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DRILLING FOR COMMON GROUND: HOW PUBLIC OPINION TRACKS EXPERTS IN THE DEBATE OVER FEDERAL REGULATION OF SHALE OIL & GAS EXTRACTION

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DRILLING FOR COMMON GROUND: HOW PUBLIC OPINION
TRACKS EXPERTS IN THE DEBATE OVER FEDERAL
REGULATION OF SHALE OIL & GAS EXTRACTION

*Elizabeth Ann Glass Geltman**

Public interest in environmental and health impacts from shale oil and gas extraction (what the public calls “fracking”) is growing. Industry claims the public outcry against the new technology is not grounded in science. In February 2013, Resources for the Future (“RFF”) published a list of high priority “risk pathways” that experts from NGOs, academia, government, and industry all agreed were real concerns about fracking. This article used the risk matrix to evaluate whether public comments in dockets of federal agencies that proposed regulation concerning hydraulic fracturing tracked expert concern. The article found that the public tracked many of the experts’ shared concerns. The highest concern was water pollution in surface and groundwater from fracking fluids (or, “frac fluids”), flowback, and produced water. The public shared expert worry over cementing and casing failures and understood that these were the primary causes of most groundwater contamination. Damage to habitat was the third greatest concern raised by the public. Methane leakage into air and water was less cited. Concerns over technical matters were rarely mentioned by the general public but were often cited by self-identified experts. The article concludes that while the general public did not go into the detail about the regulatory mechanism that was often reflected by experts, the concerns raised by the public in comments to proposed rulemakings largely reflected the consensus themes of the experts. More significantly, the public writing overwhelmingly favored increased federal regulation to protect public health and the environment. The very limited number of comments opposing increased regulation were presented by members of industry; these objections were based on financial considerations and did not present evidence that adequate

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regulations were already in place to protect public health and the environment.

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I. INTRODUCTION: THE SHALE GAS CONTROVERSY

Relatively recent changes in technology that allow the industry to extract oil and natural gas from shale is transforming domestic and international energy markets and the United States landscape.¹ The combination of high volume hydraulic fracturing (“HVHF,” or

¹ See generally Monika Ehrman, *Next Great Compromise: A Comprehensive Response to Opposition against Shale Gas Development Using Hydraulic Fracturing in the United States*, 46 TEX. TECH L. REV. 423 (2013); Timothy Fitzgerald, *Frackonomics: Some Economics of Hydraulic Fracturing*, 63 CASE W. RES. L. REV. 1337 (2012); HENRY D. JACOBY, FRANCIS M. O’SULLIVAN & SERGEY PALTSEV, MASS. INST. OF TECH. JOINT PROGRAM ON THE SCI. & POL’Y OF GLOBAL CHANGE, *THE INFLUENCE OF SHALE GAS ON US ENERGY AND ENVIRONMENTAL POLICY* (2011).

“fracking”² with horizontal drilling³ is changing the way the people in the United States think about extraction.⁴ The United States has now transformed from an oil and natural gas importer to a major natural gas exporter.⁵ The United States is now also exporting the technology to extract energy resources from shale in addition to exporting fossil fuels.⁶ In short, natural gas trapped in rocks that was once considered “nuisance gas” is now a significant energy source poised to fuel the near, if not long-term, future.⁷

² See, e.g., Claude E. Cooke Jr., Method and Materials for Hydraulic Fracturing of Wells, U.S. Patent No. 6,949,491. (issued Sept. 27, 2005).

³ The 1990s saw a proliferation of patents improving the process of horizontal drilling. See, e.g., Haraldur Karlsson et al., Method and Apparatus for Horizontal Drilling, U.S. Patent No. 5,148,875 (issued Sept. 22, 1992); Gerald E. Wilson, Method of Horizontal Drilling, U.S. Patent No. 5,165,491 (Nov. 24, 1992). For a discussion of the developments in directional drilling, see Erez N. Allouche, Samuel T. Ariaratnam & Jason S. Lueke, *Horizontal Directional Drilling: Profile of an Emerging Industry*, 126.1 J. CONSTR. ENG'G & MGMT. 68 (2000).

⁴ MICHAEL RATNER ET AL, CONG. RESEARCH SERV., R43148, AN OVERVIEW OF UNCONVENTIONAL OIL AND NATURAL GAS: RESOURCES AND FEDERAL ACTIONS 13 (2015); see also TECHNOLOGY-BASED OIL AND NATURAL GAS PLAYS: SHALE SHOCK! COULD THERE BE BILLIONS IN THE BAKKEN?, ENERGY INFO. ADMIN. 1 (Nov. 2006) (“Through the use of technology, U.S. oil and natural gas operators are converting previously uneconomic oil and natural gas resources into proved reserves and production.”). For scholarly discussions about public opinion regarding shale gas extraction (or, “fracking”), see Anastasia Hudgins & Amanda Poole, *Framing Fracking: Private Property, Common Resources, and Regimes of Governance*, 21 J. POL. ECOLOGY 222 (2014); Charles Davis & Jonathan M. Fisk, *Energy Abundance or Environmental Worries? Analyzing Public Support for Fracking in the United States*, 31.6 REV. POL'Y RESEARCH 1 (2014); Gwen Arnold & Robert Holahan, *The Federalism of Fracking: How the Locus of Policy-Making Authority Affects Civic Engagement*, 44 PUBLIUS: J. FEDERALISM 344 (2014); Elizabeth Bomberg, *The Comparative Politics of Fracking: Networks and Framing in the US and Europe* (Am. Political Sci. Ass'n, Meeting Paper, 2013); ERICA BROWN ET AL, CTR. FOR LOCAL, STATE, & URBAN POL'Y, PUBLIC OPINION ON FRACKING: PERSPECTIVES FROM MICHIGAN AND PENNSYLVANIA (2013); Peter Jones, David Hillier & Daphne Comfort, *Fracking and Public Relations: Rehearsing the Arguments and Making the Case*, 13.4 J. PUB. AFFAIRS 384 (2013); Christopher P. Borick & Barry Rabe, *Belief in Global Warming on the Rebound: National Survey of American Public Opinion on Climate Change*, 44 ISSUES IN GOVERNANCE STUD. 1 (2012); Charles Davis & Katherine Hoffer, *Federalizing Energy? Agenda Change and the Politics of Fracking*, 45 POL'Y SCIS. 221 (2012).

⁵ See, e.g., Paul L. Joskow, *Natural Gas: From Shortages to Abundance in the United States*, 103 AM. ECON. REV. 338 (2013); Kenneth Barry Medlock, *Modeling the Implications of Expanded US Shale Gas Production*, 1 ENERGY STRATEGY REVS. 33 (2012); Stephen P.A. Brown, Steven A. Gabriel & Ruud Egging, *Abundant Shale Gas Resources: Some Implications for Energy Policy* (Res. for the Future, Background Paper, 2010).

⁶ See, e.g., Tim Boersma & Corey Johnson, *The Shale Gas Revolution: U.S. and EU Policy and Research Agendas*, 29 REV. POL'Y RES. 570 (2012); Roberto F. Aguilera & Marian Radetzki, *The Shale Revolution: Global Gas and Oil Markets Under Transformation*, 26 MINERAL ECON. 75 (2014).

⁷ Interest in developing the technology to extract oil and gas from shale dates back to the energy crisis occurring during the Carter administration. See, e.g., Edward W. Cook, *Oil-Shale Technology in the USA*, 53 FUEL 146 (1974); see also Gary C. Bryner, *National Energy Policy: Assessing Energy Policy Choices*, 73 U. COLO. L. REV. 341, 341 (2002).

More available energy resources increases energy development, yet citizens in the United States do not agree on either the benefits or the risks associated with extracting oil and gas from shale. Some private landowners sitting above shale mineral rights are goaded by oil and gas developers and choose to engage in a gold rush-style frenzy.⁸ Some subsistence farmers and poor rural dwellers sitting above energy rich shale watch the price of previously low-value land skyrocket.⁹ Other land owners watch neighbors uncover incredible riches, but sit frustrated on land without extractable shale; neighbors can bear the burdens of construction and development without being able to cash in on the profits.¹⁰ In many shale rich towns, neighbors compete with each other over appropriate land use,¹¹ since shale energy development is often awkward or even incompatible with historical land use patterns.¹² Oil and gas extraction from shale is a heavy industry involving extensive use of

⁸ Juliet Eilperin, *Forest Lands in the East Attract Oil and Gas Bidders, But Some Question Rush*, WASH. POST, June 8, 2012, http://www.washingtonpost.com/national/health-science/forest-lands-in-the-east-attract-oil-and-gas-bidders-but-some-question-rush/2012/06/08/gJQA8lOvNV_story.html (“Private land overlying shale deposits can sell for thousands of dollars an acre; land in the most recent BLM forest leases averaged \$47 per acre.”).

⁹ See, e.g., SEAMUS MCGRAW, *THE END OF COUNTRY: DISPATCHES FROM THE FRACK ZONE* (2011). Compare *id.*, with TOM WILBER, *UNDER THE SURFACE: FRACKING, FORTUNES, AND THE FATE OF THE MARCELLUS SHALE*, (2012).

¹⁰ Compare Sathya Gopalakrishnan & H. Allen Klaiber, *Is the Shale Energy Boom a Bust for Nearby Residents? Evidence from Housing Values in Pennsylvania*, 96.1 AM. J. AGRICULTURAL ECON. 43 (2014), with Lucija Muehlenbachs, Elishaba Spiller & Christopher Timmins, *The Housing Market Impacts of Shale Gas Development*, 1–48 (Nat’l Bureau Econ. Research, Working Paper No. 19796, 2014). See generally RUSSEL GOLD, *THE BOOM: HOW FRACKING IGNITED THE AMERICAN ENERGY REVOLUTION AND CHANGED THE WORLD* (2015).

¹¹ See, e.g., Kai A. Schafft, Yetkin Borlu & Leland Glenna, *The Relationship Between Marcellus Shale Gas Development in Pennsylvania and Local Perceptions of Risk and Opportunity*, 78.2 RURAL SOCIOLOGY 143 (2013); see also Darrick T. Evensen, Christopher E. Clarke & Richard C. Stedman, *A New York or Pennsylvania State of Mind: Social Representations in Newspaper Coverage of Gas Development in the Marcellus Shale*, 4.1 J. ENVTL. STUDIES & SCIS. 65–77 (2014); Charles Davis & Jonathan M. Fisk, *Energy Abundance or Environmental Worries? Analyzing Public Support for Fracking in the United States*, 31 REV. POL’Y RES. 1 (2014); Joseph A. Henderson & Don Duggan-Haas, *Drilling Into Controversy: The Educational Complexity of Shale Gas Development*, 4.1 J. ENVTL. STUD. & SCIS. 87 (2014).

¹² Jeffrey B. Jacquet & Richard C. Stedman, *The Risk of Social Psychological Disruption as an Impact of Energy Development and Environmental Change*, 57.9 J. ENVTL. PLANNING & MGMT. 1285 (2014); Anna J. Willow et al., *The Contested Landscape of Unconventional Energy Development: A Report from Ohio’s Shale Gas Country*, 4 J. ENVTL. STUDIES & SCIS. 56 (2014); Brian Black & Marcy Ladson, *The Legacy of Extraction: Reading Patterns and Ethics in Pennsylvania’s Landscape of Energy*, 79 PA. HIST.: J. MID-ATLANTIC STUD. 377 (2012); Lincoln R. Larson, T. Bruce Lauber & David L. Kay, *Building Local Capacity to Address Natural Gas Development*, 16 CARDI REPORTS 3 (2014); see also Rebecca Dilla, *Hydraulic Fracturing at Bousson Experimental Forest: Not Simply a Choice Between the Income and the Environment* (Allegheny Coll., Research Paper, 2012).

machinery that can negatively impact activities¹³ and adjacent property uses like bed and breakfasts, luxury resorts, and camps.

Concerns about shale gas development are not, however, limited to NIMBYs¹⁴ and LULUs.¹⁵ The range of impacts from extraction activities that the environmental and public health community are concerned about include air,¹⁶ water,¹⁷ light,¹⁸ and noise pollution.¹⁹ Downstream disposal

¹³ See General Provisions and Non-Federal Oil and Gas Rights, 80 Fed. Reg. 65,572 (Oct. 26, 2015) (to be codified at 36 C.F.R. pt. 1, 36 C.F.R. pt. 9); Management of Oil and Gas Rights; Proposed Rule, 80 Fed. Reg. 77,200 (Dec. 11, 2015) (to be codified at 50 C.F.R. pt. 28, 50 C.F.R. pt. 29).

¹⁴ "NIMBY" is an acronym for "Not In My Back Yard." See Howard Rogers, *Shale gas—The Unfolding Story*, 27 OXFORD REV. OF ECON. POL'Y 117 (2011); Matthew Cotton, *Shale Gas—Community Relations: NIMBY or Not? Integrating Social Factors Into Shale Gas Community Engagements*, 29.9 NAT. GAS & ELECTRICITY 8 (2013); Jill Kriesky et al., *Differing Opinion About Natural Gas Drilling in Two Adjacent Counties with Different Levels of Drilling Activity*, 58 ENERGY POL'Y 228 (2013); Joseph A. Henderson & Don Duggan-Haas, *Drilling Into Controversy: The Educational Complexity of Shale Gas Development*, 4.1 J. ENVTL. STUD. & SCIS. 87 (2014). For a historical discussion, see Michael Dear, *Understanding and Overcoming the NIMBY Syndrome*, 58.3 J. AM. PLANNING ASS'N. 288 (1992). But see HAGER, CAROL & MARY ALICE HADDAD, EDS. NIMBY IS BEAUTIFUL: CASES OF LOCAL ACTIVISM AND ENVIRONMENTAL INNOVATION AROUND THE WORLD (2015) (arguing that NIMBY protests are often falsely criticized as parochial and short-lived, generating no lasting influence on broader processes related to environmental politics).

¹⁵ See Elizabeth Ann Glass Geltman, *Oil & Gas Drilling in National Parks*, 56 NAT. RES. J. 145 (2016). "LULU" is an acronym for "Locally Unwanted Land-Use." See Carissa Schively, *Understanding the NIMBY and LULU Phenomena: Reassessing Our Knowledge Base and Informing Future Research*, 21.3 J. PLAN. LITERATURE 255 (2007); see also Jeffrey B. Jacquet, *Landowner Attitudes Toward Natural Gas and Wind Farm Development in Northern Pennsylvania*, 50 ENERGY POL'Y 677 (2012); Sathya Gopalakrishnan & H. Allen Klaiber, *supra* note 10.

¹⁶ See, e.g., Aviva Litovitz et al., *Estimation of Regional Air-Quality Damages from Marcellus Shale Natural Gas Extraction in Pennsylvania*, 8 ENVTL. RES. LETTERS 014017 (2013) ("Most emissions are related to ongoing activities, i.e., gas production and compression, which can be expected to persist beyond initial development and which are largely unrelated to the unconventional nature of the resource. Regulatory agencies and the shale gas industry, in developing regulations and best practices, should consider air emissions from these long-term activities, especially if development occurs in more populated areas of the state where per-ton emissions damages are significantly higher.").

¹⁷ See, e.g., R. D. Vidic et al., *Impact of Shale Gas Development on Regional Water Quality*, 340 SCIENCE 826 (2013) ("Horizontal drilling and hydraulic fracturing make the extraction of tightly bound natural gas from shale formations economically feasible. These technologies are not free from environmental risks, however, especially those related to regional water quality, such as gas migration, contaminant transport through induced and natural fractures, wastewater discharge, and accidental spills.").

¹⁸ See generally Steve Albers & Dan Duriscoe, *Modeling Light Pollution from Population Data and Implications for National Park Service Land*, 18 GEORGE WRIGHT FORUM 56 (2001) (describing a model to "evaluate the effects of light pollution on areas administered by the National Park Service (NPS) for the purpose of protecting night sky visibility.").

¹⁹ See Jacob A. Benfield et al., *Aesthetic and Affective Effects of Vocal and Traffic Noise on Natural Landscape Assessment*, 30 J. ENVTL. PSYCHOL. 103 (2010); Jesse R. Barber, Kevin R. Crooks & Kurt M. Fristrup, *The Costs of Chronic Noise Exposure for Terrestrial Organisms*, 25 TRENDS ECOLOGY & EVOLUTION 180 (2010) ("Growth in transportation networks, resource extraction, motorized recreation and urban development is responsible for chronic noise exposure

activities associated with mineral extraction from shale, including deep well injection of extraction wastes, have also raised concerns from both scientists and the public due to studies of increased seismic activity associated with mineral extraction from shale.²⁰

The federal government documented numerous instances where private companies engaged in oil and gas extraction that contaminated federally owned land.²¹ For example, in a recent rulemaking proceeding, the National Park Service determined that pollution from shale oil and gas extraction in national parks includes instances of: surface water quality degradation from spills, storm water runoff, erosion, and sedimentation; soil and groundwater contamination from existing drilling mud pits, poorly constructed wells, spills, and leaks; air quality degradation (including “notable odors”) from dust, natural gas flaring, hydrogen sulfide gas, and emissions from production operations and vehicles; increased noise from seismic operations, blasting, construction, oil and gas drilling, and production operations; adverse effects on wildlife behavior, breeding, and habitat utilization; disruption of wildlife migration routes; adverse effects on sensitive and endangered species; view-shed intrusion by roads, traffic, drilling equipment, production equipment, and pipelines; night sky intrusion from artificial lighting and gas flares; disturbance to archeological and cultural resources from blasting associated with seismic exploration and road/site preparation, maintenance activities, or by spills; and safety hazards from equipment, pressurized vessels and lines, presence of hydrogen sulfide gas, and leaking oil and gas that can create explosion and fire hazards.²²

in most terrestrial areas, including remote wilderness sites. Increased noise levels reduce the distance and area over which acoustic signals can be perceived by animals . . . Effective management of protected areas must include noise assessment.”)

²⁰ See, e.g., William L. Ellsworth, *Injection-Induced Earthquakes*, 341 SCIENCE 142 (2013); Norman R. Warpinski, Jing Du & Ulrich Zimmer, *Measurements of Hydraulic-Fracture-Induced Seismicity in Gas Shales*, 27 SOC’Y PETROLEUM ENG’R PROD. & OPERATIONS 240 (2012); see also David M. Kargbo, Ron G. Wilhelm & David J. Campbell, *Natural Gas Plays in the Marcellus Shale: Challenges and Potential Opportunities*, 44 ENVTL SCI. & TECH. 5679 (2010); MARK ZOBACK, SAYA KITASEI & BRAD COPITHORNE, WORLDWATCH INST., ADDRESSING THE ENVIRONMENTAL RISKS FROM SHALE GAS DEVELOPMENT (2010). For a region specific study, see Cliff Frohlich & Michael Brunt, *Two-Year Survey of Earthquakes and Injection/Production Wells in the Eagle Ford Shale, Texas, Prior to the Mw 4.8 20 October 2011 Earthquake*, 379 EARTH & PLANETARY SCI. LETTERS 56 (2013).

²¹ See General Provisions and Non-Federal Oil and Gas Rights, 80 Fed. Reg. 65,572 (Oct. 26, 2015) (to be codified at 36 C.F.R. pt. 1, 36 C.F.R. pt. 9); see also GEOLOGICAL RES. DIV., NAT’L PARK SERV., 9B OIL & GAS REGULATION REVISIONS: A PICTORIAL OVERVIEW 10, 12 (2014); KERRY MOSS ET AL., NAT’L PARK SERV., POTENTIAL DEVELOPMENT OF THE NATURAL GAS RESOURCES IN THE MARCELLUS SHALE (2008); see generally Elizabeth Ann Glass Geltman, *Oil & Gas Drilling in National Parks*, 56 NATURAL RES. J. 145 (2016).

²² General Provisions and Non-Federal Oil and Gas Rights, 80 Fed. Reg. 65,572 (Oct. 26, 2015) (to be codified at 36 C.F.R. pt. 1, 36 C.F.R. pt. 9).

This article investigates the extent to which public comments in federal regulatory proceedings involving proposed regulation governing shale gas extraction have tracked the concerns of experts. Public participation is a significant element of the democratic process.²³ But there is debate about the impact of public participation on federal regulatory decision-making.²⁴ This article looks at whether public input reflects scientific concern.²⁵

II. WHAT THE EXPERTS SAY

To understand the degree to which public opinion is supported by expert opinion, it is necessary to first review expert consensus on public health and environmental issues pertaining to fracking. In February 2013, Resources for the Future (“RFF”) announced the results of a study titled *Pathways to Dialogue: What the Experts Say about the Environmental Risks of Shale Gas Development*.²⁶ The RFF study surveyed the opinions

²³ See, e.g., Marijn Janssen & Natalie Helbig, *Innovating and Changing the Policy-Cycle: Policy-Makers be Prepared!*, GOV’T INFO. QUARTERLY (2016); Ann O’Brien, *Government Crowdsourcing: The Role of Trust and Community in Creating Public Value*, in 22 INNOVATION AND THE PUBLIC SECTOR 287 (E. Tambouris et al. eds. 2015); Susan Ritchie, *Community Engagement, Democracy and Public Policy: A Practitioner Perspective*, in POLICE SERVICES 61–72 (Paresh Wankhade & David Weir eds., 2015); Cary Coglianese, *Enhancing Public Access to Online Rulemaking Information*, 2 MICH. J. ENVTL. & ADMIN. L. 1 (2012).

²⁴ See, e.g., NANCY C. ROBERTS, *THE AGE OF DIRECT CITIZEN PARTICIPATION* (2015); Jim P. Huebner, *E-Participation and Citizen Relationship Management in Urban Governance: Tools and Methods*, in PUBLIC AFFAIRS AND ADMINISTRATION: CONCEPTS, METHODOLOGIES, TOOLS, AND APPLICATIONS 11 (2015); Coglianese, *supra* note 23. For a historical discussion, see Nancy Roberts, *Public Deliberation in an Age of Direct Citizen Participation*, 34 AM. REV. PUB. ADMIN. 315 (2004). Compare Wanxin Li, Jieyan Liu & Duoduo Li, *Getting Their Voices Heard: Three Cases of Public Participation in Environmental Protection in China*, 98 J. ENVTL. MGMT. 65 (2012).

²⁵ For investigations into the effectiveness of regulatory oversight see Elizabeth Ann Glass Geltman, Gunwant Gill & Miriam Jovanovic, *Inquiry into the Impact of Bush’s Executive Order 13211 on Environmental and Public Health Regulation*, 28 FORDHAM ENVTL. L. J. 200 (2016) [hereinafter Geltman, Gill & Jovanovic, *13211 Inquiry*]; Elizabeth Ann Glass Geltman, Gunwant Gill & Miriam Jovanovic, *Impact of Executive Order 13211 on Environmental Regulation: An Empirical Study*, 89 ENERGY POL’Y 302 (2016); Elizabeth Ann Glass Geltman, *21 Years Later: Has Executive Order 12898 (Entitled Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations) Worked?*, Presentation at 143rd APHA Annual Meeting and Exposition (Nov. 3, 2015); Elizabeth Ann Glass Geltman, *Policy Surveillance on the Impact of Bush’s Executive Order 13211 (Requiring Preparation of a Statement of Energy Effects as a Condition to Federal Action) on Environmental and Public Health Policy*, Presentation at 143rd APHA Annual Meeting and Exposition (Nov. 2, 2015).

²⁶ Alan J. Krupnick & Hal G. Gordon, *What Experts Say About the Environmental Risks of Shale Gas Development*, 44 AGRIC. & RESOURCE ECON. REV. 106 (2015). For a prior version, see ALAN KRUPNICK, HAL GORDON & SHEILA OLMSTEAD, RES. FOR THE FUTURE, *PATHWAYS TO DIALOGUE: WHAT EXPERTS SAY ABOUT THE ENVIRONMENTAL RISKS OF SHALE GAS DEVELOPMENT* (2013) [hereinafter *PATHWAYS TO DIALOGUE*]; see also ALAN KRUPNICK, HAL G. GORDON & SHEILA OLMSTEAD, CTR. FOR ENERGY ECON. & POLICY, *MANAGING THE RISKS OF SHALE GAS: KEY FINDINGS AND FURTHER RESEARCH* (2013) [hereinafter *RISK OF SHALE GAS*];

of experts on shale gas extraction to determine and come to a consensus on risk. RFF surveyed 215 experts from government, industry, NGOs, and academia to produce the study.²⁷

RFF sent out a survey asking experts to identify risk pathways in shale gas extraction.²⁸ The experts had many areas of disagreement, but the goal of the RFF study was finding consensus pathways. RFF identified a list of twelve high priority “risk pathways” in which all 215 experts agreed that shale gas extraction operations could pose an environmental or health risk.²⁹ The risks involved oil and gas extraction processes generally; only a handful of risks were particular to HVHF.³⁰

First, all experts agreed that the process of clearing a site for drilling and building infrastructure could present an environmental burden by interrupting or tainting stormwater flows and by causing habitat fragmentation, as well as impact nearby surface water quality and cause habitat disruption.³¹ Second, experts agreed that venting of methane could impact air quality, both during the drilling process and during the fracturing and completion.³²

Third, experts agreed that withdrawal of vast quantities of freshwater (from either surface or groundwater) could impact the availability of accessible water causing both water quantity issues and water quality problems.³³ Resulting water shortages could have an important impact on population health and the environment. In addition, storing chemicals used in fracturing (called “fracturing fluids”) on site to use during hydraulic fracturing poses risks to surface waters.

KEY FINDINGS]; ALAN KRUPNICK, HAL G. GORDON & SHEILA OLMSTEAD, CTR. FOR ENERGY ECON. & POLICY, OVERVIEW OF KEY FINDINGS: MANAGING THE RISKS OF SHALE GAS. KEY FINDINGS AND FURTHER RESEARCH 4 (2013) (“Of the 12 consensus risk pathways . . . 7 involve potential risks to surface water quality, 2 involve potential risks to air quality, 2 involve potential risks to groundwater quality, and 1 is related to habitat disruption.”). The risk matrix was first presented by RFF on August 12, 2012. See Alan J. Krupnik, *Risk Matrix for Shale Gas Development*, RESOURCES FOR THE FUTURE (Aug. 12, 2012), <http://www.rff.org/blog/2012/risk-matrix-shale-gas-development>.

²⁷ See *supra* note 26.

²⁸ Krupnick & Gordon, *supra* note 26.

²⁹ PATHWAYS TO DIALOGUE, *supra* note 26, at 26, 54.

³⁰ RISK OF SHALE GAS: KEY FINDINGS, *supra* note 26, at 2–3.

³¹ Krupnick & Gordon, *supra* note 26; see also STEVEN HABICHT, LARS HANSON & PAUL FAETH, CNA ANALYSIS & SOLUTIONS, THE POTENTIAL ENVIRONMENTAL IMPACT FROM FRACKING IN THE DELAWARE RIVER BASIN (2015). For an analysis of potential habitat disruption during seismic studies, see NAT’L PARK SERV., ENVIRONMENTAL ASSESSMENT FOR A PROPOSED OIL AND GAS PLAN OF OPERATIONS: NOBLES GRAD 3-D SEISMIC SURVEY WITHIN BIG CYPRESS NATIONAL PRESERVE PROPOSED BY BURNETT OIL CO., INC. (2015).

³² Krupnick & Gordon, *supra* note 26.

³³ *Id.*; see also Meagan S. Mauter et al., *Regional Variation in Water-Related Impacts of Shale Gas Development and Implications for Emerging International Plays*, 48 ENVTL. SCI. & TECH. 8298 (2014).

Fourth, all experts agreed there were risks from the storage and disposal of flowback³⁴ and produced waters.³⁵ The practice of onsite pit or pond storage of flowback and produced waters, which contain both fracturing fluids,³⁶ total dissolved solids (“TDS”),³⁷ and naturally

³⁴ For studies discussing health risks from flowback, *see, e.g.*, Noura Abualfaraj, Patrick L. Gurian & Mira S. Olson, *Characterization of Marcellus Shale Flowback Water*, 31 ENVTL. ENG'G SCI. 514 (2014); Ronald S. Balaba & Ronald B. Smart, *Total Arsenic and Selenium Analysis in Marcellus Shale, High-Salinity Water, and Hydrofracture Flowback Wastewater*, 89 CHEMOSPHERE 1437 (2012).

³⁵ For studies discussing health risks from produced waters, *see, e.g.*, Denise M. Akob et al., *Organic and Inorganic Composition and Microbiology of Produced Waters from Pennsylvania Shale Gas Wells*, 60 APPLIED GEOCHEMISTRY 116 (2015); Maryam A. Cluff et al., *Temporal Changes in Microbial Ecology and Geochemistry in Produced Water from Hydraulically Fractured Marcellus Shale Gas Wells*, 48 ENVTL. SCI. & TECH. 6508 (2014); Kelvin Gregory & Arvind Murali Mohan, *Current Perspective on Produced Water Management Challenges During Hydraulic Fracturing for Oil and Gas Recovery*, 12 ENVTL. CHEMISTRY 261 (2015); Samuel J. Maguire-Boyle & Andrew R. Barron, *Organic Compounds in Produced Waters from Shale Gas Wells*, 16 ENVTL. SCI. PROCESSES & IMPACTS 2237 (2014); Katherine J. Skalak et al., *Surface Disposal of Produced Waters in Western and Southwestern Pennsylvania: Potential for Accumulation of Alkali-Earth Elements in Sediments*, 126 INT'L J. COAL GEOLOGY 162 (2014); Amit Vikram, Daniel Lipus & Kyle Bibby, *Produced Water Exposure Alters Bacterial Response to Biocides*, 48 ENVTL. SCI. & TECH. 13001 (2014).

³⁶ For discussion of the potential health impact of wastewaters, *see, e.g.*, Benay Akyon et al., *Microbial Mats as a Biological Treatment Approach for Saline Wastewaters: The Case of Produced Water from Hydraulic Fracturing*, ENVTL. SCI. & TECH. (2015); Jennifer S. Harkness et al., *Iodide, Bromide, and Ammonium in Hydraulic Fracturing and Oil and Gas Wastewaters: Environmental Implications*, 49 ENVTL. SCI. & TECH. 1955 (2015); Jason D. Johnson & Joseph R. Graney, *Fingerprinting Marcellus Shale Waste Products from Pb Isotope and Trace Metal Perspectives*, 60 APPLIED GEOCHEMISTRY 104 (2015); Kimberly M. Parker et al., *Enhanced Formation of Disinfection Byproducts in Shale Gas Wastewater-Impacted Drinking Water Supplies*, 48.19 ENVTL. SCI. & TECH. 11161 (2014); Brian G. Rahm et al., *Wastewater Management and Marcellus Shale Gas Development: Trends, Drivers, and Planning Implications*, 12 J. ENVTL. MGMT. 105 (2013); Mei Shi et al., *Bromide: A Pressing Issue to Address in China's Shale Gas Extraction*, 48.17 ENVTL. SCI. & TECH. 9971 (2014); Daniel Snyder, Abstract provided at 49th Annual Meeting of the Geological Society of America, *Impact of Oil and Gas Industry Wastewater on Water and Sediment Chemistry in One Stream in West-Central Pennsylvania* (2014); Jonathan B. Thacker et al., *Chemical Analysis of Wastewater from Unconventional Drilling Operations*, 7 WATER 1568 (2015); Nathaniel R. Warner et al., *Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania*, 47 ENVTL. SCI. & TECH. 11849 (2013); Paul F. Ziemkiewicz, *Characterization of Liquid Waste Streams from Shale Gas Development*, 30 AGH DRILLING, OIL, GAS 297 (2013).

³⁷ *See* Elizabeth C. Chapman et al., *Geochemical and Strontium Isotope Characterization of Produced Waters from Marcellus Shale Natural Gas Extraction*, 46 ENVTL. SCI. & TECH. 3545 (2012) (“Extraction of natural gas by hydraulic fracturing of the Middle Devonian Marcellus Shale, a major gas-bearing unit in the Appalachian Basin, results in significant quantities of produced water containing high total dissolved solids (TDS).”); Brian E. Fontenot et al., *An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation*, 47 ENVTL. SCI. & TECH. 10032 (2013) (“Analyses revealed that arsenic, selenium, strontium and total dissolved solids (TDS) exceeded the Environmental Protection Agency’s Drinking Water Maximum Contaminant Limit (MCL) in some samples.”). Kelvin B. Gregory, Radisav D. Vidic & David A. Dzombak, *Water Management Challenges Associated with the Production of Shale Gas by Hydraulic Fracturing*, 7.3 ELEMENTS 181 (2011) (“Wastewaters that contain high TDS levels are challenging and costly to treat.”).

occurring radioactive materials (“NORM”) or technologically enhanced naturally occurring radioactive materials (“TENORM”)³⁸ acquired from the geological formation on site was universally recognized as a risk to both ground and surface waters. Pits and ponds were susceptible to leaks and accidents, especially in adverse weather events.³⁹ The treatment of flowback and produced waters by both municipally owned treatment

³⁸ For discussion of radiation in flowback and produced waters, see, e.g., S. Almond et al., *The Flux of Radionuclides in Flowback Fluid from Shale Gas Exploitation*, 21 ENVTL. SCI. & POLLUTION RES. 12316 (2014). See also J. Henry Fair, *Radionuclides in Fracking Wastewater*, 122.2 ENVTL. HEALTH PERSP. A50 (2014); Andrew J. Kondash et al., *Radium and Barium Removal Through Blending Hydraulic Fracturing Fluids with Acid Mine Drainage*, 48.2 ENVTL. SCI. & TECH. 1334 (2013); Alejandro Lopez, *Radiological Issues Associated With the Recent Boom in Oil and Gas Hydraulic Fracturing* (Am. Soc’y of Mech. Eng’rs, Paper No. ICEM2013-96119, 2013); Andrew W. Nelson et al., *Monitoring Radionuclides in Subsurface Drinking Water Sources Near Unconventional Drilling Operations: A Pilot Study*, 142 J. ENVTL. RADIOACTIVITY 24 (2015); Andrew W. Nelson et al., *Understanding the Radioactive Ingrowth and Decay of Naturally Occurring Radioactive Materials in the Environment: An Analysis of Produced Fluids from the Marcellus Shale*, 123 ENVTL. HEALTH PERSP. 689 (2015); Gayle Nicoll, *Radiation Sources in Natural Gas Well Activities*, OCCUPATIONAL HEALTH & SAFETY (Oct. 1, 2012), <https://ohsonline.com/articles/2012/10/01/radiation-sources-in-natural-gas-well-activities.aspx>; Alisa L. Rich & Ernest C. Crosby, *Analysis of Reserve Pit Sludge from Unconventional Natural Gas Hydraulic Fracturing and Drilling Operations for the Presence of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)*, 23 NEW SOLUTIONS 117 (2013); MARVIN RESNIKOFF, *Radioactivity in Marcellus Shale: Challenge for Regulators and Water Treatment Plants*, in CONTEMPORARY TECHNOLOGIES FOR SHALE-GAS WATER AND ENVIRONMENTAL MANAGEMENT 45 (Ronald D. Neufeld ed., 2012); Jeffrey P. Schubert, Michael F. Rosenmeier & Mark P. Zatezalo, *A Review of NORM/TENORM in Wastes and Waters Associated with Marcellus Shale Gas Development and Production*, in SHALE ENERGY ENGINEERING 2014: TECHNICAL CHALLENGES, ENVIRONMENTAL ISSUES, AND PUBLIC POLICY 492 (Christopher L. Meehan et al. eds., 2014); Leong Ying & Frank O’Connor, *TENORM Radiological Survey of Utica and Marcellus Shale*, 80 APPLIED RADIATION & ISOTOPES 95 (2013); Gary R. Walter, Roland R. Benke & David A. Pickett, *Effect of Biogas Generation on Radon Emissions from Landfills Receiving Radium-Bearing Waste from Shale Gas Development*, 62 J. AIR & WASTE MGMT. ASS’N 1040 (2012); Tiejuan Zhang et al., *Analysis of Radium-226 in High Salinity Wastewater from Unconventional Gas Extraction by Inductively Coupled Plasma-Mass Spectrometry*, 49 ENVTL. SCI. & TECH. 2969 (2015); Tiejuan Zhang et al., *Co-Precipitation of Radium with Barium and Strontium Sulfate and Its Impact on the Fate of Radium During Treatment of Produced Water from Unconventional Gas Extraction*, 48 ENVTL. SCI. & TECH. 4596 (2014).

³⁹ PATHWAYS TO DIALOGUE, *supra* note 26 (according to the experts the fluid burdens found in flowback and produced water were naturally occurring radioactive materials [NORM], aromatic hydrocarbons and hydrogen sulfide; the fluid burdens found in drilling fluids and cuttings were diesel oil and NORM; the fluid burdens found in fracturing fluids were oils, including diesel). See also Brian G. Rahm et al., *Shale Gas Operator Violations in the Marcellus and What They Tell Us About Water Resource Risks*, 82 ENERGY POL’Y 1 (2015); N.R. Warner, C.A. Christie, R.B. Jackson & A. Vengosh, *Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania*, 47 ENVTL. SCI. TECHN. 11849 (2013); A.K. Werner, S. Vink, K. Watt, P. Jagals, *Environmental Health Impacts of Unconventional Natural Gas Development: A Review of the Current Strength of Evidence*, 505 SCI. TOTAL ENV’T 1127 (2015).

plants and industrial wastewater treatment plants was flagged as risky to surface water.⁴⁰

Finally, improper or faulty cementing and casing was identified as a real risk to groundwater during both routine operations and due to accidents. Methane contamination of both surface and groundwater was identified as a risk during drilling, due to poor construction or accidents. In particular, casing accidents were a concern in causing methane contamination of groundwater. Cementing accidents could lead to groundwater problems due to exposure from methane, drilling cuttings, drilling fluids, fracturing fluids, flowback, and produced waters.⁴¹

III. METHODS

For this study, I used established principles of legal epidemiology to conduct policy surveillance.⁴² I began by reviewing the Federal Register and Regulations.gov to identify dockets where federal agencies proposed regulatory action concerning shale oil and gas extraction. Our research team searched Regulations.gov on January 1, 2014, restricting our query to proposed and final rulemakings on any date and using the terms: “fracking,” “hydraulic fracturing,” “shale gas extraction,” and “shale oil extraction.” I had three results for fracking, 41 results for hydraulic fracturing, 41 results for shale gas extraction, and 314 results for shale oil

⁴⁰ Krupnick & Gordon, *supra* note 26. EPA is currently considering revising regulations concerning oil and gas wastes accepted at POTWs. *See* Effluent Limitations Guidelines and Standards for the Oil and Gas Extraction Point Source Category, 80 Fed. Reg. 18,557 (Apr. 7, 2015).

⁴¹ Krupnick & Gordon, *supra* note 26.

⁴² For an explanation of how to conduct policy surveillance using principles of legal epidemiology see, David Presley, Thomas Reinstein & Scott Burris, Resources for Policy Surveillance: A Report Prepared for the Centers for Disease Control and Prevention Public Health Law Program (Temple Univ. Beasley Sch. of Law, Working Paper No. 2015-09, 2015); David Presley & Scott Burris, A Scan of Existing 50 State Survey and Policy Surveillance Resources (Temple Univ. Beasley Sch. of Law, Working Paper No. 2015-01, 2015); David Presley et al., *Creating Legal Data for Public Health Monitoring and Evaluation: Delphi Standards for Policy Surveillance*, 43 J.L., MED. & ETHICS 27 (2015); Scott Burris, A Technical Guide for Policy Surveillance (Temple Univ. Beasley Sch. of Law, Working Paper No. 2014-34, 2014); Sarah Happy, Technical Standards for Policy Surveillance: Delphi Process and Technical Guide, Presentation at 142nd APHA Annual Meeting & Exposition (Nov. 17, 2014) (abstract available at <https://apha.confex.com/apha/142am/webprogram/Paper309688.html>). For other applications, see *supra* note 25 and accompanying text.

extraction.⁴³ I identified the following dockets depicted in Table 1⁴⁴ for review:

Docket	Date	Agency	Number of Comments Posted	Number of Comments Received
General Solicitation for Data Related to Hydraulic Fracturing *EPA-HQ-ORD-2010-0674 ⁴⁵	2010	EPA	1,841	1,749
Oil and Natural Gas Sector—New Source Performance Standards, National Emission Standards	2010	EPA	1,746	252,744

⁴³ We eliminated administrative notices such as Semiannual Regulatory Agendas and Public Plans. We also eliminated procedural notices that extended comment periods or otherwise added to data, documents or other materials to the existing docket. We eliminated Fish and Wildlife Service (“FWS”) rulemakings regarding endangered or threatened species pursuant to the Endangered Species Act, rulemakings concerning greenhouse gas (“GHG”) reporting and oil shale royalties. Finally, we eliminated the OSHA occupational exposure to crystalline silica docket (OSHA-2010-0034-1721). Although the OSHA proposed rule is clearly important to the oil and gas industry because of the use of sand in HVHF, we eliminated the OSHA silica docket from review because the data OSHA sought comments on was not included as a concern in the RFF consensus matrix. We eliminated ESA, GHG and oil shale royalty proceedings on similar grounds to the OSHA docket. While these matters are also clearly important to the oil and gas industry, the agencies posting the docket did not raise questions for comment that aligned with the RFF risk matrix. *See, e.g.*, Endangered and Threatened Wildlife and Plants, 12-Month Finding on a Petition To List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species, Listing the Northern Long-Eared Bat as an Endangered Species, 78 Fed. Reg. 61,046 (Oct. 2, 2013); Endangered and Threatened Wildlife and Plants, Proposed Endangered Status for the Neosho Mucket, etc., 77 Fed. Reg. 63,440 (Oct. 16, 2012); Mandatory Reporting of Greenhouse Gases: Technical Revisions to the Electronics Manufacturing and the Petroleum and Natural Gas Systems Categories of the Greenhouse Gas Reporting Rule, 76 Fed. Reg. 56,010 (Sept. 9, 2011); Proposed Confidentiality Determinations for the Petroleum and Natural Gas Systems Source Category, and Amendments to Table A-7, of the Greenhouse Gas Reporting Rule, 77 Fed. Reg. 11,039 (Feb. 24, 2012); Oil Shale Management—General, 78 Fed. Reg. 18,547 (Mar. 23, 2013); Occupational Exposure to Respirable Crystalline Silica, 78 Fed. Reg. 56,274 (Sept. 12, 2013).

⁴⁴ Dockets depicted in Table 1 are organized by the notice to which comments evaluated are responding, the date on which the docket was opened, the agency receiving the comments, and the number of comments received by the date research was conducted.

⁴⁵ Memorandum from Doug Beak, U.S. E.P.A., to David Jewett, Acting Lab Director, U.S. E.P.A., (Aug. 24, 2010), Docket No. EPA-HQ-ORD-2010-0674-0001 (Authorizing posting to a FDMS docket without agency notice published in the federal register) (comments entered to Docket No. EPA-HQ-ORD-2010-0674).

for Hazardous Air Pollutants, and Control Techniques Guidelines EPA-HQ-OAR-2010-0505-0002 ⁴⁶				
Hydraulic Fracturing Chemicals and Mixtures Under the Toxic Substances Control Act EPA-HQ-OPPT-2011-1019 ⁴⁷	2011	EPA	2,495	264,597
UIC Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels EPA-HQ-OW-2011-1013 ⁴⁸	2011	EPA	2,732	97,147
Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands BLM-2012-0001-0001 ⁴⁹	2012	BLM	7,668	59,705
Hydraulic Fracturing, on	2013	BLM	5,723	1,348,563

⁴⁶ Oil & Natural Gas Sector: New Source Performance Standards National Emission Standards for Hazardous Air Pollutants Reviews, 76 Fed. Reg. 52,738 (Aug. 23, 2011) (comments entered to Docket No. EPA-HQ-OAR-2010-0505).

⁴⁷ Hydraulic Fracturing Chemicals and Mixtures, 79 Fed. Reg. 28,664 (May 19, 2014) (comments entered to Docket No. EPA-HQ-OPPT-2011-1019).

⁴⁸ Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels—Draft: Underground Injection Control Program Guidance #84, 77 Fed. Reg. 27,451 (May 10, 2012) (comments entered to Docket No. EPA-HQ-OW-2011-1013).

⁴⁹ Oil and Gas; Well Stimulations, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691 (proposed May 11, 2012) (to be codified at 43 C.F.R. pt. 3160) (comments entered to Docket No. BLM-2012-0001).

Federal and Indian Lands BLM-2013-0002 ⁵⁰				
Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk USCG-2013-0915 ⁵¹	2013	USCG	1,071	70,115
SAB Review of EPA's Assessment Report on EPA's Research on the Potential Effects of Hydraulic Fracturing on Drinking Water Resources EPA-HQ-OA-2015-0245-2 ⁵²	2015	EPA	356	106,458

After a literature review, my research team developed a coding scheme to review the public comments submitted to the docket. We began by identifying whether the writers wrote as experts, and if so, in which category they self-identified: government, industry, academic, or NGO. Next we evaluated whether the comment was written de novo by the commenter or was copied from a model letter supplied by an organized group urging action. Most importantly, we evaluated the comments using the criteria the experts in the RFF study⁵³ all agreed constituted real environmental and health risks posed by shale oil and gas extraction. Coders evaluated whether or not each comment letter discussed each of

⁵⁰ Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 78 Fed. Reg. 31,636 (proposed May 24, 2013) (to be codified at 43 C.F.R. pt. 3160) (comments entered to Docket No. BLM-2013-0002).

⁵¹ Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, 78 Fed. Reg. 64,905 (Oct. 30, 2013) (comments entered to Docket No. USCG-2013-0915).

⁵² Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, 80 Fed. Reg. 32,111 (June 5, 2015) (comments entered to Docket No. EPA-HQ-OA-2015-0245).

⁵³ See *supra* notes 26–30 and accompanying text.

the sixteen codes. Table 2 depicts the sixteen codes derived from the RFF findings (along with at what stage in the shale extraction life cycle the experts thought the risk was most likely to occur):

List of Codes	Expert View on When Risk is Greatest
Stormwater	Site preparation
Habitat	Site preparation
Methane leakage	Drilling
Water usage	Fracturing & completion
Storage of frac fluids	Fracturing & completion
Venting methane	Fracturing & completion
On-site pit/pond storage	Accidents, weather
MSW treatment	Disposal
Industrial Waste Treatment Plants	Disposal
Casing	Accidents
Cementing	Accidents
NORM & TENORM	Fracturing, disposal
Aromatic hydrocarbons	Fracturing & completion
Hydrogen sulfide	Fracturing & completion
Diesel oil	Fracturing & completion
Oil	Fracturing & completion

The docket was printed out and indexed in a sortable spreadsheet using the docket identification number assigned by the agency on Regulations.gov. A sample set of comments was reviewed collectively so coders could define terms and develop a consistent approach. Two coders divided all the indexed comments and commenced coding half the materials; the coders then reviewed each other's findings and used a spreadsheet to keep track of results. An additional coder (who was not part of the initial review and did not participate in the first round of coding) was assigned to spot check results to ensure consistency. The additional coder selected random comments reviewed using an interval of 10 percent of the total number of comments reviewed in the docket to be sure of agreement.⁵⁴ Use of Computer Assisted/Aided Qualitative Data

⁵⁴ For an explanation of the methods used to develop codes and conduct coding, see David Presley et al., *Creating Legal Data for Public Health Monitoring and Evaluation: Delphi Standards*

Analysis Software (“CAQDAS”) allowed coders to cross-check for consistency using autocoding of key words and synonyms. Once complete, the results were analyzed using descriptive statistics to determine patterns and themes.

IV. ANALYSIS

A. EPA Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews (EPA-HQ-ORD-2010-0674)

The first docket opened by EPA allowed review of air themes concerning HVHF. On January 14, 2009, EPA established a docket in response to a complaint filed by WildEarth Guardians and the San Juan Citizens Alliance that urged EPA to take action over the review and potential revision of the New Source Performance Standards (“NSPS”) and the National Emission Standards for Hazardous Air Pollutants (“NESHAP”) for the Oil and Natural Gas Production source category.⁵⁵ EPA previously promulgated NSPS for two source categories covered by the oil and gas industry: one category addressed volatile organic compound (“VOC”) emissions from leaking components at onshore natural gas processing plants,⁵⁶ and the second category regulates sulfur

for Policy Surveillance, 43 J. L. MED. & ETHICS 27 (2015); Scott Burris & Evan D. Anderson, *Legal Regulation of Health-Related Behavior: A Half-Century of Public Health Law Research*, 9 ANNUAL REV. L. & SOCIAL SCI. 95 (2013); Scott Burris et al., *Moving from Intersection to Integration: Public Health Law Research and Public Health Systems and Services Research*, 90 MILBANK Q. 375–408 (2012); EVAN D. ANDERSON ET AL., PUB. HEALTH L. RESEARCH, MEASURING STATUTORY LAW AND REGULATIONS FOR EMPIRICAL RESEARCH (2012); Jennifer K. Ibrahim, Scott Burris & Scott Hays, *Public Health Law Research: Exploring Law in Public Health Systems*, 18 J. PUB. HEALTH MGMT & PRACTICE 499–505 (2012); Scott C. Burris & Evan D. Anderson, *Making the Case for Laws that Improve Health: The Work of the Public Health Law Research National Program Office*, 39 J. L. MED. & ETHICS 15 (2011); Scott C. Burris, *Law in a Social Determinants Strategy: A Public Health Law Research Perspective*, 126.supp.3 PUB. HEALTH REPORTS 22 (2011); see also Evan D. Anderson & Scott Burris, *Educated Guessing: Getting Researchers and Research Knowledge into Policy Innovation*, in REGULATING TOBACCO, ALCOHOL AND UNHEALTHY FOODS: THE LEGAL ISSUES (Tania Voon, Andrew Mitchell & Jonathan Liberman eds., 2014); EVAN D. ANDERSON ET AL., PUB. HEALTH L. RESEARCH , MEASURING STATUTORY LAW AND REGULATIONS FOR EMPIRICAL RESEARCH (2012).

⁵⁵ The complaint was made pursuant to section 304(a)(2) of the Clean Air Act (“CAA”). The complaint alleged that EPA failed to meet its obligations under CAA sections 111(b)(1)(B), 112(d)(6) and 112(f)(2). See *Oil & Natural Gas Sector, New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Review*, 76 Fed. Reg. 52,738 (proposed Aug. 23, 2011) (to be codified at 40 C.F.R. pts. 60 & 63) (comments entered to Docket No. EPA-HQ-OAR-2010-0505-0002).

⁵⁶ 40 C.F.R. pt. 60, subpart KKK; *Standards of Performance for New Stationary Sources, Equipment Leaks of VOC From Onshore Natural Gas Processing Plants*, 50 Fed. Reg. 26,122 (June 24, 1985).

dioxide (“SO₂”) emissions from natural gas processing plants.⁵⁷ Although EPA had listed crude oil and natural gas production on its priority list of source categories where promulgation of greater NSPS regulations was needed as early as 1985,⁵⁸ EPA had not previously set NSPS for oil and gas operations other than natural gas processing plants.

On February 4, 2010, EPA entered into a consent decree requiring EPA to develop proposed NSPS and NESHAP standards for the oil and gas production sector by July 28, 2011.⁵⁹ On August 23, 2011, EPA issued the first in a series of proposed rulemaking outlining NSPS and NESHAPs for the oil and gas sector.⁶⁰ Under the proposed rule, EPA expansively defined the oil and gas sector as including “operations involved in the extraction and production of oil and natural gas, as well as the processing, transmission and distribution of natural gas.”⁶¹ For the first time, EPA proposed air regulations that suggested operational standards for hydraulically fractured gas wells.

Environmental groups were enthusiastic about the plan to expand air regulations into greater aspects of oil and gas operations.⁶² EPA reported 248,349 letters from numerous environmental NGOs supporting the proposed EPA air regulations. Organizing groups included: the Clean Air Council (270 comments), Credo Action (58,678 comments), Earthjustice (58,723 comments), the Environmental Defense Fund (41,454 comments), the League of Conservation Voters (1,027 comments), the National Wildlife Federation (35,748 comments), Natural Resources Defense Council 10,769 comments), PennEnvironment (5,642 comments), Sierra Club (25,716 comments), and the WildEarth Guardians (1,667 comments). An unknown group also mounted a significant letter writing campaign favoring promulgation of further air regulations for the oil and gas industry (including HVHF), and it produced 8,655 letters. In addition, about 200 public writers wrote comments that varied language slightly to avoid grouping as a mass

⁵⁷ 40 C.F.R. pt. 60, subpart LLL; Standards of Performance for New Stationary Sources; Onshore Natural Gas Processing SO₂ Emissions, 50 Fed. Reg. 40,158 (Oct. 1, 1985).

⁵⁸ Priority List and Additions to the List of Categories of Stationary Sources, 44 Fed. Reg. 49,222 (Aug. 21, 1979).

⁵⁹ In the alternative, EPA could make a determination by July 28, 2011 that EPA need not issue standards pursuant to CAA sections 111(b)(1)(B), 112(d)(6) and 112(f)(2). *See* Oil & Natural Gas Sector, New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Review, 76 Fed. Reg. at 52,743. EPA also agreed to take final action by February 28, 2012. *Id.*

⁶⁰ *Id.* at 52,745.

⁶¹ *Id.* at 52,744.

⁶² *Id.* (comments entered to Docket No. EPA-HQ-OAR-2010-0505-0002).

mailing.⁶³ The letter expressed support for the EPA regulation and raised concern that the oil and gas industry was mounting a powerful campaign to avoid air regulation.⁶⁴

As required, comments in the air docket focused on air issues concerning HVHF and related operations. Since water issues were outside the scope of the EPA request for comments, most sophisticated entities submitting detailed reviews with legal and scientific citation either omitted water issues or mentioned water only in passing. Following requested procedure, sophisticated parties commented on that which the agency asked for feedback: air pollution from the oil and gas sector. Applying the RFF risk matrix factors, slightly over half of the posted comments discussed concerns about methane, while 4 percent discussed concerns about radiation and 14 percent discussed aromatic hydrocarbons. The other issues identified by the experts in the RFF matrix were all discussed by only a handful of commenters; lack of discussion of non-air risk factors was not surprising since the focus of the proposed regulation was on air emissions and the agency had requested comments that pertained to the scope of the proposed regulation.

The Community Municipal and Environmental Liaison for the Commissioner of Wyoming County wrote in support of EPA's proposal to modernize the oil and gas industry's air quality control regulations.⁶⁵ Wyoming County recognized that while shale oil and gas was a critical industry for the state economy, "many of the provisions of the CAA are insufficient for industrial activity with the density of exploration and production activities, coupled with locations nearby so many homes."⁶⁶ The County concluded that the "CAA was not created with the activity relative to shale oil and gas exploitation [in mind]"⁶⁷ and hence modified rules would be important to balance environmental health and economic

⁶³ Compare, Anonymous, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-5598 (Nov. 10, 2015), and Anonymous, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-5475 (Nov. 5, 2015) [hereinafter Anonymous #5475], with Anonymous, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-5558 (Nov. 9, 2015) (shifting concern to cow farts).

⁶⁴ See, e.g., Anonymous, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-5438 (Nov. 5, 2015); see also Anonymous #5475, *supra* note 63 ("Recently I also heard that Exxon (I think it was that company) learned some years ago that emissions had a negative impact on the environment but chose to ignore it.").

⁶⁵ Emily Kraffack, Community, Municipal & Environmental Liaison, Wyoming County, Pennsylvania, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-4274 (Dec. 2, 2011).

⁶⁶ *Id.*

⁶⁷ *Id.*

needs The National Association of Clean Air Agencies (“NACAA”) agreed and urged EPA “to set an NSPS for methane emissions from the oil and natural gas industry since this would be an important mechanism for reducing emissions of methane, a powerful greenhouse gas as well as an ozone precursor.”⁶⁸

Industry disagreed with the assessment of local governments and environmental groups. For example, Trilogy Operating, Inc. wrote to “request that EPA withdraw these Rules because they are unnecessary to protect human health and the environment, and the costs that they will impose on the oil and gas industry are not justified by the minute reduction in global greenhouse gases that could result if the Rules are adopted as proposed.”⁶⁹ The Texas Commission on Environmental Quality (“TCEQ”) agreed,⁷⁰ stating that, “[f]rom a regulatory perspective these rules will significantly increase the permitting and enforcement workload for TCEQ as the delegated administrator.”⁷¹ TCEQ also asserted that implementation of the proposed rules would dramatically increase the fiscal burden on Texas.⁷²

EPA published a final NSPS for the oil and natural gas sector on August 16, 2012.⁷³ Industry representatives filed petitions for administrative reconsideration of certain aspects of the NSPS standards immediately. Among issues raised were time-critical procedures related to storage vessel provisions and well completion provisions. Accordingly, on July 17, 2014, EPA published proposed amendments and clarifications of the regulations regarding technical issues concerning, *inter alia*, well completions and storage vessels. EPA combined all comments on the NSPS standard in one docket. In all, EPA reported that

⁶⁸ Compare S. William Becker, National Association of Clean Air Agencies (NACAA), Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-4208 (Dec. 1, 2011), with Sparsh Khandeshi, Environmental Integrity Project, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-4242 (Dec. 1, 2011).

⁶⁹ Mark R. Vickery, Texas Commission on Environmental Quality, Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-4356 (Dec. 7, 2011).

⁷⁰ W. Michael Scott, Trilogy Operating, Inc., Comment Letter on Proposed Rule, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, Docket No. EPA-HQ-OAR-2010-0505-6603 (Nov. 25, 2015).

⁷¹ *Id.*

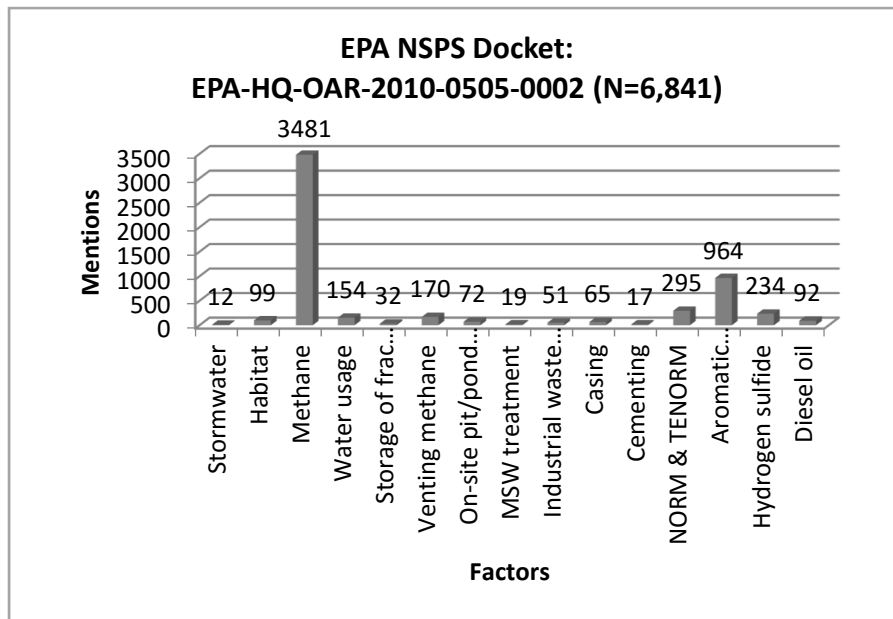
⁷² *Id.*

⁷³ Oil & Natural Gas Sector, New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49,490 (Aug. 16, 2012).

it received 1,279,037 comments on NSPS in the oil and natural gas sector, of which 6,841 were posted.⁷⁴

The NPS docket shows clear patterns. Members of the general public wrote the bulk of comments submitted to EPA. The vast majority of comments were part of campaigns mounted by environmental groups. Most individual comments submitted to the docket (that were not duplicates of the environmental campaigns) reflected the sentiments set out by environmental groups. A relatively small number of self-identified experts submitted comments to the docket. These experts presented polarized conclusions on the need for regulation but many concurred with the issues raised in the RFF risk matrix.

Graph A below depicts the numbers of times comment writers referenced the topics in the RFF risk matrix:



⁷⁴ See Oil & Natural Gas Sector, New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 76 Fed. Reg. 52,738 (proposed Aug. 23, 2011) (to be codified at 40 C.F.R. pts. 60 & 63) (comments entered to Docket No. EPA-HQ-OAR-2010-0505-0002). As of the date this article was written, 905,969 comments were sent in response to the 2015 proposal “to amend the new source performance standards (NSPS) for the oil and natural gas source category by setting standards for both methane and volatile organic compounds (VOC) for certain equipment, processes and activities across this source category.” Oil and Natural Gas Sector: Emissions Standards for New and Modified Sources, 80 Fed. Reg. 56,593 (Sept. 18, 2015) (comments entered to Docket No. EPA-HQ-OAR-2010-0505). 19 comments were sent to EPA in response to EPA’s proposed definition of “low pressure gas well.” See Oil and Natural Gas Sector: Definitions of Low Pressure Gas Well and Storage Vessels, 80 Fed. Reg. 15,180 (Mar. 23, 2015) (comments entered to Docket No. EPA-HQ-OAR-2010-0505).

The polarity in comments reflects two primary factors. First, EPA requested comments on matters pertaining to air, so most commenters adhered to administrative requirements and focused on air pollution concerns. Second, the relatively low number of comments pertaining to RFF's detailed risk matrix concerns reflects the similarly low number of experts submitting comments. Most comments submitted by the general public were based on templates provided by environmental groups. Most were a page or less and contained little or no legal or scientific citation. Most comments merely indicated general support for the proposed environmental regulation and fear of environmental contamination from industry.

On December 31, 2014, EPA promulgated final NSPS regulations for the oil and natural gas sector incorporating amendments and technical corrections that were inadvertently included in the first set of "final standards."⁷⁵

EPA issued two additional air rules governing the oil and gas sector (including HVHF) in June 2016. The first is designed to reduce methane and VOCs from the oil and natural gas sector.⁷⁶ The second clarified the definition of what is meant by an "adjacent building, structure, facility or installation" for purposes of determining whether a "stationary source" in the oil and gas sector is subject to regulation for purposes of the Prevention of Significant Deterioration ("PSD") and Nonattainment New Source Review ("NNSR") programs.⁷⁷ According to EPA, the rule also defines "major source" for purposes of the Title V program as applied to the oil and natural sector.⁷⁸

B. EPA Drinking Water Study #1⁷⁹

The second docket examined was EPA's study of the potential effect of hydraulic fracturing on drinking water, first opened in 2010.⁸⁰ On November 9, 2012, EPA requested "data and scientific literature to

⁷⁵ Oil and Natural Gas Sector: Reconsideration of Additional Provisions of New Source Performance Standards, 79 Fed. Reg. 79018-41 (Dec. 31, 2014) (to be codified at 40 C.F.R. pt. 60).

⁷⁶ See Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 35,824-942 (June 3, 2016) (to be codified at 40 C.F.R. pt. 60). Texas joined North Dakota in suing to challenge EPA's rule regulating methane emissions from oil and gas operations.

⁷⁷ Source Determination for Certain Emission Units in the Oil and Gas Sector, 81 Fed. Reg. 35,622-34 (June 3, 2016) (to be codified at 40 C.F.R. pts. 51, 52, 70, 71).

⁷⁸ *Id.*

⁷⁹ Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, 77 Fed. Reg. 67,361 (Nov. 9, 2012).

⁸⁰ *Id.* (comments entered to Docket No. EPA-HQ-ORD-2010-0674).

inform EPA's research on the potential impacts of hydraulic fracturing on drinking water resources."⁸¹ Congress urged EPA to identify factors that may affect the severity and frequency of HVHF on drinking water.⁸²

EPA defined the scope of the study as including "the full hydraulic fracturing water lifecycle—from water acquisition, through the mixing of chemicals and injection of fracturing fluids, to the post fracturing stage, including the management of flowback and produced water and its ultimate treatment and disposal."⁸³ For purposes of the study, EPA used the term "hydraulic fracturing" in the expansive manner used in the popular press (including the entire shale gas extraction life cycle) rather than in the restrictive manner used by industry (as just one step in the process designed to stimulate well production).⁸⁴

The EPA drinking water study began with a review of the published literature, analyzed existing data, enlisted scenario evaluation and modeling, laboratory studies and case studies. EPA posted three primary and ninety-two supporting documents in the docket reflecting the data the gathered from its review.⁸⁵ As administrative law requires, EPA invited public comment. The agency requested materials that would ensure its review was thorough and included all relevant data. EPA warned that deference would be given to peer reviewed information.⁸⁶ Interested persons could provide scientific analyses, studies, and other pertinent scientific information, but strong preference would be given to peer reviewed data and peer reviewed literature.

At the request of the public, EPA extended the deadline for data submissions from April 30, 2013 to November 15, 2013.⁸⁷ Once the docket was closed EPA reported 1,749 comments received, of which 1,746 were posted on Regulations.gov.⁸⁸ The vast majority of comments—79 percent—were signed. Only 138 comments were submitted anonymously. The majority of comments came from private

⁸¹ *Id.*

⁸² *Id.*

⁸³ *Id.*

⁸⁴ Compare U.S. EPA, STUDY OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING ON DRINKING WATER RESOURCES (2012), with Bruce Thompson, President, American Exploration & Production Council (AXPC), Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0244 (Aug. 28, 2015).

⁸⁵ Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, 77 Fed. Reg. 67,361 (comments entered to Docket No. EPA-HQ-ORD-2010-0674).

⁸⁶ *Id.*

⁸⁷ Request for Information To Inform Hydraulic Fracturing Research Related to Drinking Water Resources, 78 Fed. Reg. 25,267 (Apr. 30, 2013).

⁸⁸ Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, 77 Fed. Reg. 67,361 (comments entered to Docket No. EPA-HQ-ORD-2010-0674).

citizens (1,384 comments), but government (68 comments), industry (127 comments), academics (40 comments), and NGOs (127 comments) were all represented. Most of the comments (1,619) were written as original prose, but about 6 percent of the comments (115) were copied from prewritten letters prepared by NGOs and environmental groups. The Damascus Citizens for Sustainability submitted 61 comments. Democracy for America collected a petition with 3,411 signatures.⁸⁹

In general, the comments submitted to the EPA drinking water docket fell into predictable patterns. The 127 comments submitted by industry generally opposed EPA regulation of HVHF, stating that state regulations were sufficiently protective and adding a federal overlay would be duplicative, cause unnecessary expense and delay, and complicate an already heavily regulated industry. Environmental groups typically encouraged either federal regulation or outright ban on the process. Comments by environmental groups fell into two categories: detailed comments by the entities and short letters to be used as templates for comment by the public.

Private citizens expressed concern and welcomed inquiry into the need for further federal oversight.⁹⁰ An example read:

We need real protection of our water and health, communities and livelihoods, farms and pets, and the wild things that live in our ecosystems. Untested claims and assurances about the harmlessness of fracking are not enough to protect our water and our lives.⁹¹

⁸⁹ Larysa Dyrszka, Democracy for America, Comment Letter on Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, Docket No. EPA-HQ-ORD-2010-0674-1127 (Feb. 22, 2011).

⁹⁰ See, e.g., J. Pierpont, Comment Letter on Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, Docket No. EPA-HQ-ORD-2010-0674-0067 (Feb. 10, 2011); see also Anonymous, Comment Letter on Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, Docket No. EPA-HQ-ORD-2010-0674-1757 (Nov. 20, 2013) (listing as important concerns: (1) use of drinking water, (2) improper frac-well construction, (3) oversight needed to prevent excessive pressure and volume injection into the disposal zone that can cause minor earthquakes, (4) disposal of frac flow-back fluid and solids, as the contents cannot be handled by typical wastewater treatment plants, (5) disposal of shale cuttings with elevated radiation, (6) full “state control over the use of gas/oil/water/air natural resources which collectively are national resources for the greater good”, (7) the dangerous practice of “the law of capture” as it could “destroy the porosity/permeability of drinking water aquifers and possibly decrease the water recovery yield”, (8) lack of details (depth, casing, location) about historical well (public, private) penetrations (1860s-1950+) and their abandonment practices as “old wells are open straws that can allow cross connections between the water aquifers and the drilling fluids and gas encountered while drilling”, (9) lack of baseline chemistry and fundamental attributes of private drinking water wells, and (10) the paucity of baseline data needed to both prevent misguided complaints directed).

⁹¹ See J. Pierpont, Comment Letter on Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, Docket No. EPA-HQ-ORD-2010-0674-0067.

Most comments took seriously the EPA mandate that the agency could only consider serious scientific concerns at the industry and help mitigate contamination issues due to poor drilling practices.⁹² An anonymous comment supplied detailed discussion of concerns about drilling practices:⁹³

There are now over 80 producing gas wells in this immediate study area, where I live, many of which are constantly venting gas to the atmosphere in order to relieve pressure off of the shallow formation that you are talking about. Those wells act as conduits, from thousands of feet down into the Williams Fork formation all the way up through the Wasatch - some of which is not sealed by cement, that introduces the risk of migrating methane just as it does for water to travel through the already fractured geology as well as through fractures that are induced through hydraulic fracturing activity.⁹⁴

The writer was extremely frustrated with the protections availed to his community by the state, explaining that the “only conclusion that can then be drawn from such an effort is how corruptible both the democratic and scientific process can become.”⁹⁵ As a scientific matter, the commenter said that the fact “that thermogenic methane contamination is more saturated . . . is also very telling.”⁹⁶

In sum, the pattern established in the NSPS docket arose again in the first EPA drinking water study. Most comments submitted by the general public were short, less detailed, and expressed general fear. Comments discussing the RFF risk matrix factors were more likely to be discussed by self-identified experts. Public comments did indeed reflect the concerns of the RFF consensus pathways, although the degree discussed varied in proportion to the relative number of comments submitted by self-identified experts, as shown in Graph B below:

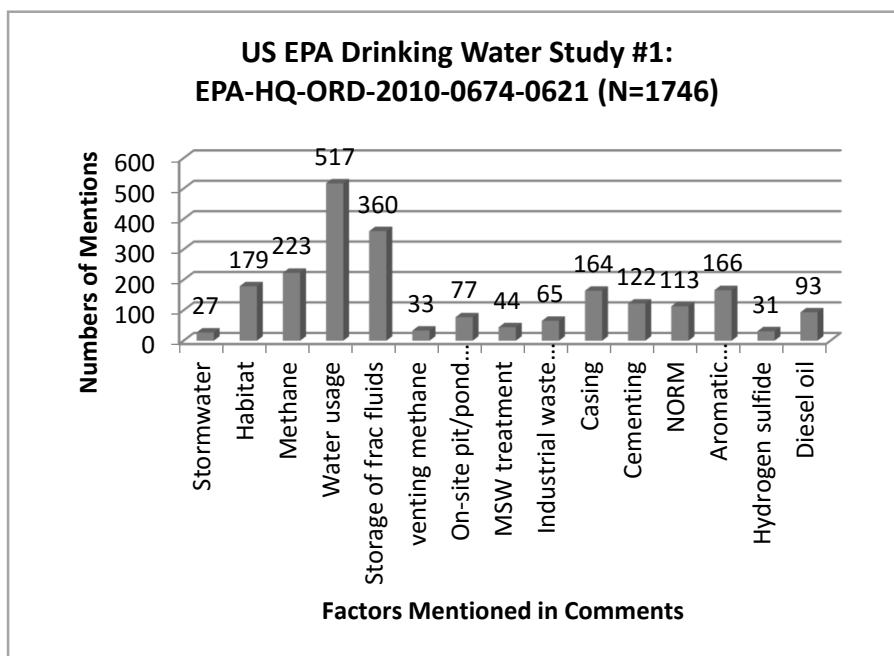
⁹² See, e.g., *Id.*

⁹³ Anonymous, Comment Letter on Request for Information to Inform Hydraulic Fracturing Research Related to Drinking Water Resources, Docket No. EPA-HQ-ORD-2010-0674-1763 (Nov. 20, 2013).

⁹⁴ *Id.*

⁹⁵ *Id.*

⁹⁶ *Id.*



Taken as a whole, and without differentiating between experts and members of the general public, the vast majority of comments focused on concerns about impact to drinking water due to storage of chemicals used for HVHF and on-site pit or pond storage of flowback and produced waters. Concerns about radiological exposure and technological failures in casing and cementing, while reflected, were less robustly shared; these concerns seemed to be expressed by expert commenters rather than comments submitted by the general public. In fact, the proportion of comments discussing the technical concerns raised by the RFF experts was proportional to the expertise of the commenter. Comments by the general public tended to be short and expressed the general need for protecting drinking water, but without significant legal or scientific citation.

C. EPA Drinking Water Study #2

EPA concluded its drinking water study and posted a draft assessment on June 4, 2015.⁹⁷ Public comment on the draft assessment continued

⁹⁷ U.S. EPA, ASSESSMENT OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING FOR OIL AND GAS ON DRINKING WATER RESOURCES (EXTERNAL REVIEW DRAFT) (2015). For a summary, see U.S. EPA, ASSESSMENT OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING FOR OIL

until August 28, 2015,⁹⁸ but EPA, as of this writing, has not published the final assessment. The August 2015 findings are very controversial. On January 7, 2016, the EPA Science Advisory Board (“SAB”) issued a draft report to EPA administrator Gina McCarthy stating that “the SAB has concerns regarding the clarity and adequacy of support for several major findings . . . that seek to draw national-level findings regarding the impacts of hydraulic fracturing on drinking water resources.”⁹⁹ Environmental groups echoed the SAB request.¹⁰⁰

EPA reported that 106,281 comments were submitted critiquing the draft assessment during the public comment period between June 4 and August 28, 2015. Three hundred fifty-six comments were posted to the docket, including late filings.¹⁰¹ The difference between reported and posted comments is attributable to mass write-in campaigns by five groups: Breast Cancer Action,¹⁰² Environment Action,¹⁰³ League of Women Voters,¹⁰⁴ Union of Concerned Scientists,¹⁰⁵ and Food and Water Watch.¹⁰⁶ Together, the write-in campaigns represented over 106,000 individuals—a large contrast with the initial EPA drinking water docket

AND GAS ON DRINKING WATER RESOURCES (EXECUTIVE SUMMARY) (2015). These documents are drafts for review purposes only and do not constitute agency policy.

⁹⁸ Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, 80 Fed. Reg. 32,111 (June 5, 2015) (comments entered to Docket No. EPA-HQ-OA-2015-0245).

⁹⁹ Science Advisory Board, U.S. EPA, Review of EPA’s draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources (Jan. 7, 2016) (draft report),

[https://yosemite.epa.gov/sab/SABPRODUCT.nsf/ea5d9a9b55cc319285256cbd005a472e/d4210ba02ebef65185257f33005a0cc2/\\$FILE/Report%20to%20Administrator-SAB%20Hydraulic%20Fracturing%20Research%20Advisory%20Panel-1-7-16%20draft.pdf](https://yosemite.epa.gov/sab/SABPRODUCT.nsf/ea5d9a9b55cc319285256cbd005a472e/d4210ba02ebef65185257f33005a0cc2/$FILE/Report%20to%20Administrator-SAB%20Hydraulic%20Fracturing%20Research%20Advisory%20Panel-1-7-16%20draft.pdf).

¹⁰⁰ See, e.g., Hollin Kretzmann, Center for Biological Diversity (CBD), Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0300 (Dec. 24, 2015).

¹⁰¹ Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, 80 Fed. Reg. 32,111 (comments entered to Docket No. EPA-HQ-OA-2015-0245).

¹⁰² Breast Cancer Action, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0134 (Sept. 2, 2015).

¹⁰³ Environment Action, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0207 (Sept. 2, 2015).

¹⁰⁴ League of Women Voters (“LWV”) of the United States, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0260 (Oct. 15, 2015).

¹⁰⁵ Union of Concerned Scientists (UCS), Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0132 (Sept. 2, 2015).

¹⁰⁶ Food & Water Watch, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0135 (Sept. 2, 2015).

where only 1,749 comments were posted in total. Like the prior EPA docket, the majority of submitted comments were signed, but about one-third of the posted comments (94) were written anonymously. The anonymous public comments again reflected frustration with EPA's ability to protect the public from environmental perils related to HVHF.¹⁰⁷

From the perspective of patterns in public discourse, the second EPA drinking water docket is a paradox of contradictions. Although there were significantly fewer posted comments in the docket for the second round of the EPA Drinking Water Study, there was a very dramatic increase in interest and participation by the general public. Signed comments were more specific than many of those made anonymously. Again, industry, NGOs, and governments typically submitted detailed attachments outlining very specific concerns with support from scientific and legal citations. The comments of industry and NGOs were again characteristically polarized in interpreting similar data.¹⁰⁸

Although typically lacking scientific or legal citation, individuals submitting written comments to the EPA docket often captured similar concerns as those identified by the RFF experts. For example, retired chemical and environmental safety engineer Ted Stroter wrote, “[i]t has also been shown by state environmental agencies and independent researchers that well cement failures are all too routine. The well failures, the high pressures used in fracturing and injection disposal have all led to pathways to water contamination . . . I have personally reviewed over 240 cases of well water contamination in Pennsylvania alone. Among the contaminants found were methane, manganese, aluminum, iron, and barium, among others.” Another commenter describing himself as a “loyal servant of the Oil/Gas industry” and a member of the little River Band of Ottawa Indians, stated that it is his experience that “radiation levels are at all-time high in drill cutting and the flow back from HVHF.”¹⁰⁹ Both agreed that they “can’t stress enough” the “safety issue to local communities in the migration of chemicals used by the industry, getting into their fresh water well.”¹¹⁰

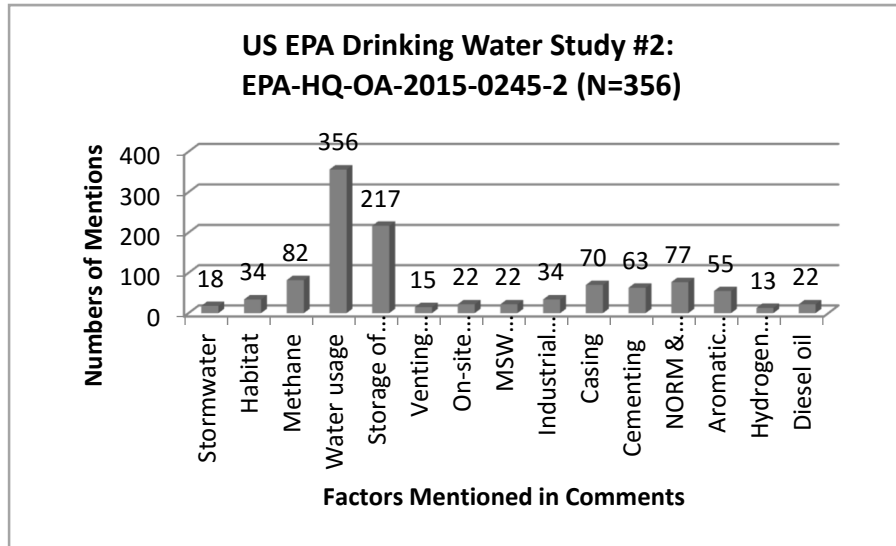
¹⁰⁷ See, e.g., Anonymous, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0093 (Sept. 1, 2015).

¹⁰⁸ Compare Kretzmann, *supra* note 100, with Jim Welty, Marcellus Shale Coalition (MSC), Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0144 (Sept. 2, 2015).

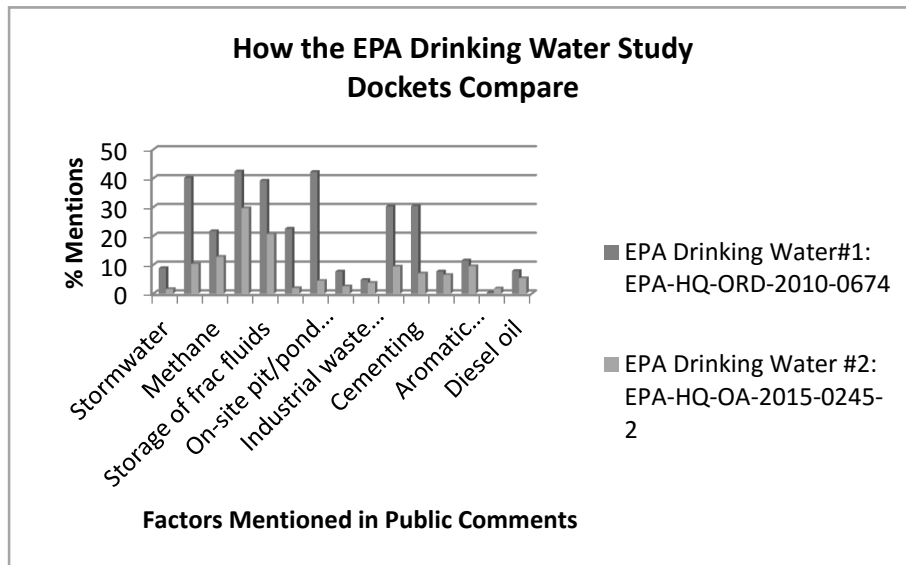
¹⁰⁹ See also R.L. Calsin, Comment Letter on Notification of Teleconferences and a Public Meeting of the Science Advisory Board Hydraulic Fracturing Research Advisory Panel, Docket No. EPA-HQ-OA-2015-0245-0291 (Dec. 8, 2015).

¹¹⁰ *Id.*

Although comments from the public addressing the draft EPA Drinking Water study again reflected some of the concerns of the RFF consensus pathways, the degree again varied as shown in Graph C1 below:



A comparison of the two EPA drinking water dockets indicates that the relative numbers of individuals expressing concerns about each of the elements in the RFF expert matrix are consistent, as can be seen in Graph C2 below:



Although the EPA Drinking Water Study remains controversial, EPA's regulatory agenda for 2016 includes regulatory proposals that address the protection of water in HVHF. EPA published regulations governing disposal of the large quantities of unconventional oil and gas extraction wastewater generated in the HVHF process in June 2016.¹¹¹ The agency said these wastes "can be generated in large quantities and contain constituents that are potentially harmful to human health and the environment."¹¹² EPA explained that "wastewater from UOG [unconventional oil and gas] wells often contains high concentrations of salt content, also called total dissolved solids or TDS,"¹¹³ hence the need for federal regulation. While this UOG regulation grows out of a notice and comment posted in a later EPA docket, the seeds of need for such regulation of fracking wastewater were sown in the early EPA drinking water studies still under consideration by the agency and the public.

D. UIC Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels (EPA-HQ-OW-2011-1013)

When Congress enacted the Energy Policy Act of 2005, the Safe Drinking Water Act ("SDWA") was revised so the definition of "underground injection" specifically excluded "underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities" from Underground Injection Control ("UIC") regulation.¹¹⁴ Thus, the SDWA generally exempted HVHF from SDWA permit requirements. Despite this exemption in the 2005 law, oil and gas operators who inject diesel fuels during HVHF must still obtain a UIC Class II permit.¹¹⁵

¹¹¹ Effluent Limitations Guidelines and Standards for the Oil and Gas Extraction Point Source Category, 81 Fed. Reg. 41,845 (June 28, 2016). The wastewater final rules follow proposed regulations published on April 7, 2015—after the dates included in the investigation in this article. See 80 Fed. Reg. 18,557 (Apr. 7, 2015); 80 Fed. Reg. 31,342 (June 2, 2015) (extending the comment period).

¹¹² Effluent Limitations Guidelines and Standards for the Oil and Gas Extraction Point Source Category, 81 Fed. Reg. 41,845.

¹¹³ *Id.* at 41,847.

¹¹⁴ See Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 694 (2005); Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels-Draft: Underground Injection Control Program Guidance #84, 77 Fed. Reg. at 27,451, 27,452 (May 10, 2012).

¹¹⁵ For a discussion of Class II UIC wells, see *Class II Oil and Gas Related Injection Wells*, U.S. EPA, <https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells> (last visited Oct. 17, 2016).

When creating the HVHF exclusion from SDWA permit requirements, the 2005 statute did not, however, specify whether there was a threshold concentration or percentage of diesel fuels in HVHF injectate that would qualify for the exclusion. EPA said that it did not have reliable data about volumes and frequency with which diesel fuel is used in HVHF fluids or as propping agents. Accordingly, on May 10, 2012, EPA posted a request for comments seeking data about use of diesel in HVHF and querying the public whether there was some *de minimis* level of diesel fuel constituents in HVHF fluids or propping agents that should be used to determine what is within the bounds of SDWA UIC regulation.¹¹⁶ EPA asked that those who supported applying a *de minimis* standard for purpose of establishing regulatory jurisdiction should also explain how a *de minimis* standard should best be defined or described, along with legal and scientific citation justifying the reasoning behind the commenter's recommendation.¹¹⁷

EPA's 2012 docket described the agency's proposed guidance for permitting the underground injection of oil and gas-related HVHF using diesel fuels as a fracturing fluid or as a component of a fracturing fluid in jurisdictions where EPA was the Class II UIC permitting authority.¹¹⁸ EPA said its goal was "to provide greater regulatory clarity and certainty to the industry, which will in turn improve compliance with the SDWA requirements and strengthen environmental protections consistent with existing law."¹¹⁹ EPA was emphatic that the draft guidance would not impose any new regulatory requirements on industry—the proposal merely sought to clarify UIC Class II permitting rules.¹²⁰

Comments were accepted from May 10 until August 23, 2012. EPA reported that 97,417 were received in the docket. Of those, EPA posted 2,732 comments for public view on Regulations.gov. The difference was attributable to mass write-in campaigns by individuals following the lead of organized environmental groups. The vast majority of comments posted to the docket were signed; only twenty comments to the UIC docket were submitted anonymously. Most comments (2,594) posted to the docket were written by private individuals, but tribes (1), industry (79), environmental groups and NGOs (300) also participated.

Again, the comments showed a distinction between those written by experts and those written by the general public. A notable number

¹¹⁶ Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels-Draft: Underground Injection Control Program Guidance #84, 77 Fed. Reg. at 27,451.

¹¹⁷ *Id.* at 27,454.

¹¹⁸ *Id.* at 27,451.

¹¹⁹ *Id.*

¹²⁰ *Id.*

of comments (898) submitted by the general public expressed concern that they could not trust the oil and gas industry to adhere to safe practices that would protect drinking water.¹²¹ Seven-hundred eight writers quoted a 2004 EPA report finding the use of diesel fuel in in HVHF poses a great threat to underground sources of drinking water.¹²²

In part due to mistrust of oil and gas corporations, many writers from the general public urged EPA to ban the practice of using diesel in HVHF altogether.¹²³ Nine-hundred six commenters asked EPA to “protect my drinking water and ban the use of diesel fuel and diesel fuel by-products in fracking fluids.”¹²⁴ Many explained concern that diesel used in fracking could lead to BTEX (benzene, toluene, ethyl benzene and xylenes) contamination of drinking water,¹²⁵ a danger because BTEX chemicals “are human carcinogens, and chronic exposure can damage the central nervous system, liver and kidneys.”¹²⁶

Many commenters from the general public favoring a ban of HVHF recognized a ban was unlikely due to legal and political constraints. In the alternative, these writers said, “if a total ban is not put in place, then the strongest possible protections must be required through formal rulemaking to give these protections the force of law.”¹²⁷ One-hundred one comments from the general public pleaded with EPA to “protect public health.”

Although EPA attempted to screen mass campaigns, our review of the docket indicated that many of the public comments were variations of recommended language from an unnamed organizer. As such, the vast majority of the comments posted on the docket contained only general comments and not detailed, cited responses to the questions EPA asked to be addressed. Accordingly, while nearly all the comments discussed concerns about water usage, drinking water contamination, and use of diesel in HVHF, relatively few addressed the other items identified in the RFF risk matrix. In fact, almost all the comments raising issues identified in the RFF consensus matrix were made by experts—either in industry or in the environmental groups.

¹²¹ See, e.g., L. Croxson, Comment Letter on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels-Draft: Underground Injection Control Program Guidance #84, Docket No. EPA-HQ-OW-2011-1013-0718 (June 1, 2012).

¹²² See, e.g., *id.*

¹²³ See, e.g., V. Marino, Comment Letter on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels-Draft: Underground Injection Control Program Guidance #84,, Docket No. EPA-HQ-OW-2011-1013-1561 (July 19, 2012).

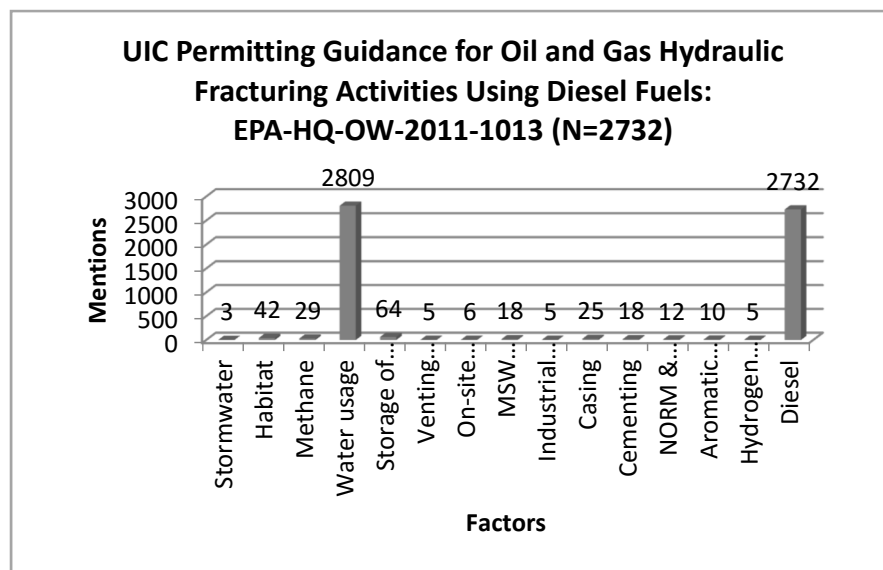
¹²⁴ See, e.g., L. Croxson, *supra* note 121.

¹²⁵ See, e.g., V. Marino, *supra* note 123.

¹²⁶ See, e.g., Croxson, *supra* note 121.

¹²⁷ V. Marino, *supra* note 123.

Graph D below records the numbers of commenters discussing the RFF matrix factors in the UIC docket:



The limited industry comments tended to oppose regulation,¹²⁸ but offered more detailed analysis based on technicalities understood by the oil and gas industry and not by the general public.¹²⁹

In February 2014, EPA issued a technical guidance document establishing technical recommendations for protecting underground sources of drinking water (“USDWs”) from potential endangerment posed from HVHF activities where diesel fuels are used.¹³⁰ The guidance defined diesel by applying five Chemical Abstract Service Registry Numbers (“CASRN”). The guidance only applied to circumstances where diesel was used in injection. Use of diesel is not subject to UIC Class II permitting in non-injection purposes.

¹²⁸ See, e.g., Ron Ness, North Dakota Petroleum Council (NDPC), Comment Letter on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels-Draft: Underground Injection Control Program Guidance #84, Docket No. EPA-HQ-OW-2011-1013-1877 (Aug. 15, 2012).

¹²⁹ *Id.*

¹³⁰ OFFICE OF WATER, U.S. EPA, PERMITTING GUIDANCE FOR OIL AND GAS HYDRAULIC FRACTURING ACTIVITIES USING DIESEL FUELS: UNDERGROUND INJECTION CONTROL PROGRAM GUIDANCE #84 (2014); see also U.S. EPA, Memo: Implementation of the Safe Drinking Water Act’s Existing Underground Injection Control Program Requirements for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels (Feb. 2014), https://www.epa.gov/sites/production/files/2015-05/documents/signedmemohfactivitiesusingdieselfuels_0.pdf.

*E. Hydraulic Fracturing Chemicals and Mixtures Under the Toxic Substances Control Act*¹³¹

EPA's proposed rulemaking on Hydraulic Fracturing Chemicals and Mixtures Under the Toxic Substances Control Act ("TSCA") was the fourth docket coded. Like the NSPS-proposed rulemaking, the TSCA docket was created in response to public pressure.¹³² On August 4, 2011, EPA received a petition from Earthjustice and 114 other environmental groups¹³³ pursuant to section 21 of TSCA.¹³⁴ The citizen-petition urged EPA to amend regulations promulgated pursuant to TSCA sections 4 and 8¹³⁵ to require toxicity testing of chemicals (and chemical mixtures) used in all phases of oil and gas exploration and production, including HVHF.¹³⁶ The petition was filed in response to increased public concern over the dramatic rise of HVHF throughout the country. The petition sought enhanced reporting requirements by oil and gas companies to EPA identifying chemicals and mixtures used in the hydraulic fracturing life cycle¹³⁷ and identified in the EPA drinking water study.¹³⁸ The chemical reporting requirement proposed in the Earthjustice petition would also mandate disclosure of known health and safety studies¹³⁹ on the oil and gas chemicals and mixtures used in different phases of shale mineral extraction.

¹³¹ Hydraulic Fracturing Chemicals and Mixtures, 79 Fed. Reg. 28,664 (May 19, 2014).

¹³² *Id.* (comments entered to Docket No. EPA-HQ-OPPT-2011-1019).

¹³³ *Id.*; see also Letter from Deborah Goldberg, Earthjustice to Wendy Cleland-Hamnett, Director, Office of Pollution Prevention and Toxics, Re: Citizen Petition Under Toxic Substances Control Act Regarding the Chemical Substances and Mixtures Used in Oil and Gas Exploration or Production (Aug. 4, 2011), Docket No. EPA-HQ-OPPT-2011-1019-0004 (May. 19, 2014); Letter from EPA Assistant Administrator Steven A. Owens to Deborah Goldberg, Earthjustice, Re: TSCA Section 21 Petition Concerning Chemical Substances and Mixtures Used in Oil and Gas Exploration or Production (Nov. 2, 2011), Docket No. EPA-HQ-OPPT-2011-1019-0004 (May. 19, 2014); Letter from Assistant Administrator Steven A. Owens to Deborah Goldberg, Earthjustice, Re: TSCA Section 21 Petition Concerning Chemical Substances and Mixtures Used in Oil and Gas Exploration or Production (Nov. 23, 2011), Docket No. EPA-HQ-OPPT-2011-1019-0007 (May. 19, 2014).

¹³⁴ Toxic Substances Control Act, 15 U.S.C. § 2620 (2012).

¹³⁵ *Id.* § 2607. TSCA section 8(a) gives EPA authority to require chemical manufacturers and processors to maintain records and submit to EPA such reports as EPA may reasonably require. 79 Fed. Reg. at 28,665–66.

¹³⁶ Letter from Deborah Goldberg, Earthjustice, to Lisa P. Jackson, Administrator EPA (Aug. 4, 2011), Docket No. EPA-HQ-OPPT-2011-1019-0004 (May 19, 2014).

¹³⁷ *Id.*

¹³⁸ See *supra* note 97 and accompanying text.

¹³⁹ 40 C.F.R. § 716.3 (2016) gives examples of health and safety studies.

Initially, EPA denied the Earthjustice petition.¹⁴⁰ On November 2, 2011, EPA explained that the Earthjustice request for issuance of a “test rule” could not be granted because the petition did not set forth sufficient facts to conclude that it was “necessary to issue” the rule, as is required by TSCA section 21(b)(1). Less than three weeks later, however, on November 23, 2011, EPA reversed itself and granted in part and denied in part the Earthjustice requests.¹⁴¹

In so doing, EPA limited the scope of the proposed rulemaking from chemicals and mixtures used in all processes of oil and gas exploration and production to focus only on those chemical substances and mixtures used in hydraulic fracturing. EPA’s use of the term hydraulic fracturing was not, however, clear or well defined. As in the EPA drinking water study,¹⁴² EPA seemed to use the term “hydraulic fracturing” as a broad term, including more aspects of the shale gas extraction process than those used by the oil and gas industry, who identify hydraulic fracturing only as a very specific step in extraction designed to stimulate well production.¹⁴³

On May 19, 2014, EPA published an advance notice of proposed rulemaking (“ANPR”) soliciting stakeholder input on various aspects of the Earthjustice petition.¹⁴⁴ EPA wanted more data on chemical substances and mixtures used in hydraulic fracturing for oil and gas exploration.¹⁴⁵ Specific EPA inquiry centered on what is the appropriate level of disclosure needed to ensure that information about the chemicals and mixtures used in hydraulic fracturing activities are provided to the public in an appropriate and transparent fashion.¹⁴⁶ The agency sought particular guidance on certain oil and gas activities, including: 1) injecting water, chemicals, proppant, and/or tracers to prepare geologic formations for hydraulic fracturing; 2) completing the hydraulic fracturing stimulation stage; and 3) evaluating the extent of resulting

¹⁴⁰ See Letter from EPA Assistant Administrator Steven A. Owens to Deborah Goldberg, Earthjustice, Re: TSCA Section 21 Petition Concerning Chemical Substances and Mixtures Used in Oil and Gas Exploration or Production (Nov. 2, 2011), *supra* note 133.

¹⁴¹ Letter from Assistant Administrator Steven A. Owens to Deborah Goldberg, Earthjustice, Re: TSCA Section 21 Petition Concerning Chemical Substances and Mixtures Used in Oil and Gas Exploration or Production (Nov. 23, 2011), *supra* note 133.

¹⁴² Hydraulic Fracturing Chemicals and Mixtures, 79 Fed. Reg. 28,664, 28,664–65 (May 19, 2014).

¹⁴³ For a discussion of industry’s perspective that EPA misuses the term “hydraulic fracturing” in a way that is misleading to the public, see, e.g., Bruce Thompson, *supra* note 84.

¹⁴⁴ Hydraulic Fracturing Chemicals and Mixtures, 79 Fed. Reg. at 28,664.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.* at 28,665.

fractures to ensure future ability to enhance production through stimulation by hydraulic fracturing.¹⁴⁷

In its directives, EPA requested feedback on both data and mechanisms. EPA invited input, including further research needed, about chemicals and mixtures used in hydraulic fracturing. EPA also wanted to know how data concerning HVHF chemicals should be obtained or disclosed. Finally, EPA requested input on the mechanisms best suited to obtain or disclose the information.¹⁴⁸

EPA did not decree in the proposed rule that future chemical disclosure would be mandatory for the oil and gas industry engaged in HVHF.¹⁴⁹ To the contrary, EPA expressly stated in the ANPR that the mechanism the agency was considering for disclosure of HVHF chemicals could be either regulatory,¹⁵⁰ voluntary,¹⁵¹ or a combination of both. The ANPR explored regulatory need and the practicality of regulatory options. On the mechanistic side, EPA was particularly interested in:

best management practices for the generation, collection, reporting and/or disclosure of public health and environmental information from or by companies that manufacture, process, or use chemical substances or mixtures in hydraulic fracturing activities—that is, practices or operations that can be implemented and verified toward achieving protection of public health and the environment—and whether voluntary third-party certification, and incentives for disclosure could be valuable tools for improving chemical safety.¹⁵²

EPA cautioned that best practices should balance the need for publicly available data in concert with minimizing reporting costs and burdens on both industry and government.¹⁵³ In conducting its inquiry, EPA set a goal of creating a system that would “avoid duplication of efforts” yet still “maximize transparency and public understanding.”¹⁵⁴ As a parallel inquiry, EPA sought insight on incentive programs that could be used by EPA to support the development and use of safer chemicals in the shale mineral extraction life cycle.¹⁵⁵

¹⁴⁷ *Id.*

¹⁴⁸ *Id.* at 28,666.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.* at 28,664. Regulatory requirements would be pursuant to TSCA section 8(a) and/or section 8(d). *Id.*

¹⁵¹ Voluntary requirements could be pursuant the Pollution Prevention Act (PPA). *See* 42 U.S.C. §§ 13101–09 (2012).

¹⁵² Hydraulic Fracturing Chemicals and Mixtures, 79 Fed. Reg. at 28,665.

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

EPA received 235,179 comments in the docket concerning the petition; of those, EPA posted 2,495.¹⁵⁶ The discrepancy was due to duplicative write-in campaigns and petitions by about 232,684 writers. A large number of comments posted online were not signed—947 were anonymous. The majority (1,463 comments) were written by private citizens, but government (18 comments), industry (21 comments), and NGOs (38 comments) were all represented.

Although the agency screened for campaigns, our coding found that of the 2,473 comments posted on Regulations.gov, almost 70 percent of the comments (1,701 comments) were not original prose but had been duplicated from language suggested by an NGO or academic. These boilerplate comments were from five different campaigns originating from Breast Cancer Action (390 comments), Center for Environmental Health (23 comments), Union of Concerned Scientists (511 comments), Earthworks (369 comments), and Safer Chemicals (1,702 comments). Only 772 comments, a little over 30 percent of the posted comments, were original writings.

The overwhelming majority of the comments submitted to the docket supported EPA promulgating a regulation under TSCA requiring disclosure of chemicals. In fact, only thirty-nine comments submitted to the docket opposed the EPA proposal. An illustrative comment supporting the EPA TSCA proposals, and was signed by 9,088 people in the form of a petition in support of the regulation, read:

Please require full public disclosure of all chemicals used in hydraulic fracturing, including any chemicals an oil and gas company might claim is a trade secret. Additionally, manufacturers and distributors of fracking chemicals should be required to conduct and report toxicity testing on all exploration and production chemicals to better understand the impacts to our public health. Greater transparency is an essential step towards protecting our communities from the dangers of fracking.¹⁵⁷

The majority of comments submitted that opposed the proposed revisions to TSCA regulation were written by members of the oil and gas

¹⁵⁶ See *Id.* (comments entered to Docket No. EPA-HQ-OPPT-2011-1019).

¹⁵⁷ Anonymous, Mass Comment Campaign, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2099 (May 19, 2014).

industry¹⁵⁸ or state and local governments.¹⁵⁹ Industry comments generally indicated that the industry was already highly regulated and thus not in need of additional regulation, deeming the TSCA proposal expensive, duplicative, and overly intrusive.¹⁶⁰ Industry comments indicated that regulation of oil and gas was best entrusted to the states, as EPA did not have the expertise to properly balance environmental and business needs best suited to promote public health. According to industry, the states had greater experience with regulation of oil and gas, were better suited to deal with industry permitting needs in a timely manner, and better reflected values of the community.¹⁶¹

The majority of comments that were categorized as ambiguous were short comments submitted by members of the public without citation or scientific support. Many were anonymous.¹⁶² Some coded as ambiguous expressed displeasure with EPA without explaining what the writer wanted done to improve EPA performance or whether the specific regulation proposed should be promulgated as written; an example read, “[s]tart doing your job and protect us better!!!!”¹⁶³

Major themes that arose in the public comments included concern about habitat disruption, water usage, and water contamination.¹⁶⁴ Discussions about risks from on-site storage of flowback and produced waters in pits, ponds, and other containment structures were found in the vast majority of comments. Concerns about damage from structural failure in casing and cementing were less discussed. Where the issues of casing and cementing were raised, however, both those who favored and those who opposed EPA’s proposed TSCA regulations acknowledged the importance of protective practices. Center for Biological Diversity wrote:

It is unavoidable that a significant portion of wells will experience structural integrity problems over time. Cement failures can be attributed to hydrostatic imbalances caused by inappropriate

¹⁵⁸ IOGA-WV, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2067 (May 19, 2014). *See also* American Exploration and Production Council (AXPC) and Independent Petroleum Association of America (IPAA), Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2030 (May 19, 2014).

¹⁵⁹ Kent Connelly, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2070 (May 19, 2014).

¹⁶⁰ *See, e.g.*, IOGA-WV, *supra* note 158.

¹⁶¹ *Id.*; *see also* American Exploration and Production Council (AXPC) and Independent Petroleum Association of America (IPAA), *supra* note 158.

¹⁶² *See, e.g.*, Anonymous, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-1900 (May 19, 2014).

¹⁶³ Anonymous, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-1500 (May 19, 2014).

¹⁶⁴ *See, e.g.*, Anonymous, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-1156 (May 19, 2014).

cement density, inadequately cleaned bore holes, premature gelation of the cement, excessive fluid loss in the cement, high permeability in the cement slurry, cement shrinkage, radial cracking due to pressure fluctuations in the casings, poor interfacial bonding, and normal deterioration with age. Casings may fail due to failed casing joints, casing collapse, and corrosion. A recent study of northeast Pennsylvania's wells found that roughly 40 percent of unconventional wells are expected to experience an integrity issue within the first 7 years of operation.¹⁶⁵

Industry comments countered that casing and cementing practices by industry were adequate to protect groundwater:

... [I]ndustry has adopted numerous measures—such as cementing into place surface casing at the uppermost portions of wells—to prevent leakage. If those measures are followed, there is no evidence to suggest that the specific chemical mix used in connection with fracking (a mix whose composition is 99.5% water and sand and only .5% other chemicals) is relevant to degree of risk that groundwater might be contaminated.¹⁶⁶

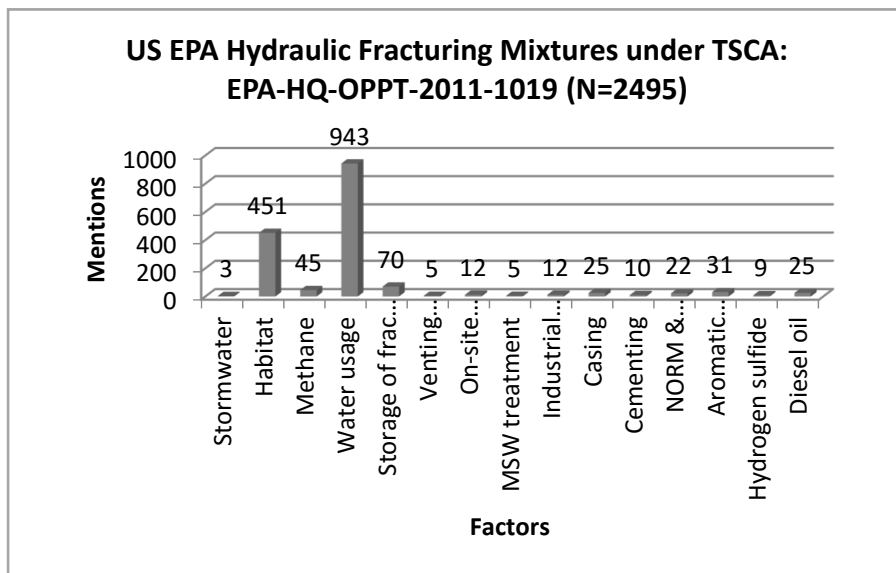
The general public expressed doubt about state ability to protect public health and industry's ability to self-police.¹⁶⁷

In sum, although the public comments reflected many concerns of the experts identified by RFF, the majority of comments written by the public did not mention factors deemed important in the RFF matrix. Writers discussing RFF concerns tended to self-identify as experts. Graph E below depicts the pattern of comments found in the TSCA docket discussing the factors in the RFF risk matrix:

¹⁶⁵ Hollin Kretzmann, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2046 (May 19, 2014).

¹⁶⁶ Washington Legal Foundation, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-2085 (May 19, 2014).

¹⁶⁷ *See, e.g.*, Anonymous, Comment Letter on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-0050 (May 19, 2014). On June 26, 2012, BLM extended the comment period until September 10, 2012. Oil and Gas; Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 38,024 (June 26, 2012).



EPA is currently reviewing the public comments and other documents and materials. EPA projects that the agency will promulgate a final rule on disclosure of HVHF chemicals and mixtures in December 2016.¹⁶⁸

*F. Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands (BLM-2012-0001-0001)*¹⁶⁹

EPA is not the only federal agency to evaluate the perceived need for regulation of HVHF. The federal government is the largest landowner in the United States. In certain circumstances, federal lands can be used by private entities for various purposes—including leasing federal property for oil and gas development. The Department of Interior (“DOI”) manages about 500 million acres of federal surface land (about 1/5 the landmass in the United States) through various subdivisions.¹⁷⁰ DOI is charged with balancing the economic need to use and develop land with the duty to preserve property for future generations.

The DOI’s Bureau of Land Management (“BLM”) issued its first proposal to regulate HVHF on federal and Indian land on May 11,

¹⁶⁸ See *Rules by Projected Publication Date*, U.S. EPA, <http://yosemite.epa.gov/oepi/rulegate.nsf/content/upcoming.html> (last visited Nov. 30, 2016).

¹⁶⁹ Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691 (proposed May 11, 2012) (to be codified at 43 C.F.R. pt. 3160).

¹⁷⁰ U.S. DEP’T OF INTERIOR, INTRODUCTION TO INTERIOR ACQUISITIONS: A GUIDE FOR SMALL BUSINESSES (2010).

2012.¹⁷¹ BLM had previously promulgated rules governing oil and gas development on BLM managed property. The existing BLM oil and gas regulations were, however, promulgated in 1982 and last revised in 1988, long before HVHF was widely used.¹⁷² According to BLM, public awareness of HVHF grew significantly as “new horizontal drilling technology allowed increased access to shale oil and gas resources across the country, sometimes in areas that have not previously experienced significant oil and gas development.”¹⁷³ In 2012, the time of the initial proposal to revise the BLM oil and gas regulations, BLM estimated that about 90 percent of the approximately 3,400 wells per year being drilled on Federal and Indian lands were stimulated using HVHF.¹⁷⁴

The 2012 BLM proposal had three key elements. First, BLM proposed requiring disclosure to the public of chemicals used in HVHF on all leased federal land and on Indian land. Second, BLM sought to strengthen regulations related to well-bore integrity. Third, BLM set out an agenda outlining ways to address environmental and health issues related to flowback and produced waters. BLM said the “rule is necessary to provide useful information to the public and to assure that hydraulic fracturing is conducted in a way that adequately protects the environment.”¹⁷⁵

The BLM definition of “hydraulic fracturing” differed from the definition set out by EPA in its drinking water study. BLM defined “hydraulic fracturing” as “a process used to stimulate production from oil and gas wells.”¹⁷⁶ BLM set out to address public concerns “about whether fracturing can allow or cause the contamination of underground water sources,” whether chemicals used in HVHF should be disclosed to the public, and whether there is adequate management of well integrity and “flowback” fluids.¹⁷⁷ BLM’s proposed fracking rule was made after consulting the Secretary of Energy’s Advisory Board and gathering data at public hearings in Washington, DC, North Dakota, Arkansas and Colorado.¹⁷⁸ BLM alleged its proposed HVHF rules were consistent with

¹⁷¹ Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691 (comments entered to Docket No. BLM-2012-0001-0001).

¹⁷² Oil and Gas Leasing, Geothermal Resources Leasing, 53 Fed. Reg. 17,340 (May 16, 1988); Minerals Management and Oil and Gas Leasing; Revision of the Regulations Covering Oil and Gas Leasing on Federal Lands, 48 Fed. Reg. 33,648 (July 22, 1983). The regulations are found at 43 C.F.R. § 3162.3–2 (2016).

¹⁷³ Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

the American Petroleum Institute's ("API") guidelines for well construction and well integrity.¹⁷⁹

BLM explained that the agency developed the draft "with an eye toward improving public awareness and oversight without introducing complicated new procedures or delays in the process of developing oil and gas resources on public and Indian lands."¹⁸⁰ Although states with robust oil and gas economies had begun requiring disclosures and oversight for HVHF operations, the BLM proposal sought to create consistent federal oversight and disclosure across federal and Indian lands that would work in concert with state requirements.¹⁸¹

BLM received 59,786 comments on its 2012 proposal to regulate HVHF on federal and Indian lands. Of the comment received, BLM posted 7,011 comments to the docket.¹⁸² The discrepancy of 52,775 comments was attributed to mass write in campaigns and petitions. Organizations spearheading petitions and write-in campaigns included: CREDO Action, Earthjustice, Environment America, Friends of the Earth, National Park Conservancy, National Wildlife Federation, National Resources Defense Council, Sierra Club, and Wilderness Society.

Of the 7,011 comments posted to the dockets, only 654 comments were signed. The vast majority of the posted comments were not signed; 6,357 comments submitted to BLM online were posted anonymously. Despite efforts by BLM to screen out mass campaigns so that duplicate comments did not obscure original contributions, our review found many letters that contained the same, almost identical or slightly individualized prose. Many of these letters were influenced by the vigorous campaigns mounted by the Sierra Club, Wilderness Society, and the National Park Conservancy. In total, 218 environmental groups and NGOs and twenty-eight religious organizations submitted comments. Ninety-three comments were submitted by state governments and Indian tribes. One-hundred fourteen comments were submitted by representatives of industry. Twenty academics opined on the BLM proposal.

The vast majority of public comments supported BLM's proposal. About 2,815 individual and anonymous commenters wrote, "I hope that the rule will make sure that Americans know what chemicals are being used before wells are fractured and that the water left over is kept in

¹⁷⁹ *Id.* See also API GUIDANCE DOCUMENT, HYDRAULIC FRACTURING OPERATIONS—WELL CONSTRUCTION AND INTEGRITY GUIDELINES, AM. PETROLEUM INST. (1st ed., 2009).

¹⁸⁰ Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691.

¹⁸¹ *Id.*

¹⁸² *Id.* (comments entered to Docket No. BLM-2012-0001).

closed containers and handled safely. You have an opportunity to protect one of America's finest resources; I hope you won't pass it up."¹⁸³ Another anonymous commenter said, "[t]he fracking industry's own data shows that 6 [percent] of the wells will FAIL immediately. This will permanently contaminate the ground water."¹⁸⁴ Another pleaded:

Please tighten regulations on energy sourcing on public and Indian lands. These precious resources need to be safeguarded. Once they are gone, we can not recreate them. Please Protect the land and ban energy sourcing in our most treasured resources.¹⁸⁵

An unidentified campaign brought a flurry of 2,913 letters posted separately in the docket expressing support for BLM regulation and concern about HVHF on BLM controlled lands near National Parks. The campaign stated that "[o]il and gas drilling is occurring with an increasing frequency next to national park units. Much of this is happening on BLM-managed lands and it threatens water quality, air quality, and wildlife inside parks. I care deeply about our national parks and want BLM to protect them."¹⁸⁶ Individual comment writers also echoed concerns about preservation of parks and public lands:

I oppose fracking and would endorse protections for public wild lands and parks to maintain them in their natural state for future generations. It is my belief short term profiteering will have unknown impact on the environment perhaps affecting changes in water quality and impact species who rely upon the pristine conditions to thrive in balance. No fracking of park lands and the peoples land trusts. These resources are the people of the USA not for corporate ventures.¹⁸⁷

¹⁸³ See, e.g., Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-7526 (June 26, 2012); Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-7231 (June 26, 2012).

¹⁸⁴ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5566 (June 26, 2012).

¹⁸⁵ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5575 (June 26, 2012).

¹⁸⁶ See, e.g., Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-7526 (June 26, 2012).

¹⁸⁷ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5632 (June 26, 2012).

Other private citizens opposed the BLM proposal as overly permissive. These commenters suggested that there should be no HVHF on federal lands¹⁸⁸ For example:

As a mother, a scientist, nature lover and business owner, I am against opening our public lands to the oil and gas industry. Hydraulic Fracturing has the potential, as we have seen, to contaminate water supplies and cause earthquakes. Also the nasty contaminated mud is hauled in open dump trucks in TX and has caused many problems including; spills on HWY's, accidents, and illegal dumping of toxic materials. We must as a Country embrace renewable energy sources.¹⁸⁹

Some public commenters went further, suggesting HVHF should be banned everywhere and not just on BLM lands.¹⁹⁰

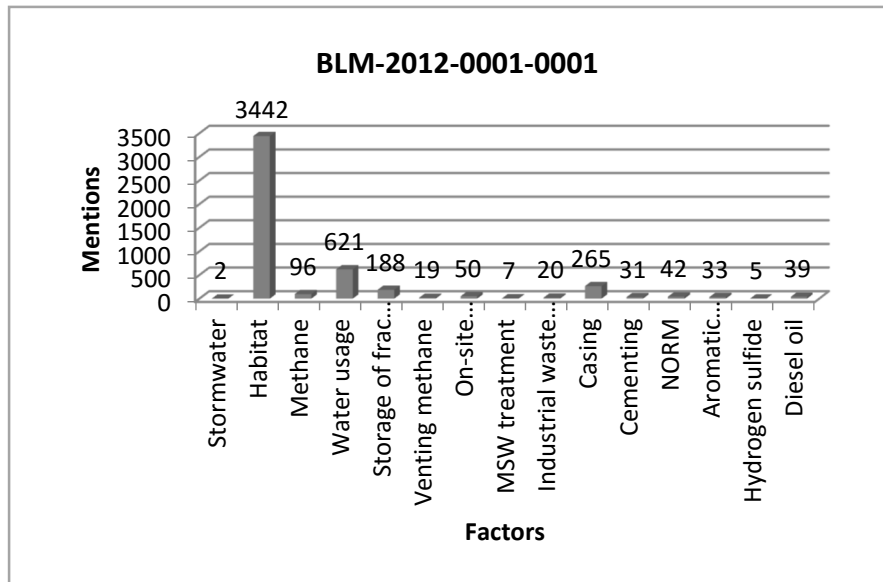
Similar to concerns expressed in the EPA drinking water study, most public comments from the general public focused on issues of habitat destruction and risk to drinking water from storing HVHF chemicals, as well as storing flowback and produced waters after well stimulation and before being either disposed of or moved for reuse off-site. Comments by the general public tended to be vague. The relatively few comments submitted by experts from industry, academia, and environmental group headquarters tended to be more specific and more in line with the concerns expressed by the RFF experts. In summary, the RFF risk matrix factors were again represented in public comments submitted to the

¹⁸⁸ See, e.g., Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-2924 (June 26, 2012).

¹⁸⁹ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5023 (June 26, 2012); see also Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5139 (June 26, 2012).

¹⁹⁰ Compare Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-6877 (June 26, 2012), and Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-5580 (June 26, 2012), with Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, Docket No. BLM-2012-0001-0047 (June 26, 2012).

docket but again not with the uniformity expressed by the RFF experts, as depicted in Graph F below:



*G. Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands (BLM-2013-0002)*¹⁹¹

After evaluating public comments, on May 24, 2013 BLM posted revisions to the rule BLM proposed a year earlier concerning regulations of HVHF on federal and Indian lands.¹⁹² According to BLM, key issues in the revised draft included: 1) the use of an expanded set of cement evaluation tools to ensure that usable water zones are properly isolated and protected from contamination and 2) more detailed guidance on handling of trade secrets claims modeled on Colorado procedures.¹⁹³ The revised rule also specified opportunities for BLM to coordinate with states and tribes to reduce administrative costs and improve efficiency.¹⁹⁴

EPA reported that 1,348,563 comments were received concerning the second BLM proposal; of those, BLM posted 5,723 to the docket.¹⁹⁵ The

¹⁹¹ Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 78 Fed. Reg. 31,636 (May 24, 2013) (comments entered to Docket No. BLM-2013-0002-0010); *see also* Oil and Gas: Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691 (proposed May 11, 2012) (to be codified at 43 C.F.R. pt. 3160).

¹⁹² Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 78 Fed. Reg. 31,636.

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Id.* (comments entered to Docket No. BLM-2013-0002-0010).

difference between the numbers received and the number posted, amounting to 1,342,840 comments, was attributable to mass campaigns that sent letters with petitions or identical text. Again, most of the 5,723 comments posted to the document were submitted anonymously. Only 294 comments were signed. One hundred forty-one signed comments were attributable to two mass write-in campaigns conducted by the Natural Resources Defense Council (128 comments) and the National Parks Conservation Association (13 comments). About 3,015 anonymous comments posted in the docket appeared to be based on materials developed by the National Parks Conservation Association; all expressed concern about land conservation on federal land, including national parks. Two-thousand four-hundred forty-two comments asked BLM to “[p]rotect our national parks from fracking!” Two-thousand two-hundred forty-one commenters stated that they “want the rule to be amended to include the National Park Service (“NPS”) as a formal cooperating agency.”

Many anonymous comments posted to the docket do not appear to be submitted by an organized campaign, but most urge BLM to ban HVHF on public lands.¹⁹⁶ Many original public comments reflected fear and anger. For example, one commenter said, “[s]ome land should be left free of your noise and pollution. Some land should be left, some water should be left. Some things are worth more than money.”¹⁹⁷ Another wrote, “[s]top the raping of the land!”¹⁹⁸ Still another asserted that, “[f]racking is, by its very nature, destructive. We should not be ruining our land and water with this technique to gain energy.”¹⁹⁹

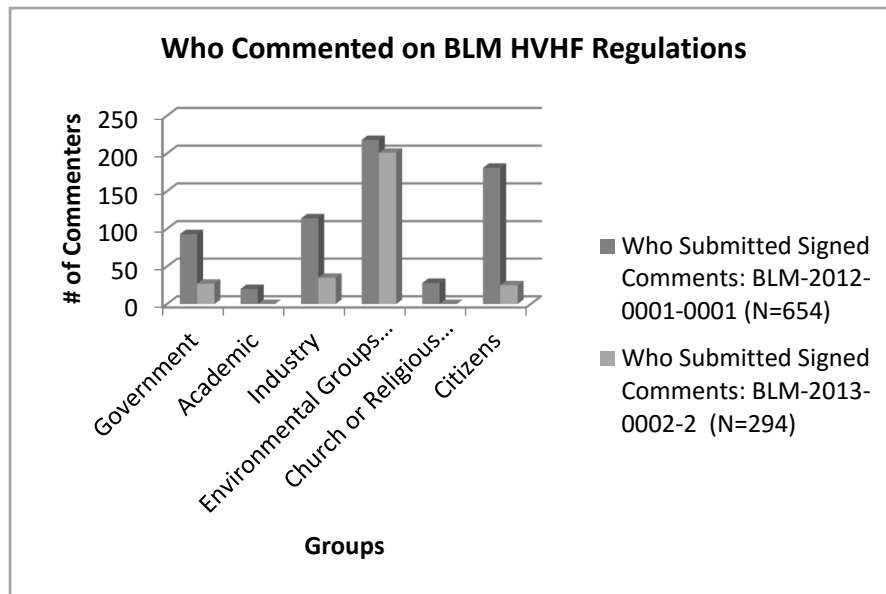
The pattern of who commented on the second BLM docket was similar to that established in the first BLM docket, as depicted in Graph G1 below:

¹⁹⁶ See, e.g., Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-1194 (June 10, 2013).

¹⁹⁷ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-1554 (June 10, 2013). Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-4099 (June 10, 2013).

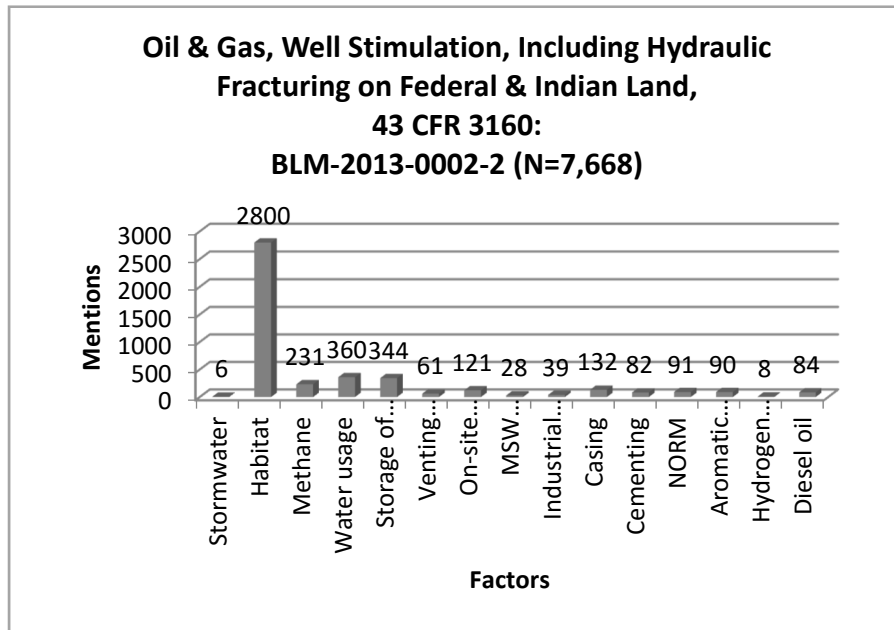
¹⁹⁸ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-1376 (June 10, 2013); see also Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-2427 (June 10, 2013).

¹⁹⁹ Anonymous, Comment Letter on Proposed Rule for Oil and Gas: Hydraulic Fracturing on Federal and Indian Lands, Docket No. BLM-2013-0002-2918 (June 10, 2013).

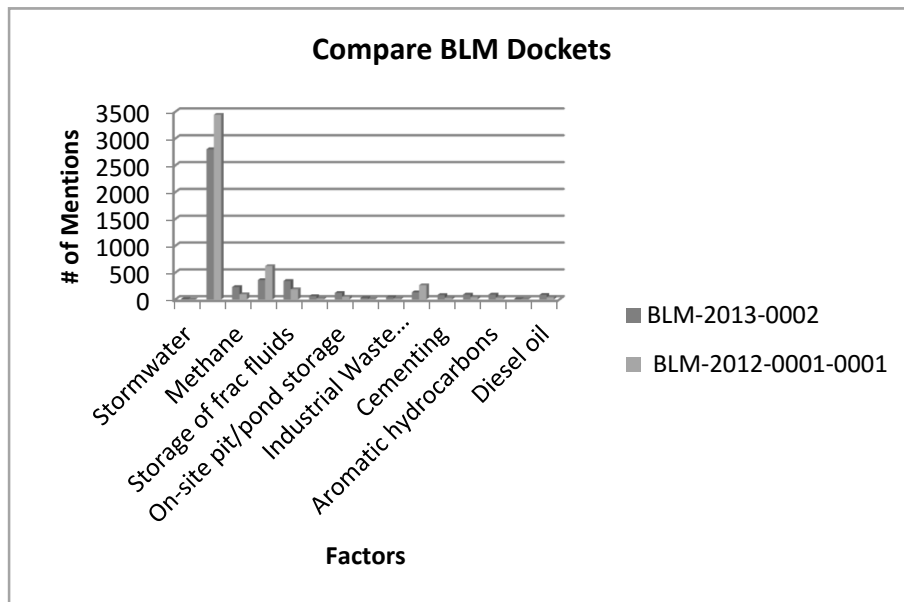


Environmental groups, however, were even more mobilized in the second BLM proposal governing regulation of HVHF on federal and Indian land. In addition to the mass campaigns, environmental groups and NGOs submitted 201 comments. Industry submitted only thirty-five comments. Although the number of environmental groups and NGOs submitting comments remained relatively static, the number of signatures garnered by the groups increased dramatically, from about 52,336 in the first BLM docket to about 1,343,041 in the second.

Although the RFF risk matrix factors could be found in comments submitted to the BLM docket, the general public again did not share the same rate of concern as the RFF experts. The vast majority of comments addressed concern about disruption to habitat and impaired drinking water, as depicted in Graph G2 below:



While the level of concern with the RFF risk factors was less evenly discussed in the BLM dockets than in the EPA drinking water study, a comparison to the two BLM dockets indicates similar concerns by the public between the first and second BLM proposals, as shown in Graph G3 below:



The number of comments discussing the RFF risk factors again coincided with the numbers of comments submitted to the docket by experts.

On March 26, 2015, BLM published its final rule.²⁰⁰ There were a number of key changes BLM made in response to the public notice and comment process.²⁰¹ First, BLM expanded use of cement evaluation tools to protect usable water zones.²⁰² Second, BLM established a requirement to demonstrate well integrity for all wells, rather than relying on the prior “type well” concept.²⁰³ Third, BLM set stringent requirements related to industry claims of trade secrets that would allow exemption from disclosure.²⁰⁴ Fourth, BLM set requirements to ensure that fluids recovered during HVHF operations are safely contained.²⁰⁵ Fifth, BLM created a regulation requiring disclosure and public availability of information about each HVHF operation on BLM land.²⁰⁶ Sixth, BLM revised federal records retention requirements to ensure that records of chemicals used in HVHF operations are kept for the life of the well.²⁰⁷ Finally, BLM changed the final rule to improve coordination on HVHF regulatory matters with states and tribes.²⁰⁸

The BLM rule was immediately challenged in court, and on September 30, 2015, a federal trial court judge in the District of Wyoming issued an order granting a preliminary injunction preventing the application of the newly promulgated BLM rule until its legality is resolved.²⁰⁹

²⁰⁰ Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands, 80 Fed. Reg. 16,128 (Mar. 26, 2015) (codified at 43 C.F.R. pt. 3160).

²⁰¹ *Id.*

²⁰² *Id.*

²⁰³ *Id.*

²⁰⁴ *Id.*

²⁰⁵ *Id.*

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ Wyoming v. United States DOI, 136 F. Supp. 3d 1317, 1351–54 (2015). Wyoming’s efforts to appeal the rule are available at *Current Issues and Special Projects*, WYOMING ATTORNEY GENERAL, <http://ag.wyo.gov/current-issues> (last visited Oct. 17, 2016).

*H. Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*²¹⁰

The final docket we examined involved a third federal agency: the U.S. Coast Guard (“USCG”), which is now part of the Department of Homeland Security.²¹¹

On October 30, 2013, the USCG announced it would propose a policy letter about carrying shale gas extraction wastewater in bulk over American rivers by barge in a rulemaking titled *Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*.²¹²

The HVHF process produces a lot of waste. USCG was approached about the possibility of using barges to transport shale gas extraction wastewater (“SGEWW”) from northern Appalachia over inland navigable rivers to Ohio, Texas, and Louisiana.²¹³ The transport of SGEWW was needed for storage, reprocessing for reuse, and final disposal.²¹⁴ Ohio, Texas, and Louisiana had facilities to accommodate SGEWW not found in the portions of the Marcellus Shale with significant oil and gas development.

Barge owners indicated to the USCG that they were confused about what was needed to obtain a permit for SGEWW because “the specific chemical composition of SGEWW varies from one consignment load to another.”²¹⁵ Barge owners knew that SGEWW accepted for shipping might contain one or more hazardous materials requiring a permit.²¹⁶ The SGEWW wastes could include radioactive isotopes such as radium-226 and radium-228.²¹⁷ SGEWW were difficult to permit because the wastes

²¹⁰ *Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*, 78 Fed. Reg. 64,905 (Oct. 30, 2013) (comments entered to Docket No. USCG-2013-0915).

²¹¹ See LCDR D.C. BALDINELLI, THE U.S. COAST GUARD’S ASSIGNMENT TO THE DEPARTMENT OF HOMELAND SECURITY: ENTERING UNCHARTED WATERS OR JUST A COURSE CORRECTION? (2002).

²¹² *Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*, 78 Fed. Reg. 64,905.

²¹³ *Id.* at 64,906 (Oct. 30, 2013). USCG defined transport shale gas extraction waste water (“SGEWW”) as follows: “SGEWW is a by-product of drilling for natural gas using unconventional hydraulic fracturing technology, which involves the injection of water, sand, and chemical additives. The sand remains in the well but a substantial portion of the injected fluid re-surfaces after the drilling and must be handled as SGEWW. At present, this SGEWW is either stored at the drilling site or transported by rail or truck to remote storage or reprocessing centers.”

²¹⁴ *Id.* (“Pursuant to 46 CFR 153.900(a) and (c), under certain circumstances a bulk liquid hazardous material may be transported by a tank vessel if it is a “listed cargo” (listed in any of several specified tables in Coast Guard regulations”).

²¹⁵ *Id.*

²¹⁶ Hazardous materials are defined in 46 C.F.R. § 153.2 (2016); see also *Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*, 78 Fed. Reg. at 64,906.

²¹⁷ *Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk*, 78 Fed. Reg. at 64,906.

are almost always different from shipment to shipment. Many variables affect the chemical composition of SGEWW shipments.²¹⁸ Different chemicals may be used (but not necessarily disclosed) by different HVHF drillers and based on the different geology of each HVHF drill site (resulting in variable levels of NORM or TENORM and TDS).²¹⁹ The USCG policy letter explained the conditions under which a barge owner could apply for a permit (called a “Certificate of Inspection” endorsement or letter) to transport SGEWW in bulk by river (such as the Ohio River).²²⁰

A total of 1,071 comments were submitted to the USCG docket; all of which were posted on Regulations.gov.²²¹ About 90 percent of comments (954) submitted were signed; only 10 percent comments (117) were submitted anonymously. The majority commented as private citizens (1,033 comments), but government (8 comments), industry (9 comments), academics (8 comments) and NGOs (17 comments) were represented. Of the comments received, almost 70 percent (710 comments) drafted original prose; 30 percent submitted comments based on language drafted from four different NGOs: Sierra Club (126 comments), Riverkeeper (158 comments), Kentucky Waterways Alliance (6 comments), and an unknown source (33 comments). The majority of the comments submitted to the USCG opposed the USCG proposal. Most did not want SGEWW waste shipped over rivers. In fact, our coding found only twenty-five comments in favor of the proposal. The typical public sentiment was similar to the following:

I am totally against allowing fracking wastewater to be transported on rivers. The world is already facing a water shortage in the future. The fracking industry should not be allowed to further risk poisoning rivers. It is already poisoning millions of gallons of water that can never again enter the water cycle on earth. Let’s conserve what we have left.²²²

²¹⁸ *Id.* at 64,905–06.

²¹⁹ *Id.* Even the age of the wells from which the waste came could affect exactly what is in the SGEWW.

²²⁰ *Id.* at 64,905. The USCG policy letter defined the information USCG would require when considering permit application. See J.W. Mauger, Proposed Policy Letter: Carriage of conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0002 (Oct. 31, 2013).

²²¹ Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, 78 Fed. Reg. 64,905.

²²² Tess Barber, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0657 (Oct. 10, 2013). Compare *id.*, with Deana Pecorale, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0826 (Oct. 10, 2013). Compare Agnieszka Grzybowska, Comment Letter on Proposed Rule for Carriage of

Concern about accidents was a recurrent theme in public comments from individuals.²²³

Public sentiments expressed to USCG echoed distrust of industry stated in comments made in earlier dockets established by EPA and the BLM on federal regulation of shale mineral extraction using HVHF. For example, an anonymous West Virginia resident said:

I, as a resident of WV, do not feel comfortable with the placement of such a facility. The statistics of fracking that have been made available are sketchy at best, but none are very favorable for said industry. The non-renewable energy sector have [sic] a stranglehold on this state. I would view a plant of this nature, especially in such close proximity to a water source, to be unacceptable.²²⁴

Other comments made by the general public expressed anger at the federal government for allowing practices that might adversely impact public health and the environment.²²⁵ Numerous writers noted that “[b]etween 3–5 million people get their drinking water from the Ohio river”²²⁶ and, accordingly, expressed outrage that any practice could be allowed that might pollute a drinking water source for so many people.²²⁷ Some commenters writing about contamination to water from transport over rivers wanted further study.²²⁸

Comments submitted to the USCG docket followed the pattern of earlier dockets. Discussion of RFF factors could be found in the docket,

Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0257 (Oct. 10, 2013), *with* Anonymous, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0644 (Oct. 10, 2013), *and* Connie Cota, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0032 (Oct. 10, 2013).

²²³ *See, e.g.*, Mary Sari, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0925 (Oct. 10, 2013).

²²⁴ Anonymous, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0182 (Oct. 10, 2013).

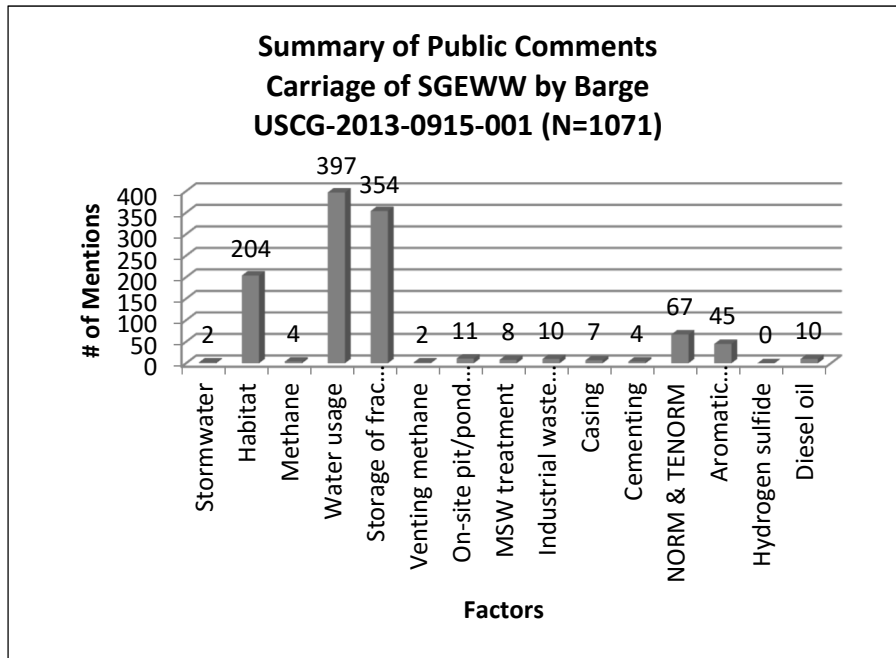
²²⁵ *See, e.g.*, Richard Mangini, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0426 (Oct. 10, 2013).

²²⁶ *See, e.g.*, Monica Santana, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0971 (Oct. 10, 2013).

²²⁷ Marvin Feil, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, USCG-2013-0915-0005 (Oct. 10, 2013). *Compare id.*, *with* Francis Matri, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0334 (Oct. 10, 2013).

²²⁸ *See* Robert Moeller, Comment Letter on Proposed Rule for Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, Docket No. USCG-2013-0915-0346 (Oct. 10, 2013).

but the numbers of detailed comments reflecting the consensus factors roughly equaled the number of experts that submitted comments. Public comments reflected the consensus concerns of the experts cited in the RFF study, but not with the uniformity of the RFF experts, as shown in Graph H below:



On February 23, 2016, USCG announced it withdrew the proposed policy and would instead keep the existing case-by-case determination in place pursuant to existing regulations.²²⁹ Although USCG had over 70,000 comments submitted mostly opposed to allowing shipping of fracking wastes by barge on U.S. rivers, the decision was at least in part due to lack of interest by industry.²³⁰ As such, USCG would not consider further change in regulations. Instead, USCG would “consider instituting a standardized process for transporting SGEWW in bulk after it has assessed whether current regulations are inadequate to handle requests for transport of SGEWW in bulk and environmental impacts that may be associated with SGEWW transport by barge.”²³¹ USCG said it would

²²⁹ Notice of Withdrawal: Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk, 81 Fed. Reg. 8,976 (Feb. 23, 2016).

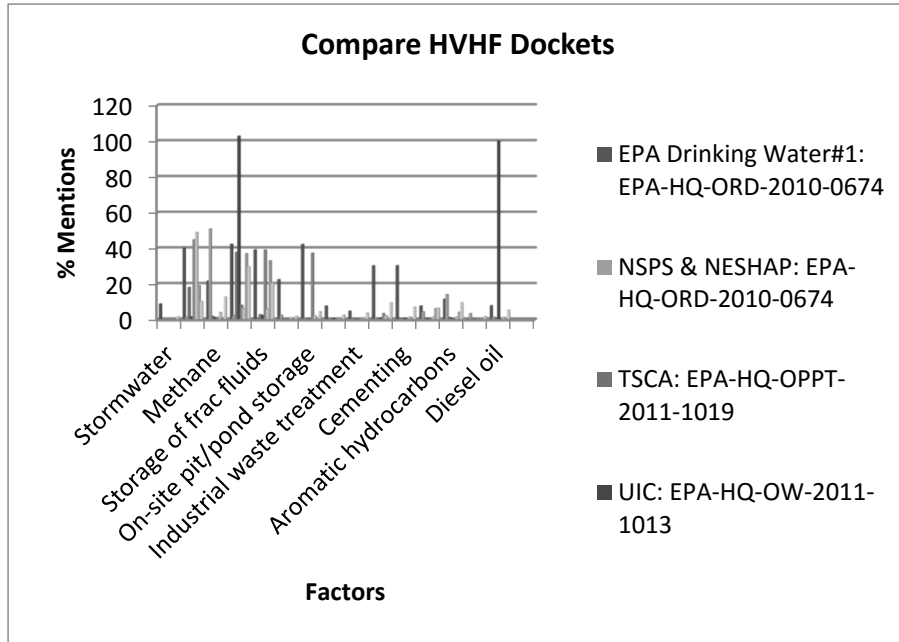
²³⁰ *Id.*

²³¹ *Id.*

“use experience with individual approvals of SGEWW barge transport to inform any future rulemaking or guidance on this subject.”²³²

V. COMPARISON OF HVHF DOCKETS

After calculating the percentage commenters addressed each issue in the RFF matrix for each docket, we created a consolidated graph for comparison (as depicted in Graph V below):



Combining the data across dockets shows clear trends in public concern. The bulk of the public’s comments reflected the concerns outlined by the experts in the RFF study, although the public did not seem well versed in the technical aspects of risk. Comments regarding the need to use vast quantities of water to undertake HVHF were the most prevalent theme across the dockets reviewed. Concerns about water pollution from storage of fracking fluids, flowback, and produced waters followed as the next-highest concerns. Most commenters addressing water pollution also raised concerns about pit and pond storage. Commenters also mentioned concern about water pollution from methane and from oil, but that was less common.

²³² *Id.*

Damage to habitat was the third-most prevalent theme addressed in the dockets. Air pollution issues (both from methane and from polycyclic aromatic hydrocarbons) were a less common theme, likely because the dockets themselves were more focused on water issues than on air.

A striking pattern across all dockets was the fear the general public felt from exposure to dangerous chemicals. A second theme crossing dockets from the general public was a profound anger at lack of government protection from potential exposure to pollution.

Signed or not signed, most of the commenters had strong opinions. The vast majority of comments was written by individuals and favored federal action to protect drinking water—both by EPA and by BLM. An overwhelming majority of comment writers wanted EPA to promulgate regulations pursuant to TSCA requiring disclosure of chemicals and mixtures used in HVHF. Most opposed the USCG allowing the transport of the SGEWW wastes by barge over rivers of the United States, such as the Ohio or Hudson Rivers for fear of accidents and spills that may cause water pollution.

There was a clear discrepancy in details and citation between comments written by experts and those written by members of the general public. While the public rarely discussed the particulars the RFF experts cited as matters of concern, the vast majority wrote wanting greater environmental and health protections. Public sentiment on HVHF in federal dockets is summed up well in this anonymous comment:

I am deeply concerned about the lack of transparency around the health and environmental impacts of chemicals used in hydraulic fracturing. The public has the right to know about the chemicals that are ending up in wildlife, our drinking water, lakes and rivers. Existing disclosure practices are not enough. Please use the full extent of your authority to require companies, especially manufacturers and processors, to report at least the identities and health effects of hydraulic fracturing chemicals and mixtures. Please then see that all relevant health and safety information is publicly disclosed so we know the risks we're facing.²³³

VI. CONCLUSION

Advanced technologies that allow for the extraction of oil and gas from shale have transformed the way the world thinks about energy. The United States now has an abundance of fossil fuels that were once thought unusable. Debate over how and where to deploy technologies such as HVHF is vigorous and often covered in the media. Both state and federal

²³³ Comment Letter submitted by Anonymous on Proposed Rule for Hydraulic Fracturing Chemicals and Mixtures, Docket No. EPA-HQ-OPPT-2011-1019-1570 (May 19, 2014).

governments face enormous pressure on how to balance the need for energy against the duty to protect public health, including the protection and preservation of the environment for future generations.

RFF developed a risk matrix of 264 “risk pathways” through a detailed survey of 215 experts in shale mineral extraction. From the larger list, RFF identified a consensus matrix of 12 key areas in which all agreed HVHF could pose a hazard. The consensus pathways involved risk to surface water quality, air quality, groundwater quality and habitat. Of particular concern were on-site pit and pond storage of produced and flowback waters, freshwater withdrawal for HVHF, venting methane, and treatment and disposal of flowback and produced waters. Accidents from cement and casing failures were uniformly deemed a danger to groundwater. NORM, aromatic hydrocarbons, hydrogen sulfide, oil and diesel were recognized as hazardous constituents of flowback and produced waters, drilling fluids and cuttings, and fracking fluids.

This article identified themes in public comments submitted to federal dockets in EPA, BLM, and USCG evaluating the need for further regulation of some segment of the shale mineral extraction industry. My analysis began by identifying who submitted comments: private individuals (both signed and as anonymous sources), government, NGOs, academics, and industry. In evaluating who submitted comments, I also considered whether the commenter drafted his or her own letter or was writing boilerplate language at the suggestion of an NGO or other entity. Where possible, the source of the boilerplate submission was identified and the numbers of writers using that form were provided.

I next identified key themes in the RFF consensus matrix and developed sixteen codes that reflected different levels of the RFF pathways. The sixteen codes were: stormwater, habitat, methane leakage, water usage, storage of fracking fluids, venting methane, on-site pit/pond storage of flowback and produced waters, treatment of shale mineral wastes by public treatment works, treatment of shale mineral wastes by industrial treatment plants, casing, cementing, NORM and TENORM, aromatic hydrocarbons, hydrogen sulfide, oil and diesel. Finally, after coding, I evaluated the overall position of the comment writer towards the proposed regulation: did the comment favor the proposed regulation, oppose the change to regulation, or, was the message mixed or was the comment unclear (or unresponsive to the regulation proposed and the avenue of queries requested by the federal agency posting the ANPR)?

The results were clear. In the dockets concerning federal regulation of shale mineral extraction identified as of January 2014, four dockets were the subject of massive letter writing campaigns by NGOs: EPA’s New Source Performance Standards, National Emission Standards for

Hazardous Air Pollutants, and Control Techniques Guidelines (252,744 comments); Hydraulic Fracturing Chemicals and Mixtures Under the Toxic Substances Control Act (264,597 comments); BLM's 2012 proposals on Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands (59,786 comments); BLM's 2013 proposal on Hydraulic Fracturing on Federal and Indian Lands (1,348,563 comments). The later BLM proposal had over six times the number of public comments submitted than did the prior year's proposal.

All dockets had a significant number of experts opine on the respective proposal. Experts hailed from industry, NGOs, and government. In most instances, at least some academics were represented. In general, the experts went into greater detail about the proposed regulation and the risks the regulation did and did not address than did individual commenters. Experts were more likely to give a mixed response, identifying both positive and negative attributes to the regulatory proposal. Experts were also more likely to discuss the RFF risk factors.

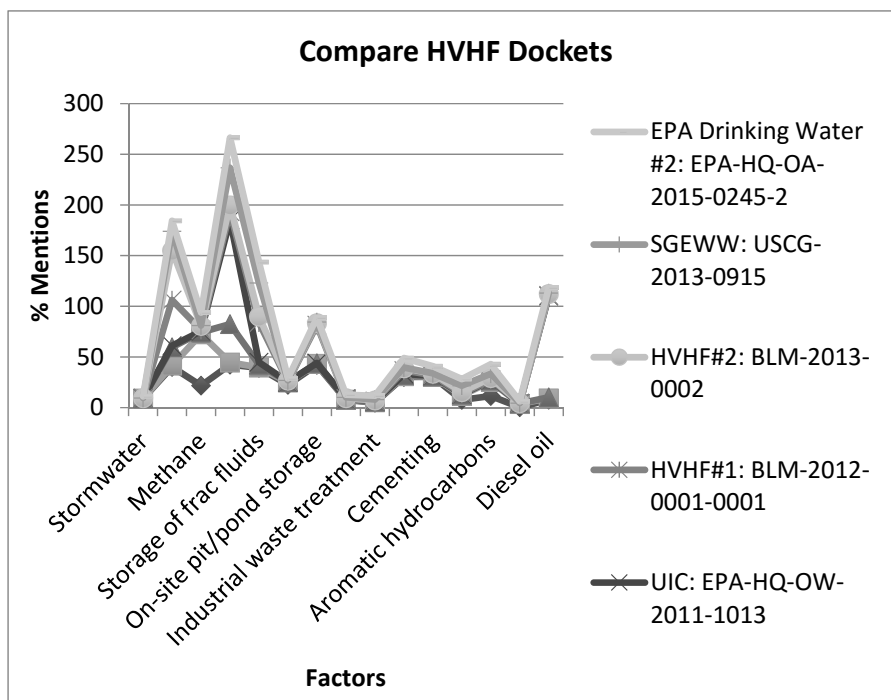
Federal agency ability to address the volume of comments differed from agency to agency and evolved over time. Some agencies did a better job than others managing the efforts to group mass mailing campaigns together. Early dockets for agencies tended to have little or no screening. In certain early dockets, the mass write-in campaign were either published separately in the docket, as in EPA's 2010 General Solicitation for Data Related to Hydraulic Fracturing (1,749 comments, all posted), or not published in the docket at all, as in USCG's 2013 Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk (1,071 comments posted, but 70,115 received).

As federal agencies began to address larger number of submissions, comments from mass campaigns began to be posted as a single copy. Grouping mass campaigns is an important development as it allows greater discussion and debate. Posting all comments separately makes public discourse more obscure as the mass campaigns may have the effect of drowning out discussion on finer points. Mass campaigns tended to be general in discussion, albeit passionate in point. Detailed comments with legal and scientific citation tended to be fewer in number. While the agencies have no difficulty finding these sophisticated submissions, the posting of mass campaigns makes it more difficult for the public to find and process the points of experts.

The ability to sort comments and separate out mass writing campaigns is an important development. Separating duplicative letters leads to better clarity on underlying themes, thus allowing better dialogue on the relative effectiveness of the underlying regulatory proposal. Including each instance of a mass campaign tends to drown out any other voices.

Including only one copy of the letter makes it easier for both the public and the evaluating agency to understand multiple concerns. Agencies could, however, do a better job of delineating how many instances each letter was duplicated. In most dockets, it is clear that many comments were part of a letter writing campaign, but it is not clear how many letters were submitted by each campaign.

With regard to the RFF risk matrix, when aggregating the data across dockets, the public clearly focused on certain consensus pathways the experts identified: potential risk to surface water quality, groundwater quality, habitat and, to a lesser extent, air quality, as depicted in Graph VI below:



The public recognized the danger of water contamination from storage of fracking fluids, flowback and produced waters. A large number also wrote about pit and pond storage. Some mentioned water contamination from methane and from oil, but air emissions (both from methane and from PAHs) were a less common theme (which is understandable, as the dockets studied were focused on water protection). Damage to habitat arose as an extremely prevalent theme throughout all dockets studied.

In short, while the general public did not go into an expert-level of detail about a regulatory mechanism, the concerns raised by the public in

comments to proposed rulemakings largely reflected the consensus themes of the experts. More significantly, the public writing overwhelmingly favored increased regulation to protect public health and the environment. Members of industry who were directly affected by the proposed regulations presented the very limited number of comments opposing increased regulation. Most of these industry objections were based on financial considerations and did not present evidence that adequate regulations were already in place to protect public health and the environment.