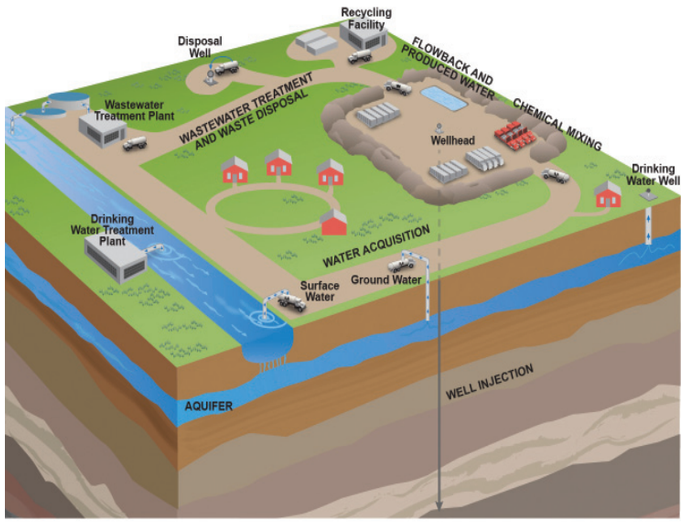
EPA's Hydraulic Fracturing Research in Brief

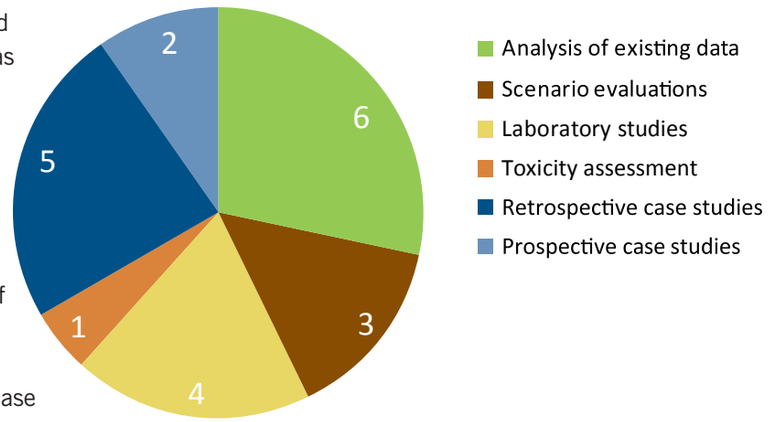


Hydraulic Fracturing Water Cycle

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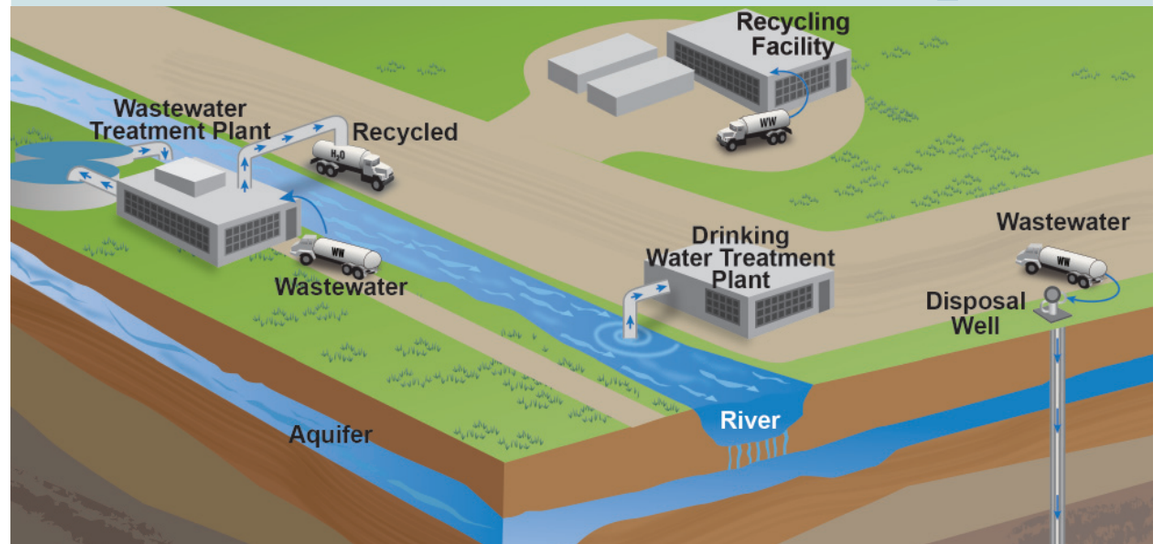
Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

2012 Progress Report

Wastewater Treatment and Waste Disposal



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Wastewater Treatment and Waste Disposal

What is wastewater treatment and waste disposal?

- The last stage of EPA's hydraulic fracturing water cycle is the ultimate fate of process wastewater. Hydraulic fracturing wastewater is managed through several methods including disposal into deep injection wells, treatment followed by discharge to surface water or treatment followed by reuse

Why is the EPA looking at wastewater treatment and waste disposal as part of this study?

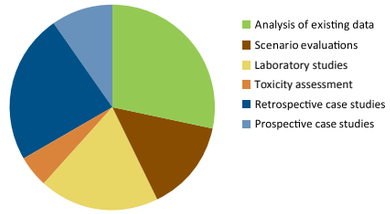
- Contaminants present in wastewater may impact public water intakes that are downstream from publicly owned treatment plants or commercial treatment systems that discharge treated hydraulic fracturing wastewater to surface waters

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

Study Questions	Research Projects
What are the common treatment and disposal methods for hydraulic fracturing wastewater, and where are these methods practiced?	• Literature Review • Well File Review • FracFocus Analysis
How effective are conventional publicly owned treatment works and commercial treatment systems in removing organic and inorganic contaminants of concern in hydraulic fracturing wastewaters?	• Literature Review • Wastewater Treatability Studies
What are the potential impacts from surface water disposal of treated hydraulic fracturing wastewater on drinking water treatment facilities?	• Literature Review • Surface Water Modeling • Source Apportionment Studies • Brominated Disinfection By-Product Precursor Studies

Research Projects

www.epa.gov/hfstudy



Literature Review

Review and summarize literature on:
- Disposal practices associated with hydraulic fracturing wastewater
- Treatability of hydraulic fracturing wastewater
- Potential impacts to drinking water treatment facilities from surface discharge of treated hydraulic fracturing wastewater

Well File Review

Well files are a record of activities that occurred at production wells that have been provided by the nine hydraulic fracturing operators. This effort will summarize data from 333 randomly selected well files on volume and final disposition of hydraulic fracturing wastewater.

FracFocus Database Analysis

Summarize data from FracFocus.org—a voluntary industry database—on water types used for hydraulic fracturing fluids by volume and geographic location, focusing on recycled water

Surface Water Modeling

Apply computer models to calculate downstream concentrations of selected contaminants at public water intakes under a variety of scenarios

Source Apportionment Studies

- Collect samples from two wastewater treatment facilities and river networks
- Use computer models to identify hydraulic fracturing wastewater in samples taken from surface waters with several pollution sources

Wastewater Treatability Studies

Identify fate of selected chemicals found in hydraulic fracturing wastewater in common treatment processes, including conventional, commercial and recycling

Brominated Disinfection By-Product Precursor Studies

Conduct laboratory experiments to study the potential for treated hydraulic fracturing wastewater to form brominated disinfection by-products during common drinking water treatment processes