# Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels

U.S. Environmental Protection Agency
Office of Ground Water and Drinking Water

***EPA Discussions with Stakeholders***

# Purpose

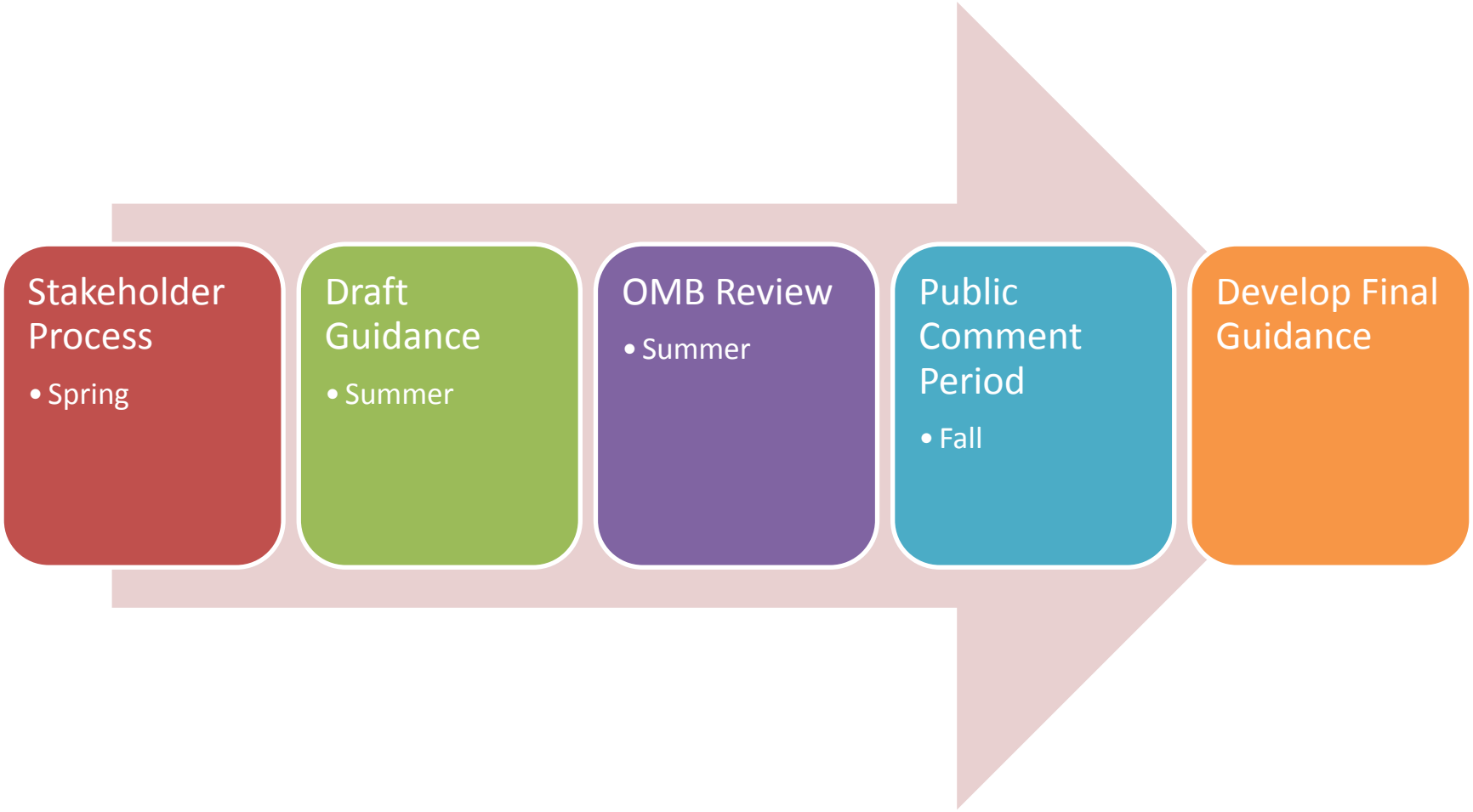
- EPA is accepting input on guidance to assist with permitting of hydraulic fracturing using diesel fuels under SDWA UIC Class II
- Safe Drinking Water Act (SDWA) requires a permit
- Current Underground Injection Control Class II regulations apply
- Regulations provide for additional permit conditions as needed

# About the Guidance

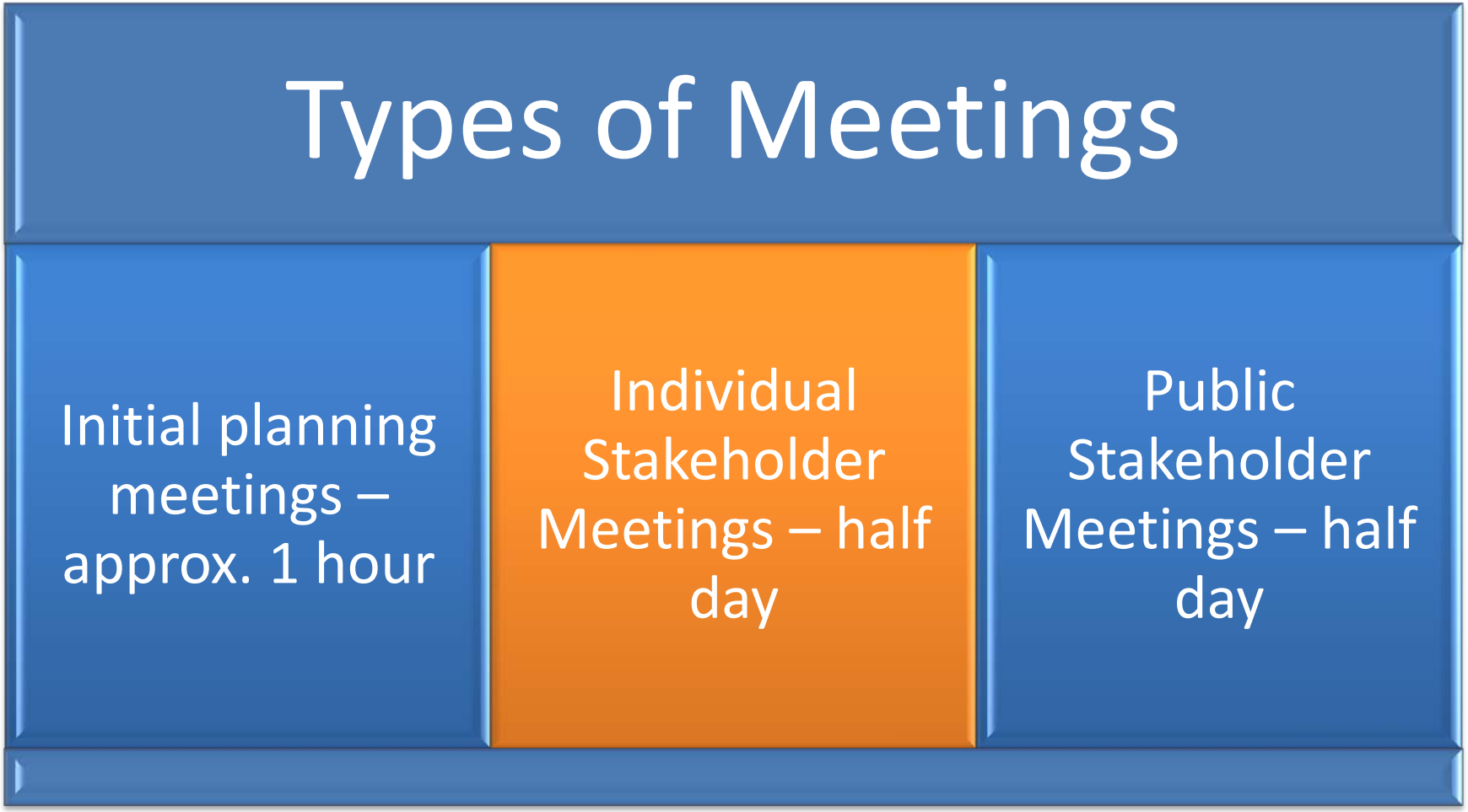
## Important Points to Remember:

| | | | |
|---|---|---|---|
| Guidance based on existing UIC Class II program requirements | Will focus on oil and gas hydraulic fracturing | Will make recommendations for permit writers to consider in writing permits | Cannot set new regulations or change existing regulations |

# Schedule


Stakeholder Process
• Spring
Draft Guidance
• Summer
OMB Review
• Summer
Public Comment Period
• Fall
Develop Final Guidance

# Stakeholder Process

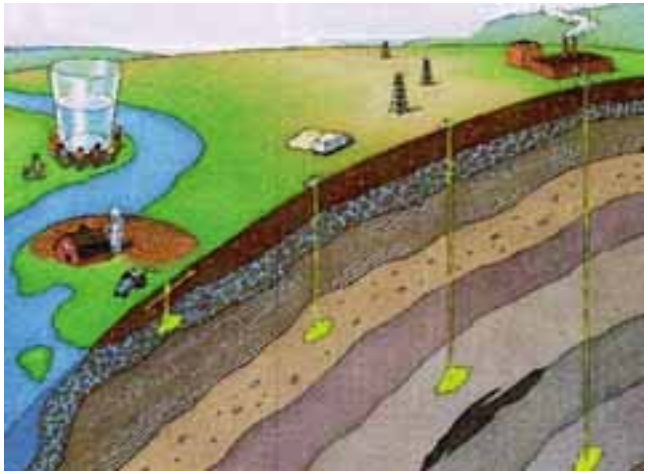


# Background
# *Safe Drinking Water Act*

- Mandate:
  - protect underground sources of drinking water (USDWs) from endangerment caused by underground injection
- 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 System

# Background
# *UIC Program*

- Pathways of fluid migration:
  - Faulty injection well casing;
  - Annulus located between the casing and well bore;
  - Injection zone through the confining strata;
  - Vertical - through improperly abandoned and improperly completed wells;
  - Lateral - from within an injection zone into a protected portion of that stratum; and
  - Direct injection of fluids into or above a USDW.



# SDWA Requires a Permit for Underground Injection

## SDWA Statutory Authority:

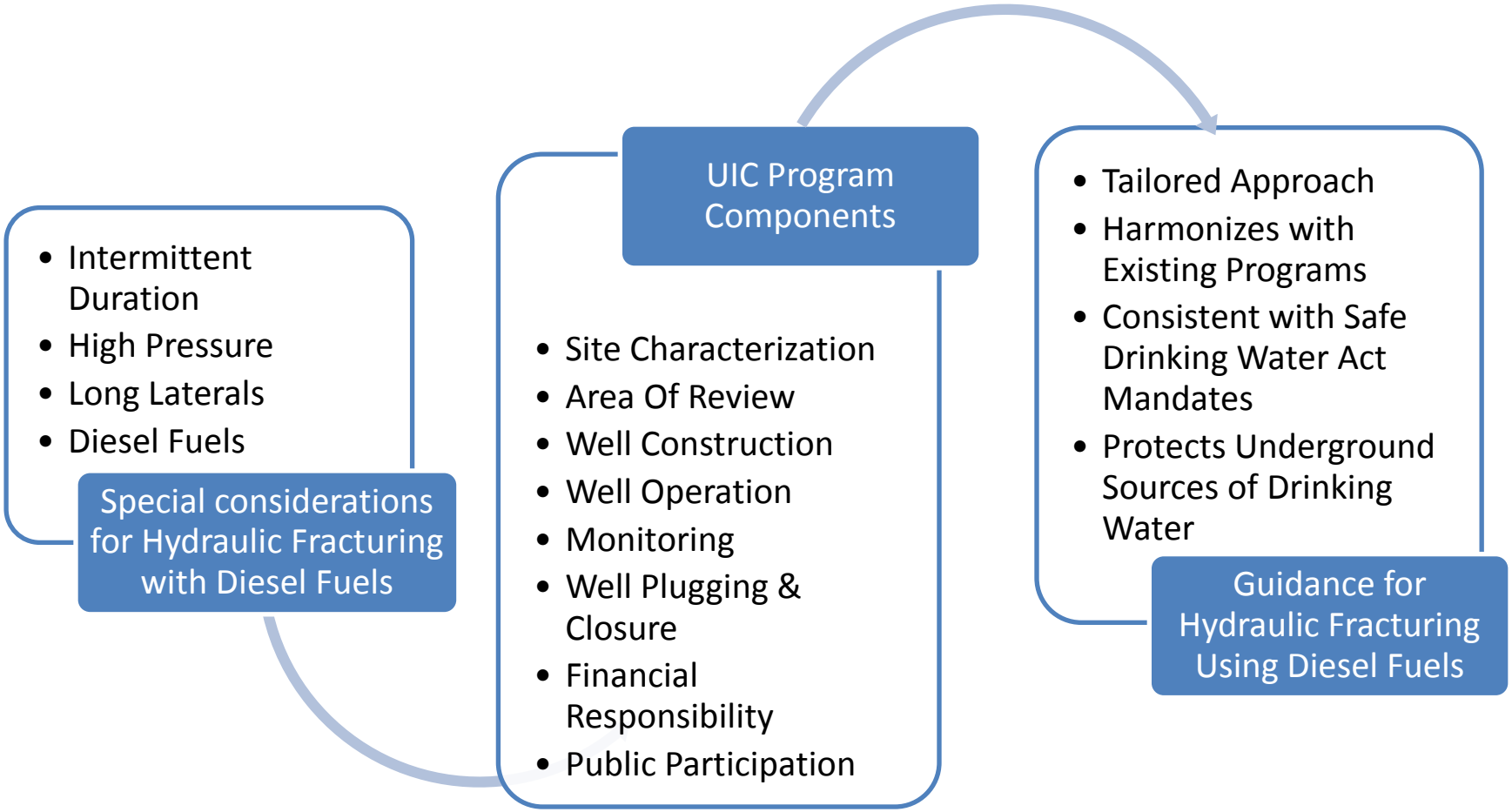
- Definition of "underground injection" (as revised by 2005 Energy Policy Act section 1421(d)(1)(B)) excludes:
  - (i) the underground injection of natural gas for purposes of storage; and
  - (ii) the underground injection of fluids or propping agents **(other than diesel fuels)** pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities.

- 1421(b)(1)(A) requires State UIC programs to prohibit underground injection not authorized by a permit issued by a state (or permitted by rule)

# Underground Injection Control Regulations

- Six classes of injection well
- Class II - oil and natural gas-related injection:
  - Wells injecting fluids brought to the surface in connection with natural gas storage, conventional oil or natural gas production;
  - Enhanced recovery of oil or natural gas; and
  - Storage of liquid hydrocarbons.
- UIC Class II requirements provide a framework

# Program Framework



# Underground Injection Control Regulations

*Key Citations*

- 40 CFR 144.12(a):
  - No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water…
- 40 CFR 144.52(a)(9):
  - *Additional Conditions.* The Director shall impose on a case-by-case basis such additional conditions as are necessary to prevent the migration of fluids into underground sources of drinking water.

# UIC Program Implementation Considerations

- The SDWA (Sections 1422 and 1425) and the regulations provide for various implementation methods:
  - State implementation
  - Direct implementation by the EPA
- States with *effective* programs (1425) have additional flexibility

# Overview of Discussion Questions

- What should be considered as “diesel fuels”?
- What are important siting considerations?
- What suggestions do you have for reviewing the area around the well to ensure there are no conduits for fluid migration?
- What should the permit duration be, considering the intermittent nature of HF and Class II plugging and abandonment provisions?
- What well construction requirements should apply to HF wells using diesel fuels?
- What well operation and mechanical integrity requirements should apply to HF wells using diesel fuels?
- What well monitoring and reporting requirements should apply to HF wells using diesel fuels?
- What information should be submitted with the permit application?
- What should the time frame be for submitting a Class II diesel fuels HF permit?
- What are alternatives for authorizing/permitting Class II wells using diesel fuels for hydraulic fracturing?
- How do the Class II financial responsibility (FR) requirements apply to wells using diesel fuels for hydraulic fracturing?
- What public notification requirements or special environmental justice considerations should be considered for authorization of wells using diesel fuels for hydraulic fracturing?

# Key Question: *What should be considered as "diesel fuels"?*

## Potential Approaches

- ASTM Standard Specification for Diesel Fuel Oils, D975–91*
- Petroleum-derived fuel that could be used in a diesel engine
- Any amount of diesel fuel (whether mixed with or applied to other constituents being injected)

## Other Potential Approaches

*The ASTM standard explains what tests to use to identify "diesel fuel." The particular properties that define diesel fuel are determined based on a series of tests, such as boiling range, volatility, cetane number (a measure of combustion quality), viscosity, carbon residue, sulfur, copper strip corrosion, and others. The series of tests are designed to describe the appropriateness of use in a diesel engine. If the fluid falls within the given range of values for the tests cited, it is considered to be diesel fuel.

Key Question: *What public notification requirements or special environmental justice considerations should be considered for authorization of wells using diesel fuels for hydraulic fracturing?*

## Potential Approaches

- Provide 30-day public notice of a pending permitting action via newspapers, postings, and mailings and in some cases a public hearing
- Provide opportunity for public input if requested (30 days)

## Other Potential Approaches

# Key Question: *What are important siting considerations?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| • Determine integrity of **confining layers** surrounding target injection zone (e.g., porosity, permeability, rock strength)<br>• Determine integrity of the **injection zone** to withstand proposed injection operation activities (e.g., fracture pressures)<br>• Evaluate project area to identify **existing fault or fracture patterns** to confirm that they will not compromise the confining layers or result in endangerment of USDWs during hydraulic fracturing events<br>• Demonstrate that proposed hydraulic fracturing events will not endanger USDWs within the project area | |

# Key Question: *What suggestions do you have for reviewing the area around the well to ensure there are no conduits for fluid migration?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| • Delineate the area of review (AoR):<br>  • using a fixed, ¼ mile radius around the wellbore, or<br>  • by calculating the zone of endangering influence<br>• Identify all artificial penetrations and evaluate features that may allow upward migration<br>• Determine if artificial penetrations and geologic features provide an adequate seal<br>• Remediate (corrective action) if possible | |

# Key Question: *What well construction requirements should apply to HF wells using diesel fuels?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| •Cased and cemented to prevent movement of fluids into or between USDW<br>•Construction materials designed for the life expectancy of the well<br>•Extend surface casing and cement through the base of the lowermost USDW<br>•Add requirements for wells adjacent to protected water supplies or other close proximity wells | |

# Key Question: *What well operation and mechanical integrity requirements should apply to HF wells using diesel fuels?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| •No significant leak in the casing, tubing, or packer<br>•No significant fluid movement into USDWs through vertical channels adjacent to the injection well bore<br>•Testing at least once every five years<br>•Conduct pressure testing prior to hydraulic fracturing to demonstrate well integrity<br>•Conduct mechanical integrity testing: before and after HF events (using diesel fuels) and/or during an HF event (using diesel fuels), conduct pressure monitoring?<br>•Use blow-out preventers | |

# Key Question: *What monitoring and reporting requirements should apply to HF wells using diesel fuels?*

## Potential Approaches

- Conduct logging, sampling, and testing to assess the injection and confining zones: During drilling and construction
- Monitor the nature of the injected fluids: At a frequency sufficient to yield data representative of the fluid characteristics
- Monitor injection pressure, flow rate, and cumulative volume: At least monthly
- Conduct baseline sampling of USDWs (and other formations) within the project area

## Other Potential Approaches

# Key Question: *What should the permit duration be, considering the intermittent nature of diesel fuels HF and Class II plugging and abandonment provisions?*

## Potential Approaches

- For the operating life of the facility
- For the duration of the fracturing activity
- Manage the well as temporarily abandoned or inactive during periods of production (when no injection is occurring), while ensuring that:
  - HF activities using diesel fuels are operated and monitored
  - Reporting, monitoring, and mechanical integrity testing are conducted throughout the life of the well

## Other Potential Approaches

# Key Question: *What are alternatives for authorizing/permitting Class II wells using diesel fuels for hydraulic fracturing?*

## Potential Approaches

- Area permits
- Individual permits

## Other Potential Approaches

# Key Question: *What information should be submitted with the permit application?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| • Maps and cross sections of project area/ AoR showing fracture network<br>• All known wells in AoR that penetrate formations affected by increased pressure<br>• Data on injection and confining zones<br>• Results of logging and testing conducted during well siting (or prior to permit application development)<br>• Well schematics<br>• Casing and cementing program with pressure tests (for new wells)<br>• Operating data and proposed fracturing and injection procedure<br>• Chemical and physical characteristics of injection fluid<br>• Submit baseline sampling of USDWs (and other formations) within the project area | |

# Key Question: *What should the time frame be for submitting a Class II diesel fuels HF permit?*

## Potential Approaches

- Allow UIC Director to determine
- 30 days prior to activity

## Other Potential Approaches

# Key Question: *How do the Class II financial responsibility (FR) requirements apply to wells using diesel fuels for hydraulic fracturing?*

| Potential Approaches | Other Potential Approaches |
| --- | --- |
| • Owner or operator must demonstrate and maintain financial assurance (trust fund, bond, or other approved mechanisms) to close and abandon the injection operation<br>• Accept oil and gas financial security demonstration as UIC FR | |

# Key Implementation Questions

How could permitting for HF using diesel fuels be done effectively, efficiently, and responsibly?

How many wells using diesel fuels do you anticipate will need permits?

How can we establish that diesel has or has not been used?

**For more information about the HF in the UIC Program please visit the following website:**

EPA Website: http://www.epa.gov/hydraulicfracturing