March 28, 2010

Mr. Edward Hanlon
Designated Federal Officer
EPA Science Advisory Board (1400F)
US Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Science Advisory Board Staff Office; Notification of a Public Meeting of the Science Advisory Board; Environmental Engineering Committee Augmented for the Evaluation and Comment on EPA's Proposed Research Approach for Studying the Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources

This statement is submitted on behalf of the Independent Petroleum Association of America (IPAA) and Energy In Depth (EID) with regard to the "Scoping Materials for Initial Design of EPA Research Study on Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources" (Scoping Materials) document of March 2010.

The IPAA represents the thousands of independent oil and natural gas producers that develop 90 percent of US wells and produce over 80 percent of US natural gas. Approximately 90 percent of these wells now require the use of hydraulic fracturing. EID is a coalition of national, regional and state trade association as well as oil and natural gas companies that is dedicated to providing information on the environmental issues associated with the development of these resources.

The Scoping Materials document raises a broad array of issues for possible research. In our view, however, it goes well beyond relationships between hydraulic fracturing and drinking water. As the Scoping Materials note, Congress requests "… the Agency to carry out a study on the relationship between hydraulic fracturing and drinking water…." The Scoping Materials expansion of this mandate bring into play consideration of a Life Cycle Assessment, air emissions issues, community health and environmental justice issues and many others that would distract the study from its Congressional intent.

We believe that the study needs to be framed around a key threshold question – whether the regulatory structures effectively manage the environmental risks of the fracturing process. If these risks are well managed, the other questions are meaningless. If the regulatory structures prevent pathways to drinking water, there is no risk. The Scoping Materials document fails to reflect this reality. For example, of the 28 items listed under the "Potential Elements of Research Study", no item is included related to evaluating the effectiveness of the regulations to prevent risks to drinking water.

Consequently, we recommend that the first focus of the research study should include the involvement of the state regulatory agencies that have designed and implemented programs to

protect ground water. These agencies bear the principal responsibility to protect drinking water supplies. As the Ground Water Protection Council stated in its report, "State Oil And Natural Gas Regulations Designed To Protect Water Resources":

> State regulation of oil and natural gas exploration and production activities are approved under state laws that typically include a prohibition against causing harm to the environment. This premise is at the heart of the regulatory process. The regulation of oil and gas field activities is managed best at the state level where regional and local conditions are understood and where regulations can be tailored to fit the needs of the local environment. Hence, the experience, knowledge and information necessary to regulate effectively most commonly rests with state regulatory agencies.

The state regulatory agencies regularly must assure that their programs protect the environment, honing them as necessary to assure they reflect new information and technologies.

For example, the New York State Department of Environmental Conservation released a Draft Supplemental Generic Environmental Impact Statement (dSGEIS), dated September 2009, regarding its analysis of the risks and regulatory controls of natural gas development in the Marcellus Shale formation using horizontal drilling and high-volume hydraulic fracturing (HF) techniques. It states:

> The regulatory discussion in Chapter 5 concludes that adequate well design prevents contact between fracturing fluids and fresh ground water sources, and text in Chapter 6 along with Appendix 11 on subsurface fluid mobility explains why ground water contamination by migration of fracturing fluid is not a reasonably foreseeable impact.

This noteworthy result demonstrates the significant importance of a regulatory system designed to impose barriers between natural gas production well bores and ground water.

Other analyses of different pathways that might affect drinking water conclude that such pathways pose no threat. For example, in its report, "Human Health Risk Evaluation For Hydraulic Fracturing Fluid Additives Marcellus Shale Formation, New York", Gradient determined that:

> The results of our conservative analysis indicate that potential human health risks associated with model HF fluid additives and measured flowback constituents *via* drinking water (and other household uses of water) are expected to be insignificant, and even *de minimis*, as defined by agency-based guidelines. None of the conservatively-modeled concentrations in shallow groundwater and surface water exceeded a risk-based drinking water concentration. Furthermore, our analysis confirms that migration of HF fluid additives from the Marcellus Shale up through overlying bedrock to a surface aquifer is an implausible contamination pathway.

Taken together, these assessments frame the fundamental issue that the EPA Research Study must first address – the effectiveness of existing regulatory systems in preventing the movement of hydraulic fracturing fluid to drinking water. Without this information, no testing plan would be well targeted. With it, chemical analysis, modeling, field studies and technology evaluations can be carefully crafted to be meaningful and cost effective.

We appreciated the opportunity to provide input to the development of the EPA Research Study and will continue to participate in its execution. If additional information is required, please contact Lee Fuller at 202-857-4731 or at lfuller@ipaa.org.

Sincerely,

Lee O. Fuller

April 12, 2010

Mr. Edward Hanlon
Designated Federal Officer
EPA Science Advisory Board (1400F)
US Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Science Advisory Board Staff Office; Notification of a Public Meeting of the Science Advisory Board; Environmental Engineering Committee Augmented for the Evaluation and Comment on EPA's Proposed Research Approach for Studying the Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources – Supplemental Statement

This supplemental statement is submitted on behalf of the Independent Petroleum Association of America (IPAA) and Energy In Depth (EID) with regard to the "Scoping Materials for Initial Design of EPA Research Study on Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources" (Scoping Materials) document of March 2010.

The IPAA represents the thousands of independent oil and natural gas producers that develop 90 percent of US wells and produce over 80 percent of US natural gas. Approximately 90 percent of these wells now require the use of hydraulic fracturing. EID is a coalition of national, regional and state trade association as well as oil and natural gas companies that is dedicated to providing information on the environmental issues associated with the development of these resources.

These supplemental materials are submitted because of a number of issues that were raised during the discussion by the Environmental Engineering Committee. Most notably, we are concerned about the Committee members' understanding of the role of hydraulic fracturing in the production process. As the Scoping Materials noted, the Congressional intent for the Agency is related to carrying out "…a study on the relationship between hydraulic fracturing and drinking water…." Much of the discussion at the Committee meeting addressed issues well beyond this scope. Consequently, we believe it would be beneficial to describe the differences between those aspects of production generally and those that are hydraulic fracturing related.

In broad terms, the production process begins with the construction of a site to conduct drilling. A drilling rig and its attendant structures are moved onto the site. Drilling commences and involves the use of drilling fluids and storage facilities for those fluids; drilling fluids are used to cool the drill bits and remove the soil cuttings from the well bore. The well bore is lined with pipe (steel casing). As the well bore penetrates through ground water, larger diameter casings are set in place through the ground water layer and cemented into place as well as above and below the ground water strata. When the well bore reaches the producing zone, the casing is perforated to allow production. For shale gas formations, the well bore is turned horizontal and drilled into the shale formation. *It is at this point in the production process that hydraulic*

fracturing is used. The fracturing process uses a water and sand mixture to break down the natural gas (or oil) containing structure. The fracturing flowback fluids are then removed and the natural gas (or oil) can move into and up the well bore. At the surface, the natural gas (or oil) is separated from water that is present (produced water) in the natural gas (or oil) bearing formation and from other chemicals such as hydrogen sulfide or carbon dioxide. The natural gas (or oil) product is then stored or sent into pipelines as product. The produced water is managed under one of two federal environmental laws – the Safe Drinking Water Act (SDWA) if the water is injected underground or the Clean Water Act (CWA) if the water is discharged to a water body.

The key point to this discussion is that all of the other aspects of producing natural gas (or oil) occur whether hydraulic fracturing is used or not. The fracturing process occurs in a narrow window of time during the drilling operation and for a specific purpose – freeing the natural gas (or oil). Generally, this activity takes place over a six hour to 48 hour time period. We raise this discussion because many of the participants at the meeting focused on aspects of the drilling and production process that were unrelated to hydraulic fracturing and, therefore, beyond the scope of Congress request.

For example, several participants discussed the implications of water use associated with hydraulic fracturing and its implications on water supply – and implicitly on drinking water supply. While it is true that hydraulic fracturing uses water, the impact on drinking water is not uniquely related to fracturing. Any new water use in an area would create similar impacts – a new golf course, shifts in agricultural use, expanding suburban housing. To expand the scope the hydraulic fracturing study to water supply issues is not consistent with the Congressional focus.

Some participants wanted to address produced water issues in the study. Once again, while managing produced water will be an environmental responsibility of producers, it is not related to hydraulic fracturing. It occurs in all wells where produced water occurs.

Hydraulic fracturing impacts on drinking water are essentially limited to three pathways – the well bore, the reservoir and surface management. Several Committee members discussed the importance of assessing the risks associated with fracturing to frame the focus of the study. We share this view and will reiterate our recommendation that the Agency work with the state regulators to define the pathways of exposure that hydraulic fracturing presents and assessing first how the regulatory system addresses those pathways. This would allow the research tasks to be targeted, particularly given the financial limitations on the study.

Some other issues that were raised deserve further attention. Several Committee members discussed concerns about the nature of the hydraulic fracturing mixtures. Yet, there seemed to be little information on the components of the fracturing fluids. First, the compounds that are used in fracturing fluids must undergo registration under the Toxic Substance Control Act (TSCA). The TSCA process then yields information that must be included in Material Safety Data Sheets (MSDS) which must be present at the site during the drilling and fracturing activities. These chemicals are needed because the fracturing process is more than a mechanical operation. The water must be treated to assure that algal or other biological contaminants are not introduced into the reservoir that would later impede production. The mixture must first be

conditioned to keep the water and sand together while the fracturing occurs and this slurry is pushed into the fractures. Then, it must be changed to allow the water to be removed while the sand remains to keep the fractures open. However, these chemicals remain a small fraction of the total fluid. To illustrate, a copy of the makeup of a typical fracturing fluid is attached.

There was also some discussion of drinking water source protection. One of the regularly misunderstood aspects of the SDWA is its definition of Underground Source of Drinking Water (USDW). The USDW definition is exceedingly broad – capturing ground water sources up to 10000 mg/l of total dissolved solids despite drinking water being limited to 500 mg/l. This broad definition was created to cover water sources where future technology might allow it to be treated to acceptable levels. However, it causes considerable confusion because of the potential for low quality water being considered a USDW. More significantly in this instance is the aspect of the USDW regulations that would disqualify ground water from consideration as a USDW if oil and natural gas is present. In reality, formations that contain natural gas (or oil) would not be viewed as a USDW.

We appreciate the opportunity to provide input to the development of the EPA Research Study and will continue to participate in its execution. If additional information is required, please contact Lee Fuller at 202-857-4731 or at lfuller@ipaa.org.

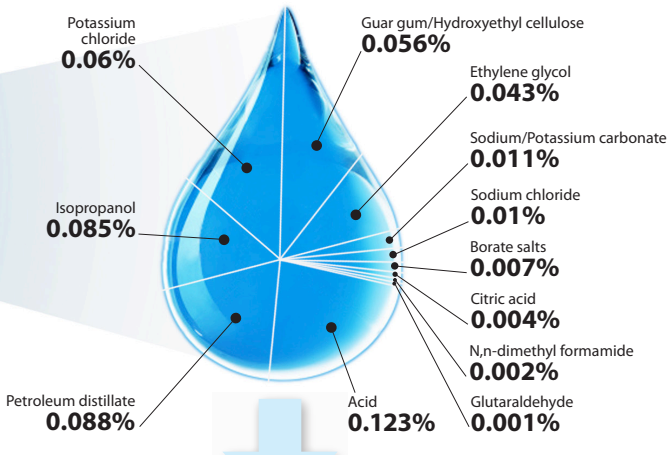
Sincerely,

Lee O. Fuller

A FLUID SITUATION:

TYPICAL SOLUTION* USED IN HYDRAULIC FRACTURING

0.49%
ADDITIVES*



On average, **99.5%** of fracturing fluids are comprised of freshwater and compounds are injected into deep shale gas formations and are typically confined by many thousands of feet or rock layers.

Source: DOE, GWPC: Modern Gas Shale Development In the United States: A Primer (2009)

Compound*	Purpose	Common application
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant; Sterilizer for medical and dental equipment
Sodium Chloride	Allows a delayed break down of the gel polymer chains	Table Salt
N, n-Dimethyl formamide	Prevents the corrosion of the pipe	Used in pharmaceuticals, acrylic fibers and plastics
Borate salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Polyacrylamide	Minimizes friction between fluid and pipe	Water treatment, soil conditioner
Petroleum distillates	"Slicks" the water to minimize friction	Make-up remover, laxatives, and candy
Guar gum	Thickens the water to suspend the sand	Thickener used in cosmetics, baked goods, ice cream, tooth-paste, sauces, and salad dressing
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice
Potassium chloride	Creates a brine carrier fluid	Low sodium table salt substitute
Ammonium bisulfite	Removes oxygen from the water to protect the pipe from corrosion	Cosmetics, food and beverage processing, water treatment
Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Washing soda, detergents, soap, water softener, glass and ceramics
Proppant	Allows the fissures to remain open so the gas can escape	Drinking water filtration, play sand
Ethylene glycol	Prevents scale deposits in the pipe	Automotive antifreeze, household cleansers, deicing, and caulk
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, and hair color

*The specific compounds used in a given fracturing operation will vary depending on source water quality and site, and specific characteristics of the target formation. The compounds listed above are representative of the major material components used in the hydraulic fracturing of natural gas shales. Compositions are approximate.