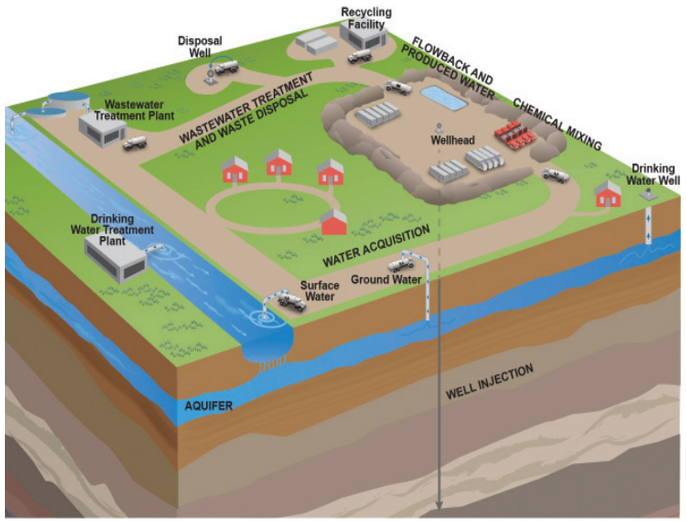
EPA's Hydraulic Fracturing Research in Brief

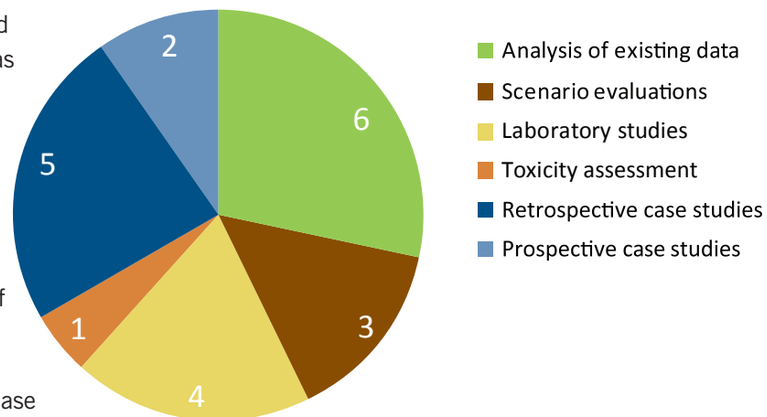


Hydraulic Fracturing Water Cycle

The EPA's study includes research on hydraulic fracturing of shale formations to extract natural gas and oil. The scope of the research is defined by the hydraulic fracturing water cycle—five areas where the process has the potential to impact drinking water resources. It begins with water acquisition and ends with treatment and/or disposal of wastewater.

Number of Projects by Research Activity

The EPA is using a variety of research activities to answer five primary and 16 secondary research questions, as outlined in the Agency's *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*, www.epa.gov/hfstudy. EPA researchers are conducting 21 individual research projects that fall under five types of activities: analysis of existing data, scenario evaluations, laboratory studies, toxicity assessments and case studies. Research progress for each type of research activity is summarized in the 2012 Progress Report.



EPA
United States Environmental Protection Agency

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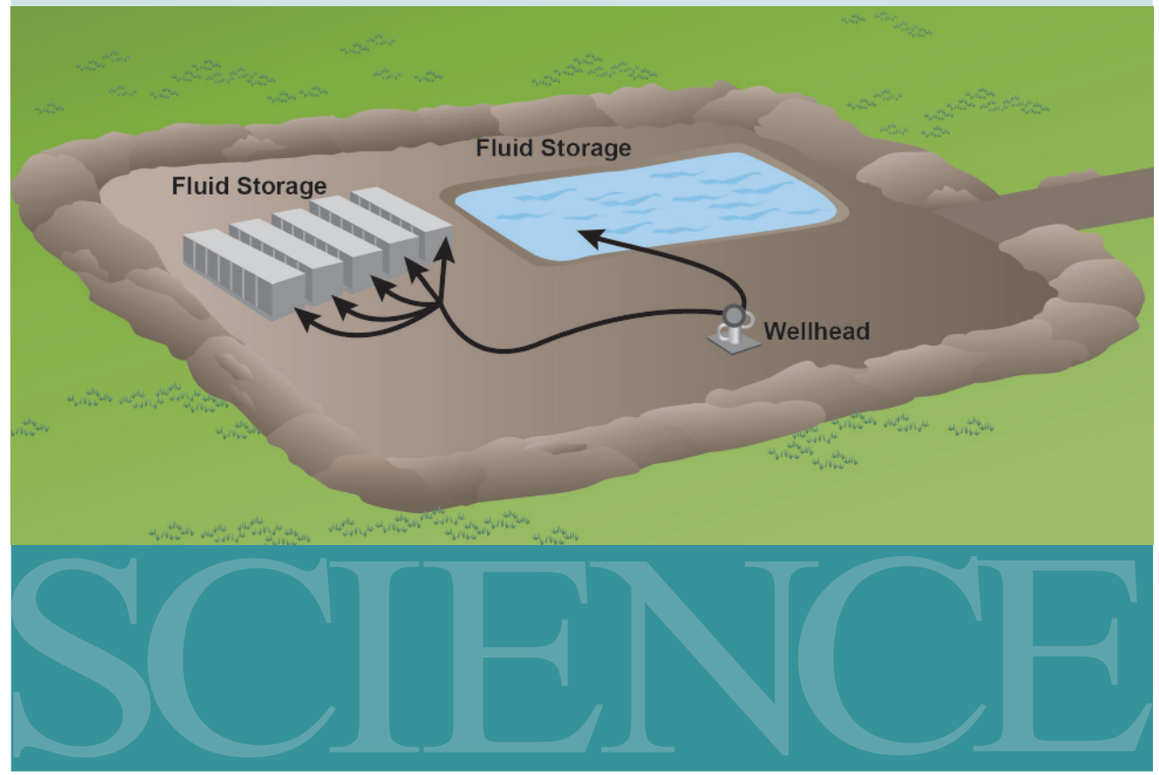
Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

2012 Progress Report

Flowback and Produced Water



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Flowback and Produced Water

What is flowback and produced water?

- Flowback is fluid returned to the surface after hydraulic fracturing has occurred, but before well is put into production
- Produced water is fluid returned to the surface after well is in production
- Both may contain added chemicals, naturally-occurring substances, hydrocarbons and potential reaction and degradation products

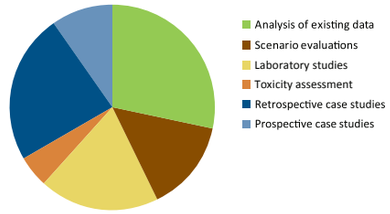
Why is the EPA looking at flowback and produced water as part of this study?

- Onsite transfer and storage of hydraulic fracturing wastewaters may result in accidental releases
- Spilled fluids have potential to flow into nearby surface or ground water, potentially reaching drinking water resources

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

Study Questions	Research Projects
What is currently known about the frequency, severity and causes of flowback and produced water?	• Literature Review • Spills Database Analysis • Service Company Analysis • Well File Review
What is the composition of hydraulic fracturing wastewaters, and what factors might influence this composition?	• Literature Review • Service Company Analysis • Well File Review • Analytical Methods Development
What are the chemical, physical and toxicological properties of hydraulic fracturing wastewater constituents?	• Toxicity Assessment
If spills occur, how might hydraulic fracturing wastewaters contaminate drinking water resources?	• Literature Review • Retrospective Case Studies

Research Projects



Literature Review

Review and summarize literature on:
- Spills of flowback and produced water
- Chemicals found in hydraulic fracturing wastewater
- Environmental fate and transport of selected chemicals in hydraulic fracturing wastewater

Spills Database Analysis

Compile and evaluate spill information from three state databases (Colorado, New Mexico and Pennsylvania) and one national database (National Response Center)

Service Company Analysis

Evaluate information provided by nine hydraulic fracturing service companies—owners and operators of production wells—for the following:
- Spills of flowback and produced water
- Chemicals detected in hydraulic fracturing wastewater

Well File Review

Well files are records of activities that occurred at production wells that have been provided by the nine hydraulic fracturing operators. This effort will evaluate spill data from 333 randomly selected well files

Analytical Method Development

Develop analytical methods for the detection of selected chemicals in hydraulic fracturing wastewater matrices

Toxicity Assessment

Compile or estimate chemical, physical and toxicological properties for chemicals reported to be in hydraulic fracturing wastewater

Retrospective Case Studies

Consider whether spills or leaks of hydraulic fracturing wastewater may be a possible source of reported changes in water quality of local drinking water wells

www.epa.gov/hfstudy