Retrospective Case Studies – Wise County, Texas
EPA's Study of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources

Case Study Background

EPA conducted a retrospective case study in Wise County, Texas to investigate reported instances of contamination of drinking water resources in areas where hydraulic fracturing activities occurred. EPA examined potential drinking water impacts and potential land use activities in the area, including but not limited to links to shale gas development in the Barnett Shale. This area of North Central Texas has been the focus of natural gas extraction from historical conventional and unconventional gas production and current unconventional gas production from the Barnett Shale.

Goals and Scope of Research

EPA set out to determine if homeowner drinking water wells were impacted, and if so to better understand the potential sources of contamination. The case study was not intended to identify all source(s) of potential impacts in the study area nor conduct detailed contaminant transport and fate studies related to any potential impacts found.

EPA Research Approach

To determine if an impact in Wise County, Texas occurred, EPA collected samples on five separate occasions. Sampling locations are shown on the map below. EPA analyzed water samples for up to 225 constituents, ensuring that a broad spectrum of indicators for potential land activities in the area was considered, including but not limited to those related to shale-gas drilling and production. EPA then evaluated the water quality data and the results from this study against the historical background data which helped determine if potential impacts existed. EPA researchers also analyzed for any changes in general water quality, geochemistry, and isotopic parameters (used to identify sources of impacts to ground water) of drinking water resources sampled in Wise County.

Key Findings from Research

- In two out of the three study locations there were no impacts to ground water. In a third study area, two domestic wells were impacted. Based on the screening of potential sources of impacts, brines associated with the specific geological formation were the only source that was consistent with the observed impacts to two of the study wells.
- A third well located at an industrial facility was potentially impacted by brines and/or landfill leachate.
- Site-specific data were only available for brines from formations in Wise County. Since local data was not available for other potential sources (landfill leachate and other land uses), literature data was used. Although using a combination of site-specific data and literature review data provided insight into which potential sources could potentially explain the impact; there are limitations to such data because differences in precipitation, geology, and ambient groundwater chemistry can result varying signatures of the source fluids.

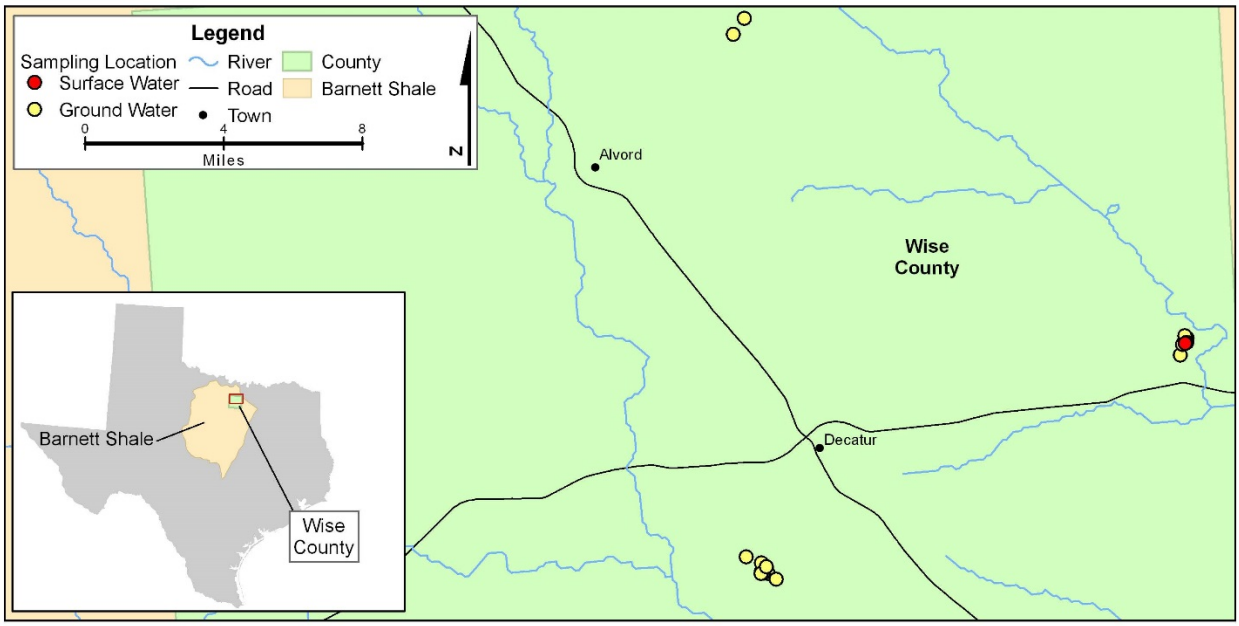
State Activities at the Case Study Location

Texas has taken follow-up actions to protect water resources and to identify the sources of potential impacts near the two impacted domestic wells.

Sampling Activities

Water samples were collected from domestic wells[1], surface water[2], and production wells[3] in three areas where homeowners expressed concerns regarding potential adverse impacts to their well water as a result of drilling and processes related in to hydraulic fracturing of nearby wells. The majority of the domestic well samples (15 of 16) were from the Trinity aquifer which is the primary source of drinking water in Wise County.

A full listing of sampling results can be found in EPA's report: *Retrospective Case Study in Wise County, Texas* at www2.epa.gov/hfstudy/published-scientific-papers.



[1]Domestic well – A homeowner well that serves as source of potable and/or irrigation water for the household.
[2]Surface Water – Water naturally open to the atmosphere (e.g. lakes, streams, ponds, etc.).
[3]Production well – A well used to retrieve petroleum or gas from an underground reservoir.

What are Retrospective Case Studies?
EPA conducted retrospective case studies at locations where hydraulic fracturing had already occurred, and where residents had reported concerns about contamination of drinking water resources. The retrospective case studies may provide information about which, if any, specific geologic and hydraulic fracturing conditions could contribute to impacts on drinking water resources by hydraulic fracturing activities. This is important because the conditions under which hydraulic fracturing occurs may vary between sites, so that the potential for impacts on drinking water resources could also be different. As part of this effort, scientists have looked for evidence of impacts to drinking water resources, and the possible cause(s) of such impacts, if applicable.

How Were They Selected?
To select the retrospective case study sites, the EPA invited stakeholders from across the country to participate in the identification of locations for potential case studies through informational public meetings and the submission of electronic or written comments. Over 40 locations were nominated for inclusion in the study.

These locations were prioritized and chosen based on a rigorous set of criteria, including proximity of population and drinking water supplies, reported evidence of impaired water quality, health and environmental concerns, and knowledge gaps that could be filled by a case study at each potential location. Sites were prioritized based on geographic and geologic diversity, population at risk, geologic and hydrologic features, characteristics of water resources, and land use.

Study Limitations: Retrospective case studies are often constrained by a lack of baseline data (e.g., site-specific water quality data) which limited the EPA's ability to link drinking water resource impacts to definitive causes or sources. Despite the difficulties in determining the specific sources of potential impacts, scientists were still able to use the data collected to shed light on potential vulnerabilities to drinking water resources.