

Hello, my name is Lauren Pagel, and I am the Policy Director for Earthworks Oil and Gas Accountability Project. Earthworks is a nonprofit organization dedicated to protecting communities and the environment from the impacts of irresponsible mineral and energy development. Thank you for allowing me to provide comments on behalf of Earthworks to the Science Advisory Board Panel for the Review of the EPA's Hydraulic Fracturing Study Plan.

Earthworks would like to commend the EPA for responding to both a mandate from Congress and to serious public concerns around the issue of hydraulic fracturing by taking an expansive approach to assessing the potential risks to water supplies posed by hydraulic fracturing and other operations closely associated with hydraulic fracturing. Water contamination is possible in nearly any stage in hydraulic fracturing process, from the transport of chemicals to the fate of the flowback and produced water. A study that addresses the full lifecycle will allow the EPA to determine the variety of risks posed and how to best mitigate them.

A full lifecycle analysis will also enable EPA to study the important issue of radioactive waste from oil and gas production and the potential threats this waste poses to both underground sources of drinking water as well above-ground surface waters.

Our experience working with communities across the United States that are impacted by oil and gas drilling has been that one of the most significant factors leading to heightened risk of release and/or contamination is the lack of a regulatory framework to make sure that industry best practices, like those you mention in the study document, are evaluated for efficacy and are indeed followed at every well site. Hydraulic fracturing is inherently a technically complex industrial activity being carried out by fallible human beings. We strongly believe that one of the most valuable outcomes of this study plan would be a realistic assessment of the irreducible risk due to human error – that is, what portion of the overall risk related to hydraulic fracturing is represented by human error, and to what extent is that portion of the risk unlikely to be eliminated.

We are encouraged by the study's plan to look at the issue of well casing, and the acknowledgement from the EPA that "near- and long-term effects of repeated pressure treatments on well components (e.g., casing, cement) are not well understood." Based upon our experience and the experience of those we work with, we believe that the Wattenberg field in Colorado might provide a good opportunity to study the effects of fracturing on casing. The Wattenberg field has a mix of fairly old wells, some of which are giving indications of deterioration of the cement casing, and much newer horizontally drilled wells.

We would like to caution the panel not to rely solely on the "state of the science" in regards to hydraulic fracturing that assumes that natural barriers in the rock strata of oil and gas formations "seals for the gas in the target formation" and "act as barriers to the vertical migration of fracturing fluids." In our experience, there is little scientific basis for this assumption, along with the assumption that it is difficult to predict and control the location and length of fractures. In at least one reported legal case that we know of, the

expert testimony was that fractures could extend as much as 3000 feet beyond where they were expected to go. Therefore, we believe it to be of paramount importance that the case studies directly and clearly assess this core uncertainty. We urge that the retrospective case studies carefully evaluate the extent to which the fracture modeling, if any, matched the actual extent and location of fractures. Similarly, we urge that the prospective case studies explicitly evaluate this issue as well.

Earthworks supports the EPA moving forward with both retrospective and prospective case studies. We ask that the SAB consider whether the sample should also consider including a representative range of operators, as well. In our experience, operators vary greatly in their experience, corporate culture and approach to both technical and regulatory aspects of their operations. We believe that that variation should be accounted for in the selection of sites.

We also urge the inclusion of both Bakken and Raton basin case studies, as those involve both oil shale and coalbed methane wells, where there may be significant differences from the shale gas case studies.

As part of its prospective case analysis, we urge that EPA address the issue of how disclosure of chemical constituents can be reconciled with the recycling of flowback fluids for subsequent reuse. That is, how can there be accurate assessment of fluid contents, when there is extensive mixing of introduced chemicals, normally occurring chemicals and the interaction of those chemicals in flowback?

The study plan also mentions the potential of using chemical tracers as a tool. We have not been able to find much published information on the types and uses of tracers; however, we understand that the use of tracers may be helpful in solving the issue of how to track the actual movement of fracturing fluid and fracture behavior. This might be a good opportunity for non-industry funded research to test the use of these tracers. This research should assess various types of tracers, including those utilizing inert gases and those tracers used in the oil shipping industry. Other existing methods for measuring fracture growth such as microseismic imaging should also be assess fracture growth and behavior.

Earthworks supports the EPA considering the environmental justice issues involved in oil and gas drilling as it moved forward with this study. But, we would like to make sure that the EPA is aware that for several of the producing basins, a split estate situation, where a non-resident mineral owner is making a leasing decision with the operator and the surface residents and neighbors are shut out of decision-making, is the rule, rather than the exception. We urge that the SAB consider modifying the consideration of environmental justice concerns to include this in the analysis called for under the study plan.

In its current form, the study plan does not deal with the issue of off-gassing from reserve pits and/or volatilization from the drill rig while carrying out hydraulic fracturing activities. We strongly urge the SAB to consider adding a research element on this issue. In western Colorado and in Texas, at least, these are fairly commonly identified pathways for contamination – pathways that this study plan does not address at all.

We appreciate your consideration of our comments in your review of the Hydraulic Fracturing Study Plan. Thank you.