United States Department of the Interior

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To: Mr. Ed Hanlon
U.S. Environmental Protection Agency
Science Advisory Board Staff Office
Mailcode 1400R
1300 Pennsylvania Avenue, NW
Washington, DC 20004

Subject: U.S. Geological Survey Comments on U.S. EPA "Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources".

Dear Mr. Hanlon:

Please find enclosed U.S. Geological Survey comments on U.S. EPA "Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources" for consideration by the Science Advisory Board. If you have any questions, please feel free to contact me

Sincerely,

Kenneth J. Skipper
Office of Groundwater
U.S. Geological Survey

Attachment

USGS Comments on U.S. EPA "Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources"

U.S. Geological Survey Comments on U.S. EPA "Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources"

General Comments (Note: comments are provided from USGS scientists with only minor edits made for clarity)

1. Overall the big picture questions EPA is asking and the methodologies proposed are reasonable and appropriate.
2. The plan weighs heavily on consultant and industry reports rather than scientific investigations or independent science informed groups.

3. Frequently the exact location of horizontal boreholes in three dimensions is unknown. Each borehole should have a deviation survey to prevent the possibility of drilling outside of a shale formation/gas reservoir, and hydraulically fracturing the wrong formation. No mention is made on how the extent and density of fractures is determined in a horizontal borehole (even a properly constructed one), or the techniques used to make those determinations (such as micro-seismic surveying). Retorts by industry that fracturing outside the zone containing the gas is not in the industry's interest would suggest that no mistakes are ever made, but Appendix F (Stakeholder Nominated Cases) would indicate otherwise. Extensive fracturing of shales might radically increase the overall permeability of the formation, causing what was once a confining bed into something approaching an aquifer. How does permeability (vertical and horizontal) change after fracking, and what does this do to the overall hydrologic regime? For example: It is estimated that Arkansas will have had 14,000 wells constructed during the production life of the Fayetteville Shale (FS). The google earth map of the 2,500 current AOGC sites makes the primary exploration area in the FS look like a pin cushion. Up to 16 horizontal wells will be allowed per section. What is the cumulative impact to the hydrologic regime resulting from this magnitude of development.
4. Little mention is made of the role of faults and difficulty associated with characterizing their hydraulic properties and how they function in a hydrologic setting. Flow and transport modeling likely will have a large degree of uncertainty because of minimal hydraulic and hydrologic property data.

Specific Comments by Section

p. 17 *As detailed in Appendix C, EPA asked for data on the chemical composition of fluids used in the fracturing process, the health and environmental impacts of the chemicals, standard operating procedures, and locations where fracturing has been conducted or is planned. The hydraulic fracturing service companies have claimed this data to be confidential business information.*

Go to TEDX website and download the chemicals derived in part from MSDS information.

http://www.endocrinedisruption.com/chemicals.introduction.php

As detailed in Appendix C, EPA asked for data on the chemical composition of fluids used in the fracturing process, the health and environmental impacts of the chemicals, standard operating procedures, and locations where fracturing has been conducted or is planned. The hydraulic fracturing service companies have claimed this data to be confidential business information.

How can an accurate assessment be accomplished without knowing or having the chemicals that are being used?

There is no mention of establishing a background water quality using an existing monitoring network.

No mention of evaluating the extent of hydro fracturing using the industry's micro seismic data.

Water acquisition: How might large volume water withdrawals from ground and surface water impact drinking water resources?

Chemical mixing: What are the possible impacts of releases of hydraulic fracturing fluids on drinking water resources?

Well injection: What are the possible impacts of the injection and fracturing process on drinking water resources?

- How extensive are the fractures and do they extend past the formation containing the gas? How are the companies doing the hydraulic fracturing monitoring the propagation extent, if at all?
- Does the fracture fluid migrate substantially, particularly if a fracture job is botched (can't happen, right?)
- If fractures propagate and chemicals intersect a bedding plane, what happens then?

Flow back and produced water: What are the possible impacts of releases of flow back and produced water on drinking water resources?

Wastewater treatment and waste disposal: What are the possible impacts of inadequate treatment of hydraulic fracturing wastewaters on drinking water resources?

With regard to gas well geometry, it is important first to know that a gas well (be it producing or plugged) have been 'steered' correctly. The industry makes great claims about where and how they can control drilling, but without hole-deviation data provided after a hole is completed, how does one 'know' where the hole went? It is conceivable that a horizontal borehole could deviate outside of the formation, particularly in faulted or structurally complex areas. See 'geosteering' online.

p. 17 EPA will collect field samples during both retrospective and prospective case studies to look for the migration of chemical and gas contaminants into drinking water resources as a result of hydraulic fracturing activities. It may take years before these chemicals show up in gw sources. Spills from holding ponds/tanks into surface water are more immediate. Monitoring change in salinity may be less expensive. Problem in AR is that none of holding ponds have monitor wells around them. Ponds leak.

p. 18 *Water acquisition*—diversion of streams causes

Section 6.1 Not much discussion of how trapping surface water in ponds, that this diversion will cause substantial reduction in flow to the stream(s) where this water would have flowed into.

TABLE 4. AN EXAMPLE OF THE VOLUMETRIC COMPOSITION OF HYDRAULIC FRACTURING FLUID

Interesting that they would use this as an example of what is in a typical hydraulic fracturing fluid. ALL Consulting got this information Chesapeake, not from any work they did on fluids. Recommend citing a more comprehensive set of potential compositions.

Why isn't diesel fuel shown as a component? This is commonly used to make 'slick water'? Go to http://www.endocrinedisruption.com/chemicals.introduction.php for a more comprehensive list of pit and drilling chemicals.

Appendices have a lot of interesting information.

Appendix F lists sites in Arkansas for potential case study

Change ARDEQ to ADEQ

Change AROGC to AOGC

Modeling Tools (p. 120)

No mention of FracMan or other discrete fracture software (there are many)

Calibration and uncertainty in Model Applications

Will pressure data from gas wells be used as observation data? What about fracking history and chemicals added at the time of fracturing (it's not a one shot process normally)?