



Draft Permits for Carbon TerraVault I - 26R Class VI Underground Injection Control Wells

USEPA Region 9
Groundwater Protection Section
January 2024



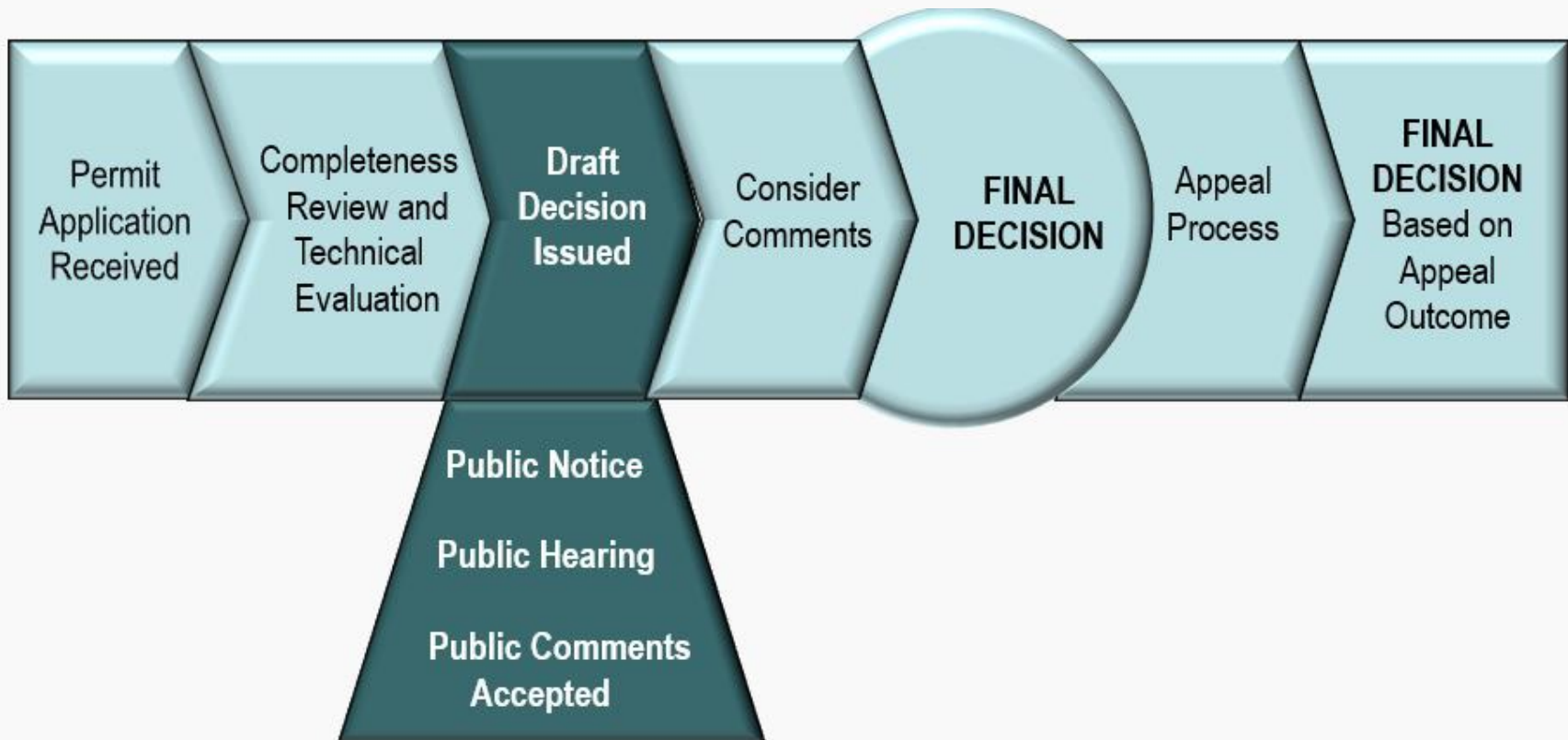
Safe Drinking Water Act of 1974 was established to protect the quality of drinking water in the U.S.



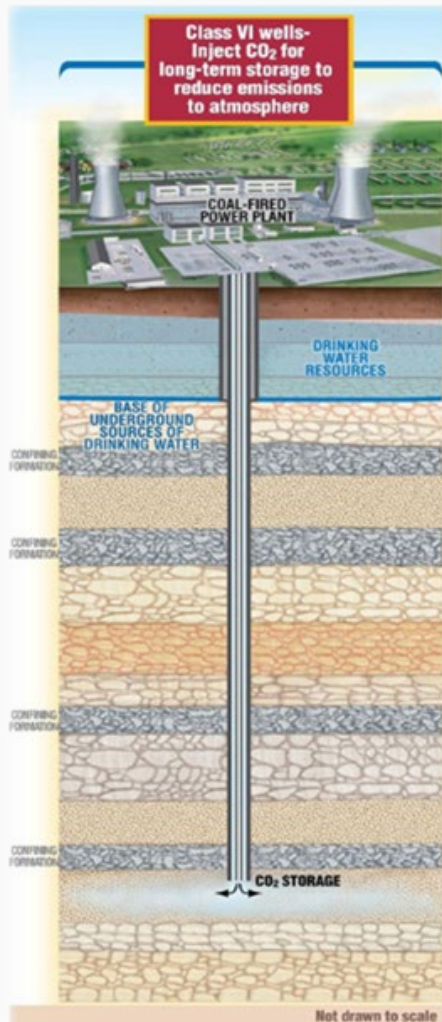
The Underground Injection Control (UIC) program's mission is to protect human health by protecting underground sources of drinking water (USDWs)



UIC Permit Process



UIC Permitting



- Review and Permitting
 - ✓ Proper geology
 - ✓ Well construction
 - ✓ Well operation & monitoring
 - ✓ Well abandonment and closure
 - ✓ Financial Assurance

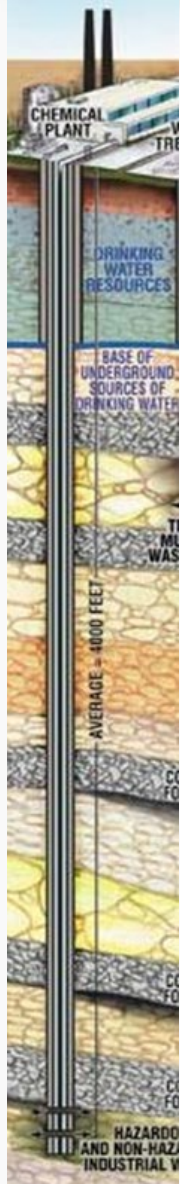
Class VI UIC Injection Wells

- Permanent storage (sequestration) of carbon dioxide
- Deep injection (usually thousands of feet below ground)
- Must occur below lowest underground source of drinking water



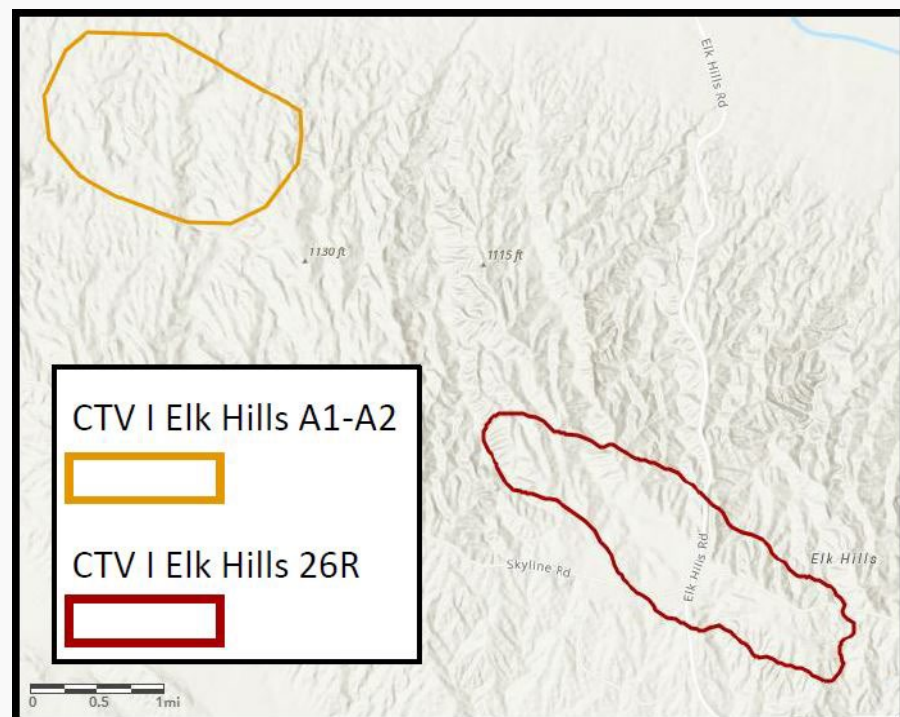
Class VI Injection Wells

- Must have proper geology
 - ✓ Formation that can receive and safely store carbon dioxide
 - ✓ Rock that will confine carbon dioxide and prevent contamination of USDWs



Carbon TerraVault I

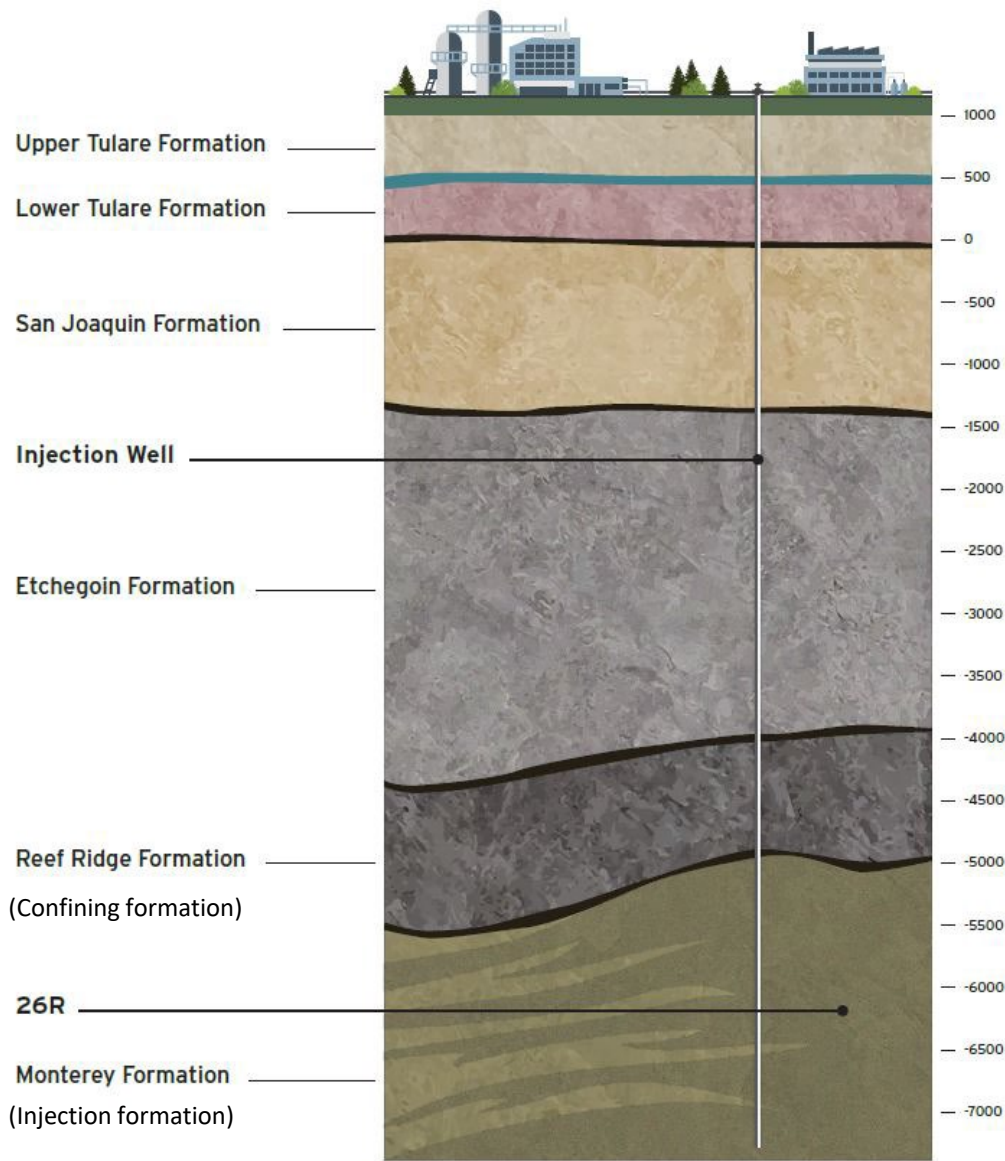
- Carbon TerraVault (CTV) submitted two separate UIC Class VI permit applications for the CTV I project.
- They submitted CTV I – A1/A2 in August 2021 for two Class VI injection wells; application is in technical review.
- They submitted CTV I – 26R in November 2021 for four Class VI injection wells; EPA issued draft permits for these four wells.





CTV I – 26R Project Overview

- Four Proposed Class VI Injection Wells
- Proposed injection rate
 - Total of 1.46 million metric tons of carbon dioxide annually over a 26-year injection period
- Proposed carbon dioxide sources
 - Lone Cypress: proposed hydrogen plant
 - Elk Hills pre-combustion gas treatment
 - Avnos: proposed direct air capture facility
 - CTV may propose additional sources for EPA review/approval

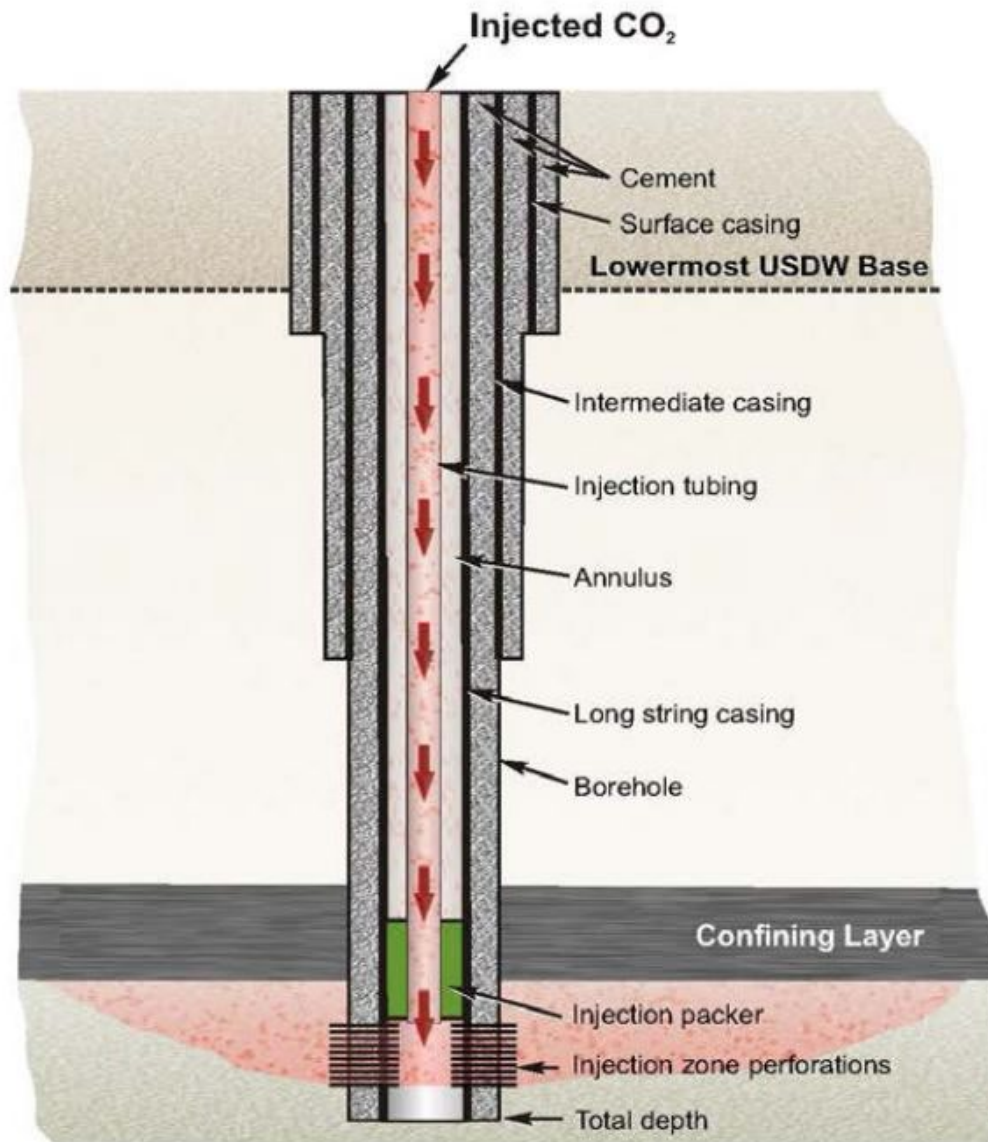


Geologic Setting



Geologic Setting

- Monterey Formation
 - Proposed injection formation
 - Approximately 6,000 feet below ground surface
 - Consists of highly porous, permeable sand
- Reef Ridge Formation
 - Confining layer
 - Approximately 5,000 feet below ground surface
 - 1,000 feet of impermeable shale
- Upper Tulare Formation
 - Lowermost potential USDW
 - From ground level to approximately 500 feet below ground surface
 - Data show the Upper Tulare has no water; will be confirmed during pre-injection testing



Class VI Well Construction



Permit Requirements

Well Construction

- Permit would authorize three newly drilled injection wells and conversion of an existing Class II EOR well to a Class VI well.
- Must be constructed with materials and cements that can withstand exposure to carbon dioxide and carbon dioxide/water mixtures.
- Wells must be cased and cemented to prevent the movement of fluids into or between USDWs.
- Wells would be equipped with an automatic surface shut-off system.



Permit Requirements

Pre-Injection Testing Requirements

- Well tests/logs will be conducted during drilling, casing installation, and after casing installation
- Objectives of the tests include:
 - * confirming site-specific geologic data
 - * collecting baseline data (e.g., formation pressures and water quality)
 - * setting operating conditions and limits (e.g., injection rate/pressure)



Permit Requirements

Operating Requirements

- Injection pressure limitation
- Injection fluid limitation
- Automatic Alarms and shut-off systems
- Well blowout prevention
- Shutdown procedures



Permit Requirements

Testing and Monitoring

- Proposed testing and monitoring plan will verify the project is operating as permitted and is not endangering USDWs
- Testing includes carbon dioxide stream analysis and mechanical integrity testing
- Continuous monitoring and recording of each well's injection pressure, flow rate and volume, and the pressure on the annulus



Permit Requirements

Testing and Monitoring (Continued)

- Shallow groundwater monitoring
- Temperature and pressure monitoring above the confining zone
- Injection zone temperature, pressure and fluid sampling to confirm plume movement
- Air monitoring and leak detection monitoring
- Seismicity monitoring



Permit Requirements

Reporting

- Semi-annual reports of monitoring data
- Publicly available reports, non-compliance events available through public website
- Real-time air monitoring and leak detection monitoring available through public website



Permitting Requirements

Post Injection Site Care

- When injection ceases, CTV would continue to monitor groundwater quality and track the position of the carbon dioxide plume and pressure front for 50 years post injection.
- The post-injection monitoring must continue until monitoring data shows the injected carbon dioxide is stable and the project does not pose any endangerment to USDWs and EPA approves site closure.



Permit Requirements

Well Plugging

- Mechanical integrity testing required prior to plugging.
- The wells must be plugged using approved materials that are compatible with carbon dioxide/water mixtures.
- The type, placement and number of plugs is evaluated to ensure the wells will not serve as a conduit for fluid movement into USDWs.



Permit Requirements

Emergency and Remedial Response Plan (ERRP)

- Site-specific ERRP
- Describes actions CTV would take to address movement of the injection fluid or formation fluid in a manner that may endanger USDWs during the life of the project
- Periodic reviews of the ERRP are required; plan is updated as needed



Permit Requirements

Financial Responsibility

- CTV provided cost estimates from a third party.
- Costs are re-evaluated/confirmed annually, changes in amounts require EPA approval.
- CTV has obtained a Letter of Credit for \$9,094,660 with a standby trust agreement.
- CTV will have a 3rd-party insurance policy in the amount of \$25,000,000.



Upcoming Events

Workshops

- January 30, 2024; 6:00-9:00pm; in-person workshop at West Side Recreation and Park District Auditorium (Taft, CA)
- January 31, 2024; 6:00-9:00pm; in-person workshop at Buttonwillow Recreation and Park District Community Center
- February 28, 2024; 3:00-5:00pm; in-person workshop at Buttonwillow Recreation and Park District Community Center

Public Hearing

- February 28, 2024; 6:00-9:00pm; in-person at Buttonwillow Recreation and Park District Community Center



Public Comment Period

- EPA is accepting public comments on the CTV I – 26R draft UIC permits until March 20, 2024.
- The draft UIC permits and application materials are available at <https://www.regulations.gov/docket/EPA-R09-OW-2023-0623>
- Written comments may be submitted through the regulations.gov docket.
- Draft UIC permits are also available for review at the Buttonwillow Branch Library and Kern County Planning and Natural Resources Department.