Carbon Sequestration Injection Well Permitting in Wyoming, USA

Groundwater Protection Council 2022 Annual & UIC Conference

Carbon Capture & Storage: State and Federal Session

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Department of Environmental Quality

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Overview

- Wyoming's Underground Injection Control Program
- Primacy of the UIC Program
- From Application to Permit Issuance For a Class VI Well

Wyoming's UIC Program

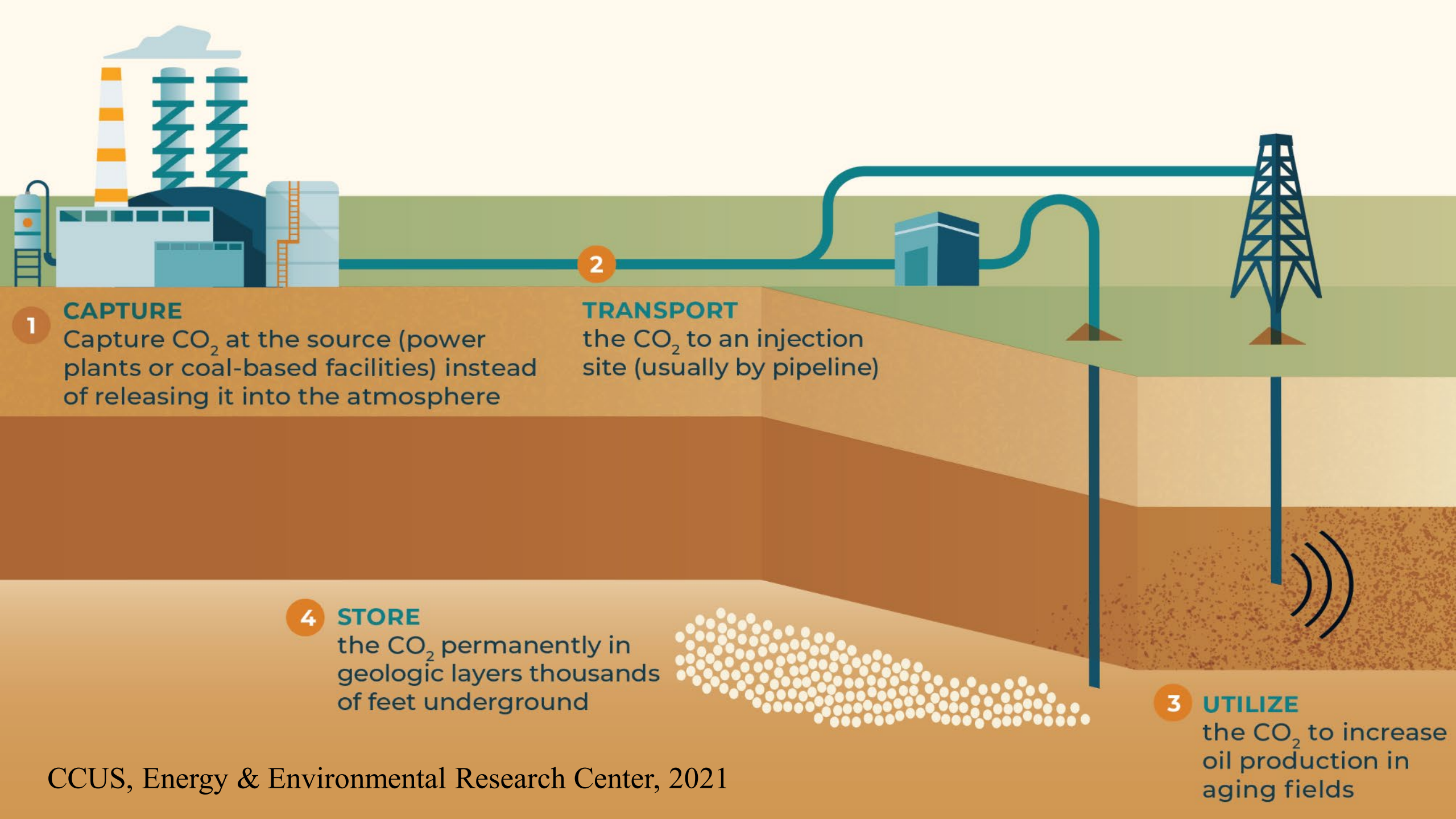
- Wyoming Department of Environmental Quality
  - Water Quality Division
    - Class I – hazardous and non-hazardous wastes into deep, isolated rock formations
    - Class V – inject non-hazardous fluids underground; dispose of wastes into or above an Underground Source of Drinking Water
    - Class VI – inject carbon dioxide for long-term storage or geologic sequestration
  - Land Quality Division
    - Class III – inject fluids to dissolve and extract minerals
- Wyoming Oil and Gas Conservation Commission
  - Class II – inject fluids associated with oil and natural gas production

Wyoming Statutes and Regulations

- W.S. § 30-5-501 – Clarifying that vis-à-vis storage rights, production rights are dominant but cannot interfere with storage
- W.S. § 30-5-502 – Providing a certification procedure for CO2 incidentally stored during EOR
- W.S. § 34-1-152 – Specifying who owns the pore space
- W.S. § 34-1-153 – Specifying that the injector, not the owner of pore space, is generally liable
- W.S. § 35-11-313 – Establishes permitting procedures and requirements
- W.S. § 35-11-315 – Unitization of storage interests
- W.S. § 35-11-320 – Mechanism for post-closure monitoring, reporting, and verification via the Special Revenue Account
- Water Quality Rules, Chapter 24 – Class VI Injection Wells and Facilities, Underground Injection Control Program
- Water Quality Rules, Chapter 29 – Special Revenue Account (Pending)

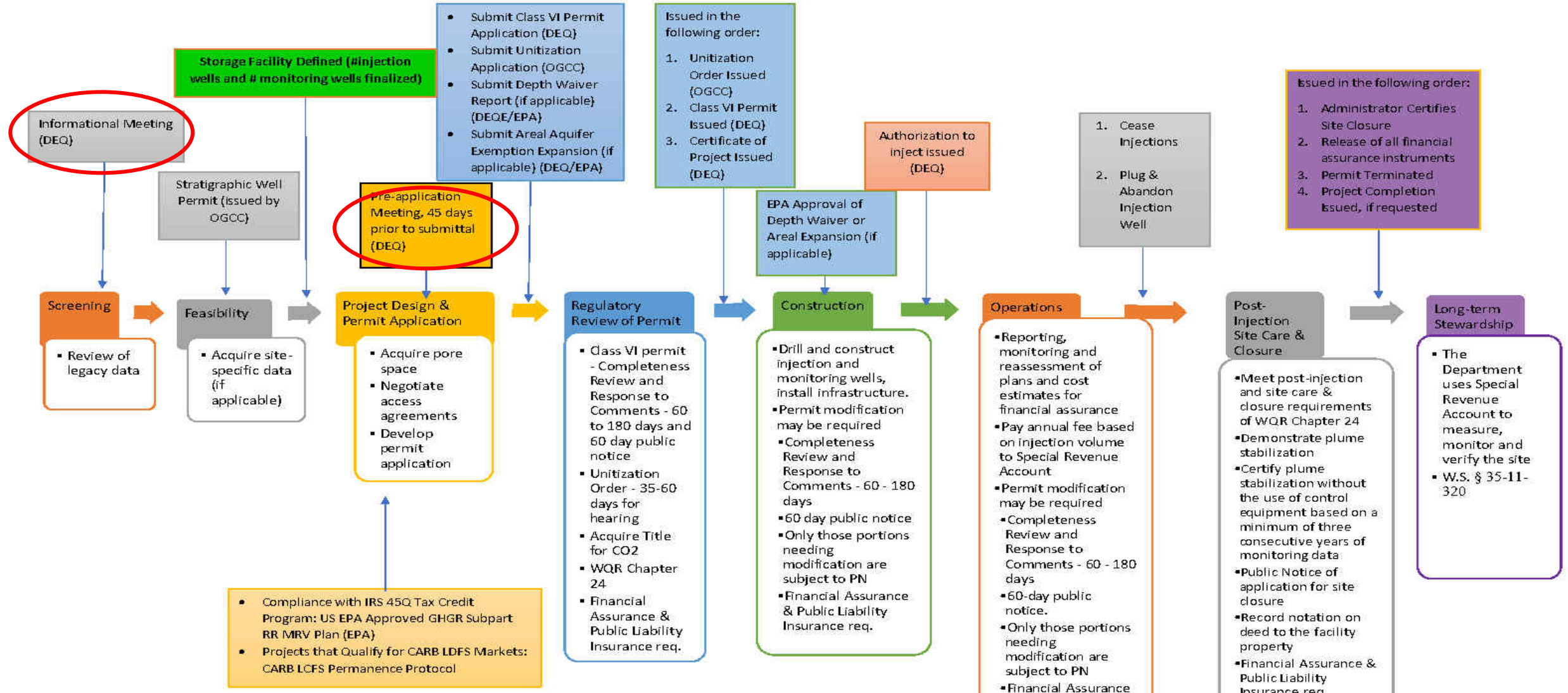
Title

- SF0047 Carbon Storage and Sequestration Liability:
- An ACT relating to geologic sequestration of carbon dioxide; clarifying ownership of carbon dioxide injected into geologic sequestration sites; specifying the transfer of title and liability of injected carbon dioxide.
- Governor Signed March 21, 2022
- W.S. § 35-11-318 – title to sequestered and injected carbon dioxide
- W.S. § 35-11-319 – Certificate of project completion; release; transfer of title and custody



CCUS, Energy & Environmental Research Center, 2021

Carbon Sequestration Storage Sequence



Note: Other items are required for permit and site closure per Wyo. Stat. § 35-11-313 and Water Quality Rules Chapter 24.

Informational Meeting

1. Scope of the project
2. Location, property ownership, Federal mineral estate
3. Site Characterization data identified to date
4. Anticipated timeframe to submit a Class VI permit application

Contact list of other agencies that may have requirements prior to starting a project	
Wyoming Department of Environmental Quality – Industrial Siting Division	Wyoming Office of State Lands and Investments
Wyoming Oil and Gas Conservation Commission	Bureau of Land Management
Wyoming Game and Fish, Habitat Protection Program	County Commissioners (planning and zoning)

Site Characterization

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER QUALITY DIVISION

GEOLOGIC SEQUESTRATION

SITE CHARACTERIZATION

The geologic setting for the proposed geologic sequestration site must be sufficiently characterized. In accordance with Wyoming Water Quality Rules, Chapter 24, Section 12, (a) The geologic system shall be comprised of:

(i) An injection zone of sufficient areal extent, thickness, porosity, and permeability to rec the total anticipated volume of the carbon dioxide stream; and

(ii) Confining zones that are free of transmissive faults or fractures and of sufficient areal e and integrity to contain the injected carbon dioxide stream and displaced formation flui allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zones or causing non-transmissive faults to beco transmissive.

(b) Owners or operators of Class VI wells shall identify and characterize additional zones, if they e that will impede vertical fluid movement, allow for pressure dissipation, and provide additional opportunities for monitoring, mitigation, and remediation. Faults and fractures that transect these shall be identified.

The following checklist should be evaluated to determine whether sufficient information has been collected to characterize the site in accordance with Wyoming Water Quality Rules, Chapter 24, S 12:

Regional geology and geologic structure	Information on lithology, the sequence of geologic units (i.e., the injection a confining zones and USDWs), the thicknesses and lateral extent of formatio and correlation of units near the project site to place the GS project in a regio context. Description of the regional stratigraphy, including stratigraph depictions. Geology should be described from the surface to the confini strata below the injection interval. Stratigraphic units, aquifer, confining zone and the injection interval shall be indicated on any cross-sections. Local geolo

FORM 1
MAY, 2009

Wyoming Oil & Gas Conservation Commission
Office of State Oil and Gas Supervisor
P. O. Box 2640
Casper Wyoming 82602

12. County: | 9. API Number:

5. Split Estate Yes No | If Split Estate, provide the Form 1A.
Answer Yes, if Surface owner differs at all from Mineral owner.

APPLICATION FOR PERMIT TO: (Submit 1 copy on Fed., 2 on Fee & 3 copies on State Lands)
DRILL ☐ RE-ENTER/ DEEPEN ☐ RENEW OR EXTEND ☐

16. Mineral Ownership: Fee ☐ State ☐ Fed ☐
Mineral Lease #:
17. Surface Ownership: Fee ☐ State ☐ Fed ☐

1.
Oil Well ☐ Gas Well ☐ CBM Well ☐
Single Zone ☐ Multiple Zone ☐
Directional ☐ Horizontal ☐ Natural Drift ☐
Other
These in gray require a separate admin or Comm. approval.

Yes No 6. **Well Spacing:**
☐ ☐ Does this well conform to Chapter. 3, Sec.2?
☐ ☐ Is this well an exception location?
If yes, attach the approval letter.
☐ ☐ Is this well in a spaced or exempted area?
If yes, Docket No.or Rule

INFORMATION ON THIS PAGE WILL BE RELEASED TO THE PUBLIC.

2. Operator:
3. Address:
Contact Person: | 3a. Phone Number: | 3b.Email:
7. Unit Name: (for committed lands only)
4. Location (quarter-quarter and footages):
14. DISTANCE from this well BHL to the nearest unit boundary or uncommitted lands, if less than 1120':

Wyoming eForm

Login Name:
Password: Forgot Password?
Operator #: *Industry users only.*

Login

Need to add a user? Register User

Service Version: 1.0.6.0 (@OGCCRBDMS)

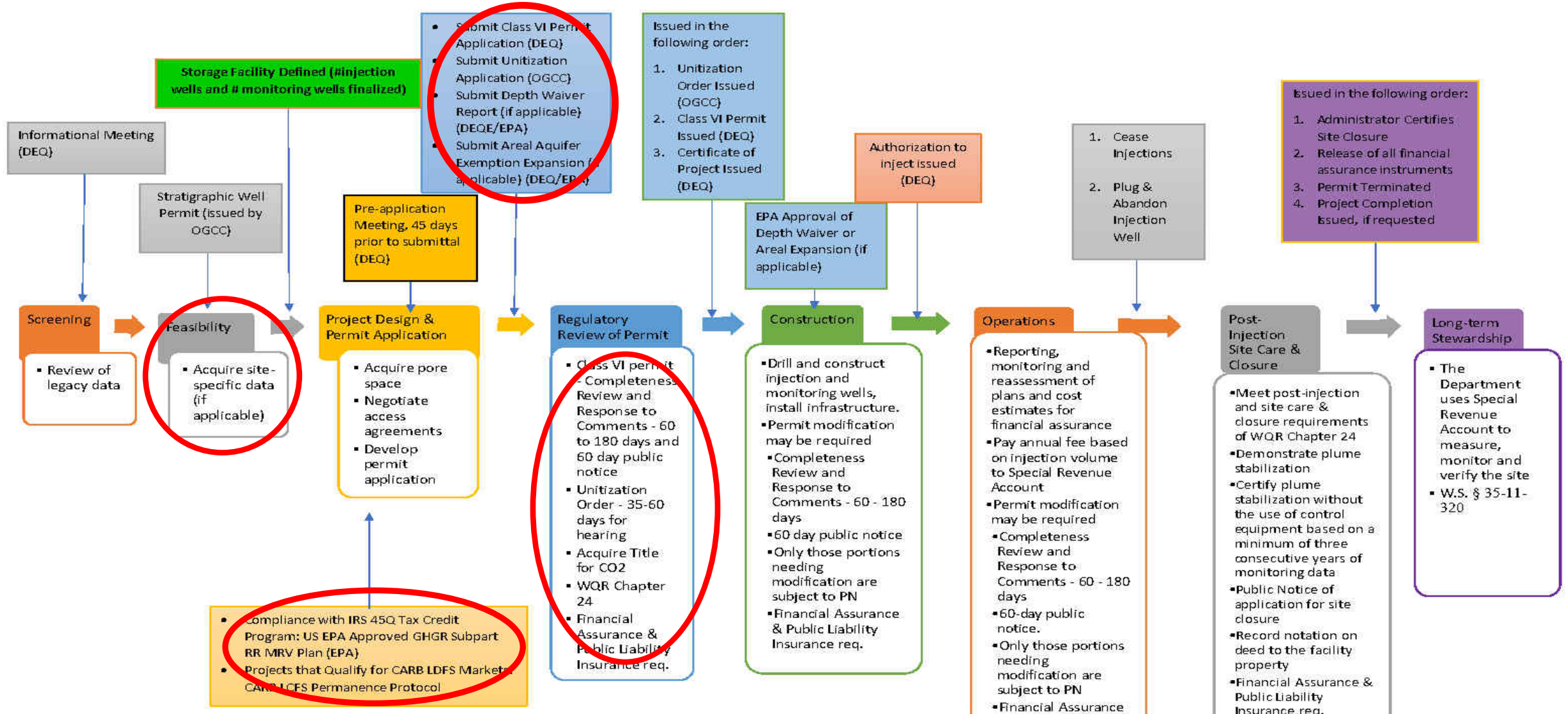
RBDMS
Energy & Water Software | Data Solutions

UIC Class VI Rule and Greenhouse Gas Reporting Requirements Under Subpart RR

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

- Regulatory requirements of the UIC Program and complementary monitoring and reporting requirements of the Greenhouse Gas Reporting Program:
  1. Ensure that sequestered carbon dioxide will remain secure, and
  2. Provide the monitoring to identify and address potential leakage and endangerment to Underground Sources of Drinking Water.

Carbon Sequestration Storage Sequence



Note: Other items are required for permit and site closure per Wyo. Stat. § 35-11-313 and Water Quality Rules Chapter 24.

UIC Class VI Rule and Greenhouse Gas Reporting Requirements Under Subpart RR

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

- Reporting under subpart RR is required for facilities that have received a UIC Class VI permit.
- Subpart RR facilities are required to report
  - Basic information on the mass of carbon dioxide received for injection;
  - Develop and implement an EPA-approved monitoring, reporting, and verification (MRV) plan;
  - Report the mass of carbon dioxide sequestered using a mass balance approach; and
  - Report annual monitoring activities.

Pre-Application Meeting

Meet with coordinators from other divisions to discuss

- Air Quality Permits
- Storm Water Permitting
- Financial Assurance
- Industrial Siting
- Land Quality Division – mine unit permits

Assess the permit application fee

- Reviewing
- Evaluating
- Processing
- Public Notice/Public Hearings

Application

1. General Information and Signatory Authority

- Address,
- Facility location,
- Consultant information,
- Site and facility description,
- SIC codes,
- Review of water quality management plans, wellhead protection area, source water protection area,
- Mineral and surface ownership,
- Access agreement, and
- Certification

2. Technical Information

- Project Information
- Site Characterization
- Area of Review
- Supporting Permit Plans
  - Emergency and Remedial Response Plan
  - Financial Assurance Demonstration
  - Testing and Monitoring Plan
  - Well Casing and Cementing Program
  - Plugging Plan
  - Postinjection Site and Facility Closure Plan
- Injection Well Operations

Unitization

- Order issued through Wyoming Oil and Gas Conservation Commission.
- Requirements for Unitization are outlined in W.S. §§ 35-11-314 through 317.
- Begin the process of pore space access/ownership – leasing early in the process.
- Unitization application requirements W.S. § 35-11-315.
- Unitization Order is required prior to issuance of a Class VI permit.
- Unitization Order is good for one year from the date of issuance; must start construction of the Class VI well within one year of issuance

Aquifer Exemptions

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER QUALITY DIVISION

GEOLOGIC SEQUESTRATION

Injection Depth Waiver Report (Form 2)

PLEASE READ THE INSTRUCTIONS BEFORE COMPLETING THE FORM. APPROVAL MUST BE OBTAINED BEFORE WORK COMMENCES.

An owner or operator seeking a waiver of the requirement to inject below the lowermost USDW shall submit a supplemental report concurrent with the permit application. The application should demonstrate that injection into non-USDWs will not endanger USDWs located above and/or below the injection zone.

Submit this application and attachments to the Water Quality Division electronic submittal website: **https://bit.ly/WDEQ-WQD**.

The report shall contain the following:

A demonstration that the injection zones are laterally continuous, are not USDWs, and are not hydraulically connected to USDWs; do not outcrop within the area of review; have adequate injectivity, volume, and sufficient porosity to safely contain the injected carbon dioxide and formation fluids; and have appropriate geochemistry.	☐
A demonstration that the injection zones are bounded above and below by laterally continuous, impermeable confining units adequate to prevent fluid movement and pressure buildup outside of the injection zones.	☐
A demonstration that the confining units are free of transmissive faults and fractures.	☐
Characterization of the regional fracture properties and a demonstration that the fractures will not interfere with injection, serve as conduits or endanger USDWs.	☐
A computer model demonstrating that USDWs above and below the injection zone will not be endangered as a result of fluid movement. The modeling shall be done in conjunction with the area of review determination described in WQR Chapter 24, Section 13.	☐
A description of how the monitoring and testing and any additional plans will be tailored to this geologic sequestration project to ensure the protection of USDWs above and below the injection zone.	☐
Information on the location of all public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review.	☐
An evaluation of the following information as it relates to siting, construction, and operation of a geologic sequestration project:	

WATER QUALITY DIVISION

GEOLOGIC SEQUESTRATION

Expansion to the Areal Extent of Existing Class II Injection Well Aquifer

Exemptions for Class VI Injection Wells (Form 3)

PLEASE READ THE INSTRUCTIONS BEFORE COMPLETING THE FORM. APPROVAL MUST BE OBTAINED BEFORE WORK COMMENCES.

To expand the areal extent of an existing Class II aquifer exemption, a demonstration that the existing approved aquifer exemption needs to be expanded and that the CO2 plume and pressure front will remain within the expanded exempted area is required. Note that no new aquifer exemptions will be approved for Class VI injection wells.

Submit this application and attachments to the Water Quality Division electronic submittal website: **https://bit.ly/WDEQ-WQD**.

The following checklist should be evaluated to develop the Expansion of Areal Extent of Existing Class II Injection Well Aquifer Exemption request:

Delineate and describe the proposed areal extent of a requested expansion to an existing Class II aquifer exemption based on the predicted extent of the injected CO2 plume and any mobilized fluids (as informed by computational modeling of the AoR) to demonstrate that the project will not allow these fluids to move into a USDW over the lifetime of the project.	☐
Demonstrate that the proposed area of the expanded aquifer exemption: (1) Does not currently serve as a source of drinking water; (2) Has a TDS content of more than 3,000 mg/L and less than 10,000 mg/L; and (3) Is not reasonably expected to supply a public water system.	☐
Define (by narrative description, illustrations, maps, or other means) and describe (in geographic and/or geometric terms such as vertical and lateral limits and gradient that are clear and definite) all aquifers or parts thereof that are requested to be designated as exempted	☐
The predicted extent of the injected carbon dioxide plume and any mobilized fluids that may result in degradation of water quality over the lifetime of the geologic sequestration project, as informed by computational modeling performed	☐

Completeness Review

- 60 days to conduct a completeness review
- Comments are submitted to the operator on application deficiencies
- Resubmittal of information restarts the 60-day completeness review timeframe over
- Non-response after 180 days of WDEQ response will require the permit to be denied based on an incomplete application.

Permit Issuance

- 60-day public comment/notice period.
- WDEQ will hold a public hearing at the end of the public comment/notice period.
- If Unitization is applicable, the OGCC Unitization Order will need to be issued and provided to DEQ prior to the issuance of the permit.
- Financial Assurance for the applicable phase is submitted and approved.
- Liability Insurance is submitted and approved.
- The permit issued allows for well construction. A permit modification may be necessary to receive authorization to inject.
- Certificate of Project is issued.

Class VI Well & Monitoring Wells

- Construct Class VI well and associated monitoring wells
- Collect additional information from well drilling
- Conduct pre-operational testing
- New information – Reevaluate and finalize previously submitted permit reports
- Permit modification may be required: Only those sections of the permit needing modification are subject to public notice requirements

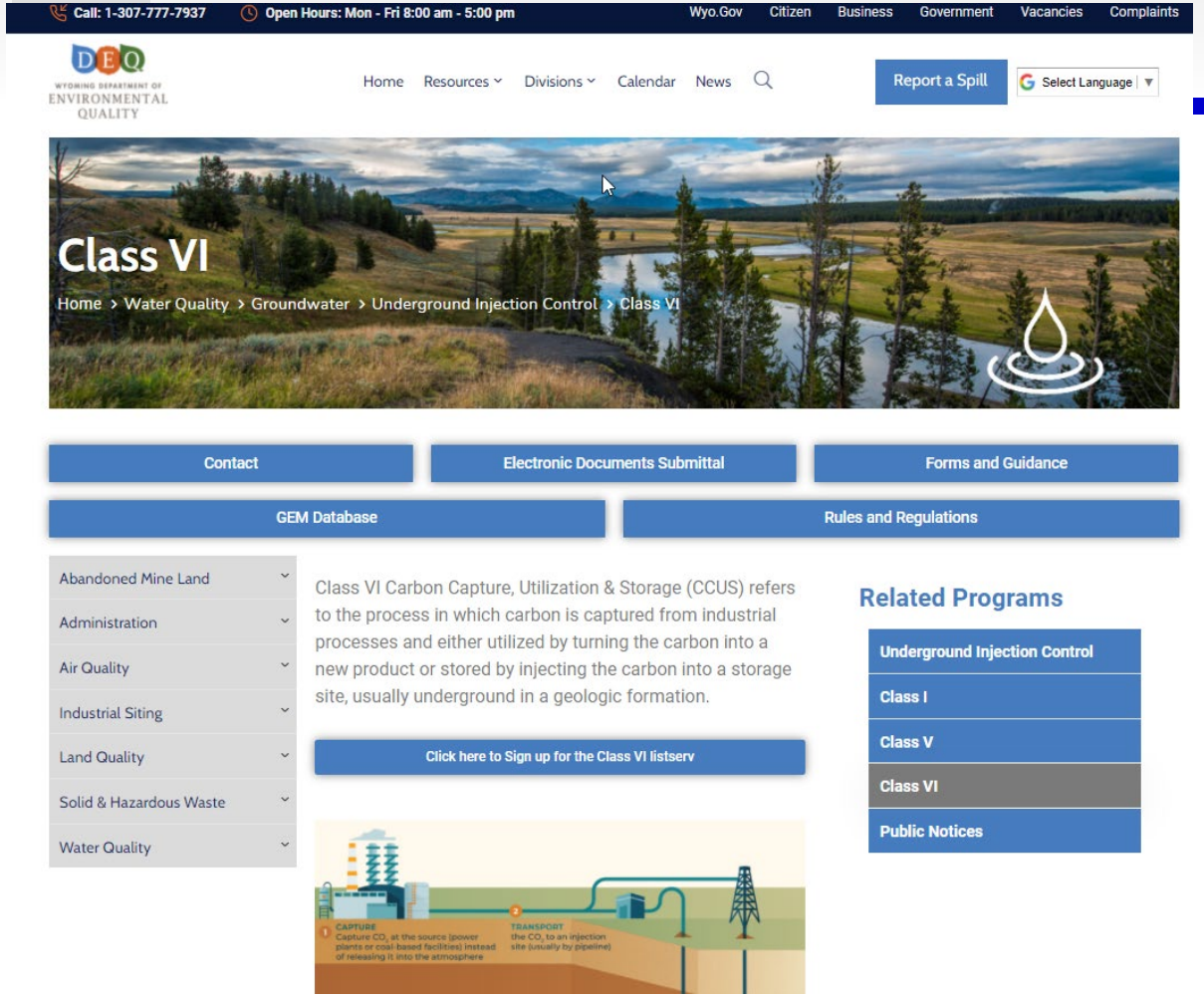
Permit Modification – Authorization to Inject

- 60-day public comment/notice period for those portions being modified.
- Financial Assurance (based on a cost estimate for all phases) is submitted for review and approval.
- Liability Insurance (if updates required) is submitted and approved.
- The permit issued allows for operation and injection

Injections to Closure

- Injection period
  - Collection of injection fees (Chapter 29)
- Cease Injections – Class VI Well Plugging and Abandonment
- Post-Injection Site Care & Closure
- Long-Term Stewardship

Thank you



Contact:

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https://deq.wyoming.gov/water-quality/groundwater/uic/class-vi/