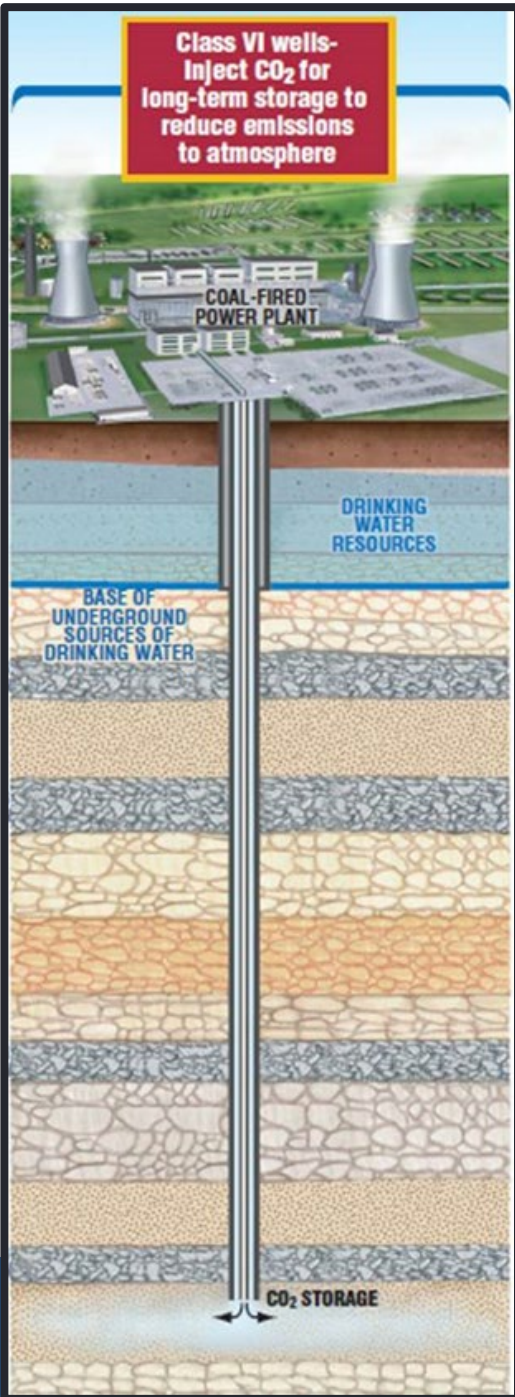


# Underground Injection Control (UIC) Class VI

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June 9, 2021



OFFICE OF GROUND WATER  
AND DRINKING WATER



# EPA Class VI Program Background

- Class VI wells, used for underground injection of carbon dioxide for the purpose of geologic sequestration (GS), are the newest Underground Injection Control (UIC) well class
- Class VI Final Rule was promulgated in 2010
- Between 2010 and 2020, EPA issued six permits for two project
- Regulators have seen increased interested in Class VI permits due to financial incentives and climate change mitigation strategies
- EPA has and is developing tools to assist permit applicants and permitting programs

# EPA UIC Class VI Guidance Documents



The screenshot shows the EPA website page for "Class VI - Wells used for Geologic Sequestration of CO2". The page title is "Underground Injection Control (UIC)". The main heading is "Class VI - Wells used for Geologic Sequestration of CO2". A list of links is provided, including "Definition of Class VI wells", "Protecting drinking water resources", "Requirements for Class VI wells", "Background information about geologic sequestration", "Class VI guidance documents", "Class VI permit application outline", "Geological Sequestration Data Tool", and "Additional information". A callout bubble highlights the following links:

- [Background information about geologic sequestration](#)
- [Class VI guidance documents](#)
- [Class VI permit application outline](#)
- [Geological Sequestration Data Tool](#)

# EPA UIC Class VI Guidance Documents



## Targeted to Permit Applicants

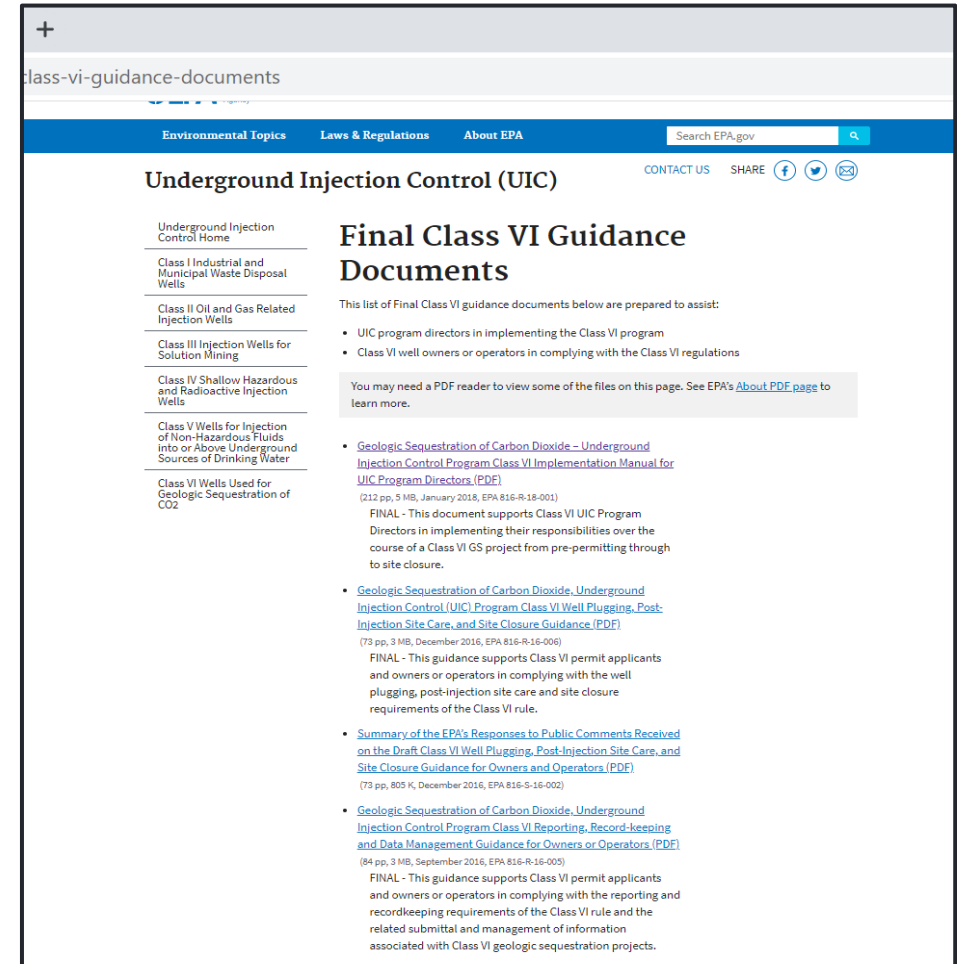
- Well Site Characterization
- Area of Review and Corrective Action
- Testing and Monitoring
- Project Plan Development
- Well Construction
- Financial Responsibility Requirements
- Reporting, Record-Keeping and Data Management
- Well Plugging, PISC, Site Closure

## Targeted to Permitting Authorities

- Implementation Manual for UIC Program Directors
- Primacy Manual for State Directors
- Key Principles in EPA's Class VI Rule Related to Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI

# EPA UIC Class VI Guidance Documents

- Class VI Rule is designed to be flexible to allow accommodation for site-specific needs and risks
- Guidance documents present Class VI Rule requirements, provide recommendations and offer alternatives that go beyond the minimum requirements
- Guidance is not prescriptive and does not cover all possible situations
- Projects should contact permitting authorities early with site-specific questions and considerations



The screenshot shows the EPA website page for "Underground Injection Control (UIC)". The page title is "Underground Injection Control (UIC)" and the main heading is "Final Class VI Guidance Documents". The page lists several guidance documents with their titles, dates, and descriptions. The documents include:

- Geologic Sequestration of Carbon Dioxide - Underground Injection Control Program Class VI Implementation Manual for UIC Program Directors (PDF)** (212 pp, 5 MB, January 2018, EPA 816-R-18-001)  
FINAL - This document supports Class VI UIC Program Directors in implementing their responsibilities over the course of a Class VI GS project from pre-permitting through to site closure.
- Geologic Sequestration of Carbon Dioxide, Underground Injection Control (UIC) Program Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance (PDF)** (73 pp, 3 MB, December 2016, EPA 816-R-16-006)  
FINAL - This guidance supports Class VI permit applicants and owners or operators in complying with the well plugging, post-injection site care and site closure requirements of the Class VI rule.
- Summary of the EPA's Responses to Public Comments Received on the Draft Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance for Owners and Operators (PDF)** (73 pp, 805 K, December 2016, EPA 816-S-16-002)
- Geologic Sequestration of Carbon Dioxide, Underground Injection Control Program Class VI Reporting, Record-keeping and Data Management Guidance for Owners or Operators (PDF)** (84 pp, 3 MB, September 2016, EPA 816-R-16-005)  
FINAL - This guidance supports Class VI permit applicants and owners or operators in complying with the reporting and recordkeeping requirements of the Class VI rule and the related submittal and management of information associated with Class VI geologic sequestration projects.



# Area of Review (AoR) and Corrective Action

# Well Construction



Geologic Sequestration of Carbon  
Dioxide

Underground Injection Control (UIC)  
Program Class VI Well Area of Review  
Evaluation and Corrective Action  
Guidance



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**Geologic Sequestration of  
Carbon Dioxide**

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**Underground Injection  
Control (UIC) Program  
Class VI Well Construction  
Guidance**

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May 2012

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# EPA UIC Program Class VI Well AoR Review and Corrective Action Guidance

## What does the guidance cover?

- Computational modeling process
- Model design requirements
  - Does not require specific modeling software
- How to delineate the area of reviewing using computational modeling results
  - Includes examples and alternatives
- Identifying artificial penetrations and performing corrective action
- Area of review reevaluation triggers and process

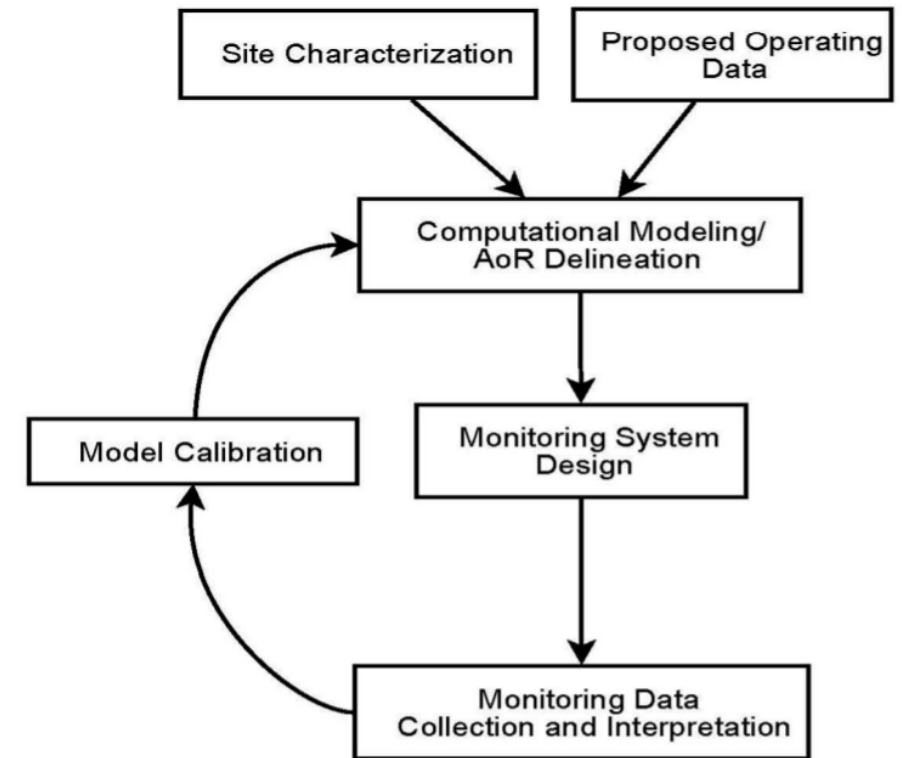


Figure 1-1: Flow Chart of Monitoring and Modeling at a GS Project.

# EPA UIC Program Class VI Well Construction Guidance

## What does the guidance cover?

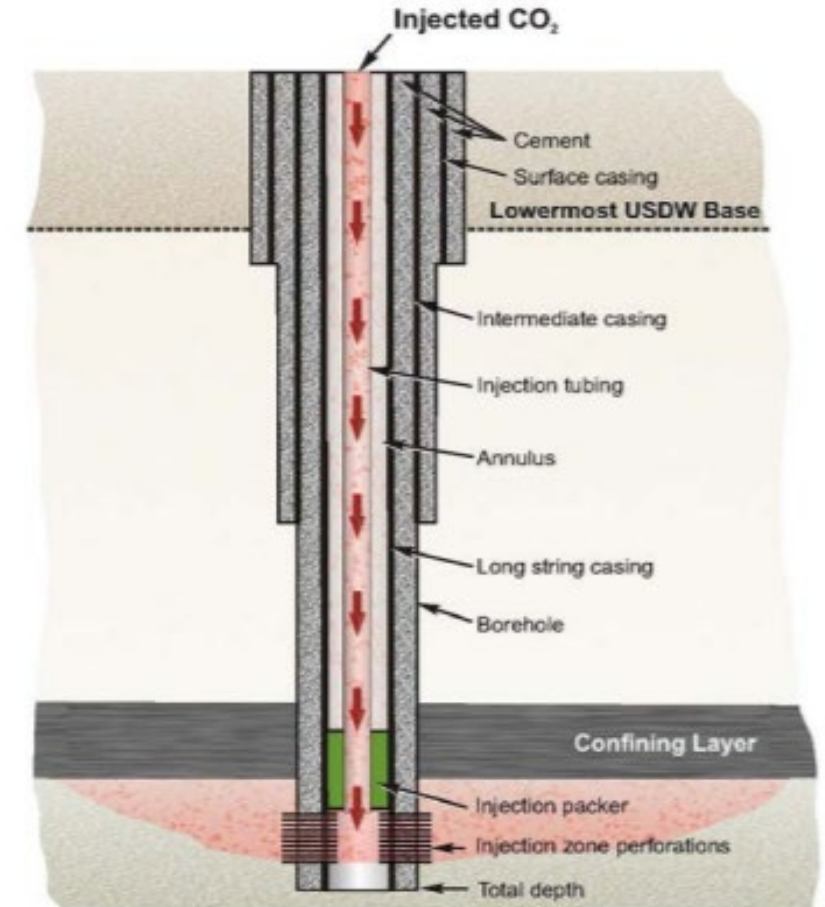
### Class VI construction requirements

1. Preventing fluid movement
2. Designing for logging and workovers
3. Well plan and design information to submit
4. Designing for down-hole stresses
5. Cementing the casing
6. Selecting tubing and packer
7. Additional construction information to submit
8. Selecting surface and down-hole shut-off devices

Consideration for conversion of other well types

Operating requirements of Class VI injection wells

Recommendations and offers alternatives that go beyond the minimum requirements



**Schematic of Class VI Injection Well**

*Note: Figure not to scale*

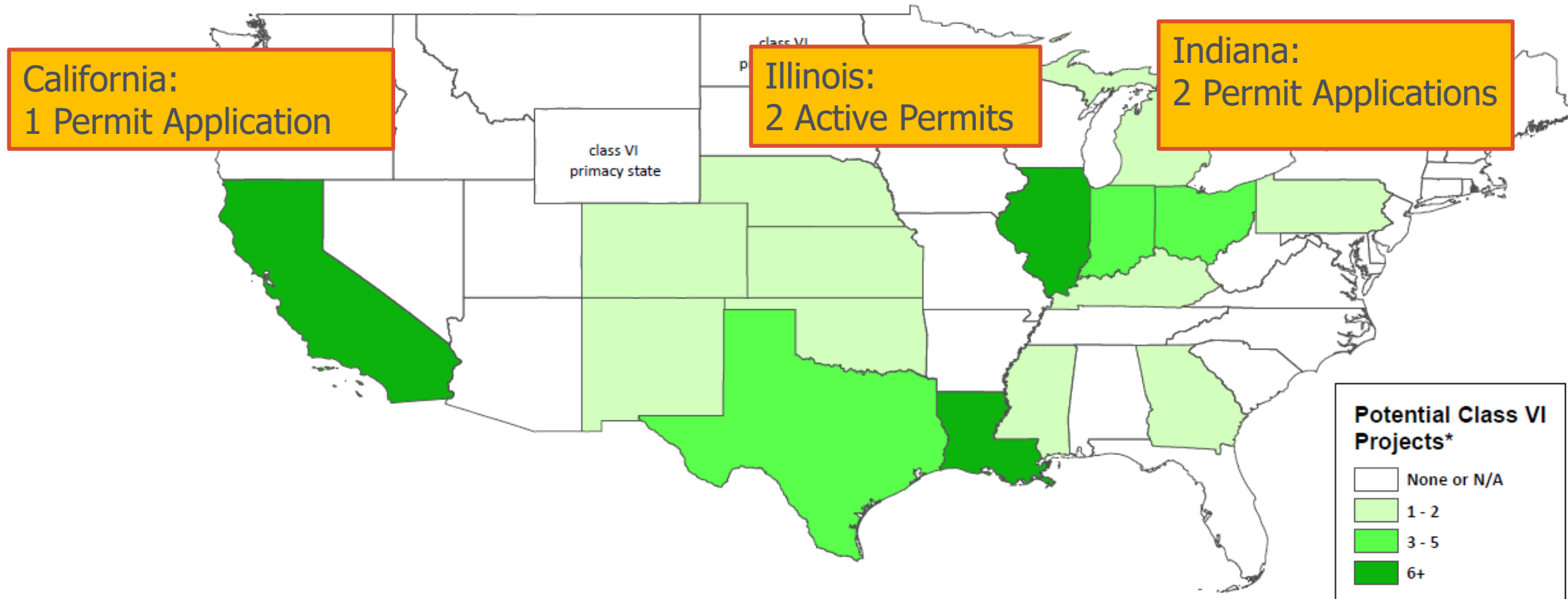


# Update on EPA UIC Class VI Activities



- 🌿 Streamlining permit application and review process
- 🌿 Developing new tools for stakeholders
- 🌿 Supporting interagency CCUS initiative requested by Congress
- 🌿 Committed to supporting Class VI permit applicants and primacy states

# Class VI Project Interest in EPA Implemented Programs



\*Based on EPA's engagements with entities interested in Class VI

# New Tools on EPA Website

 Class VI Permit Application Outline

 Permits and permit table by state

 GSDT Tutorials

## Class VI Permit Application Outline

This document provides an overview of the items and the associated activities an applicant may complete during the development of an application to inject carbon dioxide (CO<sub>2</sub>) for geologic sequestration (GS) under the UIC Class VI program. It functions as a detailed index to multiple EPA Class VI guidance documents that steer the development of the information needed for a complete Class VI application. Please note, the permit application items and activities listed herein reflect EPA's *recommendations* for complying with the federal Class VI rule requirements. It should also be noted that the elements listed below are not inclusive of every activity nor are they at the detail that is needed to meet the permit application requirements of the Federal Class VI Rule and demonstrate that underground sources of drinking water (USDWs) will not be endangered. Prospective permit applicants are encouraged to consult early with their UIC permitting authority about the specific needs for their project and review the [Class VI Rule](#) and the [EPA guidance documents](#), which are available on EPA's web site in order to gain a full understanding of the Class VI permit application process.

Item	Activity and Purpose	Guidance Reference
<p><b>Characterize the geologic setting of the proposed GS site</b> to demonstrate that the Class VI well will be sited in an area with a suitable geologic system, consisting of an injection zone with sufficient capacity to receive the CO<sub>2</sub> and a confining zone that is free of transmissive faults or fractures. This information will satisfy the requirements of 40 CFR 146.82(a)(2),(3),(5), and (6). For additional information, see the <a href="#">Class VI Well Geologic Site Characterization Guidance</a>.</p>		
<ul style="list-style-type: none"> <li><b>Regional geology and geologic structure</b></li> </ul>	Summarize information on lithology, the sequence of geologic units (i.e., the injection and confining zones and USDWs), the thicknesses and lateral extent of formations, and correlation of units near the project site to place the GS project in a regional context.	Sections 2.1, 2.3.1, and 2.3.10 of the Geologic Site Characterization Guidance
<ul style="list-style-type: none"> <li><b>Faults and fractures</b></li> </ul>	Identify and characterize faults and fractures to demonstrate that there are no transmissive faults or fractures in the confining zone(s) so that injection at proposed maximum pressures and volumes can occur without initiating or propagating fractures in the confining zone(s).	Sections 2.1, 2.2, and 2.3.2 of the Geologic Site Characterization Guidance
<ul style="list-style-type: none"> <li><b>Injection and confining zone characteristics</b></li> </ul>	Provide information about the depth, extent, porosity, permeability, and capillary pressure of the injection and confining zones to show that the site can confine CO <sub>2</sub> ; support estimations of CO <sub>2</sub> storage capacity and injectivity; and support the development of a site-specific area of review (AoR) delineation model.	Sections 2.3.3, 2.3.4, and 2.3.5 of the Geologic Site Characterization Guidance
<ul style="list-style-type: none"> <li><b>Hydrologic and hydrogeologic information</b></li> </ul>	Describe the relationship between the proposed injection formation and any USDWs, springs, and water wells within the AoR to support an understanding of the water resources near the proposed well.	Section 2.3.8 of the Geologic Site Characterization Guidance
<ul style="list-style-type: none"> <li><b>Geochemical data</b></li> </ul>	Provide water chemistry data on all water-bearing formations to identify USDWs, confirm that the injection zone is not a USDW, and establish baseline water quality in any formations for which injection and post-injection phase ground water monitoring is planned for comparison with future monitoring results. Provide geochemical information on solids and fluids to identify potential interactions that could affect injectivity or mobilize trace elements; assess the compatibility of the CO <sub>2</sub> stream with fluids and minerals in the injection and confining zones; and inform CO <sub>2</sub> storage capacity estimates.	Sections 2.3.4 and 2.3.9 of the Geologic Site Characterization Guidance

# Geologic Sequestration Data Tool (GSDT) Resources



- System acts as a guide to permit application
- Class VI Permit Application Templates
- GSDT system User Guides
- EPA GSDT team available to answer questions at [GSDataTool@epa.gov](mailto:GSDataTool@epa.gov)

A screenshot of the GSDT web application interface. The browser title is "Class VI UIC Project Information Tracking". The page has a navigation bar with tabs: "Welcome", "General Information", "Facility and Owner/Operator Information", "Initial Permit Application", "Updated Information", and "Complete Submission". Below the navigation bar is a blue header with the GSDT logo and text: "GSDT A US Environmental Protection Agency System maintained by the Department of Energy's Pacific Northwest National Laboratory". The main content area is titled "PROJECT INFORMATION TRACKING" and contains the following text:

This submission is for:

Project ID:	No Project ID Provided
Project Name:	No Project Name Provided
Current Project Phase:	UnspecifiedPhase

**NOTE:** If you have not previously made a submission using this tool it is important to learn what information is required for each of the different data entry fields by reading the [Project Information Tracking User Guide](#) (click link to view or download).

Note that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided within the tabs of this module. States with Class VI primacy have requirements that are at least as stringent as EPA's (and therefore require the information requested in these tabs). If your well is in a primacy state, consult your permitting authority about any additional required submittals.

Click on a tab name at the top of the window, or use the "Next Tab" button at the bottom to navigate through the reporting tool. Information can be saved and submitted later using the "Save" or "Save Changes and Exit" buttons. No new information will be submitted until you certify that the submission is complete in the "Complete Submission" tab.

If you have questions, contact your permitting authority or consult the UIC Program Class VI guidance documents, available online at: <https://www.epa.gov/uic/class-vi-guidance-documents>.

A copy of the Federal Class VI Rule is available online at: <http://www.gpo.gov/fdsys/pkg/FR-2010-12-10/pdf/2010-29954.pdf>.

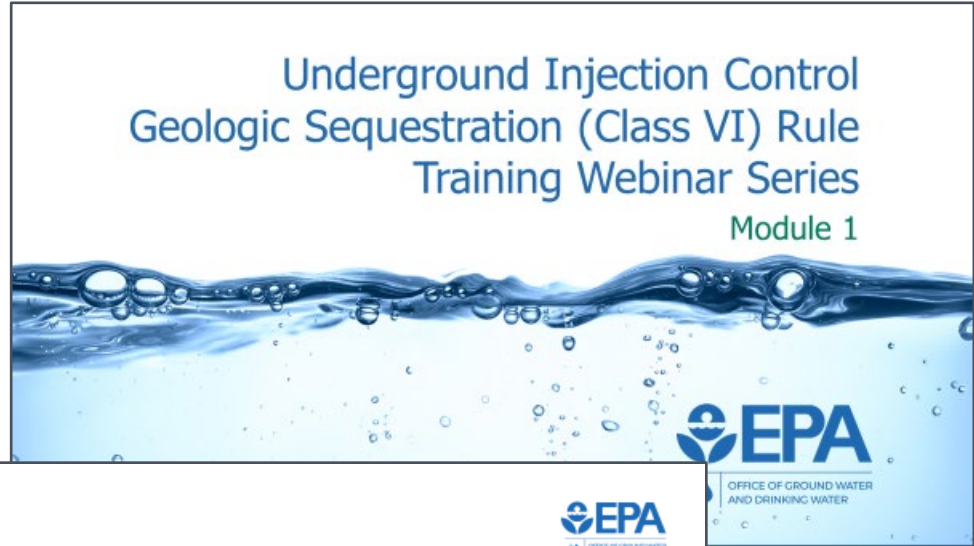
**When you are ready to submit your information to the permitting authority, use the "Complete Submission" tab.**

# Tools for States and EPA Employees

Implementation Training Tutorials

Permit Review Teams

GSDT Data Management Capabilities for Permitting Authorities



## Modules

- **Module 1: Background, Program elements overview, and Permit information**
- Module 2: Pre-construction phase activities
- Module 3: Pre-construction phase activities continued
- Module 4: Pre-construction phase activities continued
- Module 5: Pre-construction phase activities continued, Permit preparation
- Module 6: Construction, Pre-operation phase activities, Authorization to inject
- Module 7: Operation/Injection activities
- Module 8: Post-injection site care, Site closure, Class VI primacy



# Under Development at EPA

- Sample Class VI Permit Application
- Modeling Training for Permitting Authorities
- CBI Capabilities and other GSDT Improvements



## Other Helpful Resources

- 🌿 U.S. Department of Energy
  - 🌿 National Energy Technology Lab (NETL) Energy Data eXchange (EDX)  
<https://edx.netl.doe.gov/group/edx-tools>
  
- 🌿 U.S. Geological Survey
  - 🌿 National assessment results
    - 🌿 Geologic carbon dioxide national storage assessment results, Circular 1386, <http://pubs.usgs.gov/circ/1386/>
    - 🌿 Greenhouse gas emissions and sequestration assessment results, Scientific Investigations Report 2018-5131, <https://doi.org/10.3133/sir20185131>
  - 🌿 Assessment methodologies also available at <http://pubs.usgs.gov>

# Thank you!

- 🌿 For more information, go to EPA's Class VI web page at:  
<https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-co2>
  
- 🌿 Reach out to us with any questions
  - 🌿 Bill Bates ([bates.William@epa.gov](mailto:bates.William@epa.gov); 202-564-6165)
  - 🌿 Molly McEvoy ([mcevoy.molly@epa.gov](mailto:mcevoy.molly@epa.gov); 202-564-4765)