

Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

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Study Background

In 2010, Congress urged EPA to study the relationship between hydraulic fracturing and drinking water.

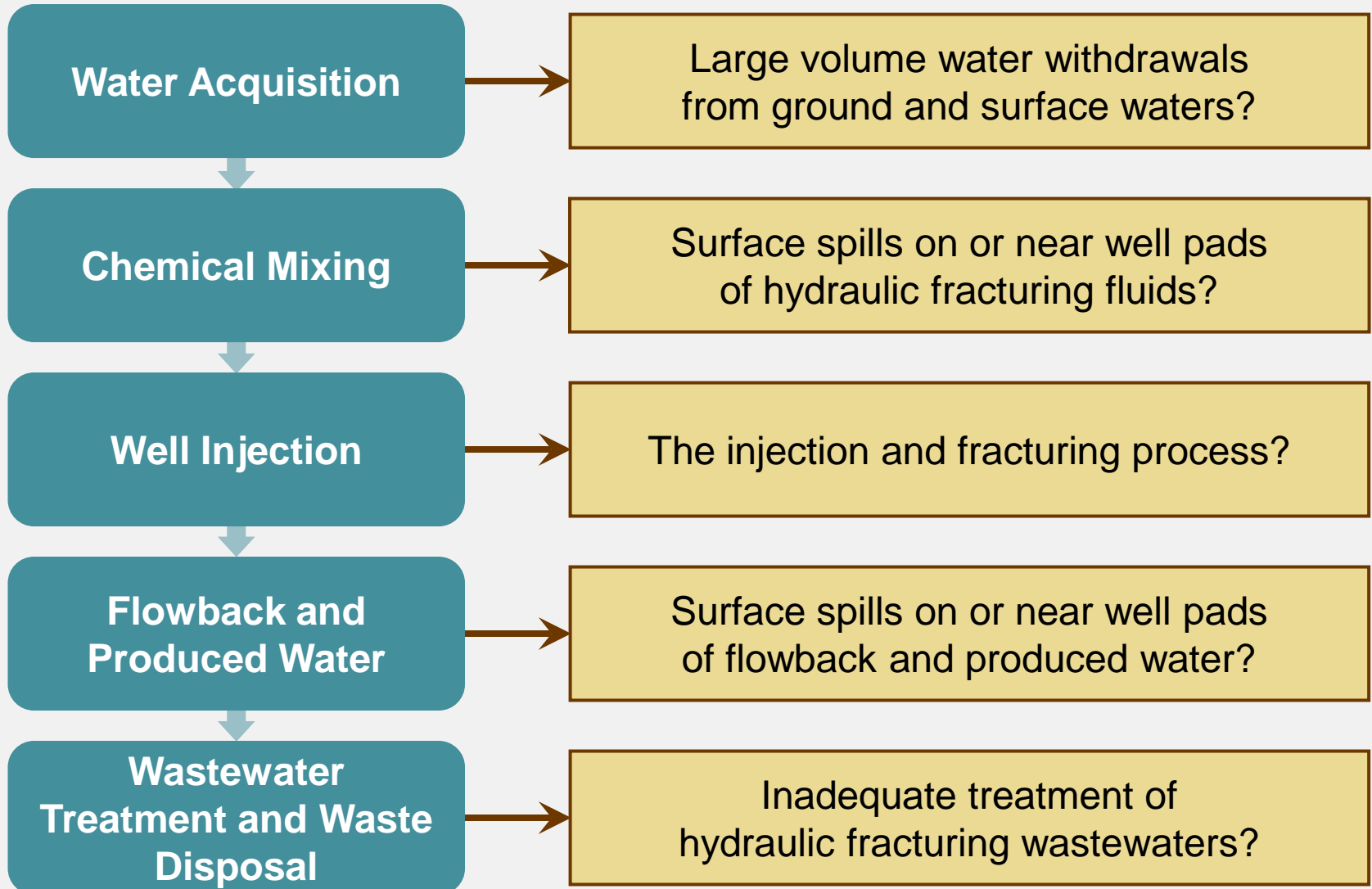
The study purpose is to:

- Assess whether hydraulic fracturing can impact drinking water resources
- Identify driving factors that affect the severity and frequency of any impacts



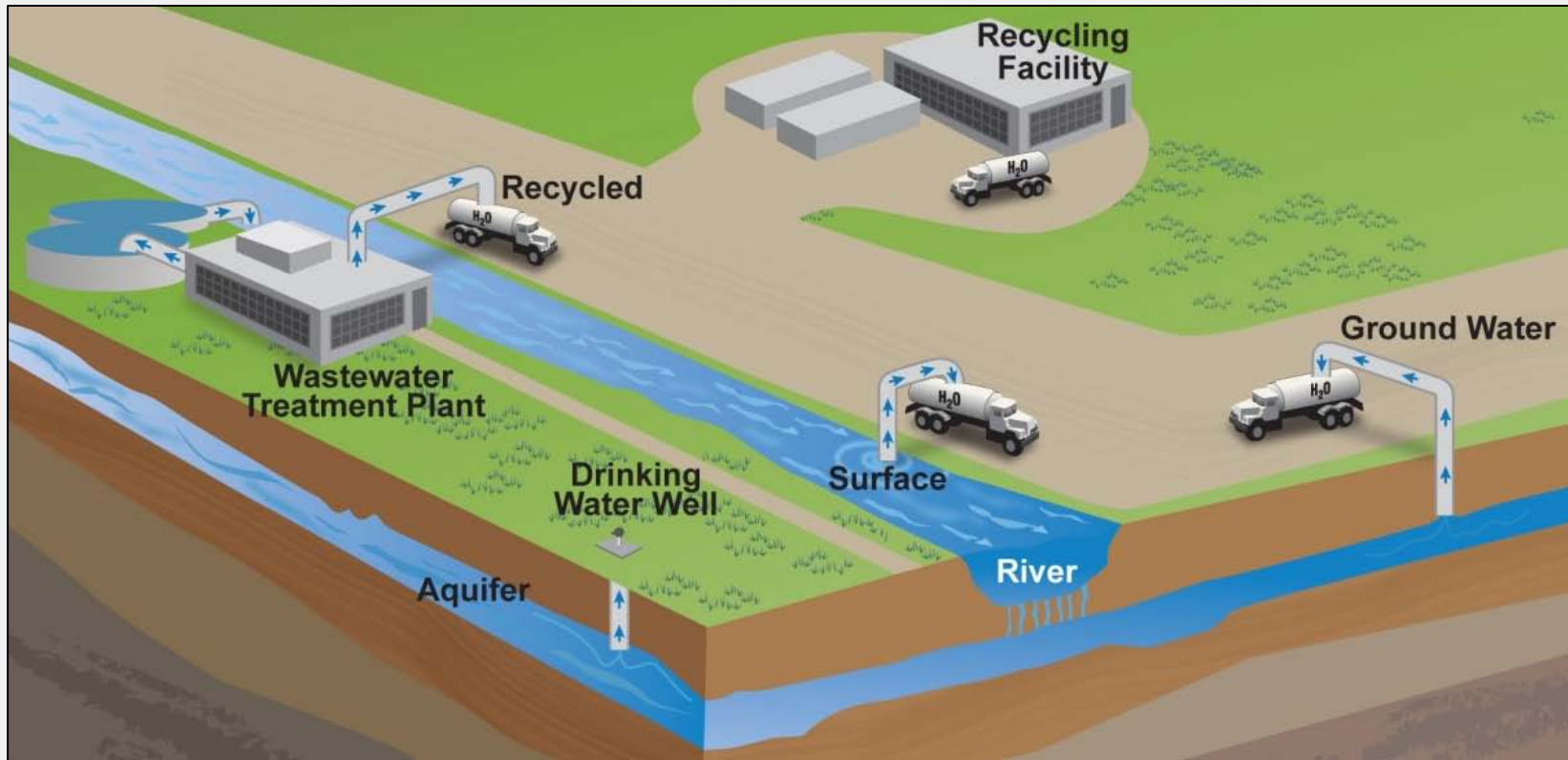
Hydraulic Fracturing Water Cycle

What are the potential impacts on drinking water resources of:



Water Acquisition

What are the potential impacts of large volume water withdrawals from ground and surface waters on drinking water resources?



Research Projects Underway

ANALYSIS OF EXISTING DATA

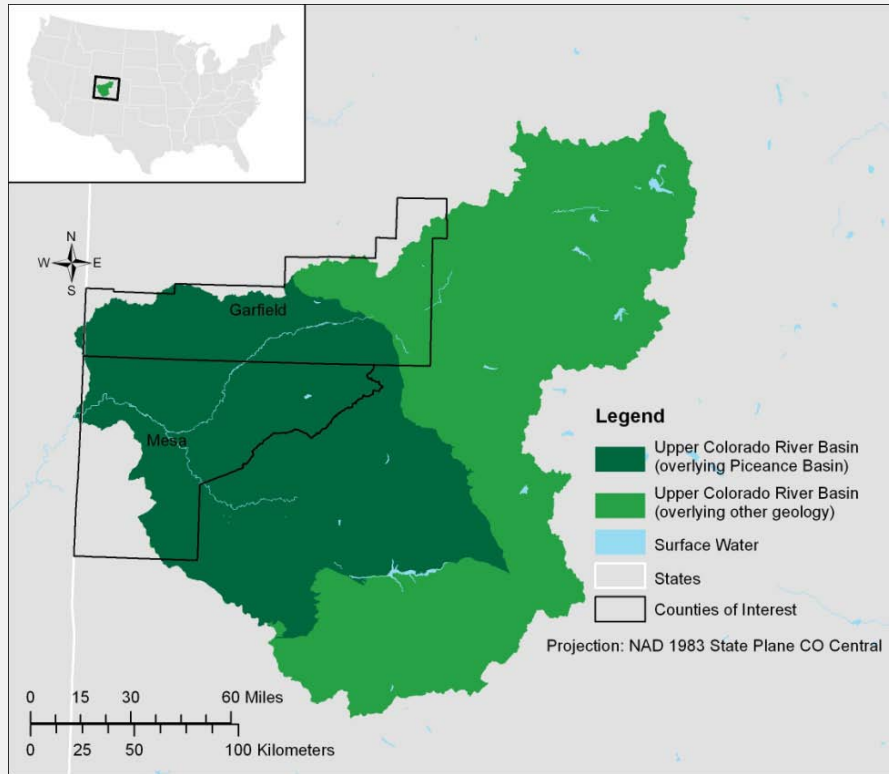
Literature Review | Service Company Analysis
Well File Review | FracFocus Analysis

SCENARIO EVALUATIONS

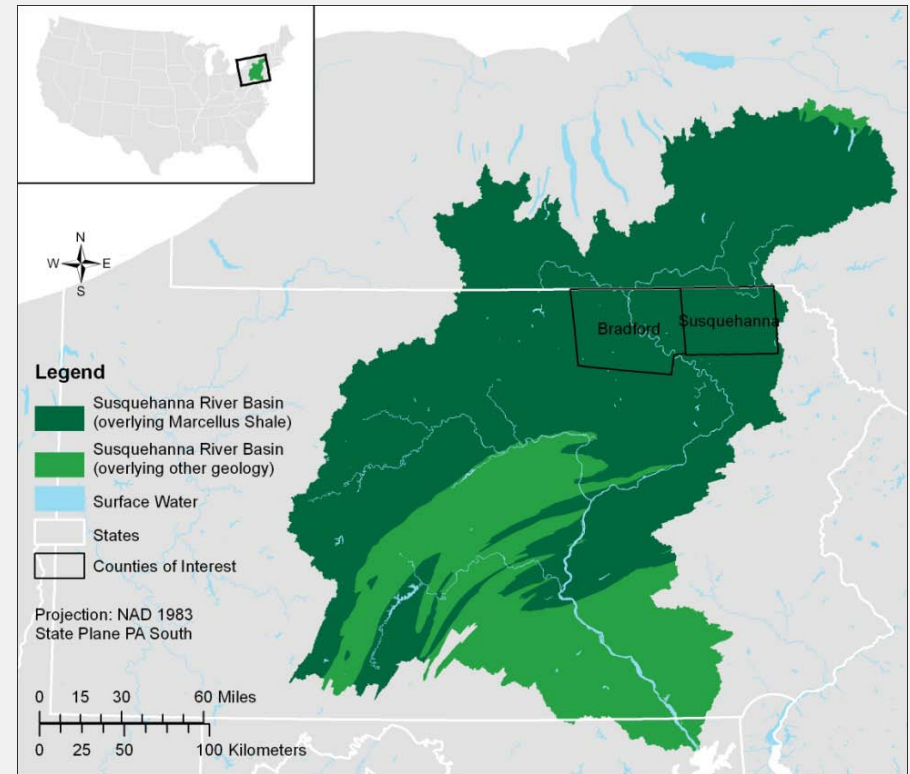
Water Availability Modeling

Water Availability Modeling

Semi-Arid: Upper Colorado River Basin



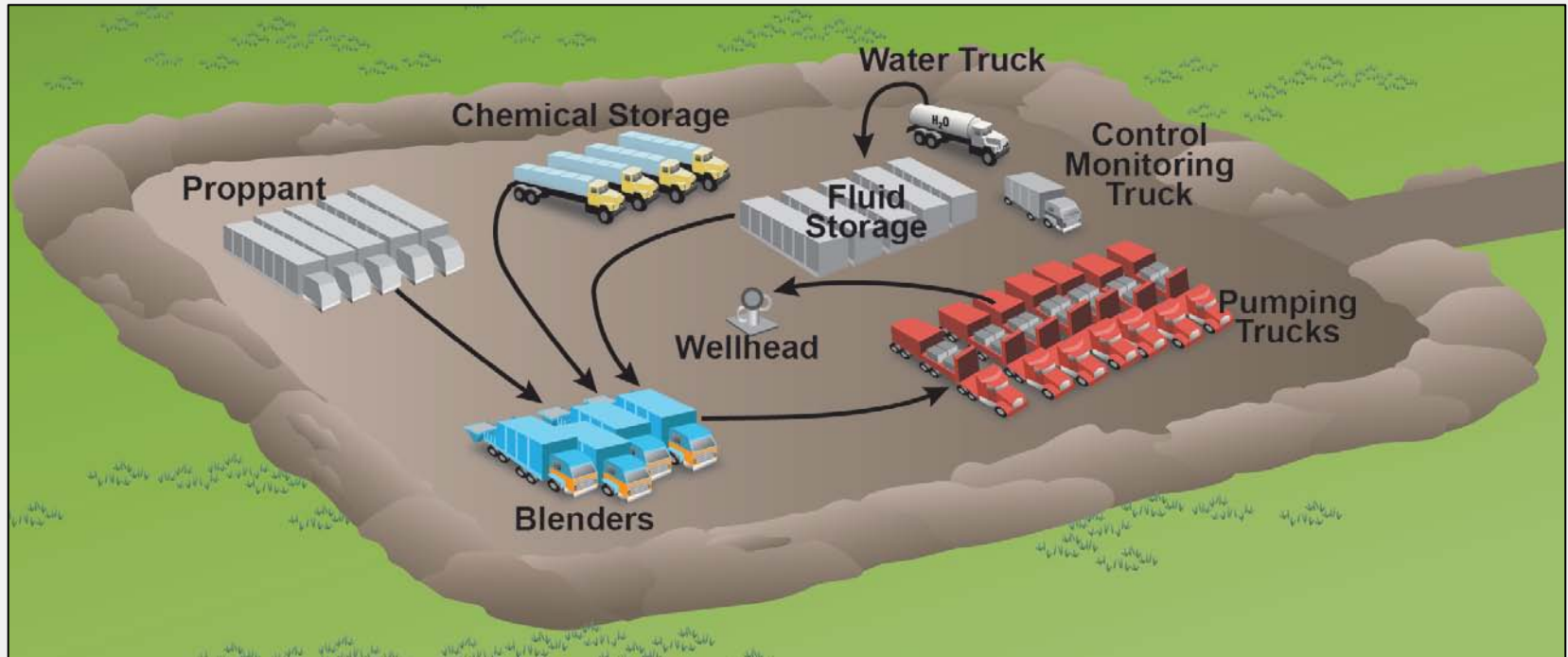
Humid: Susquehanna River Basin



- Modeling the potential impact of hydraulic fracturing on drinking water availability in semi-arid and humid river basins under different water usage scenarios
- Future water use scenarios include: business-as-usual, full development and “recycling plus”

Chemical Mixing

What are the possible impacts of surface spills on or near well pads of hydraulic fracturing fluids on drinking water resources?



Research Projects Underway

ANALYSIS OF EXISTING DATA

Literature Review | Spills Database Analysis
Service Company Analysis
Well File Review | FracFocus Analysis

LABORATORY STUDIES

Analytical Method Development

TOXICITY ASSESSMENT

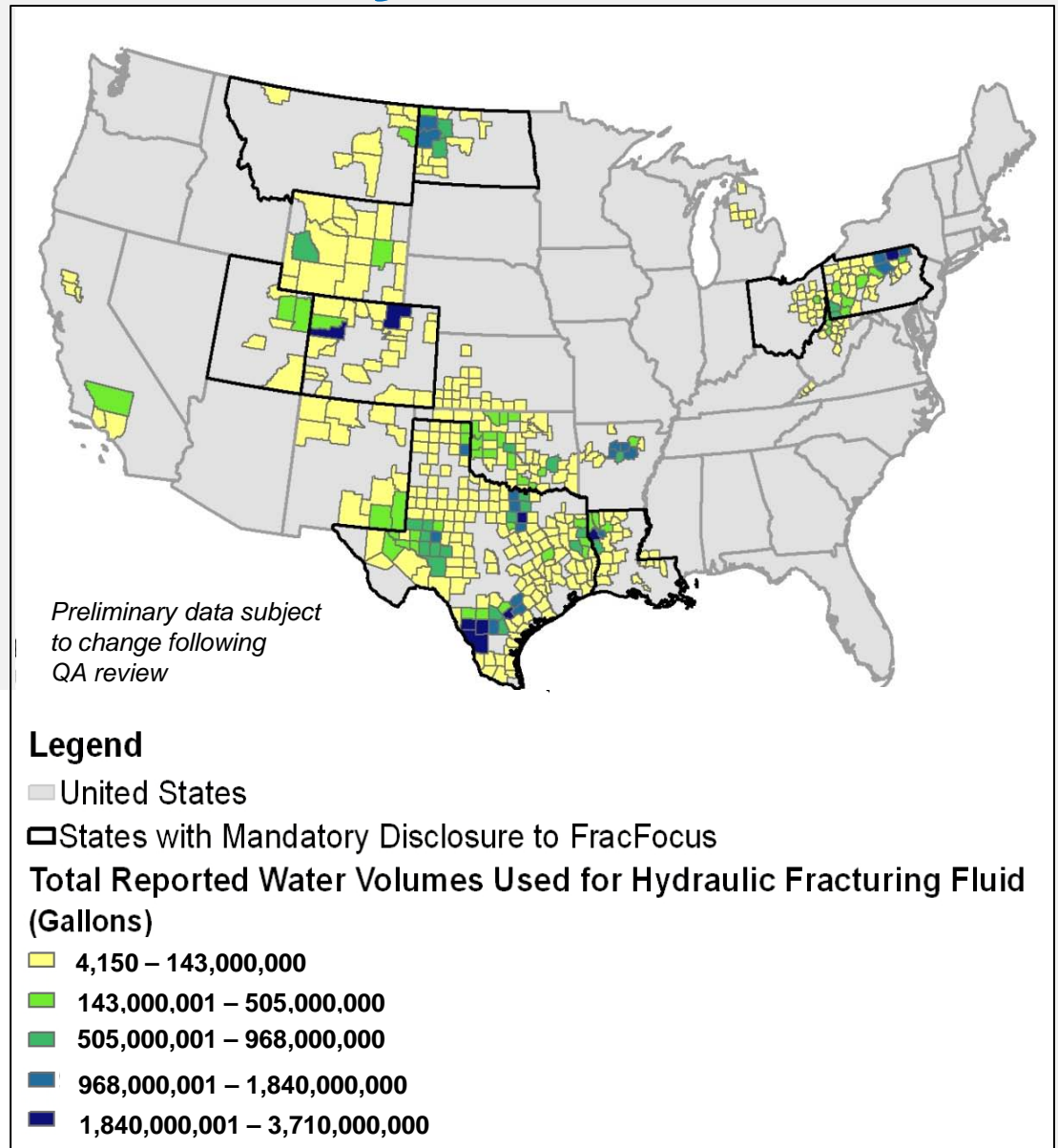
RETROSPECTIVE CASE STUDIES

FracFocus Analysis

- Data submitted to FracFocus with fracture dates between January 1, 2011, and February 28, 2013 will be summarized
- Main topics expected to be described in report
 - Water use
 - Proppants
 - Chemical use
- Summary statistics are expected to be calculated for nationwide data and selected counties

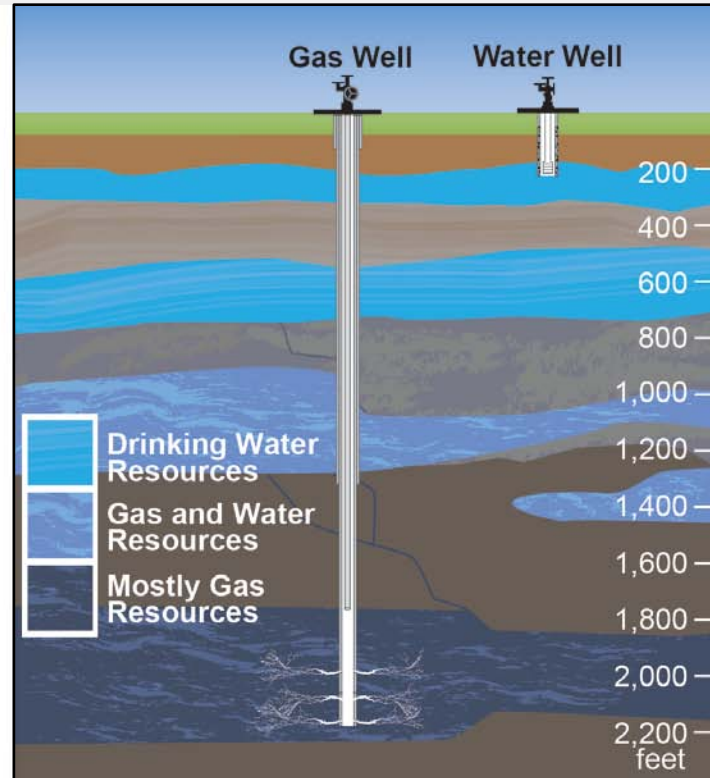
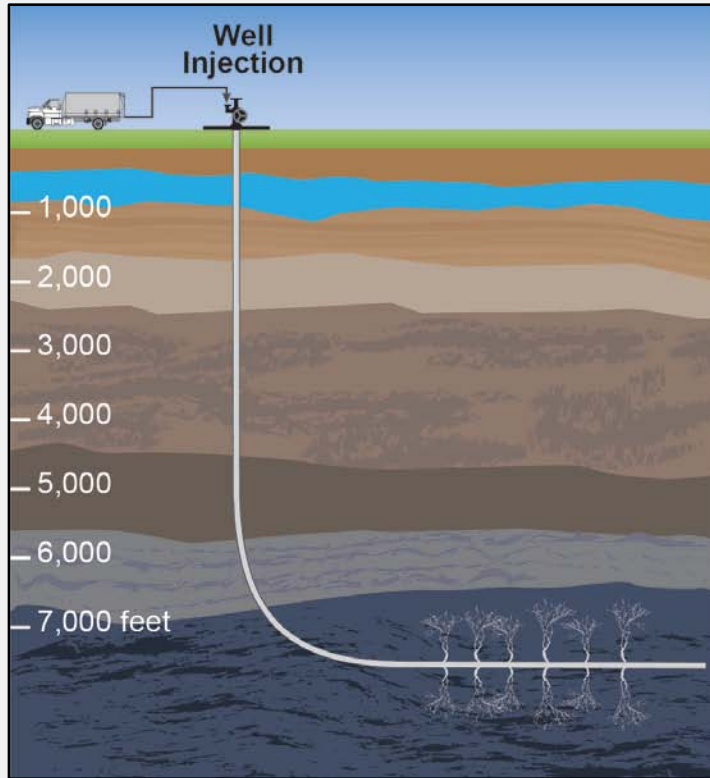
FracFocus Analysis

- Counties will be selected that show diversity in water use and chemical use as a function of geography, geology, and production type
 - Tabular data and GIS data used to select “example” counties



Well Injection

What are the possible impacts of the injection and fracturing process on drinking water resources?



Research Projects Underway

ANALYSIS OF EXISTING DATA

Literature Review
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Well File Review

SCENARIO EVALUATIONS

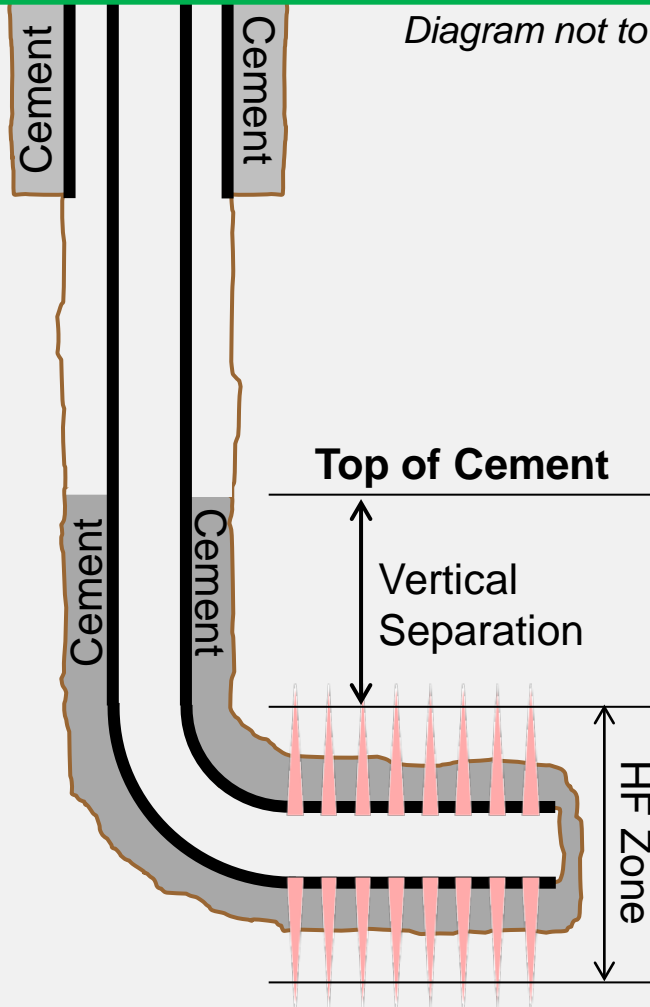
Subsurface Migration Modeling

RETROSPECTIVE CASE STUDIES

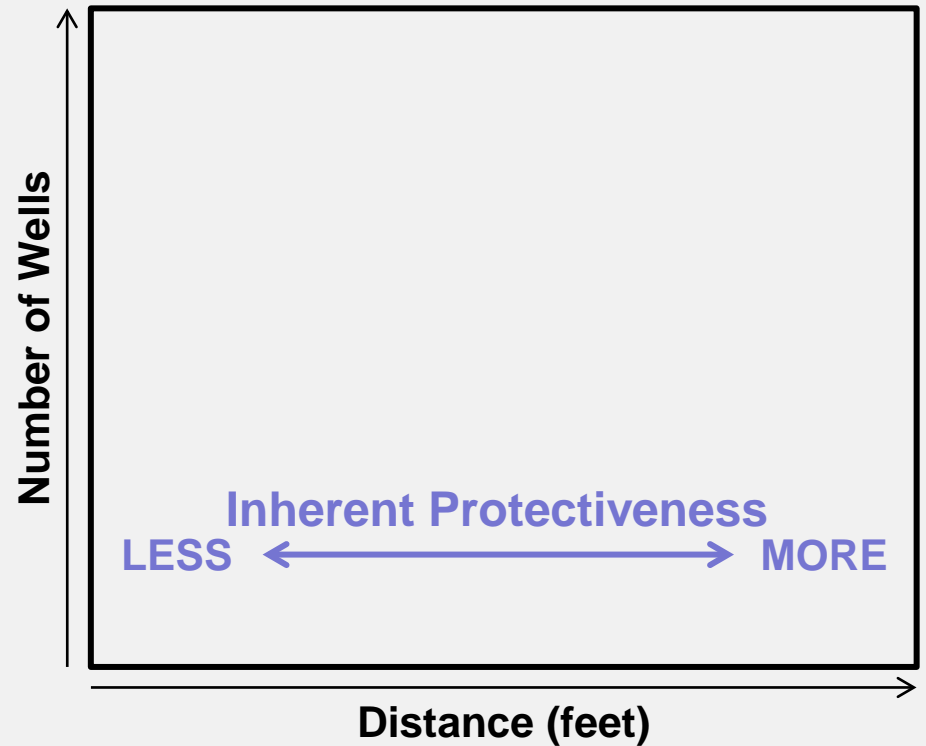
Proposed Graph for Analysis

Generic Well Diagram

Diagram not to scale



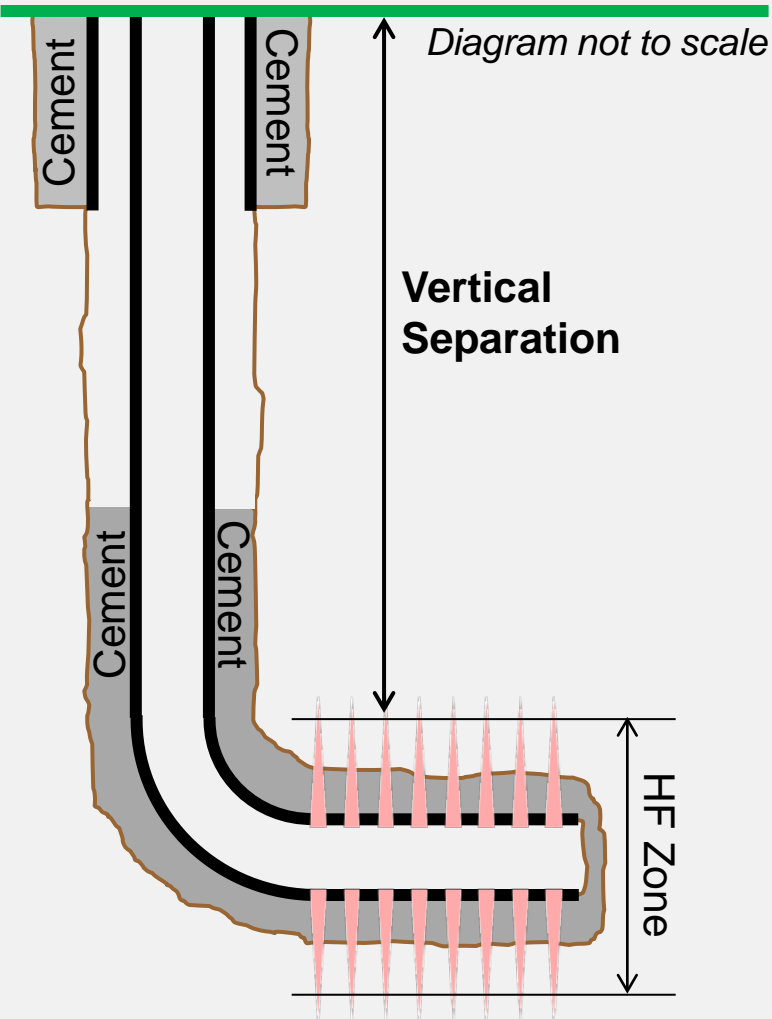
Vertical Separation between HF Zone and Top of Cement (Bar Graph)



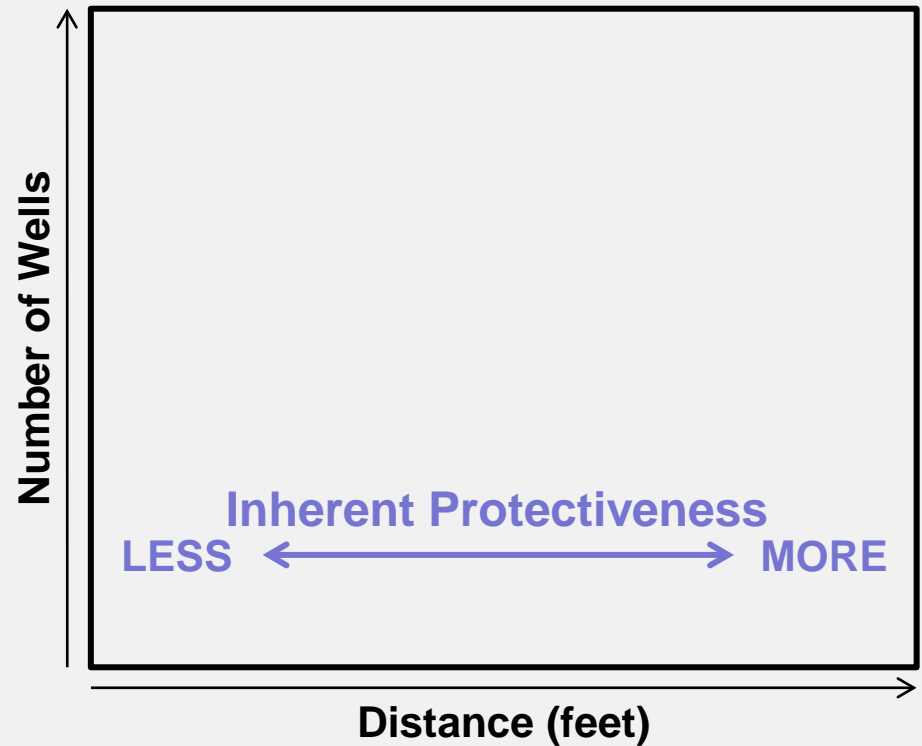
If multiple zones are fractured, distance between top of cement and uppermost zone is graphed

Proposed Graph for Analysis

Generic Well Diagram



Vertical Separation between HF Zone and Ground Surface (Bar Graph)



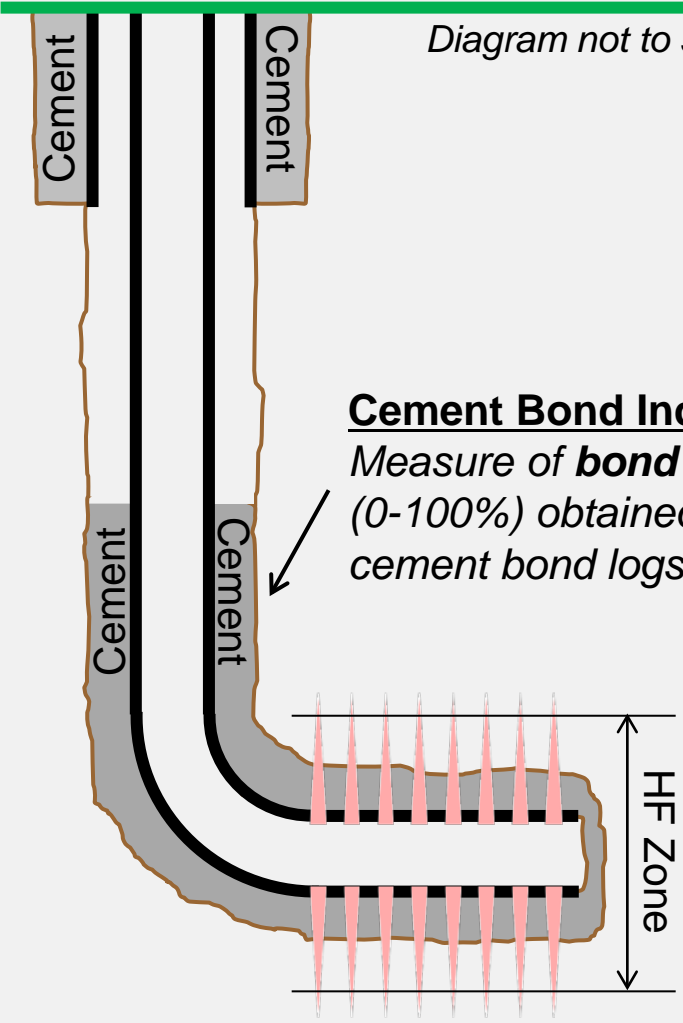
If multiple zones are fractured, distance between ground surface and uppermost zone is graphed

Proposed Graph for Analysis

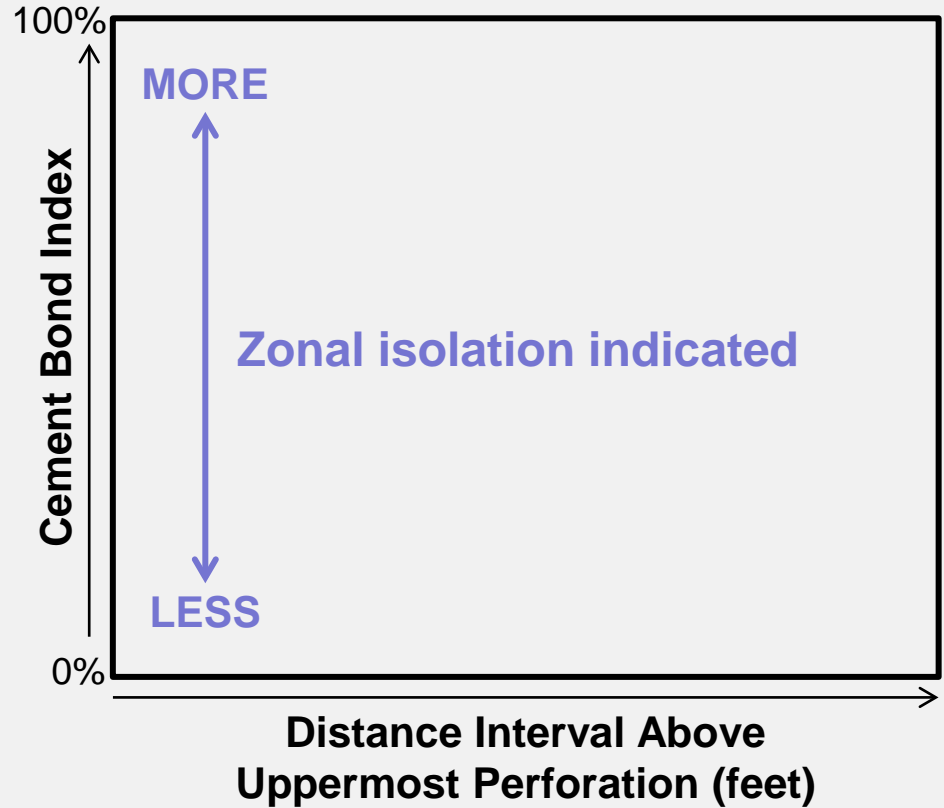
Generic Well Diagram

Diagram not to scale

Cement Bond Index
Measure of bond quality
(0-100%) obtained from
cement bond logs



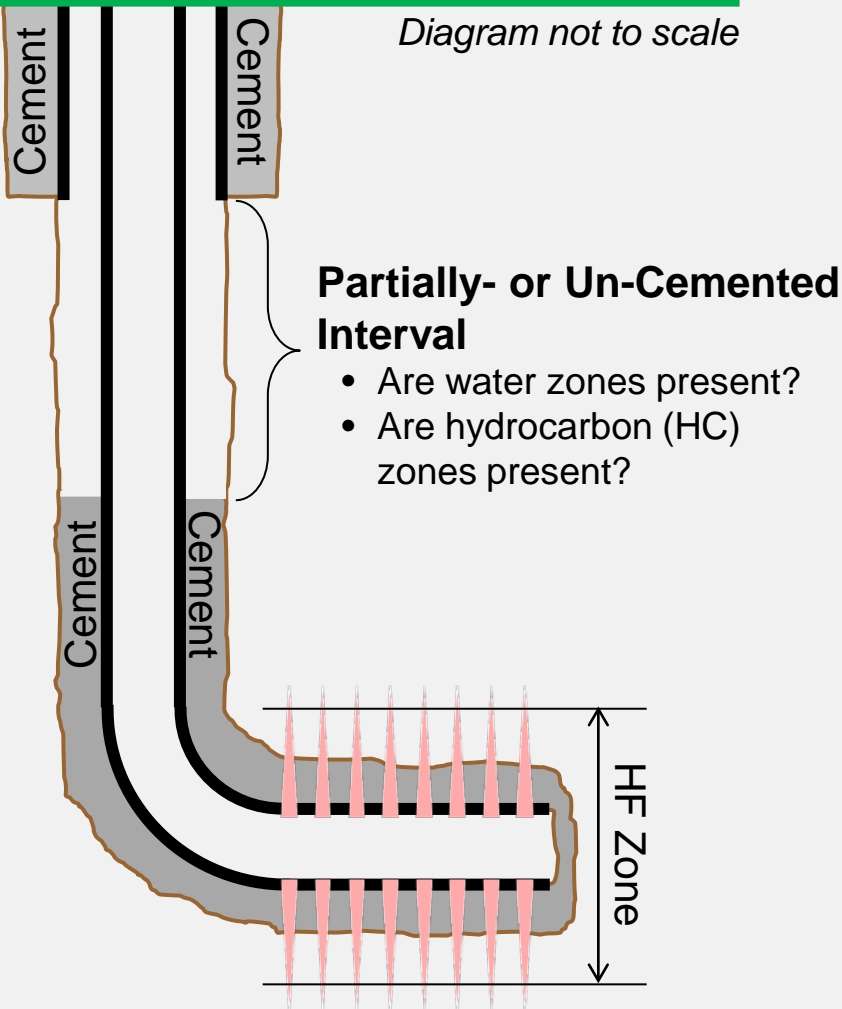
Distribution of Cement Bond Indices
(Box and Whiskers Plot)



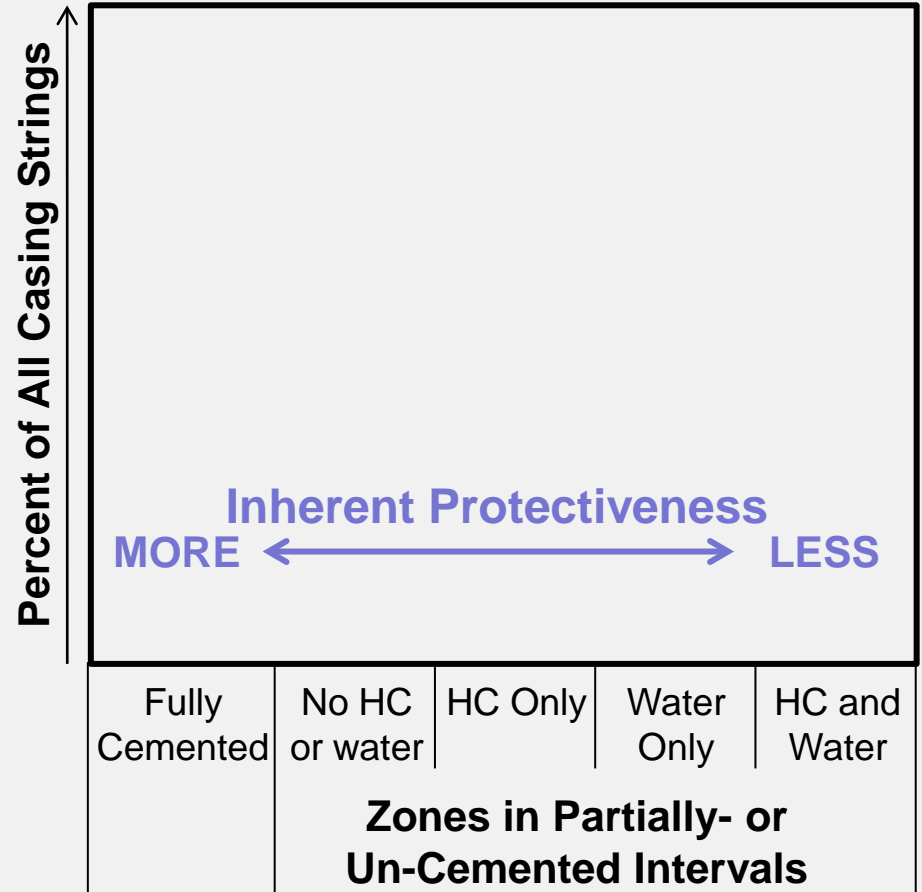
Proposed Graph for Analysis

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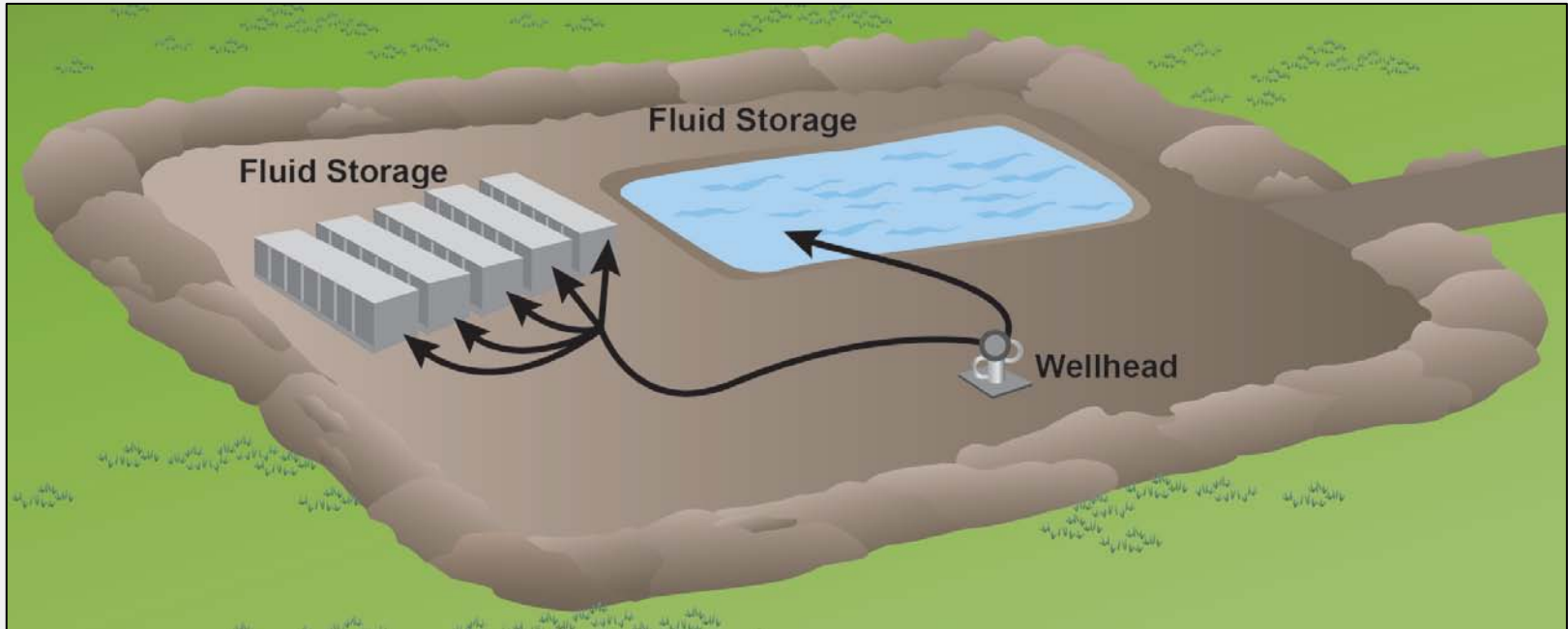


Zones and Degree of Cement (Bar Graph)



Flowback and Produced Water

What are the possible impacts of surface spills on or near well pads of flowback and produced water on drinking water resources?



Research Projects Underway

ANALYSIS OF EXISTING DATA

- Literature Review
- Spills Database Analysis
- Service Company Analysis
- Well File Review

LABORATORY STUDIES

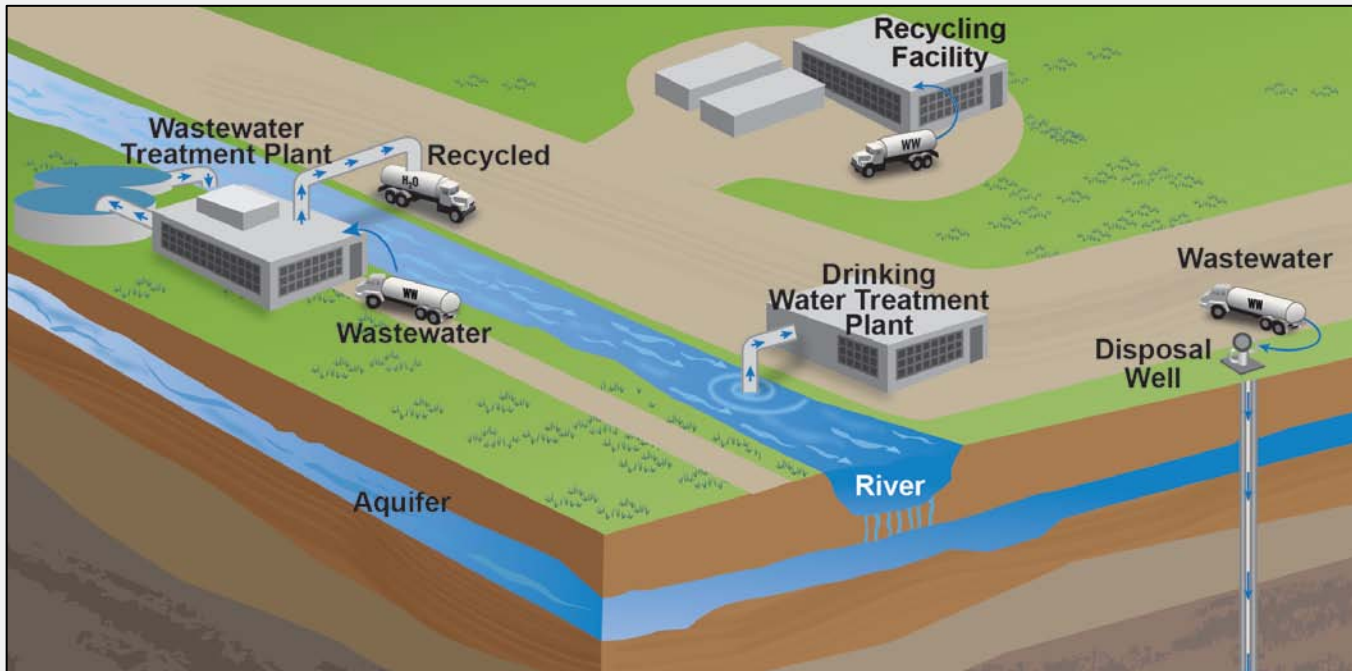
- Analytical Method Development

TOXICITY ASSESSMENT

RETROSPECTIVE CASE STUDIES

Wastewater Treatment and Waste Disposal

What are the possible impacts of inadequate treatment of hydraulic fracturing wastewater on drinking water resources?



Research Projects Underway

ANALYSIS OF EXISTING DATA

Literature Review | Well File Review
FracFocus Analysis

SCENARIO EVALUATIONS

Surface Water Modeling

LABORATORY STUDIES

Source Apportionment Studies
Wastewater Treatability Studies
Br-DBP Precursor Studies

Progress Report

- Includes project-specific updates
 - Research approach
 - Status as of Sept. 2012
 - Next steps
- Does not include research results
- Available at www.epa.gov/hfstudy



Science Advisory Board (SAB)

- On May 7-8, 2013, the SAB Hydraulic Fracturing Research Advisory Panel provided consultation on EPA's study
- In general, panel members:
 - Were impressed with EPA's accomplishments regarding the study given the time and other resource constraints, including the thoroughness and complexity of the research
 - Acknowledged the challenge EPA faces in presenting findings to a broad audience
- Panel members recommended that EPA:
 - Capture basin specific trends and location specific conditions (geology, hydrology)
 - Use professional judgment when making assumptions and interpreting results
 - Write clearly and provide enough detail to inform the public and prevent misinterpretation of data and images, including assumptions and uncertainty
 - Continue to stay informed about new industry practices and technologies
 - Manage expectations about what will be included in the report of results

Study Timeline

US Congress urges the EPA to conduct a study

Peer review of draft study plan*
(February – August 2011)

Release progress report*
(December 2012)

Release final study plan
(November 2011)

Peer review of
draft report of results
(est. late 2014)

Individual reports
and papers

Final report
of results

Planning

Conduct Research

Report of
Results

Technical workshops
(February – March 2011)

Meetings with stakeholders to identify
concerns and study scope
(July – August 2010)

Technical roundtables*
(October 2013)

Technical workshops*
(Spring/Summer 2013)

Technical roundtables* / information request
(November 2012)

****Webinars conducted to
provide updates***

Stakeholder Engagement

Examples of technical input include:

- Described variability in industry and operational practices, many of which can be dependent on shale basin geology
- Discussed trends toward more environmentally-friendly wastewater treatment
- Supplied information for EPA to consider as it conducts subsurface modeling and analytical method development

Questions?

**For more information:
www.epa.gov/hfstudy**