U.S. Environmental Protection Agency's (EPA) Underground Injection Control (UIC) Program: Class VI Geologic Sequestration Rule Implementation

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CO2-EOR Carbon Management Workshop
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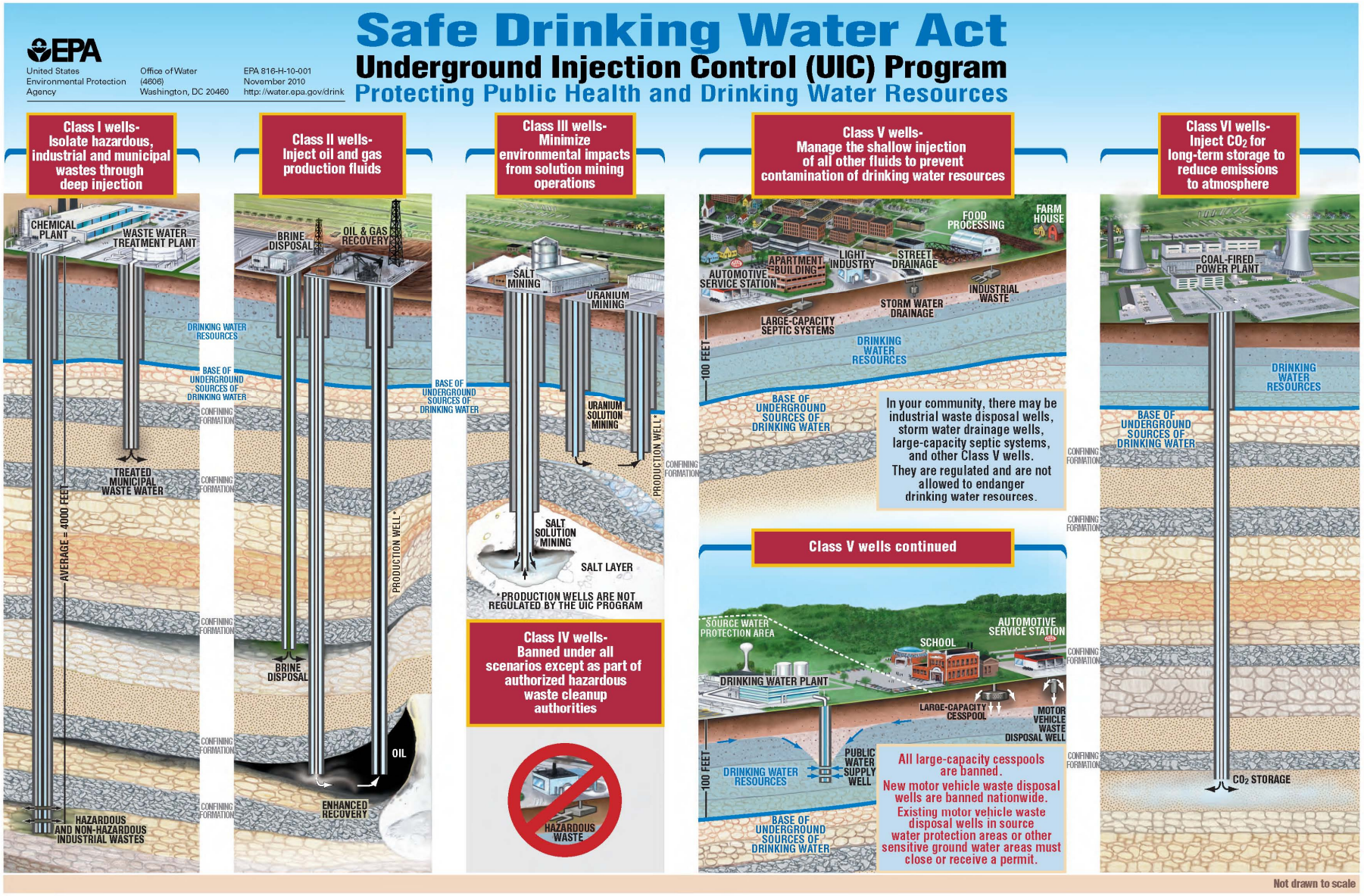
Overview

- EPA's Underground Injection Control (UIC) Program
- The Class VI Carbon Dioxide (CO_2) Geologic Sequestration Rule
- Class VI Implementation
- Stakeholder Coordination

UIC Program Background

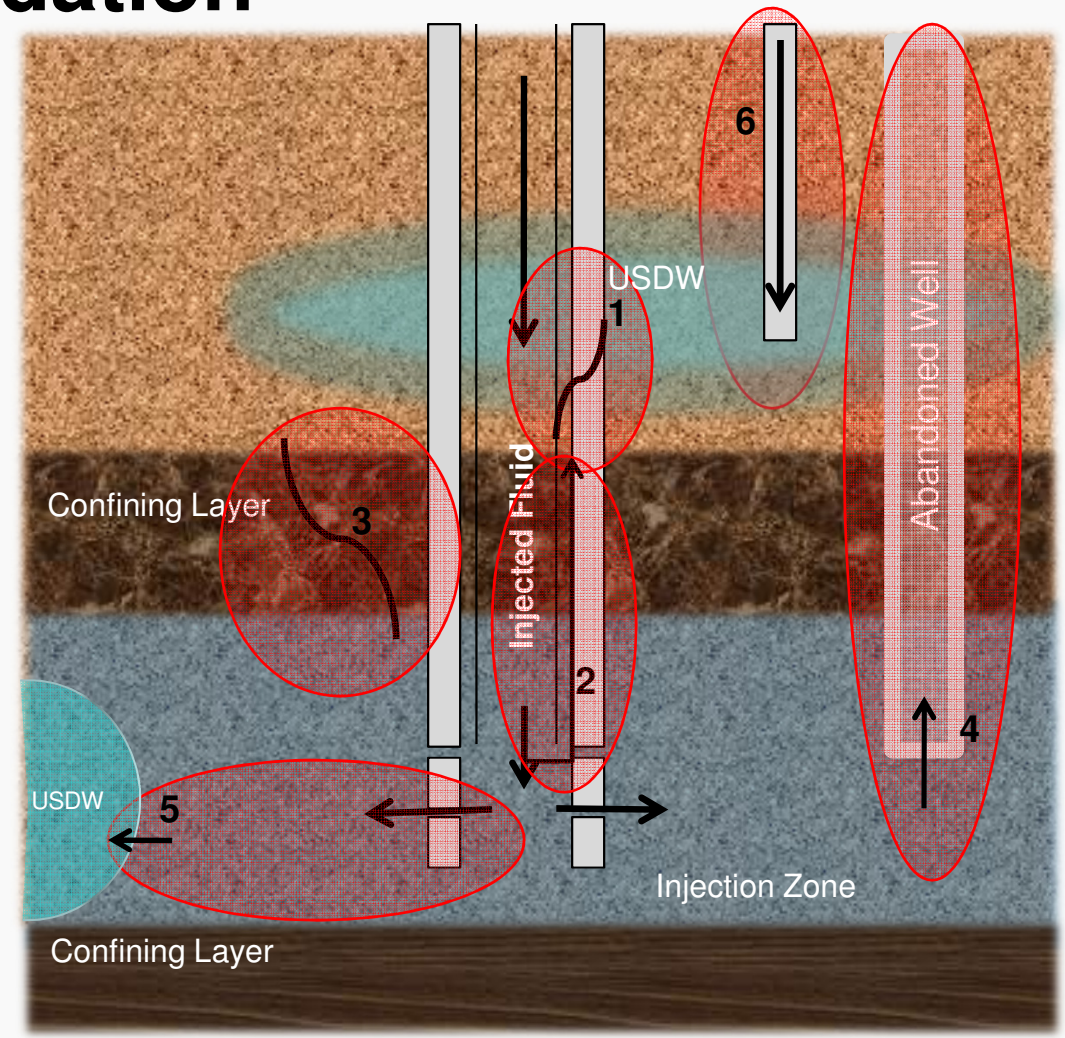
- The 1974 Safe Drinking Water Act (SDWA); Reauthorized in 1996
  - Federal regulations for protection of Underground Sources of Drinking Water (USDWs)
  - USDW defined:
    - Any aquifer or portion of an aquifer that contains water that is less than 10,000 PPM total dissolved solids or contains a volume of water such that it is a present, or viable future source for a Public Water Supply System
- The UIC Program regulates underground injection of *all* fluids – liquid, gas, or slurry
  - Designation as a commodity does not change SDWA applicability
  - Natural gas (hydrocarbon) storage, oil & gas production, and some hydraulic fracturing fluids exempted


EPA
United States Environmental Protection Agency
Office of Water (4606) Washington, DC 20460
EPA 816-H-10-001 November 2010 http://water.epa.gov/drink
Safe Drinking Water Act
Underground Injection Control (UIC) Program
Protecting Public Health and Drinking Water Resources
Class I wells- Isolate hazardous, industrial and municipal wastes through deep injection
CHEMICAL PLANT
WASTE WATER TREATMENT PLANT
DRINKING WATER RESOURCES
BASE OF UNDERGROUND SOURCES OF DRINKING WATER
CONFINING FORMATION
TREATED MUNICIPAL WASTE WATER
AVERAGE = 4000 FEET
HAZARDOUS AND NON-HAZARDOUS INDUSTRIAL WASTES
Class II wells- Inject oil and gas production fluids
BRINE DISPOSAL
OIL & GAS RECOVERY
PRODUCTION WELL*
BRINE DISPOSAL
OIL
ENHANCED RECOVERY
Class III wells- Minimize environmental impacts from solution mining operations
SALT MINING
URANIUM MINING
URANIUM SOLUTION MINING
SALT SOLUTION MINING
SALT LAYER
*PRODUCTION WELLS ARE NOT REGULATED BY THE UIC PROGRAM
Class IV wells- Banned under all scenarios except as part of authorized hazardous waste cleanup authorities
HAZARDOUS WASTE
Class V wells- Manage the shallow injection of all other fluids to prevent contamination of drinking water resources
FOOD PROCESSING
FARM HOUSE
APARTMENT BUILDING
LIGHT INDUSTRY
STREET DRAINAGE
AUTOMOTIVE SERVICE STATION
INDUSTRIAL WASTE
STORM WATER DRAINAGE
LARGE-CAPACITY SEPTIC SYSTEMS
100 FEET
In your community, there may be industrial waste disposal wells, storm water drainage wells, large-capacity septic systems, and other Class V wells. They are regulated and are not allowed to endanger drinking water resources.
Class V wells continued
SOURCE WATER PROTECTION AREA
SCHOOL
AUTOMOTIVE SERVICE STATION
DRINKING WATER PLANT
LARGE-CAPACITY CESSPOOL
MOTOR VEHICLE WASTE DISPOSAL WELL
PUBLIC WATER SUPPLY WELL
All large-capacity cesspools are banned.
New motor vehicle waste disposal wells are banned nationwide.
Existing motor vehicle waste disposal wells in source water protection areas or other sensitive ground water areas must close or receive a permit.
Class VI wells- Inject CO_2 for long-term storage to reduce emissions to atmosphere
COAL-FIRED POWER PLANT
CO_2 STORAGE
Not drawn to scale

UIC Program Foundation

Potential Fluid 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 a USDW
6. Direct injection of fluids into or above a USDW



Class VI Rule

Considerations for GS

- Large Volumes
- Buoyancy
- Viscosity (Mobility)
- Corrosivity

New well class established in 2010: Class VI

UIC Program Elements

- Site Characterization
- Area of Review (AoR)
- Well Construction
- Well Operation
- Site Monitoring
- Post-Injection Site Care
- Public Participation
- Financial Responsibility
- Site Closure

Class VI Rule

- Timeline:
  - Development announced: 2007
  - Proposed: July 2008
  - Notice of Data Availability: August 2009
  - Finalized: December 2010
- Voluntary (i.e., under the UIC Program, there is no mandate to inject CO_2)
- Coordinated with other EPA initiatives and in consultation with Federal Partners, States and Stakeholders

Class VI Implementation

- Implementation Activities
  - Implementation workshops
  - Guidance development
    - Technical Guidance addressing Site Characterization, Area of Review Delineation, Well Construction, Testing and Monitoring, Post-Injection Site Care and Site Closure, Transitioning from Class II to Class VI
    - Financial Responsibility
    - Primary Enforcement Responsibility
  - Permitting
  - Stakeholder coordination

Class VI Implementation: Permitting Goals

- Comprehensively evaluate project information to:
  - Confirm that a geologic sequestration well or wells will be sited, operated, monitored and closed in a manner that ensures USDW protection
  - Ensure a complete, clear, science-based and defensible decision making process (documented in an Administrative Record)
  - Facilitate communication regarding EPA actions and decision-making with the permittee, co-regulators and the public
- Ensure:
  - Specificity
  - Certainty
  - Consistency
  - Confidence

Class VI Implementation: Permitting

- Archer Daniels Midland Project
  - Location: Decatur, IL
  - Total proposed injection volume: 6.5 million tons of CO_2 (via two wells)
  - Proposed total project duration: 18 years
    - 8 years of injection (3 years at CCS #1; 5 years at CCS #2)
    - 10 years of post-injection site care
  - CO_2 source: An ethanol plant converting biomass (i.e., corn stover) into ethanol
- FutureGen Alliance Project
  - Location: Jacksonville, IL
  - Total proposed injection volume: 22 million tons of CO_2 (via four wells)
  - Proposed total project duration: 70 years
    - 20 years of injection
    - 50 years of post-injection site care
  - CO_2 source: Retrofit of the existing (retired), Meredosia coal-fired power plant with an oxy-combustion technology to allow CO_2 capture

Class VI Implementation: Permitting

- *Application In Review*: Berexco, LLC
  - Location: Wellington, KS
  - Total *proposed* injection volume: 40,000 tons of CO_2
  - *Proposed* total project duration: 17 months
    - Nine months of injection
    - One year of post-injection site care
  - CO_2 source: TBD
- *Anticipated*
  - Region 8: Big Sky Partnership, Kevin Dome, MT

Class VI Implementation: Class II and Class VI

- Final Class VI Rule included requirements at 40 CFR 144.19 designed to address potential, future injection operation scenarios where a well ***may*** transition from Class II to Class VI
- Draft guidance posted for public comment in December 2013
- March 2014 – Present
  - Evaluating written comments
  - Meeting with/hearing from stakeholders
  - Identifying ways to increase clarity and certainty in a final guidance
  - Engaging in Inter- and Intra-Agency coordination

Stakeholder Coordination

Federal Partners

- Department of Energy
  - Pacific Northwest National Laboratory (PNNL)
  - Lawrence Berkeley National Laboratory (LBNL)
- Department of Interior (i.e., USGS; BLM; BOEM)
- CCS Task Force Participants
- Internal Revenue Service

State-Level Partners

- States
- Ground Water Protection Council
- Interstate Oil and Gas Compact Commission
- Association of American State Geologists

Others

- Non-governmental and environmental organizations
- Industry organizations and representatives
- Academia
- Public stakeholders

Thank you! Questions?

Resources:
http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm