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JOST & SHELTON
ENERGY GROUP PC

1675 LARIMER STREET
SUITE 420
DENVER, COLORADO 80202
TEL: (720)379-1812
FAX: (720)379-1813
WWW.JSENERGYGROUP.COM

Rule 510 Statement

Full Name: Colorado Oil & Gas Association
Mailing Address: 1800 Glenarm Place, Suite 1100, Denver, CO 80202
Phone Number: (303) 861-0362
E-Mail Address: tisha.schuller@coga.org

I. INTRODUCTION

On November 15, 2013 the Colorado Oil and Gas Conservation Commission ("Commission") and the Colorado Department of Natural Resources ("DNR") received a Petition[1] (hereinafter the "Petition") on behalf of eight Colorado youths, six of whom are directors and/or members of an organization called "EarthGuardians" (hereinafter, "Petitioner"). The Petition requests suspension of "permits that allow hydraulic fracturing until it can be done without adversely impacting human health and safety and without impairing Colorado's atmospheric resource and climate system, water, soil, wildlife, other biological resources."

The Colorado Oil & Gas Association ("COGA") appreciates the young petitioners' initiative and deep commitment to civic involvement. Nevertheless, COGA respectfully submits that the Petition is misguided and ineffective. The young Petitioners' assertions about the impacts of hydraulic fracturing are exaggerated and based largely on fashionable media and unsubstantiated internet content rather than on scientifically validated studies. Moreover, the Petition requests relief on the basis of a doctrine that has never been applied in Colorado and has been repudiated by the state's courts. For these reasons and others discussed below, COGA respectfully requests that the Commission deny the Petition in its entirety.

II. APPLICABILITY OF THE PUBLIC TRUST DOCTRINE

The Petition is, in essence, a request that the Commission adopt the "public trust doctrine" (hereinafter, the "PTD") and use that doctrine as a vehicle to suspend, regulate and/or ban hydraulic fracturing. The PTD is a somewhat nebulous doctrine, but primarily is concerned with the notion that certain lands and resources are held by the state in trust for use by the public. The U.S. Supreme Court called it "a title held in trust for the people of the State that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing" free from obstruction or interference from private parties. *Illinois Central R.R. Co. v. Illinois,* 146 U.S. 387, 452 (1892). The PTD has primarily been applied with regard to tidal areas and submerged lands, but in some states, the doctrine has been expanded to lakes and/or navigable waterways.[2]

A. Colorado.

In Colorado *no court nor any law has ever recognized the PTD or acknowledged its applicability to the state's jurisprudence.* In fact, numerous Colorado courts have explicitly

[1] Pursuant to C.R.S. 24-4-103(7); and 2 CCR 404-1, 529(b).
[2] *Nat'l Audubon Soc'y v. Superior Court*, 658 P.2d 709 (1983).

repudiated the existence of the PTD in Colorado.[3] Recently, in a complaint filed by Xiuhtezcatl Martinez (one of the Petitioners and the Youth Director of EarthGuardians) as well as WildEarth Guardians (a multimillion dollar national environmental lobbying organization based out of Santa Fe, NM[4]), and others, the plaintiffs requested a declaratory judgment that the PTD exists, is in effect, and that the state should reduce GHG emissions and take other measures. In this case, the District Court concluded that the PTD has never been recognized by Colorado courts and that the Plaintiffs failed to point to a single case to support its claim.

The reality of Colorado law is quite the opposite of what Petitioner urges. The Colorado Supreme Court has rejected the PTD, stating "[t]his court has never recognized the public trust doctrine with respect to water."[5] The Petitioner is asking the Commission, therefore, to make a finding in direct opposition to findings of the Denver District Court and repugnant to long-standing precedent of the Colorado Supreme Court. While the Denver District Court's ruling is not binding on the Commission, it should be considered highly persuasive. The Commission should consider the ramifications of a state administrative agency making a sweeping decision about Colorado jurisprudence in direct contravention to one of the state's busiest district courts. The Colorado Supreme Court's decisions, on the other hand, *are* binding on the Commission, and those portions of the Petition relating to water should be dismissed without further consideration.

B. Nationally.

Any finding from the Commission that the PTD applies to air quality and atmosphere would also be contrary to what numerous other state courts and administrative agencies have held. No jurisdiction has applied the PTD to air and atmosphere, or to regulate emissions of greenhouse gases ("GHG"). Below are just a few of the decisions from courts and administrative agencies in other states that address the PTD.

1. Alaska. In 2012, a number of minor persons sued the State of Alaska Department of Natural Resources ("AKDNR"), seeking relief against the AKDNR for breach of its public trust obligations.[6] The court granted the defendant's 12(b)(6) motion to dismiss in spite of Alaskan courts' disfavor of such motions, because the suit involved a nonjusticiable political question. The court recognized the PTD for certain resources, such as wildlife, minerals and water rights, but explicitly rejected its application to the atmosphere or air.

2. Georgia. On May 4, 2011, Kids vs. Global Warming filed a petition (*very* similar to the Colorado Petition) with the Georgia Department of Natural Resources ("GDNR") to regulate GHG emissions on the basis of the PTD. The GDNR denied the petition a month later, finding it an inappropriate for state-level regulation.

3. Idaho. On May 4, 2011, Emily Smith & Kids vs Global Warming filed a petition (*very* similar to the Colorado Petition) with the Idaho Board of Environmental Quality to regulate GHG emissions on the basis of the PTD. The petition was unanimously denied based on a grossly inadequate cost-benefit ratio, impracticability, and I.C. § 58-1203, which limits the PTD to apply only to state alienation or encumbrance of the title to the navigable water beds.

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[3] Case No. 11-CV-4377 in the District Court for the City and County of Denver, Colorado.
[4] *"Financial Overview,"* WildEarth Guardians Website. WildEarth Guardians. Dec 2013.
[5] *Aspen Wilderness Workshop, Inc. v. Colorado Water Conservation Bd.*, 901 P.2d 1251, 1263 (Colo. 1995)
[6] Case No. 3AN-11-07474CI in the Alaska Superior Court, Third Judicial District at Anchorage.

4. Iowa. On May 4, 2011, Kids vs. Global Warming filed a petition (*very* similar to the Colorado Petition) with the Iowa Department of Natural Resources ("IDNR") to regulate GHG emissions on the basis of the PTD. Following a short hearing, the IDNR unanimously denied the petition for the following reasons: 1) existing greenhouse gas emissions inventory; 2) existing GHG emissions regulations; 3) conflict with anticipated future rules from the U.S. Environmental Protection Agency ("EPA"); and 4) lack of funding. Upon appeal in Case No. CV-008748, the Iowa District Court for Polk County unreservedly upheld the IDNR's decision, holding that "the scope of the [PTD] in Iowa is narrow, and we have cautioned against overextending the doctrine."[7] The Iowa Supreme Court refused to extend the doctrine to forests[8] and public alleys,[9] and the Iowa Court of Appeals refused to apply the PTD to the atmosphere.[10]

5. Minnesota. Recently, in *Aronow v. State*, A12-0585, 2012 WL 4476642 (Minn. Ct. App. Oct. 1, 2012), the Minnesota Court of Appeals upheld the Second Judicial District Court for Ramsey County, refusing to apply the PTD to the atmosphere.[11] The court held that the "'primary purposes' of the state's trust are 'to maintain such waters for navigation and other public uses.'" *Id.* The court held that the Appellant provided no legal support to apply the PTD to the atmosphere, and the court was aware of no case law from Minnesota, *or any other jurisdiction*, that expanded the scope of the PTD to include the atmosphere. *Id.*

6. Montana. Recently, a number of parties, primarily parents filing on behalf of their children, filed an original petition with the Montana Supreme Court, requesting declaratory relief that the State of Montana holds the atmosphere in trust for the present and future citizens of Montana.[12] The Montana Supreme Court denied and dismissed the petition, reasoning that the petition requested relief that would require numerous factual determinations, did not involve purely legal questions, and that the Petitioners did not establish urgency or emergency factors.

7. New Mexico. On February 16, 2012, WildEarth Guardians, *et al.*, filed a Complaint in the First Judicial District Court of the State of New Mexico in Santa Fe County against Susana Martinez in her official capacity as Governor of New Mexico, and the State of New Mexico.[13] WildEarth Guardians requested that the court apply the PTD to the state's waters and atmosphere and order the state to regulate GHG. Initially, the District Court allowed *a portion* of the case to go forward on the merits but subsequently granted the state's motion for summary judgment in its entirety, and denied WildEarth Guardians' motion for summary judgment in its entirety. The court frowned on circumventing the political process, found no justification for applying the PTD, and held that the political process in New Mexico about GHG was transparent.

8. Texas. On May 5, 2011, the Texas Environmental Law Center submitted a petition to the Texas Commission on Environmental Quality ("TCEQ") for adoption of indefinite annual 6% GHG reductions, and extensive monitoring and reporting. The TCEQ denied the petition on multiple grounds, including ongoing EPA litigation, lack of benefit from a single state's regulation, impracticability, the PTD's inapplicability to GHG, duplicity and conflict with federal regulations, and several other reasons. The petitioners appealed the TCEQ's decision and the Travis County

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[7] *Bushby v. Wash. Cnty. Cons. Bd.*, 654 N.W.2d 494, 498 (Iowa 2003) (PTD does not apply to forested areas).
[8] *Id.*
[9] *Fencl v. City of Harpers Ferry*, 620 N.W.2d 808, 813-14 (Iowa 2000) (PTD does not apply to alleyways).
[10] *Filippone ex rel. Filippone v. Iowa Dep't of Natural Res.*, 829 N.W.2d 589 (Iowa Ct. App. 2013).
[11] Case No. 62-CV-11-3952 in the Second Judicial District Court of Ramsey County, State of Minnesota.
[12] Cause No. OP 11-0258 in the Supreme Court of and for the State of Montana.
[13] Case No. D-101-CV-2011-01514, First Judicial District Court of Santa Fe County, State of New Mexico.

Texas District Court in Austin, Texas[14] *upheld* the TCEQ's denial of the petition but published some comments adverse to the TCEQ, for example, that the public trust doctrine "includes... the air and atmosphere." The court cited *no* legal precedent for its statements and the TCEQ is currently appealing the district court's ruling due to these unsupported and unnecessary comments.

9. Wyoming. On May 4, 2011, Kids vs. Global Warming filed a petition with the Wyoming Environmental Quality Council ("WEQC") substantially similar to those submitted to Georgia, Idaho, Iowa, Texas, and to the Commission. On October 5, 2011, the WEQC unanimously denied the petition, stating that "any actions by the Council at this time would be duplicative, would result in needless expenditures of limited state funds" and confusion with federal regulations. The WEQC also noted that Wyo. Stat. 35-11-213 explicitly prohibits any new rule or regulation for Kyoto Protocol emissions reductions.

10. Petitioners point to only *two* cases outside of Colorado to support their PTD argument. However, Petitioners misconstrue both cases. Petitioners refer to the Travis County Texas District Court case and claim that the court said "that pursuant to the Texas Constitution, all natural resources, including the air and atmosphere, are trust assets and must be protected by the state."[15] However, this overstates the court's language, which is simply that the PTD in Texas *includes* all natural resources, not that the resources *must be protected*. More significantly, Petitioners neglect to mention that this is only a district court case, that the language is from a letter to the parties' counsels and not the court's findings, that the language is not binding, and that the judge cited no precedent. The TCEQ, as Appellant, is currently appealing the district court's decision to strike the unnecessary and unsupported language.

Petitioner's status summary of the New Mexico case states that the case "will be proceeding on the merits to determine if the state has complied with its trust duties to protect the atmosphere when repealing regulations that address greenhouse gas emissions." That statement is untrue. As discussed above, the court granted the defendants' (the governor and the state) motion for summary judgment on June 26, 2013, **more than four months before Petitioners filed a petition asserting that this case was going forward on its merits.** Perhaps this is simply a matter of Petitioner's inadvertent failure to update citations and facts taken from a brief that was drafted for submittal to numerous other jurisdictions, but it begs the question of how many other references are out of date and inaccurate.

C. **Summary of Public Trust Doctrine**.

Petitioner has largely based its reasoning for its requested rule on the application of the PTD to water quality, air quality and GHG emissions management. However, Colorado courts have expressly repudiated the application of the PTD to water and the Denver District Court has expressed its skepticism that the doctrine exists at all in the state. Numerous other courts and administrative agencies in other states have examined the PTD and determined that it does not apply to the air and atmosphere, and is not a basis on which GHG must be regulated. Many of the judges and commissions who made these determinations not only found significant legal precedent for their decisions, but also found compelling public policy reasons why they should not extend the PTD to the atmosphere and GHG regulation. Petitioners have submitted no justification for a radical departure from the overwhelming majority rule in the country, nor a rule from the Commission that is largely repugnant to long-established precedent in Colorado.

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[14] Case No. D-1-GN-11-002194 in the Travis County Texas District Court.
[15] Petition, at 40.

III. POLICY CONSIDERATIONS

Petitioner sets forth numerous arguments regarding the public health and environmental effects of hydraulic fracturing. A point-by-point analysis of Petitioner's 54 pages of petition is well beyond the scope of a 10-page 510 statement. Rather several themes prominent in Petitioner's arguments will be addressed. These include the a) public health and environmental consequences of hydraulic fracturing's effects on water resources, b) public health and environmental consequences of hydraulic fracturing's effects on GHG emissions and air quality, c) Petitioner's persistent reliance on popular media and unscientific sources, d) existing environmental protections related to hydraulic fracturing, and e) ramifications of implementing Petitioner's requests.

A. **Hydraulic Fracturing's Effects on Water Resources**. Petitioner alleges several myths on this topic, which upon examination are revealed to be completely untrue.

1. Myth No. 1. Petitioner states that each hydraulic stimulation uses millions of gallons of water, which can lower the water table and harm biodiversity and residential water availability.[16] Petitioner's bases this on 1) a visit to a FAQ website from an environmentalist lobbying organization group in Pennsylvania over a year ago and 2) a selected statement taken in isolation and out of context from an unsupported and unscientific report.[17] The *reality* is that the oil and gas industry only uses a fraction of a percent of water in Colorado. In 2010 it was 0.08%. This percentage is based on "diversion records from the Colorado Division of Water Resources…" as well as "2010 Statewide Water Supply Initiative data from the Colorado Water Conservation Board."[18] This figure is expected to increase to just over 0.10% by 2015.[19] In comparison, thermoelectric power generation uses 0.47% of the state's water (nearly 6 times as much as oil and gas) and recreation uses 5.64% (more than 70 times as much as oil and gas).[20]

2. Myth No. 2. Petitioner states that water "used for hydraulic fracturing is 100% consumptive."[21] Petitioner cites to no source whatsoever to for this outlandish statement. Petitioner also states that hydraulic fracturing water cannot be returned to streams, and supports this statement with nothing but a cite to a pamphlet from an environmental lobbyist group, which provides no sources to support its statements, scientifically based or otherwise. The reality is that many hydraulic fracturing systems recycle and reuse the water involved in the process, which is covered by Commission Rule 907 (Management of E&P Waste). Additionally, flowback fluids and produced water can be treated to achieve water quality standards where discharges to streams is allowed under applicable regulatory permits.[22] In any case, operators must obtain any water they use through the same methods as any other water user in the state, which methods are subject to, and predominantly the result of the doctrine of prior appropriations.[23] The State Engineer's Office and the Water Courts

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[16] Petition at 8.
[17] *Id.*, at 8, citing to the Pennsylvania Alliance for Clean Water and Air, FAQ's on hydraulic fracturing, available at http://www.pacwa.org/FAQ- Photos.html (last visited Mar. 22, 2013), and International Energy Agency, Golden Rules for the Golden Age of Gas, 31-32 (2012).
[18] Colorado Division of Water Resources, Colorado Water Conservation Board, and Colorado Oil and Gas Conservation Commission, *Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015* (2012), at 4
[19] *Id.*
[20] *Id.*
[21] Petition, at 9.
[22] CDPHE, Water Quality Control Commission Regulations, *Surface Water Quality Classifications and Standards (Regulations 31-39) and Point Source Discharge Permit and Control Regulations (Regulations 61-63).*
[23] Colorado Division of Water Resources, Colorado Water Conservation Board, and Colorado Oil and Gas

oversee this process, and oil and gas operators cannot simply appropriate water away from residential, agricultural, recreational and other uses without going through a complex process that is meticulously managed by the state.[24]

3. Myth No. 3. Petitioner states that hydraulic fracturing contaminates ground water and harms wildlife. Once again, Petitioner uses improper rhetoric and unsupported studies to support this claim. For example, Petitioner makes the statement that wastewater injection *can* lead to leaks, which assertion Petitioner uses to support its statement that hydraulic fracturing actually *does* threaten groundwater.[25] Just because something *can* happen does not mean it will or even that it is a credible threat. Petitioner asserts that leaks and accidental spills are a major threat in Colorado, but the Commission just completed a rulemaking adopting rigorous new regulations to monitor, control and prevent spills. Petitioner cites to an article in Vanity Fair Magazine, published nearly *four* years ago, about hydraulic fracturing in *Pennsylvania*, to support its statistics about the number of spills resulting in water contamination in Colorado *six years ago*. Petitioner's arguments collapse in the clear light of scientifically valid, *peer-reviewed* studies regarding the effects of hydraulic fracturing on groundwater. Such studies consistently find that hydraulic fracturing techniques currently being used pose no discernible risk to groundwater and drinking water.[26] Petitioner's sole source for its assertions regarding impacts on wildlife is a December 2008 article from the Valley Journal, a newspaper out of Carbondale, Colorado that is no longer being published. The link to the article is non-functional. The reality of the risk from oil and gas operations is profoundly different from Petitioner's unsubstantiated proclamations. For example, Petition claims that "[r]oads and gravel platforms at well sites increase runoff, which often carries silt and toxic chemicals and pollutes the water wildlife relies on and can cause a decline in fish populations."[27] Petitioner's sole support for this allegation is the above-mentioned unretrievable local newspaper article. This statement has almost no relation to hydraulic fracturing, but more importantly, a cursory review of state administrative rules and regulations expose it to be grossly misleading. On June 30, 2005, stormwater regulations went into effect for Colorado Discharge Permit System ("CDPS") permits from the Water Quality Control Division ("WQCD") of the Colorado Department of Public Health and Environment ("CDPHE") for stormwater discharges from construction activities for oil and gas sites.[28] The CDPS requires the implementation of Stormwater Management Plans ("SWMP") that set forth site-specific best management practices to protect surface water and decrease runoff.[29] These SWMPs are enforced by the CDPHE to prevent discharge of silt and/or chemicals that exceed water quality standards.

B. **Hydraulic Fracturing's Effects on GHG Emissions and Air Quality**. Petitioner advances

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Conservation Commission, *Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015* (2012), at 4.

[24] *Id.*

[25] Petition, at 9.

[26] *See*, e.g. Quality Environmental Professional Associates, *Pathway Analysis and Risk Assessment for Solids and Fluids Used in Oil and Gas Exploration and Production in Colorado* (June, 2008) ("With regard to liquid discharge directly into groundwater, it is apparent that under reasonable predicted conditions, no significant risk is predicted."); University of Texas Austin, *Fact-Based Regulation for Environmental Protection in Shale Gas Development* (2012) ("No evidence of chemicals from hydraulic fracturing fluid has been found in aquifers as a result of fracturing operations."); Pennsylvania State University, *The Impact of Marcellus Gas Drilling on Rural Drinking Water Supplies* (2011) ("Results of the water quality parameters measured in this study do not indicate any obvious influence from fracking in gas wells on nearby private water well quality.").

[27] Petition at 10.

[28] 5 CCR 1002–61. Colorado Discharge Permit System Regulations.

[29] *Id.*

many of the same techniques for its air quality and GHG emissions arguments that it did for water issues. Petitioner cites to newspaper articles, outdated materials, and unscientific reports.[30] Once again, an analysis of current, peer-reviewed and scientifically conducted studies indicates that hydraulic fracturing has no significant effect on air quality[31] and actually contributes to a transition away from coal, *reducing* the net impact on GHG emissions.[32] Moreover, Petitioner makes no apparent attempt to account for current-generation technologies such as green completions and methane capture.

C. **Petitioner's reliance on popular media and unscientific sources**. Several of the Petitioner's references to popular media and unscientific sources have already been discussed above. In one case, Petitioner asserted that a New Mexico Case would be going to trial on its merits when in fact, the case resolved in a manner antithetical to Petitioner's position months prior. In another, Petitioner based an entire section of its Petition on a six year old article, published by a small newspaper that no longer exists. An analysis of each and every incorrect, outdated, and/or dubious citation and reference in the Petition is well beyond the scope of a 10-page 510 statement. That being said, a few statistics about the Petition may be helpful in understanding the magnitude of this issue. Of the 308 footnotes contained in the Petition, 52 are references to popular media. This includes 29 newspaper and magazine articles[33] and 23 website and blog references[34]. The Petition contains 22 internet universal resource locaters ("urls") that are non-functional[35]. The Petition contains six photographs apparently taken from blogspot.com. The Petition contains only *four*

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[30] Petition at 10-12.

[31] Pinyon Environmental, *Town of Erie Air Quality Toxicology Assessment* (2012) (finding the risk of cancer from benzene concentrations to be 1 in 100,000); Public Health England, *Review of the potential public health impacts of exposures to chemical and radioactive pollutants as a result of the shale gas extraction* (October 2013) (finding that the currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with properly run and regulated shale gas extraction are low); Commonwealth of Pennsylvania & Department of Environmental Protection, *Northeastern Pennsylvania Marcellus Shale Short-term Ambient Air Sampling Report* (2011) ("Results of the limited ambient air sampling initiative in the northeast region did not identify concentrations of any compound that would likely trigger air-related health issues associated with Marcellus Shale drilling activities"); Colorado Department of Public Health and Environment, *Air Emissions Case Study Related to Oil and Gas Development in Erie, Colorado* (December, 2012) ("The monitored concentrations of benzene, one of the major risk driving chemicals, are well within acceptable limits to protect public health, as determined by the U.S. Environmental Protection Agency. The concentrations of various compounds are comparatively low and are not likely to raise significant health issues of concern.").

[32] Hultman, Nathan, Rebois, Dylan, Scholten, Michael and Ramig, Christopher, University of Maryland, *The greenhouse impact of unconventional gas for electricity generation* (2011) ("the greenhouse footprint of shale gas and other unconventional gas resources is about 11% higher than that of conventional gas for electricity generation, and still 56% that of coal"); O'Sullivan, Francis and Paltsev, Sergey, Massachusetts Institute of Technology, *Shale gas production: potential versus actual greenhouse gas emissions* (November 2012) ("...it is incorrect to suggest that shale gas-related hydraulic fracturing has substantially altered the overall GHG intensity of natural gas production."); Cathles, Lawrence M., Brown, Larry, Taam, Milton and Hunter, Andrew, Cornell University (2011) ("Using more reasonable leakage rates and bases of comparison, shale gas has a GHG footprint that is half and perhaps a third that of coal").

[33] Petition, N.8 (E&E News), n.11, 12 (Denver Post) nn.21 & 22 (The Coloradoan), nn.23 & 42 (Vanity Fair), nn. 24, 25, 26, 27, 28 & 29 (The Valley Journal, *defunct*), n.34 (Aspentimes), nn.38, 39, 40 & 41 (Scientific American), n.140 (Reuters), n.293 (National Catholic Reporter), nn.294, 295, 299, 300 & 306 (Huffingtonpost), nn.298, 303 & 304 (National Geographic), and nn.301 & 302 (Mother Jones).

[34] Petition, nn.8, 18 & 18 (www.propublica.org), n.9 (www.nrdc.org), n.9 (www.foodandwaterwatch.org), n.19 (http://catskillcitizens.org), nn.62 & 227 (www.CO2now.org), nn.64 & 68 (www.nature.com), n.106 (www.climateprogress.org), n.171 (www.environment.yale.edu), nn.245, 246, 247, 248, 249, 253, 257 & 307 (www.rockymountainclimate.org), nn.296 & 297 (www.nbcnews.com), and n.308 (www.fractivist.blogspot.com).

[35] Petition, nn.13, 24, 25, 26, 27, 28, 29, 31, 46, 63, 70, 106, 120, 121, 122, 123, 124, 189, 198, 206, 275 & 279.

references to Colorado statutes and *no* references to existing Commission rules and regulations. The Petitioners' request is a rule of such import and magnitude that it *must* be based on sound scientific principles, not newspaper articles from rural Colorado and internet blogs. Moreover, it should account for the existing regulations, which the Petition totally ignores.

D. **Colorado already has extensive hydraulic fracturing regulations.**

1. Under Commission Rule 205A, the operator of every well that is hydraulically fractured must complete a chemical disclosure registry form and post it on the chemical disclosure registry. The contents of the forms are made available as part of a national public database at www.FracFocus.org. The disclosures made include, among other things:[36]

> (viii) the volume of water or other base fluid used
>
> (ix) every hydraulic fracturing additive used in the hydraulic fracturing fluid and the trade name, vendor, and a brief descriptor of the intended use or function of each hydraulic fracturing additive in the hydraulic fracturing fluid
>
> (x) each chemical intentionally added to the base fluid
>
> (xi) the maximum concentration, in percent by mass, of each chemical intentionally added to the base fluid
>
> (xii) the chemical abstract service number for each chemical intentionally added to the base fluid, if applicable

Under certain limited circumstances, operators may withhold some of this information as trade secrets, but even the withheld information must be made available to health professionals when they demonstrate a need for it.[37] The withheld information must also be made available to the Commission Director when responding to a spill, release, or complaint from a person who *may have been* directly and adversely affected or aggrieved by such spill or release.[38]

2. Other Commission Rules.

a) Commission Rule 205.c. requires operators to maintain a Chemical Inventory by well site "for each Chemical Product used downhole during drilling, completion, and workover operations, excluding hydraulic fracturing treatments, in an amount exceeding five hundred (500) pounds during any quarterly reporting period."

b) Commission Rule 305.c. requires operators to provide an information sheet about hydraulic fracturing to drillsite surface owners, nearby surface owners, and owners of all nearby building units before conducting hydraulic fracturing operations.

c) Commission Rule 316C requires operators to provide the Commission with at least 48 hours advance written notice prior to hydraulic fracturing, and that notice is then promptly passed on to the local government designee.

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[36] Commission Rule 205A.
[37] *Id.*
[38] *Id.*

d) Rule 805 requires hydraulic fracturing silica dust control.

e) Numerous other rules are aimed at protecting water quality, including 317b (Public Water System Protection), 324A (Pollution), 904 (Pit Lining Requirements and Specifications), and 907 (Management of E&P Waste).

3. In addition to Commission Rules, the state has the most rigorous air quality controls on oil and gas operations in the country. In February of 2014, the CDPHE completed a year-long rulemaking to implement these controls, which targets not only ozone precursors but GHG in the form of methane and addresses emissions from nearly every stage of upstream oil and gas operations.[39] Notably, *Petitioner made no attempt to participate in this rulemaking.*

4. In January of 2013, the Commission completed a water quality rulemaking that resulted in some of the nations' most stringent water quality sampling and monitoring for oil and gas operations. Subsequently, in December of 2013, the Commission completed a spill reporting rulemaking. *Petitioner made no attempt to participate in either of these rulemakings.*

5. In addition to the Commission's many rules that protect and monitor water quality, the CDPHE Water Quality Control Commission ("WQCC") has many regulations that affect the oil and gas industry and target water quality in the state. Two of these include Regulation No. 42 (Site-Specific Ground Water Classification and Standards for the Ground Water Within Various Oil and Gas Producing Formations)), Regulation 65 (Regulations Controlling Discharges to Storm Sewers).

Clearly, the state already has a complex regulatory regime that is among the most protective of any state in the country. This framework has been rapidly evolving over the past several years, but Petitioners have made no effort to be involved in this process. Petitioner's requests are superfluous in light of the state's existing regulations.

E. **Ramifications of implementing Petitioner's requests.**

Over 90% of the wells that are drilled in Colorado today are hydraulically fractured.[40] A moratorium on hydraulic fracturing would be, for all intents and purposes, a moratorium on all oil and gas development in Colorado. Economic results could be as high as an $8 billion dollar decrease in Colorado's GDP and 68,000 fewer jobs in the first five years, and a $12 billion dollar decrease in Colorado's GDP and 93,000 fewer jobs by 2040.[41]

Utah State University's Institute of Political Economy ("IPE") studied the impact of WildEarth Guardians' countless lawsuits across the country.[42] According to this study, "WEG continues to litigate to reduce the amount of drilling across the West, especially in the Rocky Mountain Region including Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming." This begs the question of whether the Petition is, in fact, merely a tactic in

[39] *See* 2014 revisions to 5 C.C.R. § 1001-5 (Regulation No. 3), 5 C.C.R. § 1001-8 (Regulation No. 6), and 5 C.C.R. § 1001-9 (Regulation No. 7), adopted by the Air Quality Control Commission of the Colorado Department of Public Health and Environment.

[40] Wobbekind, Richard and Lewandowski, Brian, Leeds School of Business at the University of Colorado at Boulder *Hydraulic Fracturing Ban The Economic Impact of a Statewide Fracking Ban in Colorado*, at 4 (April 2014), available at http://www.metrodenver.org/files/documents/misc/REMI_Fracking.pdf.

[41] *Id.*, at 1.

[42] Yonk, Ryan M., Simmons, Randy T., and Harri, Kayla Dawn, Institute of Political Economy at Utah State University, *Economic Impact of WildEarth Guardians Litigation on Local Communities* (May 2012).

furtherance of WildEarth Guardians' anti-development agenda. The IPE determined that WildEarth Guardians' "efforts may jeopardize industries representing $3.98 billion in economic benefits for local economies" which figure does not account for "the fiscal and budget implications, increase costs to local legal systems, and the cost of new regulations."

If 90% or more of oil and gas development in Colorado abruptly terminates, even just temporarily, tens of thousands of jobs will end, the state, royalty owners and oil and gas developers will lose many billions of dollars, prices for electricity, heat and gasoline will rapidly increase, and domestic energy security will suffer.

IV. CONCLUSION

COGA greatly appreciates the opportunity to participate in the Commission's consideration of the Petition. The Petition requests relief on the basis of a doctrine that has never been applied in Colorado and has been repudiated by the state's courts. The relief requested would have major negative economic impacts on the state and region, and would costs tens of thousands of Coloradans their livelihoods. Petitioner has provided scant data and little scientifically validated analysis, but a glut of popular media and internet content. The facts about hydraulic fracturing are that it does not demonstrably contribute to global warming, it does not adversely affect air quality, it does not harm the state's water resources, and it has a minimal impact on water scarcity in Colorado. Simply put, Petitioner is advocating for a rule that will have no appreciable benefit but will saddle the state and its citizens with a ruinous burden. For these reasons and those discussed above, COGA respectfully urges the Commission to deny the Petition.

Very truly yours,

JOST & SHELTON ENERGY GROUP, P.C.,
as general counsel for
The Colorado Oil & Gas Association

Jamie L. Jost
Managing Shareholder

SCIENCE, DEMOCRACY, AND FRACKING

A Guide for Community Residents and Policy Makers Facing Decisions over Hydraulic Fracturing

The Center for Science and Democracy at the Union of Concerned Scientists

Introduction

If you are an active citizen in a community facing decisions about fracking, this toolkit is for you. It provides practical advice and resources to help you identify the critical questions to ask and get the scientific information you need when weighing the prospects and risks of shale oil or shale gas development in your region.

Hydraulic fracturing—or "fracking"—involves drilling a well into shale formations deep underground and injecting millions of gallons of water under high pressure, along with chemicals and sand, to break open fissures in the rocks and release oil and natural gas. Recent advances in fracturing technology and other forms of "well stimulation" such as acidization, coupled with horizontal drilling (rather than conventional vertical drilling), have made it easier to reach previously inaccessible oil and natural gas reserves, leading to a rapid expansion in domestic oil and gas production.

The pace of growth is driving many communities to make decisions without access to comprehensive and reliable scientific information about the potential impacts of hydraulic fracturing on their local air and water quality, community health, safety, economy, environment, and overall quality of life.

To make sound decisions about fracking, we need independent science to play a strong role in informing our public dialogue. **This toolkit can improve decision making on fracking by helping you to:**

- Identify critical issues about the potential impacts of fracking in your area, and how to obtain answers to your questions

- Distinguish reliable information from misinformation or spin—and help your neighbors and local decision makers do the same

- Identify and communicate with scientists, journalists, policy makers, and community groups that should be part of the public discussion

- Identify and engage with the key actors in your community to influence oil and gas policy at the local and state level

Identifying the Critical Issues in Your Community

If oil or gas deposits have been found in or near your community and fracking operations are being considered or are ongoing, you are likely facing some difficult questions and active discussions on whether or how to proceed. Like most residents, you want to know about the risks and safety of hydraulic fracturing operations, consider any potential threats these operations might pose to your community, weigh the potential economic benefits and risks, and understand how to protect your community's health, safety, and quality of life.

A Brief Overview of Oil and Gas Operations and Commonly Used Terms

Throughout this toolkit, the term **unconventional oil and gas development** is used to encompass the many aspects of the shale oil and shale gas extraction process that can affect a community, including well development, production, wastewater disposal, distribution, and storage. **Hydraulic fracturing** is one step in this larger process, which begins after an operator acquires the legal right to explore and drill, usually through a lease from the owner of the subsurface oil and gas mineral rights (whether privately held or tribe- or government-owned).

After acquiring these rights, an operator will conduct tests to understand the site's geology, and build any necessary access roads and one or more **well pads**, which encompass the well site itself and space for aboveground drilling machinery and support activities such as water and wastewater storage. Some states allow **open containments** for wastewater—reservoirs that can be several acres in size—while others may require waste be kept in various types of containment vessels.

Drilling will then begin, which may be done vertically or horizontally. Unlike a vertical well, extending straight down to the oil or gas-bearing formation, a horizontal well extends down and laterally for several thousand feet. After drilling the hole (or **bore**), the operator will install a steel **casing** down the edge of the well and cement it in place to prevent leakage between the well and nearby water and land. Operators will often conduct additional tests at this stage to ensure the construction process has been successful.

At this point, the operator will hydraulically fracture (or **frack**) a well to extract fuel from shale. Once the well has been fracked, it can often produce oil or gas for years. Some wells may only be fracked once, while others may be repeatedly fracked over the course of their lifetime to increase productivity. When the well is no longer producing oil or gas economically, the operator will either **idle** it (in hopes of a future use) or abandon it (**plugging** it to prevent potential oil or gas leakage).

The complete process of hydraulic fracturing for oil and gas development, from exploration to production, can affect a community's well-being in numerous ways. Here are some critical areas to consider:

WATER QUANTITY AND QUALITY

Hydraulic fracturing can use vast amounts of water—as much as a few million gallons for a single well. This may place competing claims on water in regions with limited resources. While some water used for fracking can be recycled, the process consumes large quantities of water. For instance, a single well may require 3 million to 12 million gallons of water when it is first fracked.

In terms of water quality, oil and gas drilling can potentially contaminate drinking water supplies in several ways, most commonly from flaws in the well bore, methane migration, and wastewater. Chemicals, fuel, and drilling wastewater can spill or leak while they are being transported, while they are stored and handled during the operation itself, and when they are treated and disposed of after fracking. Leaks can also occur in producing wells or improperly plugged wells. Faulty well construction has also contaminated groundwater, and there is ongoing scientific debate about how hydraulic fracturing itself could contaminate groundwater.

Baseline testing and monitoring of groundwater, nearby surface waters, and private wells before, during, and after drilling are critical to determine whether chemicals or other pollutants from fracking operations are contaminating drinking water supplies, and to verify whether water used by municipal suppliers is contaminated.

CRITICAL QUESTIONS TO ASK:

- **Where are my drinking water and other water resources located in relation to oil and gas wells and reservoirs? Where could spills or contamination occur in my community? How might they affect my drinking water?**
- **How much water will a typical well in my region use, and where will it come from? Are our planners and local decision makers undertaking a trade-off analysis to see how fracking operations may affect water availability and competing demand for (and use of) this resource?**
- **How and where would drilling companies dispose of their wastewater, chemicals, or other potentially harmful materials?**
- **Is my public water treatment facility accepting fracking wastewater? Is it able to adequately treat the volume and quality of this wastewater?**

- **How could potential changes in drinking water quality or quantity affect the health of my community, especially among those most vulnerable (including children and those with illnesses)?**
- **What safeguards and emergency preparedness measures are in place to deal with potential spills or contamination?**

AIR QUALITY

Some research suggests that unconventional oil and gas development can affect air quality. Drilling may produce and increase emissions of methane, ozone, and hazardous air pollutants including benzene and xylene around the well site. Workers or others close to the site may be exposed to high levels of silica dust. Oil and gas drilling often involves high levels of truck traffic, which can increase diesel exhaust and soot (fine particulate) pollution near wells.

CRITICAL QUESTIONS TO ASK:

- **Could pollutants from oil and gas drilling, machinery, or increased trucking change air quality?**
- **Could these changes cause health problems in my community?**
- **Who is responsible for baseline testing and ongoing monitoring to understand any air quality changes, and how would local officials respond if the data reveal a problem?**
- **Who is responsible for community health assessments or studies that can determine whether fracking is adversely affecting public health?**

LAND USE AND ECOLOGY

Unconventional oil and gas development can have a major impact on the landscape of your community. For example, hydraulic fracturing requires a network of "feeder" pipelines that can degrade ecosystems or break up wildlife habitats. Construction of well pads and access roads may cause similar ecological disruptions. This could be especially troublesome in areas with higher levels of oil and gas development, or in areas with at-risk ecosystems and wildlife.

CRITICAL QUESTIONS TO ASK:

- **What are the land use implications of oil and gas drilling in my community?**
- **What ecological resources and protected wildlife exist in and around my community?**
- **Would oil and gas drilling occur in or near these resources? If so, how is the industry planning to prevent or address the potential negative impacts?**
- **What measures are in place to protect our ecosystems and wildlife?**

INFRASTRUCTURE

Increased truck traffic during well pad construction, hydraulic fracturing of wells, and fuel production can strain roads and bridges (especially if they were not built for industrial use) and interfere with local traffic.

CRITICAL QUESTIONS TO ASK:

- **How many trucks can my community expect? How could that affect traffic conditions?**
- **Will new roads be needed? Where will they be located?**
- **What route would trucks take to and from the well pads, and would this affect schools and other sensitive areas?**
- **How would my community's roads and bridges be affected?**
- **Is my local government considering options for managing these impacts, such as financially insuring or "bonding" the roads (i.e., requiring companies to sign road use agreements and assigning liability for infrastructure damages)?**

EARTHQUAKE RISK

The process of hydraulic fracturing does not typically cause detectable earthquakes at the surface. However, deep-well injection of fracking wastewater has been linked to a handful of noticeable earthquakes in the United States.

CRITICAL QUESTIONS TO ASK:

- **Will drillers dispose of their waste through deep-well injection? If so, where will those injection wells be?**
- **Would my region be prone to, or at a higher risk for, earthquakes resulting from deep-well injection (compared with existing levels of risk)?**
- **If disposal wells are located in or near my community, how will they be regulated?**
- **How is the oil and gas company planning to account for existing fault lines?**

CLIMATE CHANGE

Methane can leak from a gas or oil well during and after drilling, although there is disagreement on how much leakage usually occurs. These emissions are explosive and can cause asphyxiation at high enough concentrations. Further, as a potent heat-trapping gas, methane can contribute to global warming. Methane leakage aside,

investment and reliance on fossil fuels such as oil and gas hampers the development of clean, renewable energy resources, further exacerbating climate change.

CRITICAL QUESTIONS TO ASK:

- **How can my community ensure that methane emissions from existing and abandoned gas or oil wells are properly measured?**
- **What kind of processes will oil and gas drillers use to minimize "fugitive" methane emissions so they do not contribute to global warming?**
- **Will operators be required to limit global warming emissions by capturing gas escaping from wells, or at least by burning (or "flaring") it, rather than allowing its release into the atmosphere?**
- **How would oil and gas development in my region affect support for energy efficiency and renewable energy initiatives?**

SOCIAL AND ECONOMIC IMPACTS

Communities in which unconventional oil and gas development is under way typically experience an influx of oil and gas workers, higher traffic volume, and changing demands on public services, resources, and infrastructure. The negative impacts of these changes can include increased noise and light pollution, a drain on affordable housing, more traffic accidents, higher crime rates and violence against women, alcohol and drug abuse, and strains on emergency and social services. Yet oil and gas development can also boost local employment, businesses, and tax revenues.

Research suggests that communities that proactively address oil and gas development by creating opportunities for citizen engagement, strong local leadership, and clear communication and collaboration among local government, businesses, social service providers, environmental groups, oil and gas companies, schools, workforce development organizations, and others are much more successful at managing both the opportunities and the challenges from such activity.

CRITICAL QUESTIONS TO ASK:

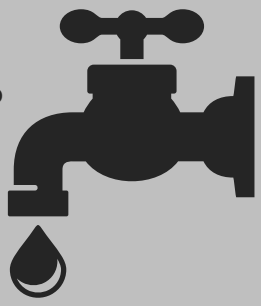
- **Could the location of wells and access roads cause problems with noise, dust, and light pollution?**
- **How many oil and gas workers could move to my community? How could this affect our services (fire, police, ambulance, schools, and hospitals), and for how long?**
- **How might an influx of workers affect property and rental values, and the affordability and availability of housing?**
- **How many jobs could oil and gas development bring to local residents?**
- **How much revenue could these operations bring to my local and state governments, and how will these revenues be distributed? How will our taxes be affected?**
- **Will oil and gas development negatively affect local outdoor recreation and tourism, disrupt culturally significant locales, or damage scenic vistas?**
- **What other kinds of social changes could oil and gas drilling bring to my community? Could it have an impact on public and mental health?**
- **What measures are in place to ensure the health and safety of oil and gas workers, and to respond to work-related accidents or health emergencies?**
- **To what extent is there communication and collaboration across the community on this issue, including regular meetings? Where can residents learn about what is occurring, engage in local decisions, and make their voices heard?**

Critical Questions to Ask

1

QUESTION

How will fracking affect my health, and the health of my family? Will there be chemicals or other pollutants that could get into the drinking water or air?



ACTION

Contact your state's environmental and public health departments for data on air quality and to request water testing for fracking compounds. Contact your state's agricultural extension office for soil testing. Other sources for information on air and water quality include federal agencies such as the Centers for Disease Control and Prevention, Environmental Protection Agency, National Institutes of Health, and U.S. Geological Survey, and peer-reviewed articles from researchers.

2

QUESTION

How will fracking affect my community's land use and quality of life? What impacts will truck traffic or noise have on my and my family's daily activities?

ACTION

Identify where well pads, wastewater storage tanks, water treatment centers, and major pipelines will be located and who is charged with monitoring. Search for this information on Fractracker.org and check with your local land management agency. Search for studies of estimated traffic increases and road damage (for example, see the Greenplan report *Land Use Analysis* for possible layout of well pads).

3

QUESTION

Does my community have adequate housing and emergency and social services to support all the new workers fracking will bring?

ACTION

Search for documents on preparedness for fire, police, and other emergency services, usually published by your local or county planning office or by your legislative committee on municipalities. For housing-related information, look to your state and local committees on housing. Check whether a community impact assessment has been conducted, which would estimate the impact that hydraulic fracturing development would have on these services in your area.

4

QUESTION

Where can I find out about the economic benefits and jobs that oil and gas development could bring to my community?

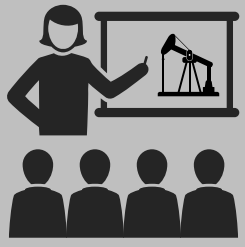
ACTION

Talk to elected officials and staff at your economic development agency. Look for studies of predicted economic impacts, revenue use, and income distribution by academic research institutions and local or state agencies such as the labor department or regional development offices.

5

QUESTION

How can residents of my community learn about what is occurring, engage in local decisions, and make our voices heard?



ACTION

Seek and share information through regular meetings with local government, workforce development agencies, school officials, businesses (including oil and gas companies), social service providers, and other nonprofit organizations. Early citizen engagement, strong local leadership, and clear communication and collaboration among these groups are crucial.

Assessing the Scientific Information

Scientific information about hydraulic fracturing technologies and impacts can be complex and uncertain. But even as this science evolves, there are still steps you can take to learn more about it from reliable, independent sources before your community makes important decisions on fracking in your region.

Tips for finding reliable information

- **Search smartly.** When searching for information online, use terms like "hydraulic fracturing" and "unconven tional oil and gas development," which will return technical and government resources that you may not find when using terms like "fracking" and "natural gas."
- **Look for experts.** Reach out to scientists at nearby universities and state and federal government agencies. Since the impacts of drilling can vary by region, seek out local assessments and experts whenever possible. They may be able to help you find reliable sources, synthesize results, analyze the limitations of current re search, and relate this information to your local needs.
- **Check for credentials and conflicts of interest.** Determine whether people being quoted have the knowl- edge and experience to speak authoritatively about the science. Determine whether these experts have ties to oil and gas companies, are consultants for companies or trade associations, or would directly benefit from drilling (for example, if they own property on which drilling would occur).
- **Get peer-reviewed publications when possible.** Rely on experts who contribute to and cite information from peer-reviewed journals—that is, research that has been examined by other experts—whenever pos- sible. If someone discusses data from a report, try to find out whether the data were collected independently or self-reported by an oil or gas company.
- **Follow the money.** Seek out information on the organization's funding and affiliations to help determine its independence. A data source with multiple affiliations (industry, government, nonprofits) may offer more comprehensive information on the topic.

Top Four Tips for Finding Reliable Information Online

1. When searching for information online, use terms like "hydraulic fracturing" and "unconventional oil and gas development," which will return technical and government resources that you may not find when using terms like "fracking" and "natural gas."
2. Combine "hydraulic fracturing" with the name of your state, municipality, or a federal or state agency (like "EPA" or "[your state] Department of Environmental Protection"). Include the current or previous year in your search terms to return the most up-to-date information.
3. Look beyond the first page of your search results for government and other trustworthy sources (since search engines like Google do not rank results based on accuracy and reliability).
4. Practice objectivity. Seek out and compare information from sources with diverse perspectives, including some with whom you may disagree.

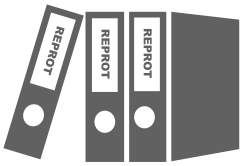
Reliability Indicator	
Heavily weighted toward reliability	⊕⊕
Some indication that the source is reliable	⊕
Needs further review	⊕/⊖
Raises some suspicions about unreliability	⊖
Heavily weighted toward unreliability	⊖⊖

Checklist for Determining Reliable Information

News article or video

Cites or links to independent experts with relevant knowledge and/or to peer-reviewed science	⊕⊕
Produced by an individual or organization that has a position on hydraulic fracturing (whether for or against)	⊕/⊖
Cites individuals without scientific or technical expertise as an authority on scientific questions	⊖⊖
Presents diverse points of view fairly	⊕
Portrays individuals who have diverse perspectives with respect	⊕
Ignores or misstates information or arguments from an alternative perspective	⊖⊖
Clearly distinguishes facts from opinions	⊕

Report or study



Authors are experts on the subject	⊕⊕
Has been peer-reviewed	⊕⊕
Individuals or entities with conflicts of interest contributed to the research or provided financial support	⊖
Authors disclosed their conflicts of interest and funding sources	⊕/⊖
Publisher has a preexisting policy or ideological position on the topic	⊕/⊖
Tone is strongly pro or con rather than objective	⊖
Describes potential positives and negatives in clear terms, cites and critiques conflicting findings	⊕

Other criteria to consider

Original sources of factual content are identified	⊕
Purpose is to provide general information, further scholarship, or offer a public service	⊕⊕
Purpose is to persuade you of a particular point of view or advocate a policy	⊕/⊖
Mentions limitations or uncertainties in the science, or contrary evidence	⊕⊕
Makes it easy to identify funding sources and ideological or policy positions	⊕

SUGGESTED RESOURCES TO JUMP-START YOUR SEARCH

Here is a sampling of good information on hydraulic fracturing and its impacts. For a more comprehensive list, see the Informational Resources Appendix at ***www.ucsusa.org/HFToolkit***.

"Breaking Fuel from the Rock" (National Geographic)

http://news.nationalgeographic.com/news/2010/10/101022-breaking-fuel-from-the-rock/

Provides an interactive and easy-to-follow animation of each step in the horizontal drilling and hydraulic fracturing process, along with detailed information.

Natural Gas Extraction—Hydraulic Fracturing (Environmental Protection Agency)

http://www2.epa.gov/hydraulicfracturing

Overview of Environmental Protection Agency (EPA) studies and laws related to hydraulic fracturing, plus links to other sources that offer detailed information on shale gas and the fracking process.

Fractracker

http://fractracker.org/

Maps of well sites and community regulations, plus downloadable data on individual drill sites.

Critical Questions for Researchers to Ensure Credibility of Their Work

- Have you fully disclosed your funding sources, any in-kind contributions in support of your research, and any other potential conflicts?
- Do you or your co-researchers have any potential conflicts of interest that could influence (or be perceived as influencing) your results?
- In your writing and conclusions, are you staying close to your research findings, and not venturing into topics outside your expertise?
- In your publications, have you acknowledged, cited, and critiqued conflicting studies?

Navigating the Policy Process

Whether you are an informed citizen or a credentialed scientist, you can have a say in your community's policies and decisions on unconventional oil and gas development. To be most effective, you need to be aware of the typical stakeholders with whom you should engage, along with the primary regulatory approaches and policy solutions to consider.

IDENTIFYING KEY STAKEHOLDERS

Federal, state, tribal, and local stakeholders are often involved in creating, implementing, monitoring, and enforcing oil and gas policy. It's important to understand what powers and authorities they have, what their political and/or economic interests are, what other stakeholders influence their decisions, who their allies are, who their primary constituents are (e.g., industry, shareholders, the public), and who their opponents might be.

Most of the stakeholders listed in the table on p. 12 have websites with information on the best way to contact them on specific issues, but don't be afraid to call their general office number if you are unable to identify an appropriate department or individual. Your state representative or elected municipal official's staff may also help steer you toward the relevant stakeholders.

To build the most effective relationship with these stakeholders, engage with them during each phase of the discussions. Establish contact early in the process—before drilling decisions are made. If drilling proceeds, stay in touch throughout the development process and continue discussions after drilling is completed.

Photos Adden. 043 utterstock.com/Henryk Sadura; © Shutterstock.com/mguttman; © Seattle.gov

Here are some stakeholders who can influence decisions on hydraulic fracturing in your community:

Stakeholders	Roles	Typical Realm of Engagement*
Mineral rights lessors	Negotiate leases for access to land, influence political actors and regulatory agencies, organize landowners, gather and publicize information	Federal, state, tribal, and local
Oil and gas operators, contractors, service companies, and transmission companies	Develop roads and infrastructure; drill and operate wells; build/operate gathering lines, pipelines, and compressor stations; in some cases conduct community relations	National, state, tribal, and local
Residents near wells	Ask questions about the risks and impacts of fracking, organize community committees to seek information that will help inform decisions	Federal, state, tribal, and local
Oil and gas trade associations	Influence political actors, conduct community relations, communicate with companies about best practices and other issues	Federal and state
Community groups	Gather information, educate and organize residents, work with companies, pressure political actors and regulatory agencies	State and local
Environmental groups	Influence political actors and companies, gather and publicize information, organize local residents	Federal, state, and local
County, city, and town elected officials and their staffs	Represent constituents' concerns, pass local regulations in some cases, negotiate with well operators and transmission companies, pressure other political actors, coordinate policy development with officials from nearby towns	State, tribal, and local
Public and environmental health officials (e.g., state and local departments of health, environmental protection, ecosystems management)	Help individuals and communities understand health and environmental impacts	Federal, state, tribal, and local
Legislative committees on energy extraction, environmental affairs, budgeting, and public works	Hold hearings, request reports, draft and pass legislation	Federal and state
Oil and gas and environmental regulators	Pass new regulations and enforce existing regulations for operations, pipelines, and transmission; conduct ongoing air/water quality monitoring; provide public information	Federal and state
Scientists and researchers	Gather and disseminate technical information	Federal, national, state, and local

*Remember that working at one level often influences what happens at another level.

Go to ***www.ucsusa.org/HFToolkit*** for for more information on the policies below.

POSSIBLE REGULATORY RESPONSES

After considering the critical questions and identifying key stakeholders, you may want to explore different types of policies that could be discussed during your town or state's decision-making process. The federal government regulates many aspects of oil and gas development on public lands, but states and tribes play a critical role in proper enforcement of laws and management of drilling activities.

Major federal regulations

Many existing federal laws could effectively govern activities associated with hydraulic fracturing. However, several of these laws currently include loopholes that exempt the oil and gas industry from comprehensive regulation. While such laws provide the grounds for studying the health and environmental impacts of unconventional oil and gas development, and for appropriate governance and monitoring, improvements are needed to ensure these laws will be effective.

Safe Drinking Water Act. Potentially gives the EPA the authority to regulate much of the hydraulic fracturing process related to groundwater quality. ***Exemption: The Energy Policy Act of 2005 exempted hydraulic fracturing unless the fracking fluid contains diesel fuel.***

Clean Air Act. Gives the EPA the authority to limit air pollution from hydraulic fracturing operations. ***Exemption: Pollution from groups of oil and gas wells cannot be aggregated for the purpose of determining regulatory standards.***

Clean Water Act. Gives the EPA the authority to regulate impacts of hydraulic fracturing on surface waters and prevents the dumping of certain wastes into surface waters. ***Exemption: Fracking wastewater is not considered to be a pollutant if the waste is managed by the state and therefore a federal permit is not needed for disposal.***

Emergency Planning and Community Right-to-Know Act. Requires well operators to keep a record on-site of all hazardous chemicals used. ***Exemption: The EPA decided that oil and gas exploration is not one of the sectors covered.***

Resource Conservation and Recovery Act. Gives the EPA the authority to regulate hazardous waste and non-hazardous solid waste. ***Exemption: Wastes from oil and gas fields are exempt because of the costs of compliance and the existence of similar regulations in some states.***

Local and state regulations

What counties, cities, and towns can do about hydraulic fracturing depends on the degree of authority granted to them by the state. Here are some examples of the kinds of decisions undertaken at the state and local level.

Local regulations include:

- Bans
- Insurance and bonding requirements
- Land use ordinances (setback requirements, noise and dust mitigation, conditional or special-use permits, time-of-day limitations, aquifer and ecosystem protection overlays)
- Moratoria
- Monitoring and sampling
- Negotiated agreements
- Notice to nearby residents
- Road use agreements
- Taxes, fees, special assessments, and differential utility pricing
- Technical advisor funds
- Zoning laws

State regulations include:

- Air and water quality monitoring
- Air pollution controls
- Chemical disclosure requirements
- Environmental/ecosystem protections
- Insurance, bonding, and liability requirements
- Operational safety requirements
- Permitting and setback requirements
- Pipeline development requirements
- Plugging of abandoned wells
- Taxes and fees
- Venting and flaring regulations
- Wastewater transportation, storage, and disposal requirements
- Water acquisition and use controls
- Well integrity requirements

How Some Communities Have Taken Action on Fracking

Longmont, Colorado

In November 2012, amid concerns that areas leased for drilling were too close to a school, parks, recreational areas, and the city's reservoir, Longmont residents **passed a resolution** (supported by 60 percent of voters) to amend their city charter to prohibit hydraulic fracturing and the storage of related waste within city limits. Community **organizers led "fracking tours"** for citizens and public officials to nearby regions where hydraulic fracturing was occurring to give them a firsthand glimpse of the effects, and then to sites in Longmont that had been leased for drilling or could be in the future. The conflict between local and state authorities over oil and gas development is still being played out in the Colorado district court system.

Illinois

The state legislature, with **input from environmental groups, citizens groups, and industry**, voted overwhelmingly in 2013 to **adopt comprehensive regulations** for hydraulic fracturing operations. Operators must disclose how and where wells will be drilled, notify property owners within 1,500 feet of proposed wells, and allow for a 30-day public comment period after the state's Department of Natural Resources receives a drilling application. The new law does not permit individual counties to ban fracking.

Culver City, California

Located in Los Angeles County and bordering the Inglewood Oil Field, Culver City is the largest urban area in the United States confronting hydraulic fracturing. In 2012, residents organized in support of a **state moratorium**, and the city council unanimously **passed a resolution** urging the governor and state regulators to ban fracking until policies protecting public health, safety, and the environment can be put into place. Residents have also taken steps to **promote public education** and **engage with experts**. In 2013, a local citizens' group **organized a public event** called "Fracking—the L.A. Story: A Seminar on Hydraulic Fracturing and the Democratic Process."

Advancing an Informed Public Discussion

You can voice your concerns, questions, and opinions to policy makers via in-person meetings, phone calls, and letters, or at public hearings, town hall meetings, municipal votes or resolutions, town planning and zoning board meetings, rulemaking comment periods, and project reviews.

The following resources can help you determine the best time and place to engage and voice your concerns:

- Local newspapers, which often have public notices issued by your local government
- State legislatures, which are usually required to post the dates and times of public hearings and comment periods online
- Your municipality's website, which may have a schedule of upcoming hearings and votes

Check out our guide to the federal legislative process at ***http://www.ucsusa.org/action/the-us-legislative-process.html*** to identify where fracking decisions could be publicly discussed and made. The milestones of initial bill introduction, amendment or comment period, and signing by an executive are generally applicable to state government.

TAP INTO YOUR COMMUNITY'S RESOURCES

Local scientists and experts. Researchers, scientists, and engineers at local or nearby colleges and universities who are studying hydraulic fracturing and its impacts can discuss research findings with you, help identify reliable information, direct you to other organizations and resources, and even collaborate on specific actions. Local community health organizations, hospitals, or public health commissions can also be good sources of information.

Community groups. By joining a group already active in your community, you can immediately get involved in public discussions, share information, experiences, and resources, and engage with active and concerned residents. A simple Internet search for local environmental, health, or community organizations will likely give you a good starting point, but be mindful that such groups might have pre-existing positions or biases on the issue.

If you want to form your own local group focused specifically on fracking, it would still be helpful to reach out to these other organizations. Consider holding meetings and public discussions in a library, community center, house of worship, or local branch of a community service organization.

Local media sources. Connecting with the local media to raise awareness is a vital aspect of moving the discussion on fracking forward. The Union of Concerned Scientists Activist Resource Center at ***http://www.ucsusa.org/action/activist-resource-center.html*** provides tips on numerous activities including how to write an effective letter to the editor and how to raise issues at public meetings. Check local television station, newspaper, and radio websites for information on how to contact reporters, submit editorials or notices for publication or broadcast, or get a story or event covered.

Photo: Adden.047 Nils Petersen

Engagement strategies for communities facing oil or gas development

General strategies:

- **Make sure policy makers know your questions and concerns.** Identify venues for public discussion—interviews with the local media, community/town hall meetings, call-in days, meetings with elected officials—and have your say.
- **Demand adequate monitoring.** Encourage your region's air and water quality monitoring agency (typically the state environmental department) to review its data for changes in air quality—especially ozone, to test water samples for common fracking compounds, and to monitor and disclose any spills or accidents by oil and gas companies. Ask your elected officials and regulatory agencies to require companies to fully disclose the chemicals they are using in hydraulic fracturing operations (to understand the effects hydraulic fracturing may have on air and water in your region).
- **Collaborate and communicate.** Urge your local government, business community, social service providers, workforce development organizations, environmental groups, and other nonprofits to meet regularly and share what each is experiencing and doing. This will help your community identify and respond quickly and comprehensively to challenges and opportunities.

For communities considering the possibility of wells:

- **Demand baseline studies.** Urge your local and state governments to conduct stronger studies—by independent, certified firms—of the area's air and water quality and environmental resources before a well is drilled. This will enable researchers to better study hydraulic fracturing impacts and help hold those responsible for any resulting pollution, harm, or damage accountable. Consider whether and how local groups can press for these kinds of studies.
- **Ask for impact assessment studies.** A "cumulative effects" analysis, conducted prior to any exploration or production activities, will describe how oil and gas development could affect the health, safety, economy, and environment of your community.
- **Don't forget the landowners.** Landowners may be in the unique position to protect public health and the environment by controlling whether or not drilling takes place on their land.

For communities with existing or expanding wells:

- **Use enforcement when needed.** Stay informed about enforcement actions taken by government agencies against oil and gas companies, and don't hesitate to report suspicious activity or wrongdoing. These agencies include the federal or state environmental protection agency and your state's oil and gas commissions. If you are concerned about a recent spill, consider contacting your state agricultural extension office for free soil testing and your state public health agency for water testing.
- **Influence operations in your area.** Through contract agreements, city/town zoning ordinances, and local regulations or resolutions, you may be able to get oil and gas operators to change some of their operations strategies, like their hours or seasons of operation, their water source, or their traffic routes.

For communities with abandoned wells:

- **Ask for inspections.** Operators who have recently plugged a well may be required to monitor water quality near the well. Contact your state's environmental department to obtain these data.
- **Monitor improperly plugged wells.** Particularly old or troublesome wells may not have been properly plugged, allowing substances to leak. If you suspect or notice leakage from an old well, contact your state's oil and gas regulatory board. It may require the former operator to plug the well properly, or it may have a program in place to do so.

MOVING THE DISCUSSION AS A SCIENTIST OR TECHNICAL EXPERT

If you have scientific or technical expertise on unconventional oil and gas development, you can be an invaluable resource to local organizations, media outlets, policy makers, and your fellow citizens. Your perspective can help promote a more informed public dialogue and better decisions.

There are many ways to share your knowledge. You can "translate" and/or summarize the results of your own research into a readable and accessible format for non-experts. You can write op-eds for local newspapers, host "teach-ins" for local residents, tweet or write a blog, or engage with local and state politicians and their staffs. Before you do, it will help to be properly prepared.

- **Answer the following questions:** What is it about my research, technical understanding, or scientific perspective on this topic that relates to people's daily lives, and how can I help them understand the issues better? Which aspects of my work will resonate with which audiences (businesses, city officials, specific demographic groups, etc.)?
- **As you prepare your comments or materials, avoid jargon**; include a clear and concise main message; provide memorable quotes that either contain vivid images, show how you feel about your work, or put your results into perspective (e.g., "For the first time ever, we found evidence that . . ."); and steer clear of speculation—be clear about what you don't know.
- To make the most of your interactions with the media and policy makers—including tips on how to get a meeting and how to become a scientific resource and authority—**check out our *Scientist's Guide to Talking with the Media*** at *www.ucsusa.org/ScientistsGuide* and the numerous other resources at *www.ucsusa.org/scientiststipsandtools*.
- Consider shaping your research agenda by **reaching out to citizens** who can help you understand your community's biggest concerns.
- To help citizens concerned about the impacts of hydraulic fracturing but unsure of where to look for answers, **create a list of resources** (individuals, organizations, publications) you know to be reputable sources of information.

Fracking is a controversial issue. You may face criticism, questions about your expertise, or even personal attacks from individuals who do not like your research results, conclusions, or recommendations. In anticipation of such circumstances:

- **Be prepared to answer difficult or off-topic questions.** Sometimes a few pre-determined words can help steer the conversation back to your main message (e.g., "I see where you're going with that question, but what's really important here is . . ." or "That's not my particular field of research, but what I can tell you is . . ."
- **Be clear about, and stay true to, your expertise and main message.**
- **Refer to our guide *Science in an Age of Scrutiny*** at *www.ucsusa.org/scientistsunderscrutiny* for details on these and other strategies.

Photo: Addendum 049

Go to ***www.ucsusa.org/sciencenetwork*** for more resources specifically for scientists and experts.

Citizens and Scientists Shape Decisions about Fracking in Their Communities

Mora County, New Mexico

In April 2013, this rural ranching county became the first in the nation to pass a local ordinance banning the extraction of oil and gas. The ban was part of a **bill-of-rights ordinance** entitling citizens to clean air and water, a healthy environment, and self-governance. Residents voiced their concern over fracking in public meetings, and with elected county commissioners who would protect their interests. The commissioners in turn **sought out experts to help** them craft the ordinance.

Dryden, New York

When residents first learned and became concerned about the environmental and community impacts of hydraulic fracturing in 2009, Town Supervisor Mary Anne Summer began working with the **Tompkins County Council of Governments (TCCOG)** to better understand the potential effects of fracking on traffic, emergency response, the workforce, housing prices, and water quality. Citizens **attended educational meetings** hosted by the TCCOG, **talked with scientists** at nearby Cornell University, and **formed the Dryden Resource Awareness Coalition (DRAC)**. Armed with this knowledge, Dryden's residents **amended the town's zoning laws** to ban drilling.

Erie, Colorado

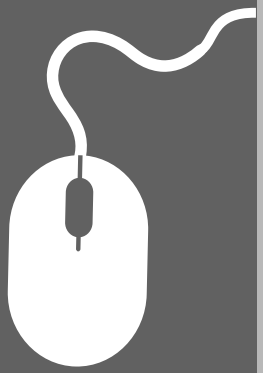
In 2011, this town already had more than 300 wells—and more than 18,000 in the county as a whole—but residents became concerned when they discovered plans for new wells less than 1,000 feet from an elementary school. A group of mothers formed Erie Rising to consider the risks, and one member **consulted with a NOAA chemist** who found elevated levels of ethane and propane in the air. Eventually, the town prohibited fracking in residential areas, then followed that with a town-wide moratorium. After the Colorado State Oil and Gas Conservation Commission expressed concern, residents successfully **negotiated an agreement** in which companies accepted the town's terms on banning the use of diesel, reducing truck traffic, and preventing spills of fracking fluids in exchange for ending the moratorium.

The Center for Science and Democracy at the Union of Concerned Scientists hopes you find this toolkit provides you with the practical advice, resources, and information you need to help your community weigh the prospects and risks of hydraulic fracturing and make informed decisions.

Available online resources

This toolkit, its appendices, and source materials are available online at ***www.ucsusa.org/HFtoolkit.***

More information on many topics covered in this toolkit can be found in an accompanying UCS report; go to ***www.ucsusa.org/HFreport.***



This toolkit was written by Danielle Fox, Jessie Agatstein, Deborah Bailin, Stephen Rabent, and Pallavi Phartiyal. Design: Penny Michalak

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The Center for Science and Democracy at the Union of Concerned Scientists
The Center for Science and Democracy works to strengthen American democracy by advancing the essential role of science, evidence-based decision making, and constructive debate as a means to improve the health, security, and prosperity of all people.
www.ucsusa.org/scienceanddemocracy

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SCIENCE, DEMOCRACY, AND FRACKING

A Guide for Community Residents and Policy Makers Facing Decisions over Hydraulic Fracturing

Photo: © BLS

With your help we can promote evidence-based decision making, combat efforts to silence or misconstrue science in public discussions, and equip scientists, analysts, and policy makers with the resources they need to develop science-based solutions to our common problems.

Union of Concerned Scientists

National Headquarters
Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

Washington, DC, Office
1825 K St. NW, Suite 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162

West Coast Office
2397 Shattuck Ave., Ste. 203
Berkeley, CA 94704-1567
Phone: (510) 843-1872
Fax: (510) 843-3785

Midwest Office
One N. LaSalle St., Ste. 1904
Chicago, IL 60602-4064
Phone: (312) 578-1750
Fax: (312) 578-1751

STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

www.colorado.gov/cdphe

Colorado Department
of Public Health
and Environment

April 7, 2014

Robert J. Frick, Hearing Manager
Colorado Oil and Gas Conservation Commission
1120 Lincoln Street, Suite 801
Denver, CO 80203

Re: Earth Guardians Request for Rulemaking

Dear Mr. Frick,

The Colorado Department of Public Health and Environment (CDPHE), Disease Control and Environmental Epidemiology Division submits this statement pursuant to Rule 510 regarding the Earth Guardians request for a hearing "for promulgation of a rule to suspend the issuance of permits that allow hydraulic fracturing until it can be done without adversely impacting human health and safety and without impairing Colorado's atmospheric resource and climate system, water, soil, wildlife, other biological resources." As the lead agency for environmental epidemiology in Colorado, CDPHE respectfully disagrees with the statement "The science unequivocally shows that hydraulic fracturing is adversely impacting human health". In fact, we believe the scientific consensus on the potential health impacts of oil and gas development activities is better characterized in the conclusion outlined in a recent peer-reviewed article on the issue:

> Despite broad public concern, no comprehensive population-based studies of the public health effects of UNG [unconventional natural gas] operations exist. Major uncertainties are the unknown frequency and duration of human exposure, future extent of development, potential emission control and mitigation strategies, and a paucity of baseline data to enable substantive before and after comparisons for affected populations and environmental media. Overall, the current literature suggests that research needs to address these uncertainties before we can reasonably quantify the likelihood of occurrence or magnitude of adverse health effects associated with UNG production in workers and communities.[1]

There have been several studies conducted in Colorado to assess the potential for public health impacts from oil and gas development. The studies all have significant limitations in the measurement of the exposures, health effects, or both that prevent CDPHE from drawing conclusions. The potential health impacts from air pollution depend on many factors, such as the amount of pollutants in the air, how the pollutants move and transform in the environment, the length of time people are exposed to the air pollution, life style, family traits and general health. Many times these studies rely on limited data collected for short periods of time and do not account for changes in exposure related to new air quality

[1] Adgate JL, Goldstein BD, McKenzie LM. Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development. *Environ Sci Technol.* 2014 Feb 24.

regulations that were implemented in 2005, 2008, 2012 and 2014. CDPHE does not believe that existing studies on the potential public health impacts from oil and gas development provide the strong, consistent base of scientific evidence to support the statement that "science unequivocally shows that hydraulic fracturing is adversely impacting human health".

The currently available data defining chemical exposures for populations living in the proximity of oil and gas development activities are not sufficient to support conclusions regarding potential health effects. Much of the available air quality sampling has been focused on atmospheric and regulatory issues and does not translate to human exposure. The air sampling data sets that do represent human exposure are limited to certain distances from the well and typically consist of only a few samples. There are currently comprehensive exposure assessment studies underway in Colorado to fill this data gap. However, until more reliable exposure data are available, a robust study of the potential health impacts associated with oil and gas development activities is not possible.

Most published studies evaluating health effects in relation to oil and gas development activities have been health risk assessments with limited value in establishing links between health effects and oil and gas-related exposure. Health risk assessments are a type of evaluation used by EPA and other agencies to determine the probability that a health effect will occur at a specific exposure concentration for a specific chemical. These assessments rely on available exposure data to calculate the probability of a health effect. It is important to understand that these are theoretical health effects, not observed health effects. As described above there are many limitations in the existing exposure data related to oil and gas. These limitations result in a large amount of uncertainty in the calculated probability of health effects.

There have been only three published population-based epidemiological studies of potential health impacts of oil and gas development. Two of these studies have reported significant associations between health outcomes and proximity to oil and gas-related activities. However, both of these studies have significant limitations including lack of exposure measurements and the inability to account for important personal risk factors. While these studies may provide an important base of information for future studies, additional research is necessary to confirm the findings. The future availability of more reliable exposure data will help to determine whether these oil and gas activities could be a causal factor for these health outcomes.

We have all read about conclusions from these health risk assessments and epidemiological studies in the news. But, it is important to understand that all of the studies conducted to date are considered preliminary investigations or screening level assessments to determine if further study is needed. All of these studies have critical data gaps and inherent limitations that have been clearly articulated by the investigators conducting the studies. The threshold for "unequivocal scientific evidence" requires a broad base of well-designed studies with consistent findings. This threshold has not been met for the potential health impacts of oil and gas activities.

Because the scientific literature does not support the claim that "science unequivocally shows that hydraulic fracturing is adversely impacting human health." The COGCC should continue to permit oil and gas operations that use hydraulic fracturing techniques. At the same time, it is important for COGCC and other stakeholders to continue to explore methods for filling the critical data gaps on human exposure to facilitate more robust studies on the potential for health impacts from oil and gas activities.

Sincerely,

Mike Van Dyke, Ph.D., CIH
Section Chief, Environmental Epidemiology,O ccupational Health, and Toxicology
Colorado Department of Public Health and Environment

Message is mixed on fracking

By NEELA BANERJEE

JULY 28, 2013, 6:13 AM

WASHINGTON -- One year ago, the Environmental Protection Agency finished testing drinking water in Dimock, Pa., after years of complaints by residents who suspected that nearby natural gas production had fouled their wells. The EPA said that for nearly all the 64 homes whose wells it sampled, the water was safe to drink.

Yet as the regulator moved to close its investigation, the staff at the mid-Atlantic EPA office in Philadelphia, which had been sampling the Dimock water, argued for continuing the assessment.

In an internal EPA PowerPoint presentation obtained by the Tribune/Los Angeles Times Washington Bureau, staff members warned their superiors that several wells had been contaminated with methane and substances such as manganese and arsenic, most likely because of local natural gas production.

The presentation, based on data collected over 4 1/2 years at 11 wells around Dimock, concluded that "methane and other gases released during drilling (including air from the drilling) apparently cause significant damage to the water quality." The presentation also concluded that "methane is at significantly higher concentrations in the aquifers after gas drilling and perhaps as a result of fracking [hydraulic fracturing] and other gas well work."

Critics say the decision in July 2012 by EPA headquarters in Washington to curtail its investigation at Dimock over the objection of its on-site staff fits a troubling pattern at a time when the Obama administration has used the sharp increase in natural gas production to rebut claims that it is opposed to fossil fuels.

In March 2012, the EPA closed an investigation of methane in drinking water in Parker County, Texas, although the geologist hired by the regulator confirmed that the methane was from gas production. In late June, the EPA dropped a study of possible contamination of drinking water in Pavillion, Wyo., despite its earlier findings of carcinogens, hydrocarbons and other contaminants in the water.

"We don't know what's going on, but certainly the fact that there's been such a distinct withdrawal from three high-profile cases raises questions about whether the EPA is caving to

pressure from industry or antagonistic members of Congress," said Kate Sinding of the Natural Resources Defense Council, an environmental group.

The EPA confirmed the authenticity of the presentation about the Dimock wells but said it was the work of one employee.

"This presentation represents one [on-scene coordinator's] thoughts regarding 12 samples and was not shared with the public because it was a preliminary evaluation that requires additional assessment in order to ascertain its quality and validity," said EPA spokeswoman Alisha Johnson.

"The sampling and an evaluation of the particular circumstances at each home did not indicate levels of contaminants that would give EPA reason to take further action," Johnson said. "Throughout EPA's work in Dimock, the agency used the best available scientific data to provide clarity to Dimock residents and address their concerns about the safety of their drinking water."

At the same time, the energy industry and its congressional allies have hammered the EPA for undertaking the studies, which they say are a pretext for regulatory overreach.

"They have attempted to link fracking to water contamination in at least three cases, only to be forced to retract their statements after further scrutiny proved them to be unfounded," Rep. Lamar Smith (R-Texas), chairman of the House Science Committee, said at a recent hearing.

Robert B. Jackson, professor of environmental sciences at Duke University, who has researched methane contamination in the Dimock area and recently reviewed the presentation, said he was disappointed by the EPA's decision.

"What's surprising is to see this data set and then to see EPA walk away from Dimock," Jackson said. "The issue here is, why wasn't EPA interested in following up on this to understand it better?"

The EPA staff presentation about Dimock was an interim analysis of water sampling data collected by Pennsylvania regulators and, later, by the EPA, from 2008 to June 2012.

The presentation provides charts for nine of the 11 Dimock-area wells, tracking natural gas production work in the area and the concentration of methane and metals over a four- to five-year period, depending on the well. Some wells underwent a "short-term disruption," or a rise in methane in the water six to eight months after nearby gas development activity. Over two or three years, the concentration of methane fell.

Four other wells experienced long-term disruption to their water quality, according to the presentation. In those instances, methane levels did not fall over time but remained high after an initial increase or began to climb after a period of decline. The presence of metals such as manganese and arsenic also rose over time in some of those wells.

A study by Jackson and other Duke scientists published in June indicates that drinking water wells near natural gas production in northeastern Pennsylvania, including Dimock, are at greater risk of methane contamination than those farther away.

Methane is the primary component in natural gas. In enclosed spaces, such as sheds and basements, it poses the risk of asphyxiation and explosion. There is little research into the long-term effects on human health from prolonged exposure to methane in drinking water.

Scientists and regulators say that when methane ends up in well water, it is usually because of faulty metal casings inside a natural gas well that allow methane to seep out as it travels to the surface or shoddy concrete work that is supposed to keep gas and water from moving into the space between the well casings and the rock.

Though EPA officials concluded that Dimock water was safe to drink, the mid-Atlantic EPA office nevertheless asked the Centers for Disease Control and Prevention to evaluate the health risk.

Cabot Oil & Gas Corp., the company drilling in Dimock, asserts that the methane in the water is unrelated to oil and gas development. "Through our investigation, Cabot concluded that methane gas existed in groundwater and water wells in the Dimock and Springville townships long before Cabot began drilling in the area," said Dan O. Dinges, Cabot's chief executive, in a May 29 letter to the Senate Energy and Natural Resources Committee.

Although methane gas occurs naturally in the area's aquifers, the Duke study showed that the chemical "fingerprint" of methane in shallow water wells near the gas sites was the same as the natural gas extracted from deep underground.

The EPA PowerPoint presentation identified five wells contaminated with methane whose chemical fingerprint, or isotopic composition, was the same as methane from the Marcellus shale formation at the center of Pennsylvania's natural gas boom.

Fred Baldassare, a former official at the Pennsylvania Department of Environmental Protection who worked on the state's Dimock studies, disputed the presentation's assertion that some wells contained Marcellus methane. Now a consultant for industry and homeowners, Baldassare said there was not enough information about the composition of the methane in the

wells to draw conclusions about the origin. "It's dangerous and inappropriate to interpret this data in a vacuum," he said.

Jackson disagreed, arguing that the methane found does not naturally occur in drinking water. "The burden of proof is different here," he said. "The question we're asking is, 'Was there enough evidence to warrant further study?' The EPA scientist clearly thought so."

neela.banerjee@latimes.com

Twitter: @neelaeast