Recommended Practices for Baseline Sampling of Water Wells in Areas of Shale Gas Development

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ABSTRACT

In many areas of shale oil and gas development, sampling of proximate water sources (e.g., residential water wells, springs, seeps, and surface waters) prior to installation or stimulation of production wells (i.e., "pre-drill") is standard practice for oil and gas operators. These programs provide a "baseline" snapshot of water quality for comparison to conditions after oil and gas production commences (i.e., "post-drill"). This information is critical for evaluating whether reported changes in local water quality (e.g., methane, salts, taste, odor) are naturally occurring or the result of nearby drilling activities. However, little guidance is currently available to operators, regulators, and contractors to support development of these sampling programs.

This talk presents the findings of a Department of Energy-funded research project, which evaluated key sources of variability in pre-drill sampling results from a series of residential water wells in Northeastern Pennsylvania and Eastern Kentucky. Findings of this study suggest that sampling methodology can play an important role in the variability of methane concentrations, where a closed-system sampling method yields the most accurate methane concentrations in effervescing conditions. Regardless of the volume of water purged prior to sampling or the timing of sampling events, changes in methane concentration greater than two-fold were rarely observed. Nevertheless, at a subset of wells, the natural variability of methane concentrations during purging or over time was found to correlate closely with changes in sodium and specific conductance of the water. This suggests that mixing dynamics within these wells (i.e., varying mixtures of relatively saline vs fresh water sourced from different fractures or layers intersected by the well) are an important factor contributing to the natural variability of dissolved methane concentration during multiple sampling events. Results from these field studies culminated in the development of recommended practices for sampling of residential water wells in areas of shale development.