continues to be accessible at the time of filing this briefing at: eDocket_Notice_Marquis_IL-155-6A-0001 <https://www.regulations.gov/docket/EPA-R05-OW-2025-1612/document>.

though consistent with EPA general policy on transparency,¹⁹ does not fulfil a regulatory requirement under 40 C.F.R. Part 124. When Marquis first applied for its permit, it claimed portions of its application as CBI, consistent with 40 C.F.R. § 144.5 and Part 2. In 2022 and 2023, the Region posted redacted application materials on its website, as it did for many Class VI permit applications.²⁰ Posting these materials was a courtesy; it did not expand the Region's obligations under 40 C.F.R. Parts 124 or 144 which pertain to the formal public notice period.

Further, nothing in the regulations requires the Region to publish the permit application much less entire administrative record during the public comment period. The regulations instead require that the record be available for public inspection upon request. During the public comment period for the Marquis Permit, the Region published the administrative record concurrently with the public notice. Petitioner then requested specific documents from the publicly available administrative record index, and the Region provided those to Petitioner, unredacted.²¹

Petitioner states that it did not receive the unredacted materials until weeks into the public comment period. But Petitioner identifies no prejudice from that timing: it makes no argument for why three weeks is an insufficient amount of time to have this material or why it was entitled to more time. Petitioner did not request an extension or to reopen the public comment period. And Petitioner ignores the fact that the public comment period was nearly double the length of time required, 40 C.F.R. § 124.10(d)(1), and that it had the unredacted application materials for three weeks, nearly three quarters of a standard public comment period. *See, e.g., Am. Radio*

¹⁹ See Message from Administrator Michael S. Regan, Administrator (April 12, 2021) (“fishbowl memo” in effect at time of posting of permit application materials).

²⁰ See e.g., <https://www.epa.gov/uic/class-vi-permit-applications-region-5>.

²¹ Petitioner asks the Agency to resolve CBI claims on application materials. The Region did that, which is why it was able to provide the unredacted versions to the Petitioner.

Relay League, Inc. v. FCC, 524 F.3d 227, 237 (D.C. Cir 2008) (citing 5 U.S.C. § 706; *Gerber v. Norton*, 294 F.3d 173, 182 (D.C. Cir 2002)) (noting, in an Administrative Procedure Act rulemaking challenge, that the Agency’s failure to disclose important information prior to public comment is subject to the rule of prejudicial error and “the court will not set aside a rule absent a showing by the petitioners ‘that they suffered prejudice from the agency’s failure to provide an opportunity for public comment.’”).²²

The regulations do not require the Region to publish the administrative record with the draft permit and the Board should not rewrite 40 C.F.R. § 124.10 to add that obligation.²³ *See In re Knaug Fiber Glass, GMBH*, 9 E.A.D. 1, 17 (EAB 2000) (rejecting petitioners’ arguments about the quality of the public participation process because the agency “fulfilled the applicable regulatory obligations, even if it did not go beyond those requirements”).

B. Petitioner asks the Board to act outside its jurisdiction under a permit appeal by issuing guidance.

Petitioner does not take issue with any of the permit terms under Issue 11. Instead, Petitioner requests that the Board “issue guidance” concerning the timing of CBI claims during the permit application process. Pet. at 45. Since the Region met the requirements for public notice, there is no legal issue here that is ripe for Board review. Further, even if there was, the Board can remand provisions of a permit when a regulation has been violated with instructions to

²² When analyzing similar regulatory language in the Clean Air Act context, EPA has held that a petitioner must demonstrate that the unavailability of information during the public comment period deprived the public of the opportunity to meaningfully participate. *See, e.g., In the Matter of Cash Creek Generation, LLC*, EPA Title V Air Permit Orders, Permit No. V-09-006, 2012 EPA CAA Title V Lexis 5 (June 22, 2012) (citing *In re Orange Recycling and Ethanol Production Facility, Pencor-Masada Oxynol, LLC*, Petition No. II-2000-07, 2001 EPA CAA Title V LEXIS 4, Order on Petition (May 2, 2001); *In re Murphy Oil USA, Inc., Meraux Refinery*, Petition No. 2500-00001-V5, 2011 EPA CAA Title V LEXIS 9, Order on Petition (Sept. 21, 2011).

²³ *Cf., In the Matter of: Coastal Energy Corp.*, NPDES Appeal No.17-04, 2017 EPA All. LEXIS 18 at 3 (EAB 2017) (“The Board is a tribunal of limited jurisdiction, however, and its authority to review permit decisions is ‘limited by the statutes, regulations, and delegations that authorize and provide standards for such review.’”).

meet regulatory requirements but cannot issue guidance outside the scope of the regulations themselves. The Board has held that, following the traditional practice of United States federal courts, it does not issue advisory opinions. *In re W. Bay Exploration Co., Haystead #9 SWD*, UIC Appeal 18-01 at 3-4 (EAB May 31, 2018) (Order denying motion for clarification). Here, Petitioner seeks the opinion of the Board on a topic wholly outside the scope of permitting requirements. The Board should deny Petitioner's request for review under Issue 11.

X. IMPORTANT POLICY CONSIDERATIONS

Petitioner has not identified any important policy considerations that should be evaluated by the Board. Petitioner asserts, in seven of the 11 issues of its Petition, that the same issues raise unique "important policy considerations." Although 40 C.F.R. § 124.19(a)(4)(i)(B) authorizes a petition to challenge a permit based on "an important policy consideration that the Environmental Appeals Board should, in its discretion, review," the Region did not identify any matters where the Board found a policy issue warranted review in a permit appeal action. Conversely, the Board has developed precedence finding that policy matters raised under a permit appeal did not warrant the Board's review. *See e.g. In the Matter of Atlas Env'tl. Servs.* 4. E.A.D. 6, 14-15 (EAB 1992) (holding that where there are no specific federal laws or regulations that require consideration of the alleged policy issue, review is not justified).

The Board's standard of review for permit decisions affords deference to EPA's technical judgment and expertise. *See In re Phelps Dodge Corp.*, 10 E.A.D. 460, 522 (EAB 2002) ("[W]e can well appreciate [petitioner's] policy argument. However, we are legally constrained to grant review sparingly.") In fact, under an appeal that similarly concerns Class VI permitting issues,

including AoR delineation, monitoring well siting, and others, the Board made the following finding:

The Board notes that in nearly every issue raised, in addition to alleging that the Region committed clear errors and abused its discretion, *Petitioners also assert that the issue raises a matter of policy that the Board in its discretion should review*. Petitioners' policy arguments essentially reflect disagreement with the underlying policy decisions EPA made when promulgating the Class VI regulations... The Class VI regulations underwent their own notice and comment process pursuant to 42 U.S.C. § 300h(a)(2) and 5 U.S.C. § 553 and are now final.... To the extent that Petitioners are dissatisfied with the structure of the regulations, which provide for an iterative permitting process and give broad discretion to the permitting authority, or the policy judgments underlying those regulations, a petition for review to this Board is not the appropriate forum."

FutureGen, 16 E.A.D. 724 (EAB 2015) (emphasis added).

The policy issues raised by Petitioner are precisely what the Board in *FutureGen* declined to review because they reflect disagreement with the underlying policy decisions EPA made when promulgating the Class VI Rule. EPA's role is to set policy concerning permitting requirements as part of its regulatory authority, while the Board's role is to evaluate whether the permit complies with the regulations and is not based on a finding of fact or conclusion of law that is clearly erroneous. Thus, for the same reasons set forth above for why the Board should decline to remand the Permit to the Region, the Board should also decline to review these matters as they do not validly raise important policy considerations that the Board should review.

XI. CONCLUSION

In issuing the Permit, the Region reviewed the application and developed permit terms consistent with the Class VI Rule. The Region also abided by regulatory procedural requirements. The record establishes that Petitioner has not identified any clearly erroneous decisions by the Region or any policy issues requiring review by the Board. The Region therefore respectfully requests that the Petition be denied.

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