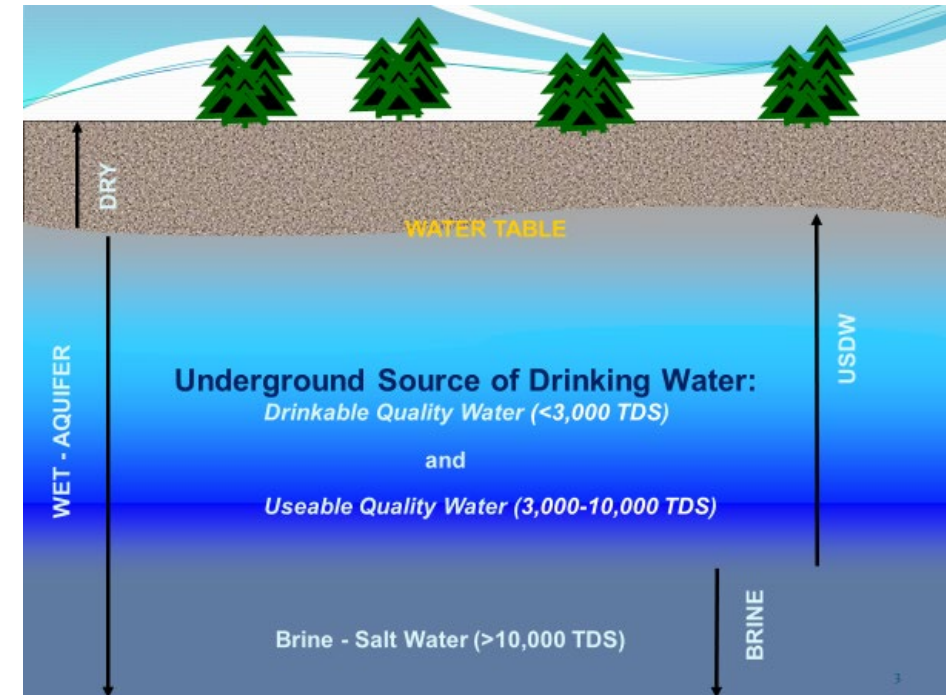




# Underground Injection Control (UIC) Program: Class VI

# The Safe Drinking Water Act

- Authorizes EPA to develop minimum federal regulations for state, territory, and tribal Underground Injection Control (UIC) programs to protect underground sources of drinking water (USDWs)
- Mandates EPA to regulate underground injection of most fluids – liquid, gas, or slurry
- Prohibits injection that endangers a USDW
- Establishes a process for approving primary enforcement responsibility to states, territories, and tribes (Primacy)
- Authorizes EPA to provide assistance grants to states, territories and tribes in support of essential UIC program functions

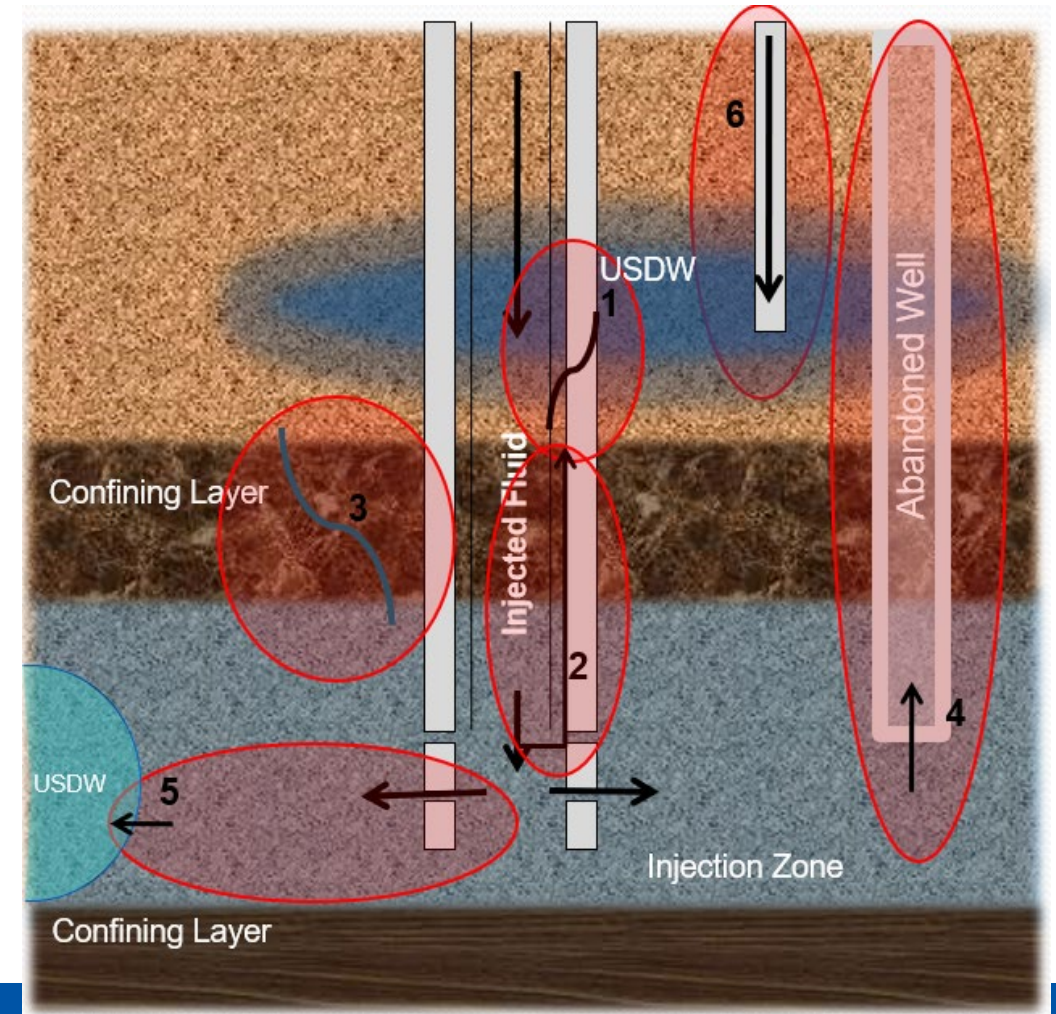


***UIC Program Mission: Protect public health by preventing contamination of USDWs***



# UIC – Prevent Potential Migration Pathways

1. Faulty injection well casing
2. Annulus between casing and the well bore
3. Migration through confining layers from injection zone
4. Vertical migration through improperly abandoned and completed wells
5. Lateral migration from within injection zone into a protected portion of USDW
6. Direct injection of fluids into or above a USDW



# Class VI Wells—

## Injection of carbon dioxide for geologic sequestration

### ■ Unique Considerations

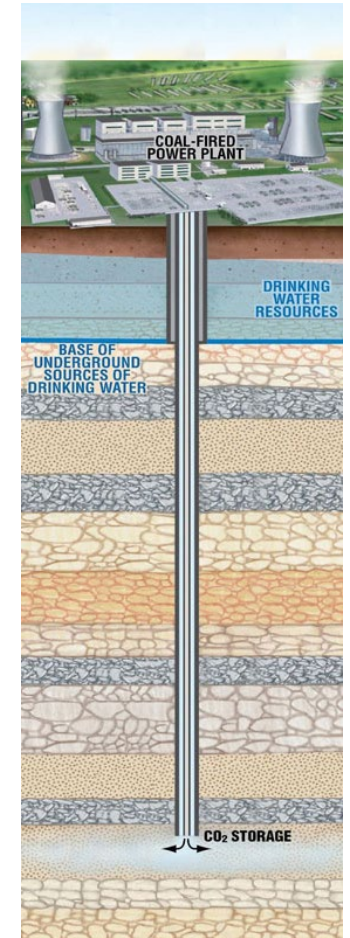
- Large injection volumes (currently sourced from ethanol plants)
- Anticipated long-duration projects (e.g., 50-100 years)
- Mobile, buoyant and potentially corrosive injectate

### ■ Tailored Requirements

- Robust, multiphase computational modeling of the Area of Review (AoR) informed by extensive site characterization
- Testing and monitoring throughout the injection and post-injection phases of a project addressing USDWs, CO<sub>2</sub> plume and pressure front location
- Updated financial responsibility requirements

### ■ Climate Change Mitigation

- Potential for carbon dioxide (injectate) to be sourced from power plant emissions



# Class VI Risk Management

Risks	Examples of Risk	Class VI Regulations Address Risk
<b>TECHNICAL RISK:</b>		
Lateral and vertical containment failure	<b>Lateral containment failure:</b> <ul style="list-style-type: none"> <li>Absence of lateral seals</li> <li>Insufficiencies in lateral seals or reservoir porosity/thickness</li> <li>Subsurface chemical reactions (e.g., formation of precipitates)</li> </ul> <b>Vertical containment failure:</b> <ul style="list-style-type: none"> <li>Caprock failure</li> <li>Wellbore/wellhead failure</li> </ul>	<ul style="list-style-type: none"> <li><b>Site characterization:</b> Owner/operator must demonstrate the suitability of the injection zone for GS.</li> <li><b>AoR and corrective action:</b> Owner/operator must delineate the AoR using computational modeling and perform corrective action on artificial penetrations that could serve as conduits for CO<sub>2</sub>/fluid migration.</li> <li><b>Testing and monitoring, construction, operation, and PISC and site closure</b> requirements ensure the protection of USDWs; the owner/operator must continue to conduct monitoring for 50 years following the cessation of injection or for an approved alternative timeframe, until it can be demonstrated that the site no longer endangers USDWs.</li> </ul>
Seismicity	<ul style="list-style-type: none"> <li>Reactivation of existing fault</li> <li>New fault created</li> </ul>	<ul style="list-style-type: none"> <li><b>Site characterization:</b> Owner/operator must demonstrate that confining zone(s) are free of transmissive faults/fractures.</li> <li><b>AoR and corrective action:</b> Owner/operator must delineate the AoR using computational modeling that considers migration through faults and fractures</li> <li><b>Testing and monitoring, construction, operation, and PISC and site closure</b> requirements ensure the protection of USDWs; the owner/operator must continue to conduct monitoring for 50 years following the cessation of injection or for an approved alternative timeframe, until it can be demonstrated that the site no longer endangers USDWs.</li> </ul>
<b>NON-TECHNICAL RISK:</b>		
Financial Risk	Risk of financial instrument failure (e.g., due to owner/operator failure, third-party failure)	<b>Financial responsibility:</b> Owner/operator must have and maintain financial resources for 1) performing corrective action; 2) injection well plugging; and 3) PISC and site closure.

# 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

class-vi-guidance-documents

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## Underground Injection Control (UIC)

Underground Injection Control Home

- Class I Industrial and Municipal Waste Disposal Wells
- Class II Oil and Gas Related Injection Wells
- Class III Injection Wells for Solution Mining
- Class IV Shallow Hazardous and Radioactive Injection Wells
- Class V Wells for Injection of Non-Hazardous Fluids into or Above Underground Sources of Drinking Water
- Class VI Wells Used for Geologic Sequestration of CO<sub>2</sub>

### Final Class VI Guidance Documents

This list of Final Class VI guidance documents below are prepared to assist:

- UIC program directors in implementing the Class VI program
- Class VI well owners or operators in complying with the Class VI regulations

You may need a PDF reader to view some of the files on this page. See EPA's [About PDF page](#) to learn more.

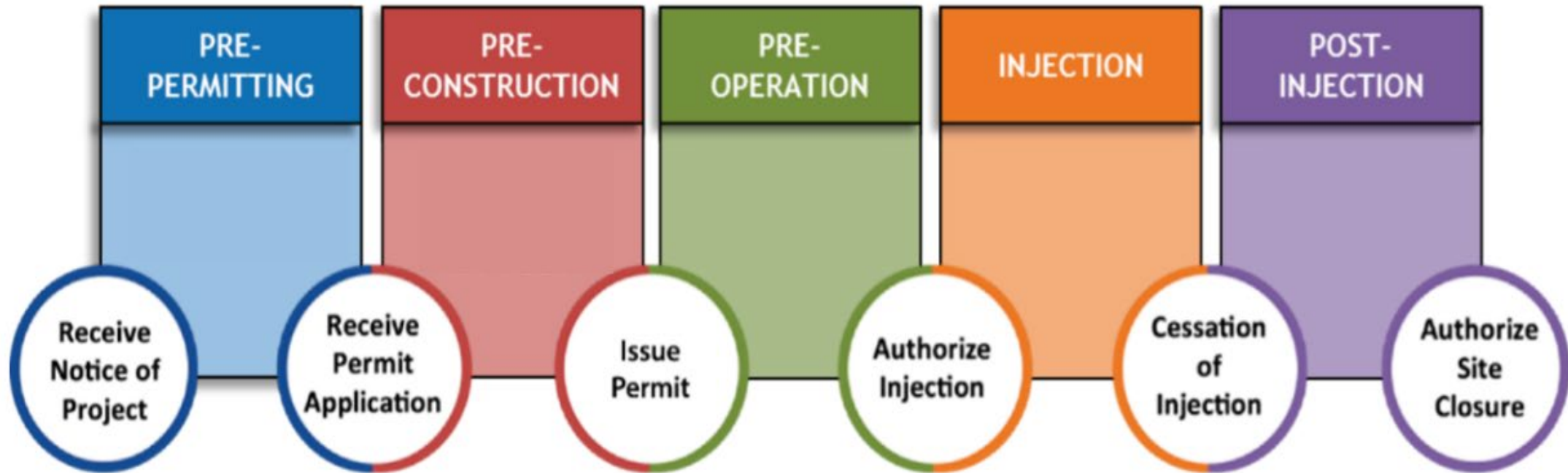
- [Geologic Sequestration of Carbon Dioxide - Underground Injection Control Program Class VI Implementation Manual for UIC Program Directors \(PDF\)](#)  
(212 pp, 3 MB, January 2018, EPA 816-R-18-001)  
FINAL - This document supports Class VI UIC Program Directors in implementing their responsibilities 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.



# EPA UIC Class VI Guidance Documents

Targeted to Permit Applicants	Targeted to Permitting Authorities
<ul style="list-style-type: none"><li>▪ Well Site Characterization</li><li>▪ Area of Review and Corrective Action Construction</li><li>▪ Testing and Monitoring</li><li>▪ Project Plan Development</li><li>▪ Well Construction</li><li>▪ Financial Responsibility Requirements</li><li>▪ Reporting, Record-Keeping and Data Management</li><li>▪ Well Plugging, PISC, Site Closure</li></ul>	<ul style="list-style-type: none"><li>▪ Implementation Manual for UIC Program Directors</li><li>▪ Primacy Manual for State Directors</li><li>▪ Key Principles in EPA's Class VI Rule Related to Transition of Class II Enhanced Oil or Gas Recovery Wells to Class VI</li></ul>

# Class VI Project Lifecycle





# 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)

The screenshot shows the 'Class VI UIC Project Information Tracking' web application. At the top, there is 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 header section with the 'GSDT' logo and text: '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'. It displays the following information: 'This submission is for:', 'Project ID: No Project ID Provided', 'Project Name: No Project Name Provided', and 'Current Project Phase: UnspecifiedPhase'. Below this, there is a note: '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)'. Further down, there is a paragraph explaining that references to EPA's Class VI Rule in the code of federal regulations (CFR) are provided within the tabs of this module. It also mentions that states with Class VI primacy have requirements that are at least as stringent as EPA's. A paragraph follows, instructing users to 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. Another paragraph states that 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 final paragraph mentions that 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>. At the bottom, it states: 'When you are ready to submit your information to the permitting authority, use the "Complete Submission" tab.'

# New Tools on EPA Website

- Class VI Permit Application Outline
- Permits and permit table by state
- GSDT Tutorials
- Class VI Permit Application Templates

## 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
<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> .		
• <b>Regional geology and geologic structure</b>	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
• <b>Faults and fractures</b>	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
• <b>Injection and confining zone characteristics</b>	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
• <b>Hydrologic and hydrogeologic information</b>	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
• <b>Geochemical data</b>	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

Page 1

# Primary Enforcement Responsibility

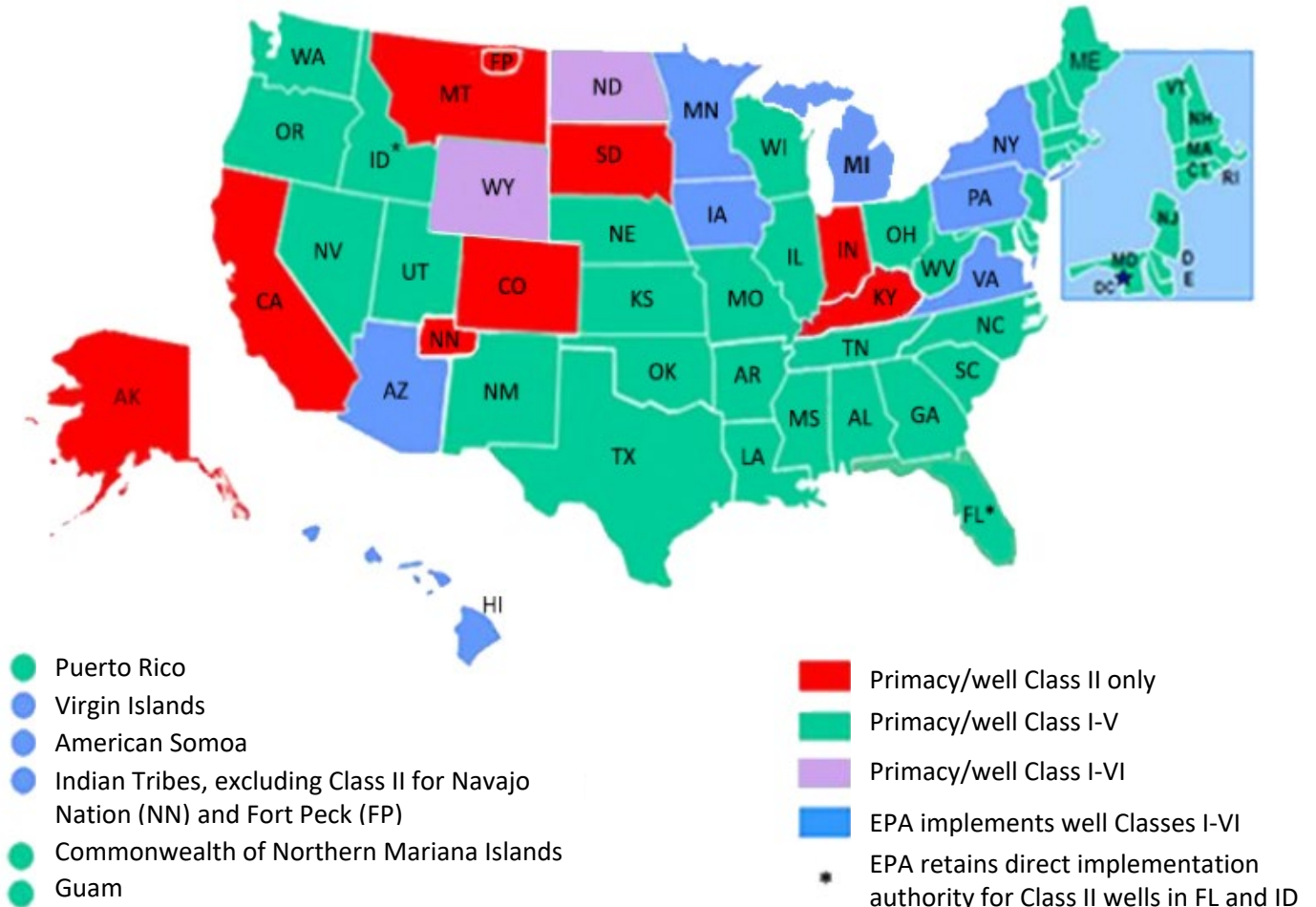
- The SDWA encourages states to seek primary enforcement responsibility (primacy) for the UIC program
- Depending on the well type(s) being regulated, states must:
  - Meet specific minimum federal requirements via Section 1422 of the Act *or*
  - Demonstrate that their programs are “effective” via Section 1425 of the Act (Class II only)
- States can be more stringent than minimum federal requirements
- Primacy approval history:
  - Most state UIC programs were approved by EPA when the regulations were initially promulgated (i.e., early 1980s)
  - Several programs were approved in the 1990s – 2000s
  - The UIC Program continues to work with states interested in primacy and revisions to their programs
- EPA is responsible for implementing the program where states do not have primacy for the program



# UIC Program Primacy Status

- 31 states and 3 territories have primacy for Classes I-V
- 8 states and 2 Tribes (Fort Peck and Navajo) have primacy for Class II only
- 2 states (ND and WY) have primacy for Class VI

Note: SDWA requires UIC primacy determination through regulation



# Additional Information

- **Class VI:** <https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-carbon-dioxide>
- **GSDT:** <https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-carbon-dioxide#GSDT>
- **Contacts**
  - **Class VI contact list:** <https://www.epa.gov/uic/underground-injection-control-class-vi-geologic-sequestration-contact-information>
  - **HQ Class VI:** [UIC-ClassVI@epa.gov](mailto:UIC-ClassVI@epa.gov)
  - **Bill Bates:** [bates.william@epa.gov](mailto:bates.william@epa.gov)

