UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

October 28, 2022

OFFICE OF THE
CHIEF FINANCIAL OFFICER

The Honorable Chellie Pingree
Chair, Subcommittee on Interior,
Environment, and Related Agencies
Committee on Appropriations
House of Representatives
Washington, D.C. 20515

The Honorable David Joyce
Ranking Member, Subcommittee on Interior,
Environment, and Related Agencies
Committee on Appropriations
House of Representatives
Washington, D.C. 20515

The Honorable Jeff Merkley
Chair, Subcommittee on Interior,
Environment, and Related Agencies
Committee on Appropriations
United States Senate
Washington, D.C. 20510

The Honorable Lisa Murkowski
Ranking Member, Subcommittee on Interior,
Environment, and Related Agencies
Committee on Appropriations
United States Senate
Washington, D.C. 20510

Dear Chairs and Ranking Members:

Enclosed is the U.S. Environmental Protection Agency's Report to Congress regarding recommendations to improve Class VI permitting procedures for commercial and research carbon sequestration projects. This report is provided as directed by the Explanatory Statement accompanying the Consolidated Appropriations Act, 2021 (Public Law 116-260), which states the following:

> *Water: Human Health-The agreement provides $108,487,000 for Water: Human Health. The Committees direct the Agency to maintain the Beach/Fish program project at the enacted level. Of the increase provided, $1,000,000 is to further support implementation of requirements under America's Water Infrastructure Act of 2018 (Public Law 115-270). Within available funds, not less than $3,000,000 is for the Agency's work within the Underground Injection Control program related to Class VI wells for geologic sequestration to help develop expertise and capacity at the Agency. These funds should be used by the Agency to review and process Class VI primacy applications from States and Tribes and to directly implement the regulation, where States have not yet obtained primacy by working directly with permit applicants. Additionally, the Agency is directed to submit a report, and provide a briefing to the Committees, not later than one year after enactment of this Act on recommendations to improve Class VI permitting procedures for commercial and research carbon sequestration projects. The report should be drafted in consultation with the Department of Energy, relevant State agencies, previous permit applicants, and nongovernmental stakeholders.*

This report provides background information on Class VI wells, outlines permitting regulations, explains the EPA's permit application and review process, summarizes feedback the agency has received from stakeholders about the process, and describes actions the EPA is currently taking in response to stakeholder feedback.

If you have further questions or you would like to set up a meeting to discuss this report, please contact Ed Walsh at (202) 564-4594 or walsh.ed@epa.gov.

Sincerely,

Amin, Faisal

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Faisal Amin
Chief Financial Officer

Enclosure

EPA Report to Congress: Class VI Permitting

October 2022

Class VI Permitting Report to Congress

1. Introduction

Climate change is one of the most complex issues facing us today. Carbon Capture, Utilization, and Sequestration (CCUS) refers to technologies that capture carbon dioxide from an emissions source, such as a power plant, and permanently store the carbon, such as through deep well injection in a permitted Class VI Underground Injection Control (UIC) well (known as geologic sequestration). To reach the President's ambitious domestic climate goal of net-zero emissions, economy-wide, by 2050, the United States will likely have to capture, transport, and permanently sequester significant quantities of carbon dioxide (CEQ, 2021). The successful widespread deployment of responsible CCUS, as well as carbon dioxide removal (CDR) approaches (e.g., direct air capture and sequestration, bioenergy generation with carbon capture and sequestration), will require strong and effective permitting and efficient regulatory regimes to safeguard public health and the environment with meaningful public engagement. The U.S. Environmental Protection Agency's (EPA's) Class VI regulations, which are a part of the U.S. regulatory regime for CCUS[1] and will be required for the geologic sequestration components of CDR approaches, are essential for geologic sequestration deployment that is protective of underground sources of drinking water (USDWs) and human health.

Interest in CCUS and in the Class VI permit program has increased dramatically after passage of enhancements to a tax credit for carbon sequestration in 2018. Since that time, EPA has met with more than 100 companies and other interested parties to discuss questions and concerns around geologic sequestration and the Class VI permitting program and EPA expects this level of interest to continue.

This report provides background on Class VI wells, outlines permitting regulations, explains EPA's permit application and review process, summarizes feedback EPA has received from stakeholders about the process, and describes actions EPA is currently taking in response to stakeholder feedback. UIC primary enforcement authority (primacy) (i.e., when a state, Tribe, or territory applies to EPA to be the permitting authority for UIC wells and receives that authority within their state, Tribe, or territory) also is briefly discussed herein. However, specific details related to requirements for Class VI primacy applications and EPA's review and approval of Class VI primacy applications are outside the scope of this report.

1.1 Overview of Congressional Request

In an effort to better understand the issues surrounding the Class VI program, on December 27, 2020, the U.S. Congress enacted Division G, Department of the Interior, Environment, and Related Agencies, of the Consolidated Appropriations Act, 2021. The Explanatory Statement

[1] For a complete picture of the U.S. CCUS regulatory regime, see Appendix A of *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration* (CEQ, 2021) available at: https://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf.

that accompanies the Act directed EPA to: "submit a report and provide a briefing to the Committees not later than one year after enactment of this Act on recommendations to improve Class VI permitting procedures for commercial and research carbon sequestration projects." The Explanatory Statement further stipulated that: "the report should be drafted in consultation with the Department of Energy, relevant State agencies, previous permit applicants, and nongovernmental stakeholders." This report was written to respond to this request and focuses on the UIC Class VI regulations and permitting process.

This report is one in a series of reports on CCUS requested by Congress as part of the Consolidated Appropriations Act, 2021. Highlighted below are those Congressionally mandated reports particularly relevant to this report.

- Utilizing Significant Emissions with Innovative Technologies (USE IT) Act (Division S of the Consolidated Appropriations Act of 2021):
    - A report to Congress on deep saline formations focusing on the risks and benefits of geologic sequestration (GS) with recommendations for risk management and mitigation (Congress directed EPA to lead this report)
    - A National Academies of Sciences, Engineering, and Medicine study to assess the barriers and opportunities relating to the commercial application of carbon dioxide (CO_2) (Congress directed the U.S. Department of Energy (DOE) to lead this report and collaborate with EPA)
    - A report to Congress that identifies and inventories existing relevant federal permitting information and resources for CCUS stakeholders, initiatives, and recent publications on CO_2 pipeline needs, gaps in the current regulatory framework, federal financial mechanisms available to project developers, and public engagement opportunities through existing laws (Congress directed the White House Council on Environmental Quality (CEQ) to lead this report and collaborate with EPA and other federal agencies)

- Energy Act of 2020 (Division Z of the Consolidated Appropriations Act, 2021):
    - A National Academies of Sciences, Engineering, and Medicine study to assess any barriers and opportunities relating to commercializing carbon, coal-derived carbon, and CO_2
    - A Government Accountability Office report on the successes, failures, practices, and improvements of DOE in carrying out commercial-scale carbon capture demonstrations
    - A report to Congress on the carbon capture technology program
    - A report to Congress that assesses the progress of all regional carbon sequestration partnerships, identifies the remaining challenges in achieving large-scale carbon sequestration, and creates a roadmap for carbon storage

- A report to Congress examining the opportunities for research and development in integrating blue hydrogen technology in the industrial power sector and how that could enhance the deployment and adoption of CCUS
- A report to Congress on CO_2 removal methods

On June 30, 2021, CEQ issued a report to Congress that identified and inventoried existing relevant federal permitting information and resources for CCUS stakeholders, initiatives, and recent publications on CO_2 pipeline needs, gaps in the current regulatory framework, federal financial mechanisms available to project developers, and public engagement opportunities through existing laws as congressionally mandated in the USE IT Act (CEQ, 2021).[2] The CEQ report provides important background on the role of CCUS in addressing climate change and the state of technologies, policies, and permitting related to CCUS that may be helpful for readers. Additionally, on February 16, 2022, CEQ published a draft Carbon Capture, Utilization, and Sequestration Guidance with a request for public comment (closed April 18, 2022).[3] Consistent with the USE IT Act, CEQ issued the guidance to facilitate reviews associated with the deployment of CCUS and to promote the efficient, orderly, and responsible development and permitting of CCUS projects at an increased scale in line with the Administration's climate, economic, and public health goals (CEQ, 2022).

1.2 Carbon Capture, Utilization, and Storage Background Information

CCUS refers to a set of technologies that capture CO_2 from emission sources and either transport, compress, and inject it deep in the earth's subsurface or transform it for utilization in industrial processes or as feedstock for useful commercial products. GS is a component of CCUS related to the underground injection and long-term containment of CO_2.

CO_2 is first captured from one or more emission source(s). To transport captured CO_2 to a GS site, operators typically compress CO_2 to convert it from a gaseous state to a supercritical fluid. CO_2 exists as a supercritical fluid at high pressures, and, in this state, the CO_2 exhibits properties of both a liquid and a gas. After capture and compression, the CO_2 is delivered to the GS site, frequently by pipeline, or alternatively using tanker trucks or ships. When injected into a suitable geologic formation, CO_2 is sequestered by a combination of trapping mechanisms, including physical and geochemical processes. Physical trapping can occur when the CO_2 reaches a geologic zone of low permeability or when residual CO_2 is immobilized in formation pore space due to capillary forces. Geochemical trapping occurs when chemical reactions between the dissolved CO_2 and minerals in the formation lead to the precipitation of solid carbonate minerals. The timeframe over which CO_2 will become trapped by these mechanisms depends on properties of the receiving formation and the injected CO_2 stream (75 FR 77230; US EPA, 2010).

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[2] The CEQ report *Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration* is available at: https://www.whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf.

[3] Draft CEQ guidance, *Carbon Capture, Utilization, and Sequestration Guidance* (CEQ, 2022) available at: https://www.federalregister.gov/documents/2022/02/16/2022-03205/carbon-capture-utilization-and-sequestration-guidance.

The injection of large volumes of CO_2 into the subsurface involves a complex suite of technologies that spans several technical and scientific disciplines. The technologies for CCUS already exist, with a reported 26 commercial-scale projects in operation globally, and an estimated 45 CCUS facilities in operation or in development in the United States today (CEQ, 2021). Current GS projects reflect the development or adaptation of technologies related to geology, geochemistry, and hydrology for site characterization; well engineering for construction, testing, and logging; modeling and reservoir simulation for area of review (AoR)[4] delineations; chemical and geophysical-based measurement, monitoring, and verification technologies; and risk assessment. Much of this research has been led by the federal government, including by DOE. DOE has invested more than $1 billion during the past two decades through its Carbon Storage Research and Development (R&D) Program to develop the technologies and capabilities for widespread commercial deployment of geologic storage, including research projects that have injected 11–12 million tons of CO_2. This investment has made the United States a leader in this worldwide effort. Federal government research on GS includes research on GS and risk management (see, e.g., *Overview of Potential Failure Modes and Effects Associated with CO_2 Injection and Storage Operations in Saline Formations* (Warner et al., 2020) and NETL's *Safe Geologic Storage of Captured Carbon Dioxide: Two Decades of Doe's Carbon Storage R&D Program on Review* (NETL, 2020)); the U.S. Department of Interior (see, *Report to Congress: Framework for Geological Carbon Sequestration on Public Land* (U.S. Department of the Interior, 2009); and EPA (see, *Vulnerability Evaluation Framework for GS of Carbon Dioxide* (US EPA, 2008)).

[4] Per 40 CFR 146.84(a), the area of review is the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity. The area of review is delineated using computational modeling that accounts for the physical and chemical properties of all phases of the injected CO_2 stream and is based on available site characterization, monitoring, and operational data.

The Intergovernmental Panel on Climate Change has identified CCUS and CDR as essential tools to limit warming to 1.5°C, in addition to achieving deep reductions in greenhouse gas emissions (IPCC, 2022). CCUS projects, including GS projects, will only deliver desired societal and environmental benefits if they are well designed and well governed.

2. UIC Class VI Regulations

The Safe Drinking Water Act (SDWA) directed EPA to develop regulations that prevent underground injection activities from endangering drinking water sources. EPA developed the UIC regulations to ensure underground injection wells are constructed, operated, and closed in a manner that is protective of USDWs and address potential risks to USDWs associated with injection activities. The UIC regulations address the major pathways by which injected fluids can migrate into USDWs, including along the injection well bore, via improperly completed or plugged wells in the AoR of the injection well, direct injection into a USDW, faults or fractures in the confining strata, or lateral displacement into hydraulically connected USDWs (see Figure 1).

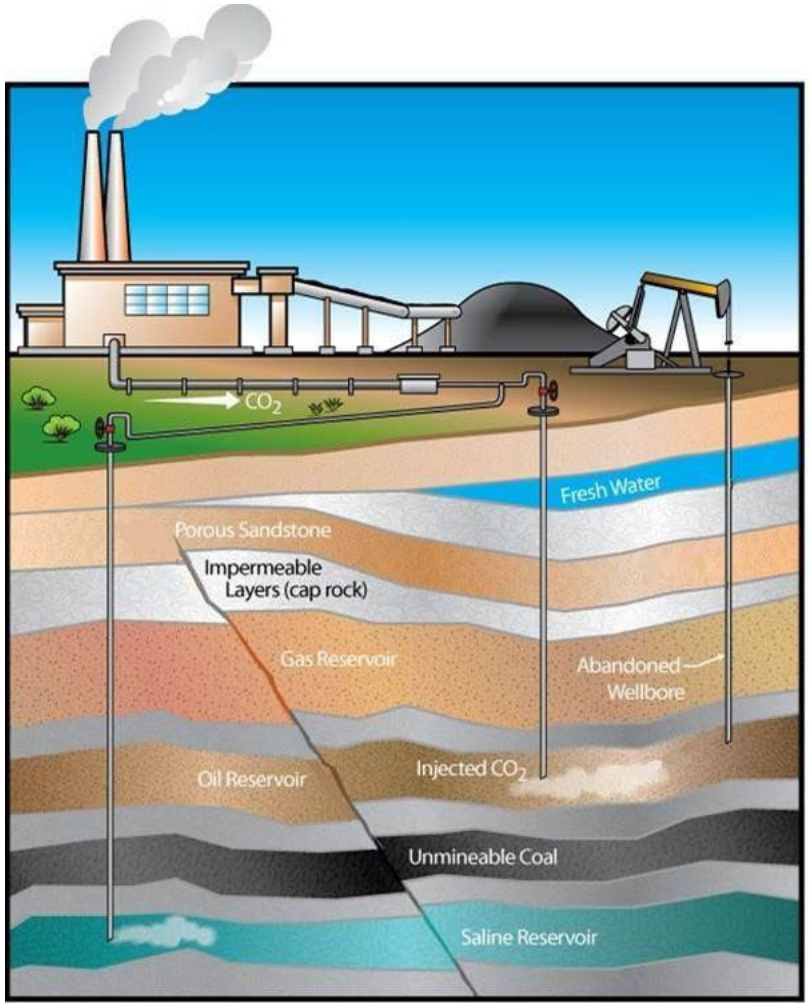

Figure 1. Schematic of CO_2 injection for geologic sequestration. (Source: LBNL)

States may apply to EPA to be the UIC permitting authority in the state and receive primary enforcement authority (primacy). Where a state has not obtained primacy, EPA is the UIC permitting authority. When the UIC regulations were first codified in 1980, the UIC Program defined five classes of injection wells and set regulations for each well class based on the risks posed by the specific injection activities (see Figure 2).

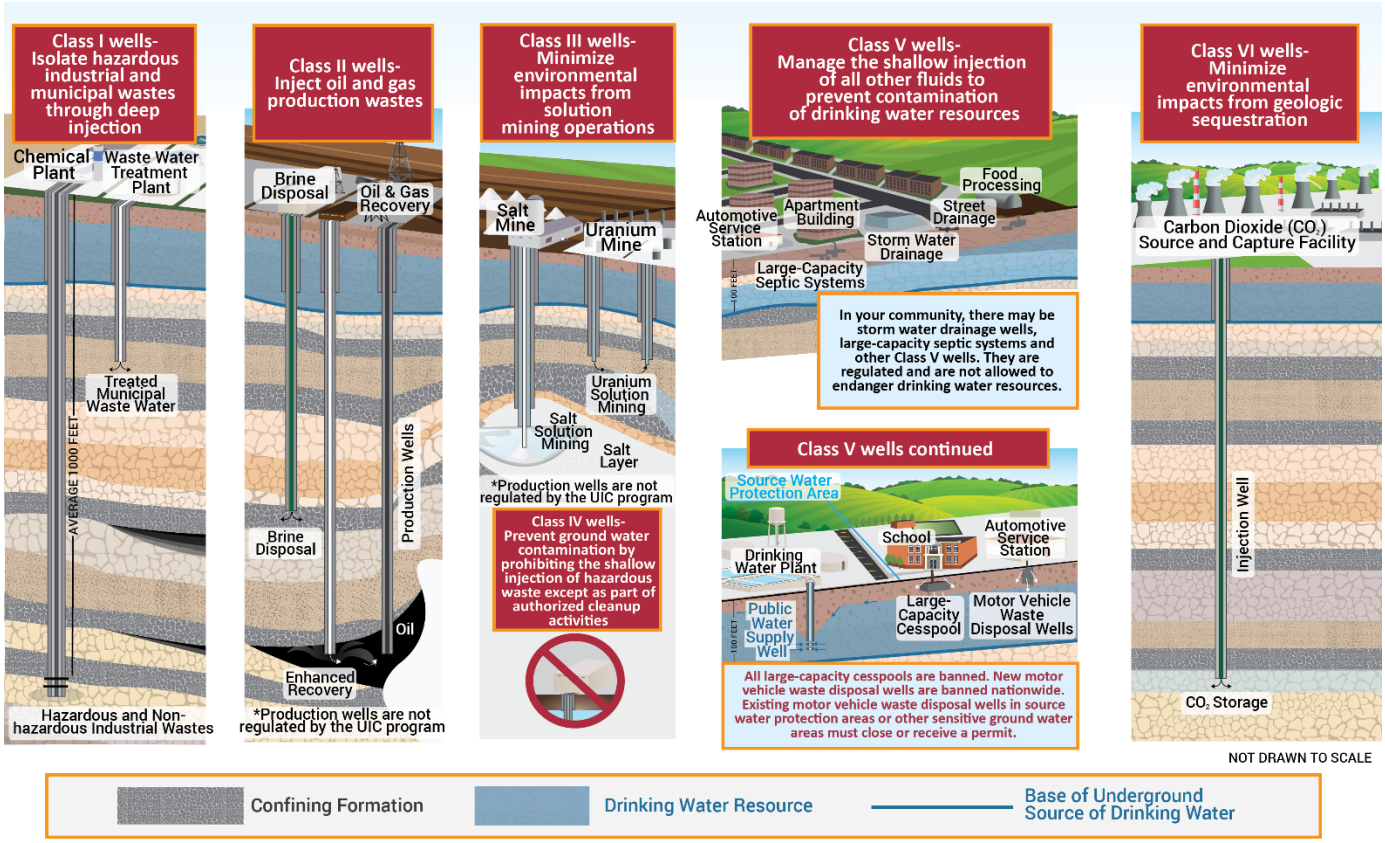

Figure 2. UIC injection well classes. Injection well Classes I, II, III, IV, and V were established as part of EPA's 1980 UIC rulemaking, and through a subsequent 1999 Class V addition. EPA established well Class VI in a 2010 rulemaking.

Recognizing that CO_2 injection, for the purpose of GS, poses unique risks relative to other injection activities, EPA promulgated *Federal Requirements Under the UIC Program for Carbon Dioxide GS Wells* (75 FR 77230; US EPA, 2010), known as the Class VI Rule, in December 2010. The rule created and set requirements for a new class of injection wells, Class VI. The Class VI Rule builds upon the long-standing protective framework of the UIC Program, with requirements that are tailored to address issues unique to large-scale GS, including large injection volumes, higher reservoir pressures relative to other injection formations, the relative buoyancy of CO_2, the potential presence of impurities in captured CO_2,[5] the corrosivity of CO_2 in the presence of water, and the mobility of CO_2 within subsurface geologic formations. These additional protective requirements include more extensive geologic testing, detailed computational modeling of the AoR and periodic re-evaluations, detailed requirements for

[5] Impurities may include incidental amounts of associated substances derived from the source materials and the capture process and any substances added to the stream to enable or improve the injection process. The composition of these substances varies by the emissions source. Any CO_2 stream that meets the definition of a hazardous waste, under 40 CFR part 261, must be injected into a UIC Class I hazardous waste injection well (see Figure 2).

monitoring and tracking the CO_2 plume and pressure front,[6] unique financial responsibility requirements, and extended post-injection monitoring and site care.

Throughout the rulemaking process for the Class VI Rule, EPA engaged with states, Tribes, and stakeholders, including those from industry, environmental groups, utilities, academia, and the public, to understand their concerns and solicit technical feedback. EPA also conducted a series of technical workshops to identify and discuss questions regarding the effective management of CO_2 injection, including site characterization, AoR modeling, testing and monitoring, well construction, and mechanical integrity testing. EPA also held public meetings on the rulemaking.

Overview of the Federal Class VI Rule Requirements

Permit information requirements establish the material that owners or operators must submit to obtain a Class VI permit [40 CFR 146.82].

Minimum criteria for siting require Class VI wells to be located in areas with a suitable geologic system, including an injection zone that can receive the total anticipated volume of CO_2 and a confining zone(s) to contain the injected CO_2 stream and displaced formation fluids [40 CFR 146.83].

AoR and corrective action provisions require delineation of the AoR for proposed Class VI wells using computational modeling. Additionally, these provisions require the preparation of a Corrective Action plan and implementation of the plan.[7] A Class VI well owner or operator must periodically reevaluate the AoR and amend the plan, if necessary [40 CFR 146.84].

Financial responsibility requirements establish that owners or operators must demonstrate and maintain sufficient funds to perform necessary corrective action on existing wells within the AoR (e.g., any wells determined to potentially cause leakage of injected CO_2 or formation fluid), plug the injection well, perform post-injection site care (PISC) and site closure[8] activities, and complete any necessary emergency and remedial response activities [40 CFR 146.85].

Injection well construction requirements specify the design and materials used in the construction of Class VI wells. To prevent the endangerment of USDWs, only materials compatible with the CO_2 stream, over the duration of the GS project, are permitted [40 CFR 146.86].

[6] The pressure front of a CO_2 plume refers to the zone where there is a pressure differential sufficient to cause the movement of injected fluids or formation fluids into a USDW (U.S. EPA, 2010).

[7] Corrective action means the use of Director-approved methods to ensure that wells within the area of review do not serve as conduits for the movement of fluids into USDWs.

[8] Site closure means the point/time, as determined by the Director following the requirements under 40 CFR 146.93, at which the owner or operator of a geologic sequestration site is released from post-injection site care responsibilities.

Requirements for logging, sampling, and testing prior to operation outline activities, including logs, surveys, and tests of the injection well and formations, that must be performed before injection of CO_2 may commence [40 CFR 146.87].

Operating requirements outline operational measures for Class VI wells to ensure that the injection of CO_2 does not endanger USDWs. As important, these provisions establish limitations on injection pressure and requirements for automatic shut-off devices [40 CFR 146.88]. The mechanical integrity requirements specify continuous monitoring to demonstrate internal mechanical integrity and annual external mechanical integrity tests [40 CFR 146.89].

Testing and monitoring requirements define the elements that must be included in the required Testing and Monitoring Plan submitted with a Class VI permit application. The testing and monitoring must be conducted throughout the project life, until site closure, to demonstrate the safe operation of the injection well (e.g., through mechanical integrity testing of the well) and track the position of the CO_2 plume and pressure front (e.g., through groundwater monitoring) [40 CFR 146.90].

Reporting requirements establish the timeframes and circumstances for the electronic submission of Class VI well testing, monitoring, and operating results and requirements for keeping records [40 CFR 146.91].

Injection well plugging requirements specify that a Class VI injection well must be properly plugged to ensure that the well does not become a conduit for fluid movement into USDWs in the future [40 CFR 146.92].

PISC and site closure requirements address activities that occur following cessation of injection. The owner or operator must continue to monitor the site for a default 50 year period following the cessation of injection or, if approved by the Director, for an alternative timeframe, until it can be demonstrated that no additional monitoring is needed to ensure that the project does not pose an endangerment to USDWs; following this, the owner or operator must plug the injection and monitoring wells and close the site [40 CFR 146.93].

Emergency and remedial response requirements specify that owners or operators of Class VI wells must develop and maintain an approved Emergency and Remedial Response Plan that describes the actions to be taken to address events that may cause endangerment to a USDW [40 CFR 146.94].

Class VI injection depth waiver requirements provide a process under which Class VI well owners or operators can seek a waiver from the injection depth requirements in order to inject CO_2 into non-USDWs that are located above or between USDWs [40 CFR 146.95].

Section 2.1 presents information on materials that EPA developed to support the Class VI regulations.

2.1 Class VI Rule Support Documents

From 2011 to 2018, EPA finalized and published a series of tools and other resources to support Class VI well permit applicants, owners and operators, and permitting authorities in understanding and implementing the requirements of the Class VI Rule.

EPA's guidance documents provide recommendations and considerations for Class VI well operators and UIC permitting authorities on meeting the requirements of the Class VI Rule. Elements included in EPA guidance documents cannot be enforced as regulatory requirements unless EPA is explicitly citing rule requirements.

Guidance documents for owners or operators address the following technical topics:

- Geologic site characterization[9]
- AoR evaluation and corrective action[10]
- Financial responsibility[11]
- Well construction[12]
- Testing and monitoring[13]
- Reporting and record keeping[14]
- Required Class VI Project Plans[15]
- Well plugging, PISC, and site closure[16]

Guidance documents for states/permitting authorities include:

- The Class VI Implementation Manual, which describes recommended activities to support the review and evaluation of Class VI project information[17]
- A Primacy Manual that provides procedural support for preparing UIC primacy

[9] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Well Site Characterization Guidance* (US EPA, 2013a)
[10] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Well Area of Review Evaluation and Corrective Action Guidance* (US EPA, 2013b)
[11] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Financial Responsibility Guidance* (US EPA, 2011a)
[12] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Well Construction Guidance* (US EPA, 2012a)
[13] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Well Testing and Monitoring Guidance* (US EPA, 2013c)
[14] *Geologic Sequestration of Carbon Dioxide, UIC Program Class VI Reporting, Record-keeping, and Data Management Guidance for Owners or Operators* (US EPA, 2016a)
[15] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Well Project Plan Development Guidance* (US EPA, 2012b)
[16] *Geologic Sequestration of Carbon Dioxide, UIC Program Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance* (US EPA, 2016b)
[17] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Implementation Manual for UIC Program Directors* (US EPA, 2018)

application materials[18]
- A 2015 Memorandum from EPA's Office of Ground Water and Drinking Water to Regional Water Division Directors, Key Principles in EPA's UIC Program Class VI Rule Related to the Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI[19]

EPA also developed a set of quick reference guides to support permitting authorities on the following topics:

- Incorporating environmental justice (EJ) considerations into the Class VI permitting process[20]
- Public participation[21]
- Interstate coordination[22]

To support the electronic reporting requirement of the Class VI Rule at 40 CFR 146.91(e), EPA collaborated with the Pacific Northwest National Laboratory (PNNL) to develop the Geologic Sequestration Data Tool (GSDT).[23] The GSDT is a centralized, web-based system that receives, stores, and manages Class VI data and also can support permitting authorities in enforcement and program oversight activities such as organizing and retaining the large volume of material related to Class VI permit applications.

3. Class VI Permitting

Class VI projects involve several phases (see Figure 3). They include:

- **Pre-permitting phase.** The prospective owner or operator prepares the Class VI permit application and is encouraged to meet with the permitting authority to discuss the permitting process.
- **Pre-construction phase.** The prospective owner or operator submits a Class VI permit application, which the permitting authority will review and, if appropriate, issue a Class VI permit for the injection well.
- **Pre-operation phase**. The Class VI well owner or operator submits the results of required pre-operational testing, updated information about site geology, the final AoR,

[18] *Geologic Sequestration of Carbon Dioxide – UIC Program Class VI Primacy Manual for State Directors* (US EPA, 2014)
[19] *Key Principles in EPA's Underground Injection Control Program Class VI Rule Related to Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI* (US EPA, 2015)
[20] *Geologic Sequestration of Carbon Dioxide – UIC Quick Reference Guide - Additional Tools for UIC Program Directors Incorporating Environmental Justice Considerations into the Class VI Injection Well Permitting Process* (US EPA, 2011b)
[21] *Geologic Sequestration of Carbon Dioxide – UIC Quick Reference Guide - Additional Considerations for UIC Program Directors on the Public Participation Requirements for Class VI Injection Wells* (US EPA, 2011c)
[22] *Geologic Sequestration of Carbon Dioxide – UIC Quick Reference Guide - Additional Considerations for UIC Program Directors on the Interstate Coordination Requirements for the Class VI Injection Well Permitting Process* (US EPA, 2011d)
[23] https://epa.velo.pnnl.gov/

any needed amendments to the Project Plans, and information about the construction and testing of the well. This phase ends when the permitting authority issues the Class VI permit holder authorization to inject CO_2 into the well.

- **Injection phase**. Class VI well owners or operators conduct injection activities, perform testing and monitoring, and reevaluate the AoR, as described in the Class VI permit and Project Plans.
- **Post-injection phase.** The Class VI well owner or operator plugs the injection well, monitors the CO_2 plume and pressure front, and, after demonstrating USDW non-endangerment, closes the site.

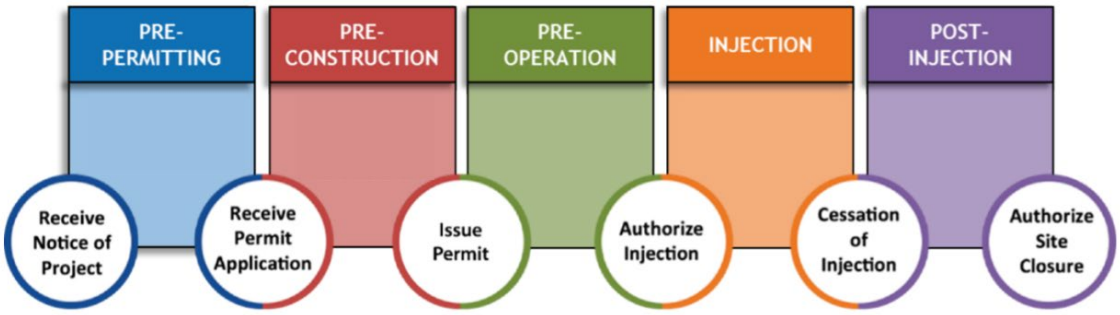

Figure 3. The Phases of a Class VI Project.

Section 3.1 provides additional information related to the permit application process for Class VI well owners and operators and Section 3.2 describes EPA's permit application review process and permit issuance process. EPA is the permitting authority for Class VI wells in all states except where a state, Tribe, or territory has applied for and received primacy for UIC Class VI wells. The Class VI regulations in primacy states, Tribes, and territories must be approved by EPA and must be as stringent as the Federal Class VI regulations. EPA maintains oversight responsibility for approved UIC primacy programs. However, processes for Class VI permit application, review, and issuance may be different in states, Tribes, or territories with Class VI primacy. As of the writing of this report, the States of Wyoming and North Dakota have Class VI primacy.

3.1 Overview of the Class VI Permitting Process

Class VI permit applicants must apply for a permit for each Class VI well they plan to operate. Permit applications are detailed and contain information about the geologic conditions at the proposed site, computational modeling of the AoR around the injection well, the construction of the injection well, planned operation/injection and post-injection phase testing and monitoring, financial responsibility, and emergency response planning. This information is typically submitted as a permit application narrative and a set of required Project Plans and related information such as maps, geologic cross sections, modeling data files, engineering schematics, and financial documents also are submitted. Permit application materials are submitted via the GSDT where EPA is the permitting authority for Class VI wells (states with Class VI primacy may elect to use the GSDT). During the permitting authority's review of the permit application,

the applicant may be asked to provide additional information to answer questions about the review or clarify the information in the permit application.

Once the final Class VI permit has been issued by the permitting authority, the permittee is authorized to construct or convert (if the intended injection well was previously constructed to Class VI well standards, but permitted or used for a different purpose) the injection well and perform required pre-operational testing. The permittee must follow these steps and submit testing results and any other information stipulated in the final permit to the permitting authority. The permittee must wait for the permitting authority to issue an Authorization to Inject before CO_2 injection can commence.

Although there is limited data on Class VI permitting timeframes specifically, information on other well classes is pertinent. For example, Class I is similar to Class VI based on regulatory structure, including the amount of site-specific data required as part of the permit application. Since 2019, EPA has issued 25 new Class I permits. The processing time (measured from receipt of permit application to permit issuance) was typically less than two years. EPA anticipates that prospective owners or operators submitting complete Class VI applications will be issued permits in approximately two years. Factors that may impact permitting timeframes include the quality and quantity of site-specific data submitted by the applicant, the amount of time the applicant takes to respond to requests for additional information from the permitting authority, and the number and complexity of public comments received on the draft permit.

3.2 Permit Application Reviews

Review of a Class VI permit application by the permitting authority entails a multidisciplinary evaluation to determine whether the application includes the required information, is technically accurate, and supports a risk-based determination that USDWs will not be endangered by the proposed injection activity.

The permit application review necessitates a team approach—involving subject matter experts in geology, hydrology/hydrogeology, modeling, well engineering, finance, and risk analyses—to collectively review the topics addressed in the application. EPA works to ensure a scientifically rigorous and efficient process in reviewing permit applications. The EPA Region where the project will be located has the lead for the permit application review, communicating with the applicant, and issuing permitting decisions, in coordination with other EPA components, as well as federal, state, Tribal, and local entities, as appropriate. A permit application review involves the following activities:

- **Completeness review.** The first step of this review is determining that the permit application is complete (i.e., that it contains all of the information required at 40 CFR 146.82(a)). If any required information is missing, the permitting authority requests it from the applicant.
- **Technical review**. Following a completeness determination, a technical review of each element of the permit application commences. The technical review focuses on evaluating the geologic and hydrogeologic information to confirm site suitability (i.e.,

that the proposed project site can receive and store the total volume of CO_2 to be injected over the life of the project). This geologic information, in turn, supports a thorough review of the AoR delineation modeling effort to confirm that an appropriately robust model was used, the model inputs and assumptions are consistent with available geologic information, and the results accurately represent the area over which the CO_2 plume and pressure front are anticipated to expand during injection operations. The modeling results will then inform an evaluation of the adequacy of the testing and monitoring plan and the proposed PISC timeframe. Engineering evaluations of the injection and monitoring wells ensure that they will be designed, constructed, tested, and plugged in a manner that will not endanger USDWs. Financial assurance and risk reviews also are performed to verify that procedures and adequate financial resources are available to respond to unanticipated events, such as a leak in the well casing.

Throughout the review, as questions arise, they are posed to the applicant via formal requests for additional information (RAIs). The permitting authority stipulates a timeframe for response in the RAI, which will depend on the nature of the missing information. It is important for the applicant to provide the missing information in a timely manner so as not to extend the overall time for the review.

- **Considerations under federal law.** Along with the technical review, EPA will conduct reviews required under other relevant federal requirements and policies for EPA-issued permits. This includes Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7269, Feb. 16, 1994), which states that Federal Agencies "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The EPA UIC program completes an EJ review using EPA's EJScreen Tool, an online mapping tool that integrates numerous demographic, socioeconomic, and environmental data sets that are overlain on the delineated AoR to identify whether any portions of the AoR encompass disadvantaged communities. If the results indicate a potential EJ impact, permit writers consider potential permitting measures to mitigate the impacts of the Class VI project on those communities and enhance the public participation process to be inclusive of all potentially affected communities (e.g., conduct early targeted outreach to communities and identify and mitigate any communication obstacles such as language barriers or lack of technology resources). Other federal laws that may apply to EPA issuance of UIC permits and must be considered are listed in the U.S. Code of Federal Regulations at 40 CFR 144.4.
- **Draft permit package, public notice draft permit, and issue final permit.** Once a permitting authority determines that a permit application meets the requirements of the Class VI Rule, the permitting authority issues a Class VI draft permit for public comment. The permit package consists of the draft UIC permit, Class VI Project Plans (for AoR and Corrective Action, Testing and Monitoring, Injection Well Plugging, Post-Injection Site Care, and Emergency and Remedial Response); a summary of operating

requirements; well construction details; financial responsibility information; and a well stimulation program.

The draft UIC permit must be issued for public comment with a minimum public comment period of 30 days (required by 40 CFR 124.10(b)). The permitting authority issuing the permit also will hold a public hearing if one is requested during the comment period or may elect to schedule a public hearing if significant public interest is anticipated.

Following consideration of comments received, the permitting authority modifies and issues a final permit, as appropriate. A final permit authorizes the applicant to construct or convert the injection well and any new monitoring wells and perform required pre-operational testing. The final permit contains conditions for construction/conversion, injection/operation, PISC, and site closure, but it will not authorize injection if pre-operational testing is needed.

- **Pre-operational testing review/authorization to inject.** The permitting authority reviews the results of the pre-operational testing and any other new information submitted by the Class VI well owner or operator. Information may include an updated AoR model, "as-built" specifications for the injection and monitoring wells, and any revisions to the Project Plans necessitated by the new data.[24] The permitting authority would then approve the updated Project Plans and authorize injection, if appropriate.
- The Class VI well owner or operator will continue to engage the permitting authority throughout the life of the permit (i.e., through site closure) including for activities related to testing, monitoring, and reporting during the injection and PISC phases, as well as during AoR reevaluations, and also for any necessary updates to the project plans, financial responsibility information, or permits, as stipulated in the Class VI regulations and permit conditions.

3.3 Overview of EPA Class VI permitting efforts

As of June 2022, EPA has issued six Class VI permits, all in Illinois. Two of these Class VI permits are currently active, with one in the injection phase and one in the post-injection monitoring phase. The other four Class VI permits were issued for wells that were never constructed. EPA is currently reviewing Class VI permit applications for nine projects, including three in California, one in Indiana, one in Ohio, one in Illinois, and three in Louisiana. Each project may consist of more than one injection well and thus, more than one Class VI permit.

The 2018 passage of revisions and enhancements to the Internal Revenue Code Section 45Q tax credit that provides tax credits for carbon oxide (including CO_2) sequestration led to an increase in Class VI permit applications. EPA has met with more than 100 companies and other interested parties to discuss questions and concerns around GS and the Class VI permitting process. EPA

[24] Any permit modifications not listed as a minor permit modification at 40 CFR 144.41 are considered major modifications and must be issued for public notice before being finalized.

also anticipates that Bipartisan Infrastructure Law investments related to CCUS development and deployment, including funding opportunities (e.g., financial assistance) available through DOE for Carbon Storage Validation and Testing, as well as the DOE CarbonSAFE program will lead to 100 additional Class VI permit applications. The map in Figure 4 presents an overview of potential projects, as of June 2022, in the states where EPA directly implements the Class VI Program. Up-to-date information about Class VI permitting activities is available on EPA's website at: https://www.epa.gov/uic/class-vi-wells-permitted-epa.

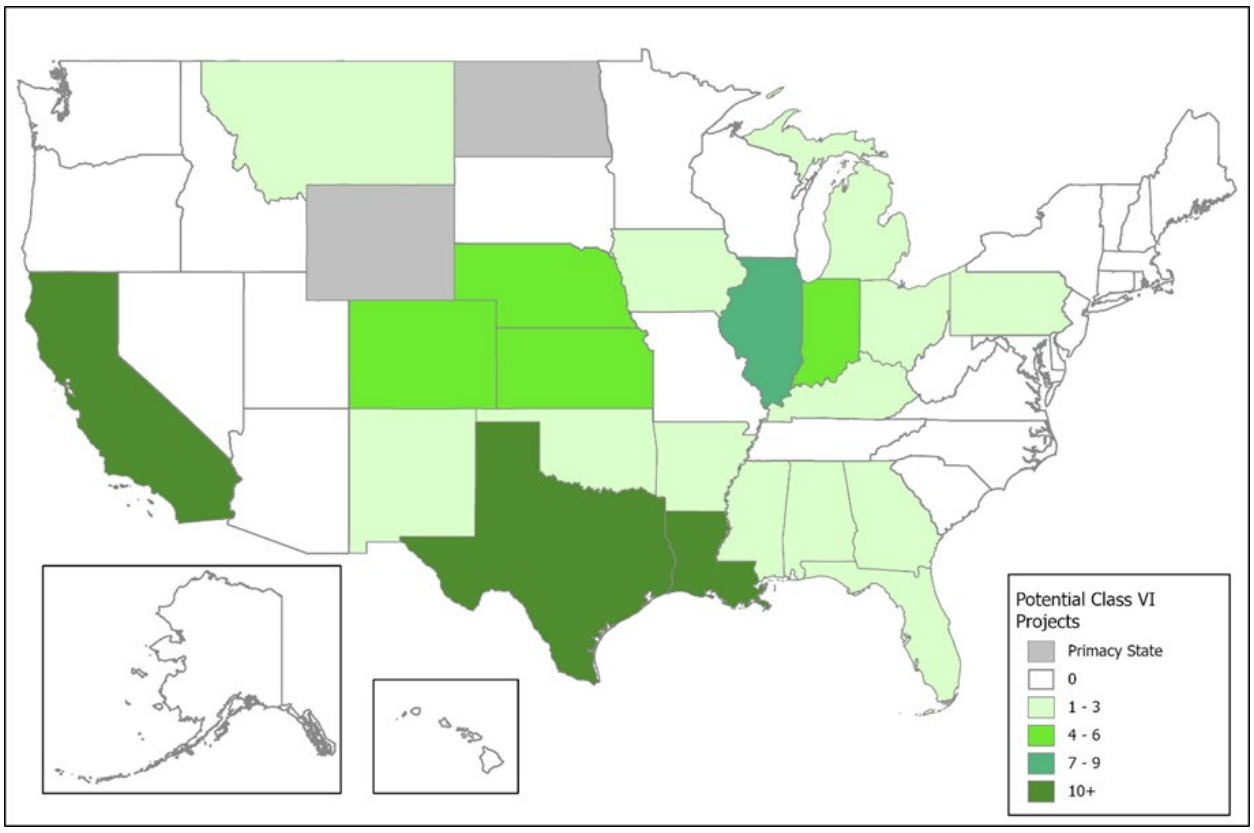

Figure 4. Potential Class VI projects in states where EPA has implementation authority, based on EPA's engagement with entities interested in Class VI permitting.

4. Stakeholder Feedback on Class VI Permitting

Section 4.1 provides an overview of EPA's engagement with stakeholders during which the Agency gathered feedback on the Class VI permitting process. Section 4.2 presents a summary of feedback received.

4.1 Overview of Engagement with Stakeholders

Since the development of the Class VI Rule, EPA has continually engaged with and received feedback from stakeholders representing industry and industry advocates, non-governmental organizations (NGOs), and states (including those with and without Class VI UIC primacy). EPA developed this report considering the input received from various stakeholder groups as well as the recent reports and studies, letters, memoranda, and other communications from these groups.

4.2 Summary of Stakeholder Recommendations

Stakeholders have offered recommendations and suggestions to improve Class VI permitting and protect USDWs. These recommendations are summarized below.

- **Ensure the fair treatment of all people potentially affected by Class VI projects.** Stakeholders recommended that EJ considerations become a routine part of Class VI permitting decisions to ensure meaningful stakeholder engagement in the permitting process and prevent disproportionate community impacts.
- **Implement risk- or performance-based Class VI permitting decisions.** Stakeholders requested additional flexibility to allow the development of site-specific permit conditions. Stakeholders expressed concern that some of the activities required of operators are not needed for every project and advocated for a site-specific, performance-based approach to managing risk to USDWs.
- **Shorten Class VI permitting timeframes.** Citing concerns that long or uncertain permitting timeframes can be an obstacle for CCUS project developers, stakeholders recommended that EPA decrease the timeframe for issuing Class VI permits. Stakeholders recommended that EPA issue a permit to construct within 6 to 12 months of receiving a complete permit application and authorize injection within 3 to 6 months of receiving a well completion report. One recommended avenue for streamlining the review is early coordination with applicants to avoid the need to replicate AoR delineation modeling as part of the permit application review. Stakeholders also suggested that EPA increase staffing and funding to prioritize permit application reviews.
- **Revise the Class VI regulations.** Stakeholders recommended that EPA review the Class VI Rule and data on GS projects to determine if modifications are needed to the Class VI program. They noted that in the Preamble to the final Class VI Rule, EPA stated that the Agency planned to review the rulemaking and relevant data every six years. Stakeholders also offered several specific recommendations to revise the Class VI requirements to align them with a site-specific and performance-based approach and reflect the current understanding of risks associated with Class VI wells.
    - *Eliminate default monitoring timeframe.* The Class VI Rule, at 40 CFR 146.93, requires a default 50 years of monitoring and PISC following the cessation of injection and continued PISC until the Director authorizes closure of the site following a demonstration of non-endangerment to USDWs. This timeframe may be reduced if an operator can demonstrate, either as part of the permit application process or following injection, that a shorter time frame is appropriate. Stakeholders assert that this requirement is overly conservative in many cases (particularly for small demonstration projects) and that it can present a challenge to project financing. They requested that EPA eliminate the 50-year default PISC timeframe and allow applicants to propose a PISC timeframe during the application process or at any time during the operation or closure of the site. They also asked EPA to clarify what is required for authorizing site closure.
    - *Allow AoR to be separated into subareas.* Pursuant to 40 CFR 146.84, Class VI permit applicants must delineate an AoR using computational modeling that

accounts for the physical and chemical properties of all phases of the injected CO_2 stream and displaced fluids. Stakeholders requested that EPA allow the AoR for a Class VI project to be separated into different subareas based on whether the primary concern for USDW endangerment is free-phase CO_2 or pressure-driven upward brine leakage. They assert that the area of the free-phase CO_2 plume around an injection well is typically much smaller than the area of the elevated pressure front capable of endangering a USDW.

- *Allow greater flexibility in selecting methods for tracking and monitoring.* The Class VI regulations require direct monitoring in the injection zone to track the extent of the CO_2 plume and pressure front (at 40 CFR 146.90(g)) and, if needed, surface air monitoring and/or soil gas monitoring to detect movement of CO_2 that could endanger a USDW (at 40 CFR 146.90(h)). Stakeholders asked that the Class VI regulations be revised to allow applicants to use monitoring methods that are appropriate to the site-specific risk to USDWs, including indirect monitoring through perimeter and above-zone monitoring to track the CO_2 plume. They also asked for flexibility when determining the need for surface or soil gas monitoring.
- *Permit pilot, research, and demonstration projects as Class V wells.* 40 CFR 144.15 prohibits the construction of non-experimental Class V wells for GS, and 40 CFR 145.23(f)(4) requires the UIC Program Director to notify operators of Class V experimental technology wells that are no longer being used for experimental purposes that they must apply for a Class VI permit. Stakeholders requested that EPA revise the requirement to allow pilot, research, and demonstration GS projects to be more freely permitted as Class V Experimental Technology (ET) wells.
- *Create aquifer exemptions for Class VI projects.* Under 40 CFR 144.7(a)&(d), aquifer exemptions associated with Class VI wells are not allowed, except for the expansion of an existing aquifer exemption associated with Class II Enhanced Oil Recovery (EOR). Stakeholders asked that EPA allow aquifer exemptions for Class VI projects in all cases.
- *Allow for area permits.* UIC area permits are issued on an area basis rather than for each well individually. Per 40 CFR 144.33, area permits are not allowed for Class VI wells. Stakeholders assert that area permits would streamline the permitting process for very large projects and requested that they be allowed for Class VI projects.
- *Create risk-based financial assurance requirements.* Class VI permit applicants must submit information to demonstrate financial responsibility for corrective action, injection well plugging, PISC and site closure, and emergency and remedial response using allowable financial instruments as described at 40 CFR 146.85. Stakeholders also asked EPA to revise the Class VI financial responsibility requirements in a manner that would reduce the amount of financial coverage that a Class VI well owner or operator would need to carry, focus on a risk-based approach to developing financial responsibility cost estimates, and clarify what information is needed from the applicant.

- **Clarify and codify thresholds for Class II versus Class VI.** Owners or operators that are injecting CO_2 for the primary purpose of long-term storage into an oil or gas reservoir under a Class II permit must obtain a Class VI permit when there is an increased risk to USDWs compared to Class II well operations associated with oil and natural gas production. The factors for determining if there is an increased risk are described in 40 CFR 144.19(b), but stakeholders requested that the process for quantifying "increased risk" be identified in the regulations or guidance. Stakeholders also encouraged EPA to prioritize the expeditious approval of state primacy applications to facilitate the oversight of these transitioning projects. Additionally, stakeholders have requested clarification on the appropriate well classification for the injection of acid gas that contains significant concentrations of CO_2 and was collected as part of oil or natural gas operations. The underground injection of acid gas collected as part of oil or natural gas operations has historically been classified as Class II disposal.
- **Review and revise the Class VI Guidance Documents.** While stakeholders have expressed appreciation for EPA's comprehensive technical and policy guidance documents, they have recommended that EPA review the Class VI guidance documents to ensure that they reflect the latest technical and financial information. They also request that EPA clarify which application components referenced in the guidance documents are required by regulation and which are merely recommended. They encouraged a review to ensure the guidance documents are consistent with the Class VI Rule in full. Stakeholders further suggested that EPA consolidate the number and volume of the documents to make them more user-friendly.

Stakeholders also provided input on topics related to the UIC Program, such as the definition of a USDW. However, these are outside the scope of this report, which focuses on Class VI permitting.

5. EPA Recommendations for Improving Class VI Permitting

EPA has worked with stakeholders to identify potential areas and avenues for improvement. In response to stakeholder feedback (summarized in Section 4), as well as in recognition of the increased interest in Class VI permitting from potential well owners and operators, EPA has identified action items to improve the Class VI permitting process. These items focus on streamlining the permitting process, performing continuous programmatic evaluations, and increasing public outreach, awareness, and transparency while ensuring the protection of public health and the environment by protecting USDWs.

Additional details on the action items and associated tools and strategies to address these categories are provided in Sections 5.1, 5.2, and 5.3, respectively.

5.1 Streamline the Permitting Process

Stakeholders recommended that EPA reduce the amount of time needed to issue final permits for Class VI wells and the time to authorize injection. GS is a complex process that is highly dependent on site-specific conditions; therefore, a robust and comprehensive permit application

and permit review process is fundamental to preventing endangerment of USDWs from these activities. EPA agrees that the permitting process could be streamlined, particularly when compared to the process used to permit the very first Class VI wells and has since made significant progress in updating the Class VI permit application and review process to improve the efficiency of permitting timeframes while ensuring the protection of public health and the environment through the protection of USDWs from contamination.

Since the Class VI Rule was finalized in 2010, EPA released comprehensive technical guidance documents to accompany the regulations, discussed in Section 2.1. More recently, EPA has developed a suite of tools and strategies to further streamline the permitting process.

- **Early engagement**. Incomplete or insufficient application materials can result in substantially delayed permitting decisions. When EPA receives incomplete or insufficient permit applications, EPA communicates the deficiencies, waits to receive additional materials from the applicant, and then reviews any new data. This back and forth can result in longer permitting timeframes. EPA therefore encourages applicants to contact their permitting authority early on so applicants can gain a thorough understanding of the Class VI permitting process and the permitting authority's expectations. To assist potential permit applicants, EPA maintains a list of UIC contacts within each EPA Region office on the Agency's website.[25] EPA also focuses on working with the applicants to develop pre-operational testing objectives during the pre-construction phase of a project with the goal of limiting the time that will be needed to authorize injection.
- **GSDT improvements**. EPA has recently upgraded the GSDT and is currently working on additional improvements. The GSDT was designed to create a streamlined Class VI permit application process and guide Class VI permit applicants through the application requirements. In 2020, EPA modified the language in the GSDT reporting modules to enable states with primacy to adopt the system. EPA continues to upgrade the system to improve the efficiency of the application process.
- **GSDT video tutorials**. In June 2021, EPA released five GSDT video tutorials on the Agency's website.[26] These tutorials provide an overview of GSDT capabilities as well as technical instructions for both the permit applicant and permitting authority, such as how to upload supporting documents and how to sign and submit permit application materials and reports within the system.
- **Permit application templates**. The Agency provides multiple templates to support the development of various documents associated with Class VI permitting and project oversight. These templates—for materials to be developed by both owners/operators and permitting authorities—streamline the development and evaluation of applications, issuance of permits and required notifications, and submission of reports.
- **Permit application outline.** In March 2021, EPA released a Class VI Permit Application Outline to guide applicants in the development of a Class VI permit application. The

[25] https://www.epa.gov/uic

[26] https://www.epa.gov/uic/geologic-sequestration-data-tool-gsdt-video-tutorials

outline provides quick access to key regulatory and guidance resources relevant to each section of the application. It is available on EPA's website.[27]

- **Sample permit application**. EPA is currently developing a sample Class VI permit application, with publication expected in 2022. This sample application will use a mock project site and project data to provide permit applicants (as well as permitting authorities) with a better understanding of the recommended contents of a Class VI permit application.
- **Training for regulators.** EPA continues to develop trainings for permitting authority staff to build capacity for Class VI permitting within UIC programs across states and EPA Regions. This training includes:
    - *Class VI Implementation Training Series.* EPA's UIC national program office presented an eight-part webinar series that covered all major aspects of Class VI program implementation for EPA regional staff in 2020. The trainings were recorded and are now available in EPA's learning management system where states and EPA staff can access the training recordings (released in 2021).
    - *Computational Modeling Training.* EPA is developing an AoR delineation and computation modeling training for permitting authorities. This training will not be specific to one modeling software package.
    - *Other UIC Trainings.* EPA continues to develop a robust training series for the UIC Program. These trainings are not all specific to Class VI permitting, but will help capture institutional knowledge in the EPA UIC program as a whole and ensure that new and future UIC staff, including Class VI staff, are knowledgeable on important program topics, such as primacy and financial responsibility. The trainings are being recorded and will be made available in EPA's learning management system, where states and EPA staff can access the trainings as they are finalized. At the time this report was written, 15 of the training modules have been made available. EPA continues to develop additional materials.
- **AoR Map Tool.** EPA is developing a web-based AoR map tool that will display the AoRs of active and permit pending Class VI CO_2 injection wells. The tool also will incorporate additional UIC program data to help delineate zones where other classes of permitted injection activities may be taking place, which will assist permitting authorities in detecting areas of potential interference between proposed wells. Potential permit applicants may use the tool to choose injection sites and zones that will not interfere with pre-existing GS projects.
- **Tools for EPA UIC permit writers**. EPA developed a series of internal EPA resources to standardize and expedite the application review process across EPA Regions. These include documentation of internal EPA best practices for efficient and effective permit application reviews and internal trainings to increase staff understanding of computational modeling. In addition to streamlining the permitting process, these tools help permitting authorities gain the necessary expertise to permit Class VI wells in a manner that addresses site-specific risks and concerns, for example by including

[27] https://www.epa.gov/uic/class-vi-permit-application-outline

appropriate monitoring and operating requirements in the permit, to ensure the protection of public health and the environment through USDW protection.

In addition to these streamlining activities for Class VI permitting, EPA will coordinate with other federal permitting agencies as part of issuing Class VI permits to projects covered under Title 41 of the Fixing America's Surface Transportation Act (FAST-41). The Consolidated Appropriations Act, 2021, allowed CCUS projects to be identified as covered projects under FAST-41, a statutory program designed to improve the timeliness, predictability, and transparency of the federal environmental review and authorization process for significant infrastructure projects. In this context, carbon capture infrastructure includes construction of any facility, technology, or system that captures, utilizes, or sequesters CO_2 emissions, including direct air capture projects. FAST-41 covered projects benefit from coordinated Federal agency environmental reviews and authorizations overseen by the Federal Permitting Improvement Steering Council (Permitting Council). FAST-41 requires that agencies establish and execute a coordinated project plan and permitting timetable which provides transparency and accountability to the project sponsor, other federal and state agencies, and the public through the Federal Permitting Dashboard (CEQ, 2021). Information on becoming a FAST-41 Covered Project is available at: https://www.permits.performance.gov/fpisc-content/become-fast-41-covered-project.

5.2 Programmatic Evaluations

Some stakeholders have recommended that EPA revise Class VI regulations and guidance. EPA continues to evaluate its regulations and guidance for opportunities to strengthen public health and environmental protections through protection of USDWs and will revise them, as appropriate. At this time, only two Class VI wells have injected CO_2 and no Class VI wells have completed a full permit lifecycle (i.e., through the injection phase and PISC phase to site closure). As Class VI activity increases and additional projects are permitted and deployed, EPA will have additional data and information to perform a data-driven evaluation of its regulations and guidance to determine if any revisions are needed.

Stakeholders have requested that EPA clarify its guidance documents to ensure that they reflect the latest technical and financial information and are clear about what information is required by the Class VI regulations versus recommended by EPA. EPA guidance documents follow the federal requirements and are written with deliberate use of terms such as "should" versus "must" to clarify recommendations and has included appropriate citations of regulatory requirements in the guidance documents. For example, the EPA Class VI Plugging, PISC, and Site Closure Guidance notes that:

> "The Safe Drinking Water Act (SDWA) provisions and EPA regulations cited in this document contain legally-binding requirements. In several chapters, this guidance document makes recommendations and offers alternatives that go beyond the minimum requirements indicated by the Class VI Rule. This is intended to provide information and recommendations that may be helpful for UIC Class VI Program implementation efforts. Such recommendations are prefaced by the words 'may' or

> ‘should’ and are to be considered advisory. They are not required elements of the Class VI Rule. Therefore, this document does not substitute for those provisions or regulations, nor is it a regulation itself, so it does not impose legally-binding requirements on the EPA, states, or the regulated community. The recommendations herein may not be applicable to each and every situation.”

This statement is an accurate description of all EPA UIC Class VI guidance documents. Additionally, the Class VI Permit Application Outline, discussed in Section 5.1, was designed to make the EPA UIC Class VI guidance documents more accessible and useful for permit applicants.

EPA will reevaluate the technical recommendations for GS in the Class VI Program to ensure they match the current state of science and technology. For example, EPA is currently updating the Class VI Financial Responsibility Guidance document based on lessons learned and plans to release the revised guidance document in Fall of 2022. Updating Class VI guidance to incorporate the best science and technologies available will ensure Class VI wells are permitted and operated using the best practices for USDW protection.

To receive feedback on EPA Class VI resources and answer Class VI-related questions from stakeholders, EPA created a designated email account for UIC Class VI inquiries, UIC-ClassVI@epa.gov.

5.2.1 Risk-Based Permitting for Class VI

Stakeholders have recommended that EPA use a risk/performance-based approach to implement the Class VI Rule to ensure that permit requirements are protective against the risks posed to USDWs. EPA agrees with these stakeholders that GS wells should be permitted with consideration of the unique risks of each project and that EPA has the responsibility to permit Class VI projects in an efficient and effective manner while ensuring the protection of public health and the environment.

EPA designed the Class VI requirements to address the specific risks associated with CO_2 injection for GS. A summary of technical risks for onshore GS projects and the Class VI regulations that address these risks is included in Table 1. A full list of risks and associated Class VI regulations can be found in Appendix A.

Table 1. UIC Class VI Requirements Address Risk

Class VI Requirements	How Risks are Addressed
Permit information requirements [40 CFR 146.82]	Require a thorough characterization of the geologic, hydrogeologic, geochemical, and geomechanical properties of the injection and confining zones to identify potential lateral and vertical migration pathways and faults/seismic risk.

Class VI Requirements	How Risks are Addressed
Geologic siting requirements [40 CFR 146.83]	Require permit applicants to demonstrate the presence of a geologic system that can receive the total volume of CO_2 without expanding beyond the lateral and vertical extent of the confining system or initiating/propagating fractures.
AoR and corrective action requirements [40 CFR 146.84]	Require computational modeling based on site-specific geologic and operational information that considers potential migration through faults and fractures to ensure that the CO_2 will remain within authorized zones. Also require identifying/repairing wells that could be conduits for vertical fluid movement.
Financial responsibility requirements [40 CFR 146.85]	Require operators to demonstrate and maintain financial responsibility for corrective action, plugging the injection well, PISC and site closure, and emergency and remedial response to ensure that these activities will be conducted without the cost being borne by the public.
Well construction requirements [40 CFR 146.86]	Ensure that the Class VI well is constructed with casing, cement, and other materials of sufficient strength that are compatible with fluids with which they may come into contact to prevent the vertical movement of fluids that can endanger USDWs.
Pre-operational testing requirements [40 CFR 146.87]	Require testing before injection may be authorized to confirm the geologic information on which the permit application is based and to verify the integrity of the injection well.
Operating requirements [40 CFR 146.88]	Limit injection pressure to prevent initiation or propagation of fractures; also require operators to maintain mechanical integrity of the injection well.
Mechanical integrity testing requirements [40 CFR 146.89]	Require continuous monitoring of internal mechanical integrity and periodic testing of external mechanical integrity to ensure that the injection well will not become a conduit for vertical fluid movement due to damage during injection operations or as a result of a seismic event.
Testing and monitoring requirements [40 CFR 146.90]	Require well testing, groundwater quality monitoring, and CO_2 plume and pressure front tracking to identify potential lateral or vertical fluid movement, including movement via faults.
Reporting requirements [40 CFR 146.91]	Require operators to report all monitoring information so that it can be reviewed by permitting authorities, and to notify the permitting authority of any event that could endanger a USDW.

Class VI Requirements	How Risks are Addressed
Well plugging requirements [40 CFR 146.92]	Require Class VI operators to plug the injection well using proper materials to ensure that it does not become a conduit for fluid movement into USDWs after injection ceases.
PISC and site closure requirements [40 CFR 146.93]	Require permittees to monitor the position of the CO_2 plume and pressure front following the cessation of injection until they can demonstrate that the GS project no longer poses an endangerment to USDWs. To close the site, operators must properly plug all monitoring wells so they will not become conduits for fluid movement.
Emergency and remedial response requirements [40 CFR 146.94]	Require operators to submit and follow an Emergency and Remedial Response Plan that describes actions to address fluid movement of the injection or formation fluids due to a vertical or lateral containment failure.

As noted in Section 5.1, EPA has implemented a variety of measures to help ensure the Class VI permitting process is efficient, is protective of USDWs, and considers the unique risks of each project site. For example, EPA developed templates for required project plans that can be tailored to site-specific conditions. EPA also implemented a Class VI permit application review approach that focuses on the site-specific aspects of proposed projects and the identified risks associated with injection (e.g., evaluation of boreholes, fluid movement to USDWs) to set permit conditions that are appropriate to the risks at the site.

More specifically, EPA believes the Class VI regulations allow for a risk-based approach, including in the following areas:

- **PISC timeframe.** Stakeholders have recommended that setting the requirements for PISC be based on actual site conditions using a risk-based approach. The Class VI Rule provides a risk-based approach to PISC that considers geologic information, AoR modeling results, and other site-specific information provided by the applicant to determine the appropriate PISC timeframe. EPA provided training to permitting authorities in Spring of 2021 that facilitates these reviews, described in Section 5.1. In EPA's GSDT, the Alternative PISC Timeframe demonstration module provides a checklist to guide submittals that allows the use of existing information to fulfill the requirements for the alternative PISC timeframe demonstration.
- **Flexible monitoring.** Stakeholders have recommended that EPA allow flexibility in monitoring requirements and technologies, for example, the use of indirect and above-zone monitoring. EPA's tailored permitting approach focuses monitoring plan reviews on site-specific information, the anticipated behavior of the CO_2 plume and pressure front (based on AoR modeling), and associated risks to USDWs; this allows EPA to target monitoring conditions in Class VI permits at those locations where USDWs may be

endangered, and specific monitoring techniques based on the extent of the plume versus the pressure front.

- **Financial responsibility demonstrations.** Determination of financial coverage needs will be made in consideration of the specific nature of a Class VI project. The costs that must be covered by the financial instruments and demonstrated, particularly the cost to cover any potential emergency and remedial response activities, must be based on the specific risks associated with a particular project site and operational activity (e.g., the construction of the injection and monitoring wells, the size of the AoR, and whether USDWs are present near the project).
- **Pilot projects**. Stakeholders have recommended that EPA allow pilot and demonstration projects to be permitted as Class V experimental technology wells. EPA believes that its tailored approach to Class VI permitting, including the use of site-specific information, streamlines the permits conditions for pilot and demonstration projects while managing the risk to USDWs.

Stakeholders also recommended that EJ considerations become a routine part of Class VI permitting decisions. While EPA currently employs EJ screening as outlined in the Class VI EJ quick reference (see US EPA, 2011b), EPA plans to explore additional ways in which EPA Class VI permitting can consider the specific needs of any EJ communities located near a proposed Class VI project to ensure that no groups of people are disproportionately adversely affected by the project. EPA will aim to engage nearby communities to ensure meaningful involvement in the permitting process and include mitigating permit conditions, if necessary, to address site-specific risks and concerns.

EPA will continue to consider site-specific risks and set permit conditions that are appropriate to those risks when permitting Class VI wells. Site-specific, risk-based permitting is essential for ensuring underground injection occurs without contaminating USDWs, thereby protecting public health and the environment.

5.2.2 Class II Versus Class VI

Some stakeholders have requested that EPA define the difference between Class II and Class VI injection of CO_2 and tailor permitting approaches to ensure that projects are permitted in a manner that is appropriate to risk. EPA developed the UIC Class VI GS well regulations, under the authority of SDWA, to facilitate injection of CO_2 for GS, while protecting public health and the environment by ensuring the protection of USDWs. The Class VI regulations are built upon decades of federal experience regulating underground injection wells and many additional years of state UIC program expertise. EPA and states also have experience with the Class II program, which provides a regulatory framework for the protection of USDWs for CO_2 injected for purposes of enhanced oil recovery. The UIC Class II regulations were established for wells used only to inject fluids associated with oil and natural gas production; specifically, disposal wells, enhanced recovery wells, and storage wells. For Class II disposal wells, injected fluids are primarily brines (salt water) that are brought to the surface while producing oil and gas, or "acid" or "sour" gas produced with the hydrocarbons. Acid gas typically consists primarily of hydrogen sulfide and CO_2 and small amounts of other gases including hydrocarbon gases and water

vapors. For Class II enhanced recovery wells, injected fluids consist of brine, freshwater, steam, polymers, or CO_2. Finally, Class II storage wells are used for the storage of hydrocarbons which are liquid at standard temperature and pressure. The Class II regulations were not designed for GS.

As mentioned in Section 4.2, owners or operators with Class II permits that are injecting CO_2 must obtain a Class VI permit when there is an increased risk to USDWs compared to Class II well operations (i.e., the Class II tools are insufficient to manage the increased risk). The determination if there is an increased risk to USDWs would be based on factors specified in 40 CFR 144.19(b), including increase in reservoir pressure within the injection zone; increase in CO_2 injection rates; and suitability of the Class II AoR delineation. In response to these questions from stakeholders, EPA provided principles to the EPA regional offices regarding that transition in a 2015 EPA memorandum to the Regions titled, *Key Principles in EPA's Underground Injection Control Program Class VI Rule Related to Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI*. This memorandum provides high level guidance in the form of six "key principles." EPA interprets these key principles as applicable to Class II Disposal wells injecting acid gas.[28]

5.3 Increase Class VI Public Outreach

As discussed in Sections 4.2 and 5.2.1, stakeholders recommended that EPA ensure the fair treatment and meaningful involvement of all people potentially affected by Class VI GS projects. EPA agrees with this feedback and is committed to understanding and addressing effects of climate change mitigation strategies, including GS, on underserved communities and other EJ concerns. EPA defines EJ as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. In October 2021, EPA launched the "EJ and Civil Rights in Permitting Community of Practice." The Community of Practice serves as a best practice repository for methods and tools to identify potential issues of equity, EJ, and civil rights in permitting, to assess vulnerabilities in communities, to share relevant literature and resources, and to make available sample language developed by EPA permitting programs. This Community of Practice will develop teams, as needed, to focus on permitting issues such as analysis and data, legal issues, communications, and to provide assistance and share information relevant to particular permitting contexts.

In 2011, EPA developed a quick reference guide that describes available tools and considerations for incorporating EJ into the Class VI permit application review and approval process (U.S. EPA, 2011b). Then in 2015, EPA published an EJ evaluation tool, EJScreen, and incorporated its use into the Class VI permit application review process. EPA plans to re-evaluate the quick reference guide and update or create new materials to support EJ considerations for UIC permitting, including Class VI. EPA also is exploring various ways to better engage communities to ensure their meaningful involvement in the Class VI permitting process. CEQ recommended, in its CCUS Guidance, that agencies undertake measures to facilitate a transparent process and

[28] https://www.epa.gov/uic/final-class-vi-guidance-documents

meaningful public engagement and to develop EJ best practices for CCUS efforts (CEQ, 2022). EPA plans to work with other federal agencies in the development and deployment of strategies to further public outreach and meaningful engagement with communities, including where disadvantaged communities may be impacted by CCUS projects.

EPA will increase the Class VI permit information available to the public. For example, EPA keeps an inventory of wells with active Class VI permits and Class VI well permit applications that have been submitted to EPA and deemed administratively complete publicly available on its website.[29] EPA also has added templates and other documents previously only available to permitting authorities and applicants via the GSDT to the Agency's website. These steps will allow the public to review the breadth and complexity of the data EPA requests from Class VI permit applicants and well owners and operators.

6. Conclusions

Class VI permitting is critical to reducing the unique risks associated with GS, while simultaneously providing an option for effectively capturing and storing CO_2. It holds promise for mitigating climate change and providing a source of green jobs in the United States. GS is a complex process. It is highly dependent on site-specific conditions and requires a robust and comprehensive permitting process to ensure the protection of an important source of drinking water, USDWs. EPA heard stakeholders' feedback on the Class VI permitting process and identified areas for potential improvement. EPA will continue to evaluate the program with a focus on streamlining the permitting process while ensuring the protection of human health and USDWs.

EPA will continue to collaborate across offices working on CCUS and CDR within the Agency as well as work closely with other federal agencies and stakeholder groups. Funding allocated to the Class VI program, through the 2021 Consolidated Appropriations Act and the Bipartisan Infrastructure Law, allows the UIC Program to commit to the effective and efficient permitting of Class VI wells, to encourage and support states with applying for Class VI primacy and to actively improve Class VI permitting.

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[29] Please see: https://www.epa.gov/uic/class-vi-wells-permitted-epa.

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Appendix A. Table of Geologic Sequestration Risks and Risk Management

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
Lateral containment failure (i.e., causing leakage pathway or storage failure)	• Absence of or insufficiencies in lateral seals or presence of high permeability thief zones • Insufficiencies in reservoir porosity, permeability, lateral extent, or thickness that lead to lower storage capacity • CO_2 or brine migrates beyond a structural spillpoint • Caprock extent is less than anticipated • Subsurface chemical reactions reduce injectivity (e.g., form precipitates) and/or mobilize metals or other hazardous constituents • Injection rate is higher than anticipated	**Site Characterization Requirements**: The owner/operator must: • Perform a detailed assessment of the geologic, hydrogeologic, geochemical, and geomechanical properties of the proposed site to ensure that Class VI wells are sited in suitable locations prior to receiving authorization to construct the well **[40 CFR 146.82(a)]** and update and gather more site-specific information, including running appropriate logs, samples, and tests **[40 CFR 146.87]**, prior to receiving authorization to inject **[40 CFR 146.82 (c)]**. • Demonstrate that the proposed project site has a suitable geologic system (i.e., an injection zone of sufficient areal extent, thickness, porosity, and permeability) to receive the total anticipated volume of the CO_2 stream **[40 CFR 146.83(a)]**. • Provide information on the compatibility of the CO_2 stream with fluids in the injection zone(s) and minerals in both the injection and the confining zone(s) **[40 CFR 146.82(c)(3)]**. **Area of Review Requirements**: The owner/operator must: • Delineate the AoR for the proposed Class VI well, which is the region surrounding the GS project where USDWs may be endangered by the injection activity, using computational modeling that accounts for the physical and chemical properties of all phases of the injected CO_2 stream and is based on available site characterization, monitoring, and operational data **[40 CFR 146.84(a)].** • Predict the projected lateral (and vertical) migration of the CO_2 plume and formation fluids in the subsurface using existing site characterization, monitoring and operational data, and computational modeling **[40 CFR 146.84(c)(1)]**.

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		• Reevaluate the AoR at a minimum fixed frequency of five years **[40 CFR 146.84(e)]**. **<u>Injection Well Construction and Operating Requirements:</u>** The owner/operator must: • Ensure that the Class VI well(s) is/are constructed and completed to prevent the movement of fluids into or between USDWs or into any unauthorized zones **[40 CFR 146.86(a)(1)]**; with casing and cement or other materials of sufficient structural strength that are designed for the life of the geologic sequestration (GS) project **[40 CFR 146.86(b)(1)]**; and with well materials that are compatible with fluids with which the materials may be expected to come into contact **[40 CFR 146.86(b)(1)]**. • Ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) **[40 CFR 146.88 (a)]**. • Maintain mechanical integrity of the injection well at all times **[40 CFR 146.88 (d)]**. **<u>Testing and Monitoring Requirements:</u>** The Class VI Rule requires various testing and monitoring activities, including well testing, groundwater quality monitoring, and plume and pressure front tracking, to identify any risks to, and endangerment of, USDWs during the injection and post-injection phases of a GS project **[40 CFR 146.89, 146.90, 146.93]**. **<u>Injection Well Plugging, Post-Injection Site Care, and Site Closure Requirements:</u>** • To ensure that the well does not become a conduit for fluid movement into USDWs after injection ceases, the owner/operator must perform a final external mechanical integrity test **[40 CFR 146.92(a)]** and plug the injection well using materials that are compatible with the injectate **[40 CFR 146.92(b)(5)]**. • The owner/operator must monitor the GS project site following the cessation of injection (during the post-injection site care or PISC phase)

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		to show the position of the CO_2 plume and pressure front and demonstrate that USDWs are not being endangered **[40 CFR 146.93(b)]**. This monitoring must continue for at least 50 years or for the duration of the alternative timeframe approved by the Director **[40 CFR 146.93(b)(1)** and until the owner/operator can demonstrate that the GS project no longer poses an endangerment to USDWs **[40 CFR 146.93(b)(2)]**. • To close the site, the owner or operator must properly plug all monitoring wells **[40 CFR 146.93]**. **<u>Emergency and Remedial Response Requirements</u>**: The owner/operator must submit and follow an emergency and remedial response plan that describes actions to address movement of the injection or formation fluids that may endanger a USDW during construction, operation, and PISC periods **[40 CFR 146.94]**.
Vertical containment failure (i.e., leakage pathway)	• Caprock failure, i.e., due to pore pressure-driven opening of faults/fractures, deformation of caprock, heterogeneities or deficiencies in caprock, or exceedance of caprock capillary entry pressure • Wellbore/wellhead leakage (i.e., failure of seals, casing, or cement) from inadequate construction or degradation/corrosion • Improperly plugged and abandoned wells [known or unknown] • Improperly sealed active wells	**<u>Site Characterization Requirements</u>**: The owner/operator must: • Perform a detailed assessment of the geologic, hydrogeologic, geochemical, and geomechanical properties of the proposed site to ensure that Class VI wells are sited in suitable locations prior to receiving authorization to construct the well **[40 CFR 146.82(a)]** and update and gather more site-specific information, including running appropriate logs, samples, and tests **[40 CFR 146.87]**, prior to receiving authorization to inject **[40 CFR 146.82 (c)]**. • Demonstrate that the proposed project site has a suitable geologic system (i.e., an injection zone of sufficient areal extent, thickness, porosity, and permeability) to receive the total anticipated volume of the CO_2 stream **[40 CFR 146.83(a)].** The Director may require operators to identify and characterize additional zones that will impede vertical fluid movement and are free of faults and fractures that may interfere with containment. **[40 CFR 146.83(b)].**

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		• Provide information on the compatibility of the CO_2 stream with fluids in the injection zone(s) and minerals in both the injection and the confining zone(s) **[40 CFR 146.82(c)(3)].** **<u>AoR and Corrective Action Requirements</u>**: The owner/operator must: • Delineate the AoR for the proposed Class VI well, which is the region surrounding the GS project where USDWs may be endangered by the injection activity, using computational modeling that accounts for the physical and chemical properties of all phases of the injected CO_2 stream and is based on available site characterization, monitoring, and operational data **[40 CFR 146.84(a)]**. • Predict, using computational modeling, the projected vertical (and lateral) migration of the CO_2 plume and formation fluids in the subsurface using existing site characterization, monitoring, and operational data **[40 CFR 146.84(c)(1)]**. • Identify and perform corrective actions on all wells in the AoR that are determined to need corrective action **[40 CFR 146.84(d)]**. • Reevaluate the AoR at a minimum fixed frequency of five years and identify and perform corrective actions on all wells in the reevaluated AoR that require corrective action **[40 CFR 146.84(e)]**. **<u>Injection Well Construction and Operating Requirements:</u>** The owner/operator must: • Ensure that the Class VI well(s) is/are constructed and completed to prevent the movement of fluids into or between USDWs or into any unauthorized zones **[40 CFR 146.86(a)(1)]**; with casing and cement or other materials of sufficient structural strength that are designed for the life of the GS project **[40 CFR 146.86(b)(1)]**; and with well materials that are compatible with fluids with which the materials may be expected to come into contact **[40 CFR 146.86(b)(1)]**. • Ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) **[40 CFR 146.88 (a)]**.

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		• Maintain mechanical integrity of the injection well at all times **[40 CFR 146.88 (d)]**. **<u>Testing and Monitoring Requirements:</u>** The Class VI Rule requires various testing and monitoring activities, including well testing, groundwater quality monitoring, and plume and pressure front tracking, to identify any risks to, and endangerment of, USDWs during the injection and post-injection phases of a GS project **[40 CFR 146.89, 146.90, 146.93]**. **<u>Injection Well Plugging, PISC, and Site Closure Requirements:</u>** • To ensure that the well does not become a conduit for fluid movement into USDWs after injection ceases, the owner/operator must perform a final external mechanical integrity test **[40 CFR 146.92(a)]** and plug the injection well using materials that are compatible with the injectate **[40 CFR 146.92(b)(5)]**. • The owner/operator must monitor the GS project site following the cessation of injection to show the position of the CO_2 plume and pressure front and demonstrate that USDWs are not being endangered **[40 CFR 146.93(b)]**. This monitoring must continue for at least 50 years or for the duration of the alternative timeframe approved by the Director **[40 CFR 146.93(b)(1)]** and until the owner/operator can demonstrate that the GS project no longer poses an endangerment to USDWs **[40 CFR 146.93(b)(2)]**. • To close the site, the owner or operator must properly plug all monitoring wells **[40 CFR 146.93]**. **<u>Emergency and Remedial Response Requirements</u>**: The owner/operator must submit and follow an emergency and remedial response plan that describes actions to address movement of the injection or formation fluids that may endanger a USDW during construction, operation, and PISC periods **[40 CFR 146.94]**.

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
Seismic events (i.e., induced and triggered seismicity)	• Reactivation of existing fault • New fault created due to brittle failure/reduction in rock strength, increased pore pressure, or thermal stress • Wellbore shearing during seismic events	**Site Characterization Requirements**: The owner/operator must: • Provide information on the location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the AoR and a determination that they would not interfere with containment **[40 CFR 146.82(a)(3)(ii)]**; geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone(s) **[40 CFR 146.82(a)(3)(iv)]**; and information on the seismic history of the area, including the presence and depths of seismic sources and a determination that the seismicity will not interfere with containment **[40 CFR 146.82(a)(3)(v)]**. • Demonstrate that the confining zone(s) is/are free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the CO_2 stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures **[40 CFR 146.83(a)(2)]**. **AoR Requirements**: The owner/operator must: • Predict the projected lateral and vertical migration of the CO_2 plume and formation fluids using existing site characterization, monitoring and operational data, and computational modeling that considers potential migration through faults and fractures **[40 CFR 146.84(c)(1)(iii)]**. **Injection Well Construction and Operating Requirements:** The owner/operator must: • Ensure that the Class VI well(s) is/are constructed and completed with casing and cement or other materials that have sufficient structural strength and are designed for the life of the GS project **[40 CFR 146.86(b)(1)]**. • Ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		zone(s); in no case may injection pressure initiate fractures in the confining zone(s) or cause the movement of injection or formation fluids that endangers a USDW **[40 CFR 146.88(a)]**. • Maintain mechanical integrity of the injection well at all times **[40 CFR 146.88 (d)]**. **<u>Testing and Monitoring Requirements:</u>** The Class VI rule requires various testing and monitoring activities, including well testing, groundwater quality monitoring, and plume and pressure front tracking, to identify any risks to, and endangerment of, USDWs during the injection and post-injection phases of a GS project **[40 CFR 146.89, 146.90, 146.93]**. **<u>Injection Well Plugging, PISC, and Site Closure Requirements:</u>** • To ensure that the well does not become a conduit for fluid movement into USDWs after injection ceases, the owner/operator must perform a final external mechanical integrity test **[40 CFR 146.92(a)]** and plug the injection well using materials that are compatible with the injectate **[40 CFR 146.92(b)(5)]**. • The owner/operator must monitor the GS project site following the cessation of injection to show the position of the CO_2 plume and pressure front and demonstrate that USDWs are not being endangered **[40 CFR 146.93(b)].** This monitoring must continue for at least 50 years or for the duration of the alternative timeframe approved by the Director **[40 CFR 146.93(b)(1)]** and until the owner/operator can demonstrate that the GS project no longer poses an endangerment to USDWs **[40 CFR 146.93(b)(2)]**. • To close the site, the owner or operator must properly plug all monitoring wells **[40 CFR 146.93]**. **<u>Emergency and Remedial Response Requirements</u>**: The owner/operator must submit and follow an emergency and remedial response plan that describes actions to address movement of the injection or

Technical Risk	Examples of Technical Risk	Class VI Regulations Address Technical Risks to USDWs
		formation fluids that may endanger a USDW during construction, operation, and post-injection site care periods **[40 CFR 146.94]**.

Non-Technical Risk	Examples of Non-Technical Risk	Class VI Regulations Address Non-Technical Risks
Financial risk	• The long duration of GS projects presents risks that the GS owner or operator could change over time or be unable to meet future cost obligations of the project or complete any needed corrective action. • Risk of financial instrument failure (due to owner/operator failure, third-party failure, or cancellation/non-renewal of instrument).	**Financial Responsibility Requirements:** • The owner/operator must demonstrate financial responsibility for corrective actions, injection well plugging, PISC and site closure, and emergency and remedial response **[40 CFR 146.82(a)(14); 146.85(a)]**. • The financial responsibility instrument(s) that may be used to demonstrate compliance with financial responsibility requirements: o Include, but are not limited to, trust funds, surety bonds, letter of credit, insurance, self-insurance, and escrow **[40 CFR 146.85(a)(2)]**; EPA recognizes that a combination of financial instruments could be used to limit the risk of instrument failure. o Must be sufficient to address endangerment of USDWs **[40 CFR 146.85(a)(3)]**. o Must comprise protective conditions of coverage that include, at a minimum, cancellation, renewal, and continuation provisions **[40 CFR 146.85(a)(2)]**.