Singh, Angela K (DOA)

From: Colombie, Jody J (DOA)
Sent: Tuesday, April 02, 2013 8:36 AM
To: Singh, Angela K (DOA)
Subject: FW: Comments on AOGCC Hydraulic Fracturing Regulations
Attachments: CBD Comments on AOGCC Fracking Regs 4 1 13.pdf

Not sure if you have received these.

From: Andrea Weber [mailto:aweber@biologicaldiversity.org]
Sent: Monday, April 01, 2013 3:52 PM
To: Colombie, Jody J (DOA)
Subject: Comments on AOGCC Hydraulic Fracturing Regulations

Jody Colombie
Special Assistant to the Commission
Alaska Oil and Gas Conservation Commission
Jody.colombie@alaska.gov

Dear Jody:

Attached please find the Center for Biological Diversity's comments on the AOGCC's hydraulic fracturing regulations. I am sending you a hard copy of our comments with a compact disc of all the references cited therein via Federal Express priority overnight delivery today. In addition, Center for Biological Diversity Attorney Rebecca Noblin will deliver a hard copy of the comments and a copy of the CD in person at Thursday's public hearing (April 4, 2013 at 9:00 a.m.).

Please let me know if you have any questions. I can be reached directly at 415-632-5311. Thank you.

Sincerely,

Andrea Weber
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CENTER for BIOLOGICAL DIVERSITY Because life is good

April 1, 2013

Via Federal Express Overnight Delivery
CD of Attachments to be Hand Delivered at Public Hearing

Alaska Oil and Gas Conservation Commission
333 West 7th Avenue, Suite 100
Anchorage, Alaska 99501
Attention: Jody Colombie

Re: Alaska Oil and Gas Conservation Commission's Proposed Hydraulic Fracturing Regulations

Dear Commissioners Foerster, Norman, & Seamount:

Thank you for the opportunity to provide comments on the Alaska Oil and Gas Conservation Commission's ("Commission") Proposed Hydraulic Fracturing Regulations ("Draft Regulations" or "Draft"). The Center is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center also works to reduce greenhouse gas emissions and other air pollution to protect biological diversity, our environment, and public health. The Center has over 40,000 members, including members who live in Alaska and members who enjoy Alaska's public lands for recreational, scientific, educational, and other pursuits.

I. Introduction and Summary of Comments

The new form of hydraulic fracturing – or "fracking" – that is sweeping across the country is extremely dangerous. Fracking today can utilize hundreds of toxic, carcinogenic, and otherwise dangerous substances and consume millions of gallons of fresh water in fracking a single well. Serious effects, including surface water and groundwater contamination, air pollution, and induced earthquakes, have been documented as fracking has expanded in other areas of the country, such as Pennsylvania, North Dakota, and Texas. Fracking has also consumed entire landscapes, turning previously peaceful rural towns into gritty industrial zones. Now it appears that a fracking boom may be imminent in Alaska, as industry is now looking to exploit the billions of barrels of shale oil and many trillion cubic feet of shale gas potentially hidden in Alaskan shale formations. This is cause for great concern.

The contamination of Alaska's environment with hazardous fracking chemicals would be a great tragedy. A fracking boom in Alaska would threaten the degradation of some of our last pristine wilderness areas, would harm wildlife and valuable fisheries, and would threaten subsistence and cultural practices.

In light of the serious and far-reaching damages that fracking can wreak on Alaska, we urge the Commission to consider replacing its regulatory proposal with a simple fracking prohibition. Such a prohibition is the only way to guarantee the protection of our health and environment from the dangers of fracking and to continue the transition to a clean energy economy. Moreover, preventing catastrophic climate change requires that we leave the great majority of current fossil fuel reserves in the ground. We therefore cannot afford to keep opening up additional fossil fuel reserves to ever more dangerous and polluting forms of production.

If the Commission is to regulate, rather than ban, fracking, however, it is imperative that it implement stringent regulations that provide as much protection as possible to Alaska. The Draft Regulations should be strengthened to address the following problems:

1. **Public Process.** The Draft Regulations do not require notice of fracking operations be given to potentially affected individuals and entities over a broad enough area. Also, they do not ensure that notice will be given enough in advance to allow public participation in the permitting process.

2. **Disclosure.** The Draft Regulations do not provide pre-fracking chemical disclosure, and the post-fracking disclosure does not reveal the concentration of each chemical and only provides the public information through the industry-funded website FracFocus. Also, the Draft does not clearly require the disclosure of substances in the fracking fluid that were not intentionally added.

3. **Monitoring and Enforcement.** The Draft Regulations lack specific standards and provisions ensuring Division evaluation, verification, monitoring, and enforcement, and some of the specific obligations the Draft creates are not stringent enough.

4. **Water Resources.** The Draft Regulations do not provide sufficient protection to water resources. Specifically, the Draft does not require the identification of all potentially affected waters that could be put to beneficial use, does not require the collection of sufficient baseline data on water, does not require the identification of the source of water to be used in the fracking operation, and does not sufficiently protect against fluid migration and spills by ensuring the integrity of the well casing and cementing and the containment zone, and by requiring the safe handling and disposal of all fracking fluids and wastes.

5. **Natural Gas Emissions.** The Draft Regulations do not require operators to reduce natural gas emissions and eliminate flaring, and thus, would allow operators to needlessly emit and flare natural gas, contributing to climate change and resulting in the substantial waste of a valuable resource.

6. **Air Quality.** The Draft Regulations do not address the numerous air quality concerns associated with fracking, including operations increasing ozone concentrations, emitting silica dust, which can cause the deadly disease silicosis, and emitting highly hazardous volatile organic compounds.

7. **Earthquakes.** The Draft Regulations do not require operators to monitor for earthquakes that the operations could cause or sufficiently analyze the potential for fracking to result in an earthquake.

8. **Definitions.** The Draft Regulations do not sufficiently define specific important terms.

II. The Draft Provides Inadequate Notification of Operations

The Draft Regulations do not provide sufficient notice to the public that fracking operations are planned. Importantly, the Draft Regulations require that notice be given only to individuals who live within one-quarter mile of the well trajectory. 20 A.A.C. § 25.283(a)(1). However, if a spill or blowout occurs – especially one that results in the contamination of water – the effects of the incident are likely to be felt over a much larger area. The Commission should revise the Draft to require the operator to give a complete copy of the application to all residences, businesses, schools, hospitals, and any other potentially affected interests within one mile of the confining zone, as measured from the surface. As explained below, this notice should include complete information on all the chemicals the operator plans to use during the fracking process. Also, the operator should provide all villages and other governmental entities within 10 miles of the confining zone with a copy of the application. Further, the Commission, upon receiving the application should upload all the information and data to a publicly accessible website, in a manner that allows the public to search and aggregate the data, and immediately publish notice to the general public that information on a new proposed fracking operation is available.

Another serious problem is that the Draft Regulations do not specify how far in advance notice must be given. Meaningful public involvement in decisions on fracking is vital, and the Commission should give the public at least a 30-day period after notice is given of the submission of the application to review the information and to submit comments. The regulations must specify that the Commission will not issue any approvals until it has evaluated any and all comments received, responded completely to the concerns expressed, and allowed a suitable time interval to elapse for agencies, organizations, and individuals to evaluate the Commission's response to their comments.

III. The Proposed Chemical Disclosure Requirements Should be Strengthened

As discussed throughout these comments, fracking involves the use of extremely dangerous chemicals that pose dangers to water and air quality, the environment, and human health. One study found that more than 75 percent of the chemicals used in fracking could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems; approximately 40 to 50 percent could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37 percent could affect the endocrine system; and 25 percent could cause cancer and mutations.[1] Newsweek has reported that in one instance an

[1] Colborn, Theo et al., Natural Gas Operations for a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039 (2011) ("Colborn 2011").

employee of an energy-services company got caught in a fracking fluid spill, and was taken to the emergency room, complaining of nausea and headaches.[2] The fracking fluid the worker was exposed to was so toxic that it ended up harming not only the worker, but also the emergency room nurse who treated him.[3]

In light of the very dangerous chemicals that fracking involves, it is absolutely essential that the public have access to information on what substances companies are pumping into the environment. The Draft Regulations provide for some disclosure of what chemicals an operator will use, but not enough. Section 25.283(a)(14) requires the operator to include information in the application regarding the name and volume of the principal fluids to be used. This information would be provided to nearby land owners and operators under section 25.283(a)(1). Also, section 25.283(h) requires the operator to submit to the Commission within 30 days of fracking: a description of the fracking fluid identified by additive type; and the chemical name and Chemical Abstract Service Registry number for each ingredient of the additives used, along with the concentration for each additive. Section 25.283(i) requires that operators, before submitting information to the Commission under section 25.283(h), upload to FracFocus the information required by the website.

A major problem with these disclosure requirements is that the pre-fracking disclosure under section 25.283(a)(14) does not require the disclosure of the chemicals or concentrations of chemicals used in the fracking process, but rather reveals only information on the principal fluids to be used. Further, pre-fracking disclosure is provided for owners and operators near the well, but not for the general public. Complete disclosure to the general public is necessary to allow the public to engage in the permitting process and to gather information on what sorts of activities will take place. The Commission should revise the Draft to require that operators disclose all chemicals to be used in fracking fluid, identified by Chemical Abstract Service Registry numbers, as well as their concentrations. The Commission should be required to upload the data to a publicly accessible website in a format that is searchable and aggregable at least 30 days prior to fracking. Further, the Commission should provide public notice of the submission of the application.

There are also a number of problems with the post-fracking disclosure requirements. First, the Draft does not require disclosure of the concentrations of the chemicals in the fracking fluid. Instead, it directs the operator to disclose the concentrations of the fracking fluid additives, which can each contain multiple individual chemicals. The Commission should revise the Draft so that it requires the operator to disclose the concentration of every chemical present in the fracking fluid.

Also, the Draft does not clearly require the disclosure of substances present in the fracking fluid that were not purposefully added by the operator or its service company. This is a serious problem because companies are now reusing fracking fluid that has already been injected into a formation, meaning that the fracking fluid could have picked up substances that occur

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[2] Wiserman, Hannah, Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation, 20 Fordham Envtl. Law Rev. 115, 138-39 (2009).
[3] *Id.*

naturally in formations, such as the carcinogen benzene or radionuclides. The Commission should revise the Draft to require the operator to disclose every chemical in the fracking fluid, whether or not it was purposefully added.

Additionally, the Draft Regulations require the posting of the chemical data to FracFocus, which does not provide the public with sufficient access to the information. FracFocus does not give the public the necessary ease of access or scope of information. Indeed, the FracFocus site does not allow users to search or aggregate data, and does not provide the data in a database or spreadsheet format.[4] This would seriously hinder the ability of an individual to learn about how many wells are fracked in a given area, or the total quantity of a given chemical used in that area, and thus would prevent people from fully understanding the environmental and health impacts of the fracking that may occur. In addition, FracFocus does not identify which chemicals are hazardous air pollutants or toxic air contaminants, and as a result, would not allow a person to fully understand all of the health risks that a fracked well nearby is creating for them.

Further, FracFocus has close ties to the oil and gas industry, which calls into question its objectivity and credibility in providing the public with important industry information. In its final report, the Natural Gas Subcommittee of the Secretary of Energy Advisory Board raised the issue of industry funding and objectivity with regard to the Groundwater Protection Council, stating that "[t]o maintain credibility to have an ability to set their own agenda [the Groundwater Protection Council and the State Review of Oil and Natural Gas Environmental Regulations] cannot rely exclusively on funding provided by companies of the regulated industry."[5] Also, FracFocus leadership's ties to industry are clear, as exemplified by the biography of Interstate Oil and Gas Compact Commission Executive Director Mike Smith, who is a past president of the Oklahoma Independent Petroleum Association.[6]

Thus, the Commission clearly should not rely on FracFocus to facilitate public disclosure of information on fracked wells, including chemical information. The Commission should set up a government website that is easily searchable and that allows users to aggregate data from multiple wells. Further, the website should make available to the public all information the operator discloses to the Commission, and should do so at the earliest possible time.

Another problem with the Draft is that section 25.283(i) directs operators to post to FracFocus the information "required by the Interstate Oil and Gas Compact Commission/Groundwater Protection Council hydraulic fracturing web site," which essentially gives FracFocus control over what information should be made public. Moreover, it is unclear how enforceable this provision is since FracFocus does not require an operator to upload information; the Commission has that power. Thus, at best this provision is ambiguous with regard to what it demands, and at worst it delegates authority to an industry-funded entity. As stated above, the Commission should not use FracFocus for disclosure. However, if it insists on

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[4] FracFocus.org, Frequently Asked Questions, http://fracfocus.org/faq (2012).

[5] Natural Gas Subcommittee of the Secretary of Energy Advisory Board (SEAB). Second 90-day Report/Final Report, November 18, 2011 at 3.

[6] Interstate Oil and Gas Compact Commission, Press Release: Carl Michael Smith Named Interstate Oil and Gas Compact Commission Executive Director (March 18, 2008), http://www.iogcc.state.ok.us/carlmichael-smith-named-interstate-oil-and-gas-compact-commission-executive-director.

doing so, it must specify the information that operators must upload to the site, and should not depend on FracFocus to require an operator to submit sufficient information.

Finally, the Draft does not appear to allow operators to withhold any information from the Commission or the public on the basis of a trade secrets claim. Nevertheless, to be clear on the matter, the Commission should affirmatively state in the regulation that no information may be withheld on the basis of such a claim. Allowing industry to withhold such information endangers the public by making it more difficult for health professionals to effectively care for individuals exposed to fracking fluids. The Commission should not put economic interests before the public health in such a manner.

IV. The Draft Provides Inadequate Substantive Review

The Draft Regulations provide for inadequate substantive review by the Commission of an operator's application and other submissions. A number of obligations the Draft Regulations create lack specific standards and provisions ensuring Division evaluation, verification, monitoring and enforcement, and other obligations created by the Draft are simply not stringent enough. Some specific examples are identified below. In addition to these other examples, the Commission's regulations state that an Application for Sundry Approval must be approved before operations can go forward, but do not provide details on how an application is reviewed or provide a standard for that review. The Commission should fix this by creating a provision in section 25.283 explicitly stating that the Commission will review each application to ensure that the application is complete and that available information establishes to a high degree of certainty that the operations will not endanger the public health or the environment, and that the Commission will respond to all public comments on the application.

V. The Draft Inadequately Protects Water

a. Fracking Poses an Extreme Danger to Water

While much remains to be learned about fracking,[7] it is clear that the practice poses major dangers to water resources, and that these dangers must be met with new laws and regulations.[8]

Fracking affects water quantity. The practice requires an enormous amount of water – often up to five million gallons – to frack each well.[9] The extraction of water for fracking can lower the water table, affect biodiversity, harm local ecosystems, and reduce water available to communities.[10]

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[7] United States Government Accountability Office, Unconventional Oil and Gas Development – Key Environmental and Public Health Requirements (2012); United States Government Accountability Office, Oil and Gas – Information on Shale Resources, Development, and Environmental and Public Health Risks (2012).

[8] NRDC, In Fracking's Wake: New Rules are Needed to Protect Our Health and Environment from Contaminated Wastewater (2012).

[9] Pennsylvania Alliance for Clean Water and Air, FAQ's on hydraulic fracturing, http://www.pacwa.org/FAQ-Photos.html (last visited Mar 22, 2013)

[10] International Energy Agency, Golden Rules for the Golden Age of Gas at 31-32 (2012).

Also, the fluids associated with fracking can contaminate the environment. The spilling or leaking of fracking fluids, flowback, or produced water is a huge problem. Harmful chemicals present in these fluids can include volatile organic compounds ("VOCs"), such as benzene, toluene, xylenes, and acetone.[11] Large percentages of the chemicals can affect the brain and nervous system, immune and cardiovascular systems, the kidneys, or the endocrine system, and 25 percent could cause cancer and mutations.[12] Spills can occur at the surface, and underground. At the surface, pits or tanks can leak fracking fluid or waste.[13] Also, many fluids must be transported to and from the well, and this presents an opportunity for spills.[14] Indeed, there are multiple reports of truckers dumping waste uncontained into the environment.[15] Fracking fluid can also spill at the surface during the fracking process. For instance, mechanical failure or operator error during the process has caused leaks from tanks, valves, and pipes.[16]

Underground, fracking can contaminate groundwater in a number of ways. Leaks can occur as a result of faulty well construction, cementing, or casing;[17] migration through newly created or natural fractures;[18] and the disposal of fracking waste through underground injection.[19] These sorts of problems at the well are common.[20] Additionally, nearby active and abandoned wells provided additional pathways for contamination. In the last 150 years, as many as 12 million "holes" have been drilled across the United States in search of oil and gas, many of

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[11] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (Nov. 2011) ("EPA Plan to Study Fracking Impacts").

[12] EPA Plan to Study Fracking Impacts; White, Ivan E., Consideration of radiation in hazardous waste produced from horizontal hydrofracking, National Council on Radiation Protection (2012).

[13] *See, e.g.*, E&E Staff Writer, Fracking Fluid leaks from wellhead in Colo., E&E News (Feb 14, 2013). ("At least 84,000 gallons of water contaminated from hydraulic fracturing seeped from a broken wellhead and into a field . . . .").

[14] Warco, Kathy, *Fracking truck runs off road; contents spill*, Observer Reporter (Oct 21, 2010).

[15] Kusnetz, Nicholas, *North Dakota's Oil Boom Brings Damage Along with Prosperity* at 4, ProPublica (June 7, 2012) ("Kusnetz North Dakota"); E&E News, Ohio man pleads not guilty to brine dumping (Feb. 15, 2013).

[16] Natural Resources Defense Council, Water Facts: Hydraulic Fracturing can potentially Contaminate Drinking Water Sources at 2 (2012) ("NRDC, Water Facts"); Food & Water Watch, The Case for a Ban on Fracking (2012) ("Food & Water Watch 2012") at 5.

[17] NRDC, Water Facts at 2; Food & Water Watch 2012 at 7.

[18] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (2011) ("EPA Draft Pavillion Investigation."); Warner, Nathaniel R., et al., Geochemical Evidence for Possible Natural Migration of Marcellus Formation Brine to Shallow Aquifers in Pennsylvania, PNAS Early Edition (2012).

[19] Kusnetz, North Dakota; Lustgarten, Abraham, Polluted Water Fuels a Battle for Answers, ProPublica (2012); Lustgarten, Abraham, Injection Wells: The Poison Beneath Us, ProPublica at 2 (2012); Lustgarten, Abraham, Whiff of Phenol Spells Trouble, ProPublica (2012).

[20] Ingraffea, Anthony R., Some Scientific Failings within High Volume Hydraulic Fracturing Proposed Regulations 6 NYCRR Parts 550-556, 560, Comments and Recommendations Submitted to the NYS Dept. of Environmental Conservation (Jan 8, 2013); Drajem, Mark, *Wyoming Water Tests in Line with EPA Finding on Fracking*, Bloomberg (Oct. 11, 2012); U.S. Environmental Protection Agency, Investigation of Ground Water Contamination near Pavillion, Wyoming Phase V Sampling Event - Summary of Methods and Results (September 2012); Myers, Tom, Review of DRAFT: Investigation of Ground Water Contamination near Pavillion Wyoming Prepared by the Environmental Protection Agency, Ada OK (Apr. 30, 2012); Myers, Tom, Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers (Feb. 2012).

which are old and decaying, or are in unknown locations.[21] Fracking can contaminate water resources by intersecting one of those wells. For instance, one study found at least nineteen instances of fluid communication in British Columbia and Western Alberta.[22]

b. The Draft Provides Inadequate Protection against Dangers to Waters

The Draft Regulations fall far short of adequately protecting water. Fracking poses numerous and extreme dangers to water resources, and the contamination of Alaska's water would destroy pristine wilderness, threaten wildlife and fisheries, and degrade subsistence resources. The Commission should do more to identify potentially affected waters, require the collection of baseline data, demand that operators report the source of the water to be used in fracking operations and analyze the effects of the water withdrawals, and protect against fluid migration and spills.

i. Identification of Potentially Affected Waters

The Draft Regulations do not sufficiently require the identification of water that could be affected by the operation. The Draft requires that applications identify water wells that are within one-quarter mile radius of the wells and wells within one-quarter mile of the wellbore trajectory. 20 A.A.C. § 25.283(a)(2). Further, the Draft requires the identification of all freshwater aquifers within a one-quarter mile radius, and the name and the depth to the bottom of each aquifer. *Id.* § 25.283(a)(3), (11).

Because a spill or leak could affect a much larger area than the small area that an operator must consider under the Draft Regulations, the Commission should expand the area of review. At minimum, the regulations should require that operators identify all waters that are within one mile of any part of the well, as measured from the surface location above the well. However, an operator should be required to identify waters over a larger area if the confining zone extends beyond the one-mile boundary. For instance, there could be a natural fracture near the well that extends for a long distance and that could serve as a conduit through which fracking fluid could migrate.[23] For the portion of the fracture that extends beyond the 1 mile boundary, the operator should have to identify all waters reasonably near that fracture.

Also, the Draft Regulations provide too great a limit on the types of waters that an application must identify. The Draft Regulations require the identification of only freshwater, which is defined as having a total dissolved solids concentration of less than 10,000 mg/l or occurring in a stratum not exempted under the Freshwater Aquifer Exemption. *See* 20 AAC § 25.990 (27). However, this definition excludes many waters that could be put to other beneficial uses. The Commission should revise the Draft Regulations so that an operator must identify all waters that could be put to a "beneficial use." Additionally, the Draft Regulations should require the identification of surface waters because both surface and subsurface spill could affect those waters as well.

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[21] Kusnetz, Nicholas, *Deteriorating Oil and Gas Wells Threaten Drinking Water, Homes Across the Country*, ProPublica (April 4, 2011).
[22] BC Oil & Gas Commission, Safety Advisory 2010-03, Communication During Fracture Stimulation (2010).
[23] Warner (2012).

Further, to ensure that operators made a reasonable effort to identify all relevant waters, the Commission should require an operator to provide the basis for its findings and demonstrate that there are no informational gaps.

ii. Baseline Data on Waters

It is essential that the Commission improve the provision for the collection of baseline data on potentially affected waters. The International Energy Administration emphasized this issue as one of its "Golden Rules" for unconventional gas development, recommending the policy-makers should:

> *Establish baselines for key environmental indicators, such as groundwater quality, prior to commencing activity, and continue monitoring during operations.* This is a shared responsibility between the regulatory authorities, industry and other stakeholders. The data gathered needs to be made public and opportunities provided for all stakeholders to address any concerns raised, as an essential part of earning public trust. At a minimum, resource management or regulatory agencies must have groundwater quality information . . . in advance of new drilling activities, so as to provide a baseline against which changes in water level and quality can be compared.[24]

The Draft Regulations would require the operator to conduct water sampling of nearby water wells both prior to hydraulic fracturing in order to collect baseline data and after hydraulic fracturing to verify that freshwater contamination did not occur. 20 A.A.C. § 25.283(a)(5). However, to provide a high level of protection to waters, the Commission should require operators to do more.

The Draft Regulations require the testing of only existing freshwater wells. Testing should be required on all waters identified in the application, surface and subsurface, that can be put to a beneficial use. If no well provides access to particular subsurface waters, the Commission should require the construction of a monitoring system to allow the gathering of baseline data.

Also, while the Draft Regulations require pre-fracking and post-fracking testing for a wide range or parameters, in order to help ensure that it is possible to attribute contamination events to the appropriate party, the Commission should require that operators perform sampling for pollutants that will be included in the fracking fluid. To accomplish this, the Commission should require operators to disclose pre-fracking the expected contents of the fracking fluid and post-fracking the actual contents. The Commission could accomplish this by revising Section 25.283(a)(14). With the information on the chemicals the operator may use, the Commission could adjust the sample parameters to fit the specific operations. Additionally, the Commission should require operators to include a non-hazardous tracer substance in the fracking fluid so that

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[24] International Energy Agency, Golden Rule for Golden Age of Gas (2012) at 43 (emphasis in original).

post-fracking sampling could test for the substance, making it easier to attribute pollution to particular operators.

The Commission should also specify when the operator should perform pre-fracking baseline testing and instruct operators to perform post-fracking testing over a longer period. Pre-fracking baseline testing should occur no more than 30 days prior to fracking. Further, baseline testing should occur within 30 days after the fracking of a well, and thereafter, testing should continue quarterly for a period of five years and then annually for 20 years.

Additionally, as the Draft Regulations currently read, the operator must include post-fracking sampling data in the initial pre-fracking application. *See* 20 A.A.C. § 25.283(a)(5). In order to avoid confusion, the Commission should adjust the structure of the Draft Regulations, so that the requirements for post-fracking sampling are not included as something that must be included in the application. The Commission could create an independent section for pre-fracking and post-fracking sampling, and then note in the application requirements that the pre-fracking sampling information must be included.

iii. Identification of the Source of Water Used in Fracking

As noted above, an additional impact of fracking is the removal of freshwater from the environment for use in fracking fluid. Each fracked well can use over five million gallons of water, so if fracking expands quickly across Alaska, the boom could result in the consumption of huge amounts of water, damaging the environment or preventing the water from being available for other uses. To protect against these harms, the Commission should require operators to disclose where they intend to obtain their water and to analyze the impacts of such water withdrawal. To accomplish this, the Commission could revise section 25.283(a)(14) to require that an application must include a description of the expected source and volume of the water to be consumed, and an analysis of the impacts of the water withdrawal.

iv. Protection against Fluid Migration and Spills

The Draft Regulations do not do enough to protect against the migration of fluid underground and the spilling of fluid above ground. In particular, the Commission should strengthen rules ensuring the integrity of well casing and cementing, assuring the effectiveness of confining zones at containing fluids, and preventing surface spills.

1. Integrity of Well Casing and Cementing

In order to prevent discharges of fracking fluids, oil, or other fluids, it is essential that the Commission ensure that proposed well casing and cementing plan will prevent casing failures for the life of the well anywhere along the well bore. The Draft Regulations do not do enough to ensure no failures will occur.

Under Draft Regulation section 25.283(a)(7) operators must provide in their application information to "demonstrate that casing is cemented below the base of the lowermost freshwater aquifer and according to 20 AAC 25.030 and that all hydrocarbon zones penetrated by the well

are isolated." This is insufficient. In particular, the requirement that the casing is cemented "below the base of the lowermost freshwater aquifer" provides an insufficient buffer to protect groundwater. The Commission should revise its regulations to state, at minimum, that operators must cement casings to a certain reasonable distance below the aquifer, for example, 75 feet.[25] Also, the Commission should specify that it will review, and the standard under which it will review, a demonstration "that all hydrocarbon zones penetrated by the well are isolated." The Draft Regulations currently do not provide nearly enough detail on what type of demonstration will be sufficient.

Additionally, under section 25.283(a)(8), there is no requirement that an operator submit the results of a pressure test of the casings and tubing before fracking. Instead, an operator needs to submit only available information and details of its plans to test the casings and tubing. The Commission should revise this so that an operator must provide as an update to its application before fracking begins the details and results of a pressure test.

The Draft Regulations also should include post-fracturing well monitoring requirements in section 25.283 because wells can fail a long time after fracking has occurred. In particular, the Draft Regulations should require operators to regularly check well equipment and to monitor wells for pressure changes or leaks. The Commission should also require operators to periodically submit reports on the conditions of fracked wells, and if there is a problem, operators should be required to report the incident and take immediate corrective action.

2. Integrity of the Containment Zone

The reliable containment of all fluids underground is also essential in ensuring that discharges will not occur. Again, the Commission should do more to ensure containment.

Section 25.283(a)(12) requires that an operator submit information on other oil or gas wells, but does not sufficiently ensure that other wells will not interfere with containment. Importantly, the provision does not specifically require the operator to ensure that there are no forgotten wells in the area. The Commission should require the operator to perform surveys sufficient to locate any additional wells and ensure to a high degree of certainty that the operator has not missed a well. Additionally, the Commission should require operators to demonstrate to a high degree of certainty that other wells will not interfere with containment, not merely enough information to "support a determination" that other wells will not interfere with containment.

Section 25.283(a)(13) requires operators to supply information on known or suspected fractures or faults that may transect the confining zone. In addition, the Commission should explicitly direct operators to perform surveys to check for faults or fractures if there is incomplete information on the location. Additionally, as above, the Commission should require

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[25] New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs* at 7-50 (Sep. 7, 2011) (stating that current cementing and casing practices require that a "surface casing shall extend at least 75 feet beyond the deepest fresh water zone encountered or 75 feet into bedrock, whichever is deeper").

information sufficient to ensure to a high degree of certainty that the faults and fractures will not interfere with containment, not merely information sufficient to "support a determination" that the faults or fractures will not interfere with containment.

Section 25.283(a)(14)(F) requires operators to submit information on the intended height and length of the fractures the operations would create, but it does not do enough to ensure the accuracy of those predictions. More specifically, the regulations do not require operators to meet a certain technical standard in predicting the height and length of fractures. The Commission should require an operator to use the best available technology for modeling the fractures and require that the operator have adequate data on the subsurface to input into the model.

Section 25.283(e) directs that the "placement of all hydraulic fracturing fluids shall be confined to the approved formations during hydraulic fracturing." However, the Commission should also reiterate that fluids should not be caused or allowed to migrate out of the formations after fracking. Moreover, to ensure that no such migration occurs, the Commission should require operators to design fracture treatments to leave a buffer zone between the extent of the fracture and the boundary of the formation, to account for error in modeling and designing fracture treatments.

Also, in order to provide additional protection against the potential for a well failure to result in a leak or spill, the Commission should require passive seismic monitoring during and after fracking activities. Passive seismic monitoring will help the operator detect problems, such as well casing failures or faults in cap rock integrity,[26] and may give those operators enough time to correct the problem before serious environmental harm results.

3. Handling, Storage, and Disposal of Flowback

The handling, storage, and disposal of fracking fluid and wastewater from the fracking process are widely recognized as one of the most hazardous parts of the fracking process.[27] Fracking involves the handling of huge amounts of fracking fluid, sometimes as much as five million gallons per well. This fluid is handled onsite before and during the fracking process. Moreover, a large percentage of the fracking fluid pumped into the ground during fracking returns to the surface as flowback.[28]

The handling of these fluids has resulted in numerous spills around the country. In North Dakota, where oil production is booming due to fracking, for 2011 alone, oil companies reported more than 1,000 accidental releases of fluids, with perhaps may additional incidents going

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[26] *See, e.g.*, ESG Solutions, What is Microseismic Monitoring?, available at https://www.esgsolutions.com/english/view.asp?x=852.

[27] *See, e.g.*, Natural Resources Defense Council, In Fracking's Wake: New Rules are Needed to Protect Our Health and Environment from Contaminated Wastewater at 10-11 (May 2012).

[28] U.S. Department of Energy, National Energy Technology Laboratory, Oil & Natural Gas Projects, Exploration and Production Technologies, Sustainable Management of Flowback Water during Hydraulic Fracturing of Marcellus Shale for Natural Gas Production (Dec. 15, 2012), available at http://www.netl.doe.gov/technologies/oil-gas/Petroleum/projects/Environmental/Produced_Water/00975_MarcellusFlowback.html.

unreported and the state having no accurate estimate of much fluid has actually been spilled.[29] In one incident in North Dakota, a company reported a spill of 12,600 gallons, but when officials came to investigate, they found that the leak had gone undetected for perhaps weeks, spilling at least two million gallons of brine and damaging 24 acres of land.[30] Nearly a year after the spill, even weeds would not grow on the land.[31] There are multiple reports of truckers dumping waste uncontained into the environment, including one case where a company is accused of dumping fracking waste directly into an Ohio river.[32] There are also numerous examples of waste pits leaking into fields. For example, in Pennsylvania, 140 cattle were exposed to fracking wastewater when an impoundment was breached.[33] Approximately 70 cows died, and the remainder produced only 11 calves, of which only three survived.[34]

To prevent spills and protect human health and the environment, the Commission should create strong rules requiring responsible handling, storage, and disposal of the fluids involved in the fracking process. The Draft Regulations do not do enough to accomplish this, but instead require only that the Operator submit "a detailed description of the plan for post fracture wellbore cleanup and fluid recovery through to production operations" with its application to frack a well. Section 25.283(a)(15). The regulations must include not only the submission of a plan, but standards for the handling, storage, and disposal of wastewater, as well as mechanisms to monitor and enforce compliance.

After being injected into a well, large amounts of fracking fluid will flow back out of the well. Operators collect this flowback and store it in open pits or in closed tanks until it is transported to an injection well for disposal. The use of closed tanks is a far superior practice to the use of open pits. The pits commonly leak, releasing hazardous substances into the environment.[35] Moreover, the pits are often attractive to animals, especially birds, which mistake them for ponds of water. Animals coming in contact with these pits can suffer serious injury or death.

Because of the dangers of storing fracking fluid in pits, the Commission should explicitly ban the practice under the regulations. Further, the Commission should require the use of a closed loop system in which the chemicals are brought to the site and mixed with water in closed tanks, the fracking fluid is piped into the well during fracking, and flowback is piped away from the well to closed tanks. Requiring the use of a closed loop system would reduce the opportunities for spills and reduce harmful air pollution emissions.

Additionally, as part of the application process, the Commission should require an operator to identify how it will dispose of the fracking fluids and other wastewater, and then

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[29] Kusnetz, Nicholas, North Dakota's Oil Boom Brings Damage Along with Prosperity, ProPublica (Jun. 7, 2012).
[30] *Id.*
[31] *Id.*
[32] *Id.*; E&E News, *Ohio man pleads not guilty to brine dumping* (Feb. 15, 2013).
[33] Bamberger, Michelle, Robert E. Oswald, Impacts of Gas Drilling on Human and Animal Health (2012).
[34] *Id.*
[35] New Mexico Oil and Conservation Division, OGAP Analysis of data provided in New Mexico Energy, Minerals and Natural Resources Dep't, Oil and Conservation Div., Cases Where Pit Substances Contaminated New Mexico's Ground Water (2008).

once disposal is complete, the Commission should require that the operator submit a report detailing and verifying that the operator has done so lawfully.

VI. The Draft Fails to Protect the Climate

a. Fracking Operations Contribute Significantly to Climate Change and Waste Natural gas

Climate change is a major concern for Alaska. The state is warming much more rapidly than the rest of the country, threatening ecosystems and Alaska Native cultures and communities. Fracking operations contribute significantly to climate change. In particular, the practice often results in the venting or fugitive emission of large amounts of natural gas, which is generally about 84 percent methane.[36] Methane is a powerful greenhouse gas that has a global warming potential approximately 33 times that of carbon dioxide over a 100 year timeframe and 105 times that of carbon dioxide over a 20 year timeframe.[37]

Across the entire oil and gas sector, EPA has estimated that "oil and gas systems are the largest human-made source of methane emissions and account for 37 percent of methane emissions in the United States or 3.8 percent of the total greenhouse gas emissions in the United States." [38] Methane emissions result from both oil and gas operations. [39] Fracked wells leak an especially large amount of methane, with some evidence indicating that the leakage rate is so high that shale gas is worse for the climate than coal.[40] In fact, a research team associated with the National Oceanic and Atmospheric Administration recently reported that preliminary results from a field study in the Uinta Basin of Utah suggest that the field leaked methane at an eye-popping rate of nine percent of total production.[41]

In addition to driving climate change, natural gas is a valuable commodity. Thus, the substantial emissions of natural gas occurring throughout the country, and in Alaska, constitute a significant waste.

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[36] Brown, Heather, Memorandum to Bruce Moore, USEPA/OAQPS/SPPD re Composition of Natural Gas for Use in the Oil and Natural Gas Sector Rulemaking, July 28, 2011.at 3 ("Brown Memo") at 3; Power, Thomas, The Local Impacts of Natural Gas Development in Valle Vidal, New Mexico, University of Montana (2005) ("Power").

[37] Howarth, Robert, et al., Methane and the greenhouse-gas footprint of natural gas from shale formations, Climactic Change (Mar. 31, 2011) ("Howarth 2011"); Shindell, Drew, Improved Attribution of Climate Forcing to Emissions, 326 Science 716 (2009).

[38] U.S. Environmental Protection Agency, Natural Gas STAR Program, Basic Information, Major Methane Emission Sources and Opportunities to Reduce Methane Emissions ("USEPA, Basic Information"); *see also* Petron, Gabrielle, et al., Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study, 117 Journal of Geophysical Research (2012).

[39] Williams, Megan & Cindy Copeland, Earthjustice, Methane Controls for the Oil and Gas Production Sector (2010).

[40] Howarth 2011; Wang, Jinsheng, et al., Reducing the Greenhouse Gas Footprint of Shale (2011); Alvarez, Ramon et al., Greater focus needed on methane leakage from natural gas infrastructure, Proc of Nat'l Acad. Science Early Edition (Feb 13, 2012) at 3; *see also* Howarth, Robert, et al., Venting and Leaking of Methane from Shale Gas Development: Response to Cathles et al., (2012); Hou, Deyi, et al., Shale gas can be a double-edged sword for climate change, Nature Climate Change at 386 (2012).

[41] Tollefson, Jeff, Methane leaks erode green credentials of natural gas, Nature News (Jan 2, 2013).

b. The Draft Regulations Should Require Reductions in Greenhouse Gas Emissions

Alaska's existing regulations state that operators "shall take action in accordance with good oil field engineering practices and conservation purposes to minimize the volume of gas released, burned, or permitted to escape into the air." 20 A.A.C. § 25.230(c). However, the regulations lack specific provisions sufficiently ensuring that operators follow this directive. This is a major problem because oil and gas operations in Alaska are currently wasting natural gas, and the potential spread of fracking across the state threatens to increase this waste significantly.

The Commission must do more to prevent the waste of natural gas. As detailed in Exhibit A, there are numerous technologies and practices available to effectively and economically minimize the waste of natural gas. In fact, many of these practices will pay for themselves in a short period of time, and can ultimately make money for an operator. Moreover, Alaska's Constitution prohibits the Commission from ignoring the massive amount of waste occurring by requiring that the state's resources be utilized to the maximum benefit of its people. Alaska Constitution, Article VIII.

The Draft Regulations do not address the venting of gas or fugitive emissions of gas in any manner. However, the Commission should use the opportunity presented by this rulemaking to promulgate regulations slashing natural gas emissions across the oil and gas industry. The Commission could accomplish this by adding three mechanisms to its regulations. First, the Commission should require that operators employ best available technology to dramatically cut natural gas emissions. Best available technology should be defined as the best technologies and techniques in use in the industry at the time of the operator's application. Second, the Commission should establish a natural gas leakage performance standard to complement the best available technology requirement. Specifically, the performance standard would dictate that under no circumstances will an application be approved if it would result in the loss of more than a certain percentage – established by the Commission – of all produced gas. Lost gas would be defined as any gas that is emitted to the ambient air, whether purposefully or not, or flared. Third, to enforce these mechanisms, the regulations should require an operator to demonstrate its operations will comply with the best available technology and natural gas leakage performance standard as part of its permit application and should require that operators closely monitor their emissions.

If the Commission refuses to implement these improvements for all oil and gas operations, it should at least require these measures for fracking operations by including the requirements in section 25.283.

VII. The Draft Fails to Protect Air Quality

Oil and gas operations emit numerous air pollutants, including volatile organic compounds (VOCs), nitrogen oxides ("NO_X"), and particulate matter. Fracking operations are particularly bad for air quality, emitting air pollution beyond that which is associated with conventional operations.

Oil and gas operations emit large amounts of VOCs and NO_X.[42] VOCs make up about 3.5 percent of the gases emitted by oil or gas operations.[43] The VOCs emitted include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which Congress listed as Hazardous Air Pollutants.[44] There is substantial evidence of harm from these VOCs.[45] With regard to NO_X, one of its primary sources is flaring.[46] Both VOCs and NO_X are ozone precursors, which can result in heart and lung disease and mortality. Thus, due to emissions of these pollutants, many regions around the country with substantial oil and gas operations are now suffering from extreme ozone levels.[47] A recent study of ozone pollution in the Uintah Basin of northeastern Utah, a rural area that experiences hazardous tropospheric ozone concentrations, found that oil and gas operations were responsible for 98 to 99 percent of VOCs and 57 to 61 percent of NO_X emitted from sources within the Basin considered in the study's inventory.[48]

Fracking results in air pollution beyond that resulting from conventional operations. One analysis found that 37 percent of the chemicals found at fracked gas wells were volatile, and that of those volatile chemicals, 81 percent can harm the brain and nervous system, 71 percent can harm the cardiovascular system and blood, and 66 percent can harm the kidneys.[49] Also, a California air quality management district has identified several areas of dangerous and unregulated air emissions from fracking: the mixing of the fracking chemicals, the use of the silica, or sand, as a proppant, which causes the deadly disease silicosis if inhaled, and the storage of fracking fluid once it comes back to the surface.[50] Preparation of the fluids used for well completion often involves onsite mixing of gravel or proppants with fluid, a process which potentially results in major amounts of particulate matter emissions.[51] Further, these proppants often include silica sand, which increases the risk of lung disease and silicosis when inhaled.[52] Finally, as flowback returns to the surface and is deposited in pits or tanks that are open to the

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[42] Sierra Club et al. comments on New Source Performance Standards: Oil and Natural Gas Sector; Review and Proposed Rule for Subpart OOOO (Nov. 30, 2011) ("Sierra Club Comments") at 13.
[43] Brown Memo at 3.
[44] 42 U.S.C. § 7412(b).
[45] Colborn 2011; McKenzie, Lisa et al., Human Health Risk Assessment of Air Emissions form Development of Unconventional Natural Gas Resources, Sci Total Environ at 5 (2012), doi:10.1016/j.scitotenv.2012.02.018 ("McKenzie 2012"); Food & Water Watch 2012.
[46] *See, e.g.*, U.S. Environmental Protection Agency, Oil and Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution: Background Technical Support Document for Proposed Standards at 3-6 (July 2011); Armendariz, Al, Emissions for Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (2009) ("Armendariz") at 24.
[47] *See, e.g.*, Wendy Koch, *Wyoming's Smog Exceeds Los Angeles' Due to Gas Drilling*, USA Today (May 9, 2011).
[48] Lyman, Seth and Howard Shorthill, Final Report: 2012 Uintah Basin Winter Ozone & Air Quality Study, Utah Department of Environmental Quality (2013); *see also* Gilman, Jessica et al., Source signature of volatile organic compounds from oil and natural gas operations in northeastern Colorado, Envtl Sci and Technology (Jan 14, 2013), DOI: 10.1021/es304119a.
[49] Colborn 2011 at 8.
[50] South Coast Air Quality Management District, Draft Staff Report on Proposed Rule 1148.2 - Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers (January 2013) at 15 ("SCAQMD Revised Draft Staff Report PR1148-2").
[51] *Id.*
[52] South Coast Air Quality Management District, Response to Questions re air quality risks of hydraulic fracturing in California,Submission to Joint Senate Hearing (2013) at 3.

atmosphere, there is the potential for organic compounds and toxic air pollutants to be emitted, which are harmful to human health as described above.[53]

The Commission should amend the Draft to control these emissions. First, one of the biggest problems with fracking is that resulting emissions can contain unknown and hazardous chemicals and are not well characterized. More information is needed to understand the impacts fracking can have on the air. Thus, in order to fully understand the effect the operations are having on air quality, the Commission should require continuous air quality monitoring, beginning at least 10 days prior to the start of operations, and lasting through the life of the well.

Second, because venting and fugitive emissions of natural gas results in substantial VOC emissions, and flaring results in large amounts of NO_X emissions, implementing the controls recommended above for natural gas and methane will also significantly benefit air quality.

Third, the Commission should require the use of best industry practices to control particulate matter from the onsite mixing of proppants, such as silica. In determining what these practices should be, the Commission should refer to the recommendations of the U.S. Occupational Health and Safety Administration ("OSHA").[54] For instance, OSHA recommends:

- the enclosure of points where dust is released, for instance, by installing thick plastic stilling or staging curtains around the bottom sides of the sand movers and at the ends of the sand transfer belts;
- the configuration of operator cabs and booths with filtration and climate controls to protect workers;
- the use of local exhaust ventilation on equipment that can release dust to collect silica-containing dusts and prevent dust escape;
- the replacement of transfer belts with screw augers on sand movers in new designs or retrofits; and
- the provision of respiratory protection to workers.

Fourth, to prevent emissions of VOCs from fracking chemicals and flowback, the Commission should require the use of a closed loop system in which the chemicals are brought to the site and mixed with water in closed tanks, the fracking fluid is piped into the well during fracking, and flowback is piped away from the well to closed tanks. As explained above, these requirements also will help prevent harmful fluid spills.

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[53] SCAQMD Revised Draft Staff Report PR1148-2 at 15.

[54] U.S. Occupational Safety and Health Administration, Hazard Alert, Worker Exposure to Silica during Hydraulic Fracturing, available at http://www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html.

VIII. The Draft Contains Inadequate Seismic Monitoring and Reporting Requirements

Fracking results in earthquakes. Studies indicate that fracking has directly triggered earthquakes in the Horn River Basin, British Columbia, and in the United Kingdom.[55] Additionally, there are a number of reports indicating that the disposal of fracking waste into wastewater injection wells has been causing earthquakes across the continental United States.[56] Indeed, one recent study linked wastewater injection to a magnitude 5.7 earthquake in Oklahoma.[57] In an extremely seismically active place like Alaska, the threat of induced earthquakes must be taken seriously. A larger earthquake could cause harm to individuals or their property. An earthquake could also cause well failure, resulting in contamination of the environment.

Due to the threat of induced seismicity from fracking activities, the Commission should require seismic monitoring during and after the fracking operations. Additionally, as part of the application process, the Commission should require the identification of all faults in the region and an analysis of the potential for the operations to induce seismic activity.

IX. The Commission Should Define Certain Terms

A number of the terms used in the Draft Regulations are ambiguous and should be defined. This includes: "wellbore trajectory," "confining zone," and "total volumes planned," and "principle fluids to be used."

Thank you for the opportunity to comment on this critically important issue. If you have any questions, please contact David Hobstetter, (415) 632-5321, dhobstetter@biologicaldiversity.org.

Respectfully submitted,

/s/ David R. Hobstetter
David R. Hobstetter
Staff Attorney

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[55] BC Oil and Gas Commission, Investigation of Observed Seismicity in the Horn River Basin (Aug. 2012); *see also* Jardine, Nick, *UK Fracking Firm Admits They Are Causing Earthquakes*, Business Insider (Nov. 7, 2011), *available at* http://www.businessinsider.com/fracking-earthquakes-uk-2011-11.

[56] *See, e.g.*, Holland, Austin, Examination of possibly induced seismicity from hydraulic fracturing in the Eola Field, Garvin County, Oklahoma, Oklahoma Geological Survey Open-File Report OF1-2011 (2011); Frohlich, Cliff, Two-year survey comparing earthquake activity and injection-well locations in the Barnett Shale, Texas, Proceedings of the National Academy of Sciences Early Edition (2012); Ohio Department of Natural Resources, Executive Summary: Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area (2012) ("Ohio DNR Northstar").

[57] Keranen, Katie M. et al., Potentially induced earthquakes in Oklahoma, USA: Links between wastewater injection and the 2011 M_W 5.7 earthquake sequence (Mar. 26, 2013).

/s/ Rebecca Noblin
Rebecca Noblin
Alaska Director

Encls:

List of References Cited and Attached to Comments
Exhibit A – Summary of Technologies and Techniques to Reduce Methane Emissions from Oil and Gas Operations

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EXHIBIT A

Summary of Technologies and Techniques to Reduce Methane Emissions from Oil and Gas Operations

David Hobstetter

Numerous technologies and practices are demonstrated to effectively and economically reduce methane emissions. In fact, many of these controls not only reduce methane emissions, but by capturing salable natural gas, provide operators with additional income, quickly paying back their cost. As the comment letter discusses, the Bureau of Land Management is legally obligated to require operators to employ such reasonable controls.

- **Compressors**

Fugitive natural gas emissions from compressors are a very large source of natural gas emissions. "All told, methane emissions from compressors reportedly account for at least one fifth of all methane emission from oil and gas systems."[1] Also, because volatile organic compound ("VOC") emissions accompany methane emissions in natural gas leaks, compressors are a significant source of VOCs as well. Compressor stations are used to transport gas through transmission lines throughout the United States. Natural gas is highly pressurized as it travels by pipeline. To ensure the pressurization of the gas flowing through a pipeline, compression of the natural gas is required periodically along the pipe. Compressor stations are usually placed at 40 to 100 mile intervals to accomplish this. The natural gas enters the compressor station, and is compressed by a turbine, motor, or engine.[2]

There are a number of methods of reducing emissions from compressors. First, operators can cut leakage by implementing a proper schedule for replacing packing rings and piston rods and requiring state-of-the-art rod-packing technology.[3] Operators can establish baseline leakage rates and corresponding replacement frequencies in order to minimize the uneconomical and environmentally harmful leakage of natural gas. Such a program will carry the added benefit of extending the life of other equipment.[4]

Second, operators should use advanced new technology that prevents leaks from compressors. For example, "[n]ew packing ring materials, types, and entirely new packing systems are available now and becoming more common" and "[t]here are many examples of companies that provide new low emission packing rings and packing case assemblies."[5] Replacing wet seals used on the rotating shafts of compressors with dry seals can achieve great reductions in gas emissions, and in fact, installing two or more dry seals in series is even more effective. Estimates by EPA indicate that the use of these technologies could reduce methane emissions by very large amounts.[6] For instance, according to EPA, the installation of multiple

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[1] Megan Williams & Cindy Copeland, Earthjustice, Methane Controls for the Oil and Gas Production Sector (2010) ("Williams & Copeland") at 11.
[2] NaturalGas.org, The Transportation of Natural Gas.
[3] Williams & Copeland at 13.
[4] *Id.* at 14.
[5] *Id.*
[6] *Id.*; USEPA, Lessons Learned from Natural Gas STAR Partners, "Reducing Methane Emissions from Compressor Rod Packing Systems", October 2006.

dry seals result in less than 1 percent of the leakage of a wet seal system and also cost considerably less to operate.

Third, gas starters that use natural gas to run compressor starter motors release gas to the atmosphere, but starters that use compressed air or electricity do not generate gas emissions. EPA's Natural Gas STAR program reports that the use of compressed air or electric starters is a cost-effective control technique.[7]

- **Wellhead facilities**

Well venting activities, including well completion, well blowdown, and well workover, are significant sources of methane and VOC emissions. However, available technology can greatly reduce—or even eliminate—these emissions. One method of reducing methane emissions that the GAO identifies is the use of reduced emission completions ("RECs") equipment, also known as "green completions," during the natural gas drilling phase.[8] This process separates the mud and debris to capture the gas or condensate, instead of venting or flaring the gas into the atmosphere.[9] It can be highly effective. Indeed, EPA Natural Gas STAR partners report that RECs can recover up to 100 percent of completion gas.[10]

Further, this method of slashing emissions has been proven cost-effective by partners in EPA's Natural Gas STAR program for over five years.[11] RECs produce additional revenue from the recovery of produced natural gas and gas liquids while resulting in less solid waste, less water pollution, and safer operating conditions. For example, BP has invested at least $1.2 million in reduced emission completions since 2000.[12] This change not only prevented over 2,000 metric tons of methane and 100,000 of carbon dioxide from entering the atmosphere, it increased revenues by almost $5.8 million, according to company documents.[13]

Another significant source of methane emissions results from the venting of mature gas wells to the atmosphere in order to remove accumulated fluids. This is also known as well blowdown. During drilling, liquids collect in wells and slow or stop the flow of gas completely. Operators often re-establish flow by closing the well to build pressure and then opening the well to the atmosphere. This succeeds in removing the liquid, but it also vents the harmful gases. The

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[7] *See* USEPA, Natural Gas STAR Program, Partner Reported Opportunities for Reducing Methane Emissions Fact Sheets No. 103 (Install Electric Compressors) and 105 (Install Electric Motor Starters) (2012).
[8] U.S. GAO, *Federal Oil and Gas Leases. Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases* at 7 (2010) ("GAO Report").
[9] *Id.*
[10] *See* U.S. Environmental Protection Agency, Natural Gas STAR Program, Reducing Methane Emissions During Completion Operations (Oct. 24, 2006).
[11] *See* US Environmental Protection Agency, Natural Gas STAR Program, Lessons Learned: Reduced Emissions Completions for Hydraulically Fractured Natural Gas Wells; US Environmental Protection Agency, Natural Gas STAR Program, Lessons Learned: Reducing Methane Emissions During Completion Operations, 2006 Natural Gas STAR Annual Implementation Workshop, Houston, TX, October 24, 2006; US Environmental Protection Agency, Natural Gas STAR Program, Lessons Learned, Natural Gas STAR Partners, Reducing Methane Emissions from Production Wells: Reduced Emission Completions, May 11, 2010.
[12] GAO Report at 23.
[13] *Id.*

best available technology to minimize this waste is the plunger lift system.[14] The system drops the plunger to the bottom of the well, creating a barrier between gas and liquid. When the built-up gas pressure pushes the plunger to the surface, the plunger brings liquids with it, allowing the operator to remove the liquids while efficiently routing the gas to the gas line rather than venting it to the ambient air. Plunger lift systems can also use computerized timers to adjust the dropping of the plunger according to the rate of fluid accumulation, further reducing the venting of methane.[15] According to the EPA, plunger lift systems "can significantly reduce gas losses, eliminate or reduce the frequency of future well treatments, and improve well productivity."[16]

Plunger lift systems can be cost effective. For example, in analyzing a plunger lift installation program implemented by Amoco, the EPA found that "[f]or the first year of operation, the company realized an average annual savings of approximately $90,200 per well at 2006 prices. In addition the company realized approximately $41,500 per well from salvage of the beam lift equipment at 2006 costs."[17]

- **Vapor Recovery Units**

Storage tanks are another major source of methane and VOC emissions. Emissions can occur several ways: losses resulting from the reduction of pressure in the tank; losses due to the filling and emptying of a tank; and losses caused by environmental conditions triggering tank gas expansion or contraction. According to EPA, storage tank emissions are likely higher than currently reported in the U.S. GHG Inventory.[18] Thus, the substantial uncertainties regarding how much storage tanks may contribute to emissions warrant rigorous requirements preventing storage tank emissions.

Vapor recovery units can cost effectively reduce methane and VOC emissions from storage tanks.[19] Instead of allowing the gas to vaporize from the tank into the atmosphere, the vapor recovery unit captures the gas and transmits it directly to the pipeline.[20] The GAO recommends the installation of these vapor recovery units to capture the gas vapor from the condensate storage tanks and send it into the pipeline to maximize recovery. EPA agrees with the GAO, stating that "vapor recovery can provide generous returns to the relatively low cost of the technology,"[21] providing both economic and environmental benefits.

Vapor recovery units are highly efficient at capturing gas, and recognizing this, states have begun requiring that operators use units that capture a high proportion of emissions. For

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[14] *Id.* at 8.
[15] *Id.*
[16] USEPA, Natural Gas STAR Program, Lessons Learned: Installing Plunger Lift Systems in Gas Wells, (last visited Aug 1, 2012).
[17] *Id.* at 11.
[18] USEPA, Greenhouse Gas Emissions Reporting from the Petroleum and Natural Gas Industry Background Technical Support Document, Climate Change Division Washington D.C. (2010).
[19] USEPA, Natural Gas STAR Partners, Lessons Learned: Installing Vapor Recovery Units on Crude Oil Storage Tanks (October 2006).
[20] *Id.* at 9.
[21] *Id.* at 6.

example, Wyoming requires 98 percent control for all new facilities or modified facilities with new and existing flashing emissions.[22]

- **Dehydrators**

Technologies are available to reduce emissions from dehydrators. Saturated water found in produced gas must be removed prior to transmitting the gas. Glycol dehydrators are the most common technology used to remove this water from the gas. Normally a dehydrator circulates the chemical glycol to absorb moisture in the gas; unfortunately, this also absorbs small amounts of gas, which is later released into the atmosphere when water vapor is released from the glycol.[23]

Zero emission dehydrators can reduce greatly these emissions by combining several technologies to virtually eliminate emissions.[24] Zero emissions dehydrators employ flash tanks, which capture gas that flashes or evaporates from water wet glycol in an energy-exchange pump, as well as electric pumps and electric control valves. "Zero emissions dehydrators are also designed to collect all condensable components from the still column vapor and use the remaining non-condensable still vapor (methane and ethane) as fuel for the glycol reboiler."[25] EPA has found that due to gas savings, zero emission dehydrators can payback their implementation cost in a short period of time, making them economically efficient.

Another way to reduce methane and VOC emissions from glycol dehydrators is to optimize the circulation rates of the glycol. Methane emissions from a glycol dehydrator are proportional to the amount of glycol circulated through the system. However, production rates at wells decrease over time and circulation rates designed for early production exceed the necessary circulation rates for a mature well. Thus, optimizing circulation rates throughout a well's period of production can reduce emissions.

There are cases in which the use of zero emissions dehydrators or glycol dehydrators will not be feasible. "Glycol dehydrators require electric utilities or an engine generator set to achieve zero emissions"[26] However, solid desiccant dehydrators reduce methane by substantial amounts and have low operating and maintenance costs.[27] They are very simple devices with no moving parts and no external power supply needs, and are appropriate for use in a wide variety of applications.

- **Pneumatic devices**

Pneumatic devices utilized by the natural gas industry in all sectors of its business are also substantial methane and VOC emissions sources. Pneumatic devices are tools and

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[22] Wyoming Dept of Environmental Quality, Oil and Gas Production Facilities Permitting Guidance Chapter 6, Section 2 (March 2010) ("Wyoming DEQ 2010") at 5.
[23] *Id.*
[24] USEPA, Natural Gas STAR Program, Partner Reported Opportunities for Zero Emissions Dehydrators Fact Sheet No. 206 (2011).
[25] *Id.*
[26] *Id.*
[27] Williams & Copeland at 26-27.

instruments that generate and utilize compressed air. However, the natural gas industry's pneumatic devices are typically powered by natural gas and vent large amounts of methane to the atmosphere as part of their normal operation. Some pneumatic devices bleed methane into the atmosphere continuously, while others release gas intermittently. By replacing the pneumatic devices that bleed gas at a high rate with more efficient devices that do not utilize natural gas (instrument air controls) or devices that bleed at a lower rate (low-bleed pneumatics operators can effectively capture additional natural gas, thus protecting the environment and producing additional revenue.[28]

Pneumatic controls that use instrument air rather than natural gas can achieve 100 percent emission reductions. Instrument air technology can be used where electrical power is available, or instrument air devices can be converted to solar powered, battery operated devices. A number of Natural Gas STAR partners have had success employing solar power technology.[29] Also, pneumatic controllers can use mechanical control, nitrogen gas, or electrical valve controllers. "The most common mechanical control device is a level controller, which translates the position of a liquid-level float to the drain valve position with mechanical linkages. There is no gas usage in either the process measurement or valve actuation, and reliability is very high."[30] The use of nitrogen gas or electric valve controllers is more limited, but could provide an effective, low-emission alternative for certain operations.[31]

If the use of non-gas powered devices that achieve a 100 percent emissions reduction is not possible, low-bleed pneumonic devices should be used to effectively cut emissions. According to the EPA, the cost of switching from high-bleed to low-bleed pneumatic devices ranges from $700 to $3,000 per device, which can be recovered quickly by operators.[32] Switching to low-bleed devices involves replacing, retrofitting, and maintaining devices to achieve a substantially reduced emissions rate. This has the added benefit of increasing operational efficiencies by improving system performance and reliability, and monitoring of important parameters.

The use of low-bleed pneumonic devices should be required where 100 percent methane reduction cannot be achieved because the use of low-bleed devices has been proven feasible. Colorado and Wyoming already have programs in place that require low-bleed pneumatic devices. With certain exceptions, Colorado requires that new pneumatic devices must be low-bleed—meaning that it emits 6 standard cubic feet per hour (scfh) of natural gas or less—and that existing devices that do not meet this standard must be retrofitted to meet it.[33] Wyoming

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[28] *Id.* at 9-10.
[29] USEPA, Natural Gas STAR Program, Lessons Learned: Solar Power Applications for Methane Emissions Mitigation (2009) at 15-23.
[30] USEPA, Natural Gas STAR Program, Lessons Learned: Convert Pneumatics to Mechanical Controls (2004) at 1-2.
[31] USEPA, Natural Gas STAR Program, Lessons Learned, Natural Gas STAR Partners, Options for Reducing Methane Emissions from Pneumatic Devices in the Natural Gas Industry, October 2006, at 6.
[32] *Id.* at 21-22.
[33] Colorado Department of Public Health and Environment, Air Quality Control Commission, Regulation Number 7, XVIII.C (2011).

requires that new facilities with natural gas operated pneumatic controllers must not emit more than 6 scfh or the controller discharge system must be routed to a closed loop system.[34]

- **Pipelines**

Operators transport natural gas from the gas fields through pressurized pipelines. According to U.S. Greenhouse Gas Inventory data, pipeline leaks account for a large proportion—about 8 percent—of methane emissions from the transmission sector.[35] An important factor in facilitating or limiting leakage is the material from which the pipeline is constructed. Cast iron and steel piping materials used in underground gas distribution systems tend to leak more than any other distribution piping materials.[36] On the opposite end of the spectrum is plastic pipe, which EPA states has the lowest leakage rate.[37] Further, while using plastic pipe is not always feasible, an operator should always be able to use plastic insert liners that have the potential to significantly reduce emissions.[38]

Additionally, substantial amounts of gas are leaked to the atmosphere during pipeline maintenance and repair. A number of techniques can reduce emissions in these circumstances, including pump-down techniques to reduce the gas line pressure in the pipeline before venting or the use of an ejector or inert gases and pigs to purge pipelines.[39] Also, hot tapping allows for a new pipeline connection while the pipeline is kept in service, avoiding product loss, methane emissions, and disruption of service to customers.[40]

Lastly, gas line breaks can result in unexpected emissions of methane gas into the ambient air. These emissions can be avoided or reduced through the installation of excess flow valves that ensure an automated shutoff of a ruptured gas line.[41]

- **Direct inspection and maintenance**

Gas plants annually lose more than 24 billion cubic feet of methane due to fugitive emissions from leaking compressors and other equipment components such as valves, connectors, seals, and open-ended lines.[42] The implementation of direct inspection and maintenance (DI&M) programs is a cost-effective method of detecting, measuring, prioritizing, and repairing equipment leaks to reduce methane emissions.[43] In fact, Natural Gas STAR partners have shown that a DI&M program can eliminate 96 percent of gas losses and a corresponding 80 percent of methane emissions.[44]

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[34] Wyoming DEQ 2010 at 10, 19.
[35] US GHG Inventory 2012.
[36] *See* USEPA, Natural Gas STAR Program Partner Reported Opportunities Fact Sheet No. 402, Insert Gas Main Flexible Liners.
[37] *Id.*
[38] Williams & Copeland at 47.
[39] *Id.* at 48.
[40] *Id.*
[41] *Id.*
[42] USEPA, Natural Gas STAR Partners, Lessons Learned: Directed Inspection and Maintenance at Gas Processing Plants and Booster Stations (2003).
[43] *Id.*
[44] *Id.*

There are numerous methods that are effective in detecting leaks. Soap bubble screening, which involves spraying soap on a component, is a fast, easy, and low-cost technique.[45] Electronic screening uses a small handheld gas detector to identify leaks, and is also fast and convenient.[46] Organic Vapor Analyzers and Toxic Vapor Analyzers are portable hydrocarbon detectors that can be used to spot and quantify leaks.[47] Devices are also available that spot leaks by detect the acoustic signature created by a gas leak.[48] Infrared cameras are able to identify gas leaks because hydrocarbon emissions absorb infrared light of a certain wavelength. These cameras are particularly effective due their ability to screen hundreds of components per hour and to identify leaks from inaccessible equipment. They can even be used in aerial inspection to screen many miles of transmissions pipelines and dispersed equipment to detect plumes.[49]

[45] *Id.*
[46] *Id.*
[47] *Id.*
[48] *Id.*
[49] *Id.*

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