**IN THE UNITED STATES DISTRICT COURT**
**FOR THE NORTHERN DISTRICT OF CALIFORNIA**

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| SIERRA CLUB; CENTER FOR BIOLOGICAL DIVERSITY; EARTHWORKS; ENVIRONMENTAL DEFENSE FUND; NATURAL RESOURCES DEFENSE COUNCIL; THE WILDERNESS SOCIETY; NATIONAL WILDLIFE FEDERATION; CITIZENS FOR A HEALTHY COMMUNITY; DINÉ CITIZENS AGAINST RUINING OUR ENVIRONMENT; ENVIRONMENTAL LAW AND POLICY CENTER; FORT BERTHOLD PROTECTORS OF WATER AND EARTH RIGHTS; MONTANA ENVIRONMENTAL INFORMATION CENTER; SAN JUAN CITIZENS ALLIANCE; WESTERN ORGANIZATION OF RESOURCE COUNCILS; WILDERNESS WORKSHOP; WILDEARTH GUARDIANS; and WYOMING OUTDOOR COUNCIL,<br><br>Plaintiffs,<br><br>v.<br><br>RYAN ZINKE, in his official capacity as Secretary of the Interior; BUREAU OF LAND MANAGEMENT; and UNITED STATES DEPARTMENT OF THE INTERIOR,<br><br>Defendants. | ) | Case No. 3:17-cv-7187 |

**APPENDIX TO MOTION FOR PRELIMINARY INJUNCTION**

**Volume 2 – Attachments 20 to 40 – Pages A475 to A651**

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# Attachment 20

**Declaration of Francis Don Schreiber**, Environmental Defense Fund

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

**DECLARATION OF FRANCIS DON SCHREIBER**
**Submitted In Support of Environmental Defense Fund**

I, Francis Don Schreiber, declare as follows:

1. I am currently a member of the Environmental Defense Fund ("EDF"). I am a rancher and landowner in Gobernador, New Mexico. My wife, Jane, and I own the Devil's Spring Ranch ("Ranch") on 480 deeded acres in Rio Arriba County, and have a permit to graze cattle, sheep and horses for approximately 3,000 additional acres of Bureau of Land Management ("BLM") land adjacent to the Ranch.

2. My ranch is located in the San Juan Basin, one of the most active areas in the country for oil and gas production. I have a split estate—I own the surface rights to my land, and the mineral rights on my property are owned by the federal government and managed by the BLM. We graze our own horses on the Ranch, and I currently lease some of my grazing rights to other ranchers, who run cattle on the land.

3. Because there are oil and gas operations on my property, I closely follow regulatory developments concerning federal oil and gas regulations, including through communications that I receive from EDF. I have advocated for

the adoption of measures that would reduce waste and limit emissions from oil and gas development on public lands.

4. I am aware that BLM finalized waste prevention standards for oil and natural gas production on federal and tribal lands in November 2016 ("waste prevention rule"). These standards will help ensure reductions in emissions and minimization of waste from oil and gas production through equipment and performance requirements. I understand that BLM recently finalized a one-year suspension of the compliance dates for key provisions of the waste prevention rule, including requirements to capture gas, reduce flaring, upgrade or replace certain equipment, and inspect for and repair leaks. These provisions account for the majority of the waste reduction BLM anticipated from the Rule.

5. There are currently 122 oil and gas wells on and immediately adjacent to the Ranch, all managed by BLM and all of which are subject to BLM's waste prevention rule.

6. Jane and I bought our land in 1999, with the goal of developing a model for sustainable agriculture with cattle, and passing the Ranch down to our children and grandchildren. At that time there were about BLM-managed 75 wells operating or in construction on the land. We have since curtailed our ranch activities, focusing instead on mitigating the environmental impacts this development has had on our land.

7. Through our negotiations with oil and gas producers and the BLM, we were able to develop better siting practices, so that new wells would be drilled on existing well pads, limiting the amount of necessary ancillary equipment, and minimizing the land that would be affected by oil and gas operations. These agreements, however, do not encompass the waste prevention practices that the BLM rule addresses and that are now suspended, including, for example, minimizing the venting of natural gas through practices like leak detection and repair and regular equipment maintenance.

8. I am aware that oil and natural gas facilities emit significant amounts of harmful air pollution, both through designed releases and unintentionally leaking equipment. I understand that these pollutants include methane, volatile organic compounds (VOCs), carcinogenic air toxics such as benzene and toluene, and other harmful air pollutants. I understand that methane is a highly potent greenhouse gas, capable of warming the climate at a rate over 80 times that of carbon dioxide over a 20-year period. I also understand that VOCs contribute to the formation of ground-level ozone, or smog, which is hazardous to human health, exacerbating existing respiratory and cardiovascular conditions, and can cause respiratory disease and premature death. I am aware that the best practices that reduce methane and VOC emissions also help mitigate other harmful air pollutants.

9. I have personally experienced air emissions associated with venting, flaring, and leaking wells on the Ranch. As I ride, walk and drive around the ranch, I can often see vapors escaping from leaking wells distorting the air and creating shadows on the ground. I have had horses spook violently under me when they were startled by the roar of a nearby well suddenly venting, which can sound like a jet engine.

10. Most noticeable is the near-constant smell from leaking wells, which can be extremely strong when we are driving, riding, and working around areas with oil and gas development on the Ranch. These odors make breathing uncomfortable and often cause us to leave affected areas as quickly as possible, as I am concerned that we are breathing harmful hydrocarbons, such as benzene, toluene, ethylbenzene, and xylenes (these toxic components of natural gas are sometimes referred to as BTEX).

11. VOC emissions from oil and gas operations in the San Juan Basin, including facilities covered by the BLM standards, contribute to elevated ozone levels in the Four Corners region, including in our part of northwestern New Mexico. While the Four Corners is a sparsely populated rural region, we have roughly the same ozone levels as San Francisco. During the 2016 ozone season, Rio Arriba County experienced 58 yellow flag ozone days, according to EPA's AirNow database, meaning the air quality posed a moderate health concern for

some individuals who are particularly sensitive to ozone levels. I am aware that people with cardiovascular disease are at higher risk from breathing ozone. In 2014, I had open heart surgery for congestive heart failure, and have post-operative residual congestive heart failure. I am constantly concerned about the impact of the air quality on my heart condition. I worry that ozone levels in my county will cause respiratory or cardiovascular problems for myself and my family.

12. Jane and I have five grown children, and eight grandchildren. Although we had hoped the Ranch would be a place we would share with our grandkids, the oil and gas operations on our land limit our ability to enjoy it with them. We worry about their exposure to air pollutants from oil and gas development on the Ranch, and always are careful to keep them away from the wells and above ground pipeline equipment. Protecting our grandchildren from the negative health effects of oil and gas emissions is a constant concern when they come to visit us.

13. There is a group of several wells on the Ranch located less than a third of a mile from our house. On five separate occasions over the last four years, we have visited these wells with Forward Looking Infrared ("FLIR") cameras. On all five occasions, we observed and recorded leaks at these wells. When we observe leaking wells we report them to the well operator, but we do not have the resources or ability to monitor all of the wells on the Ranch.

14. The impacts of climate change caused by greenhouse gases such as methane are evident on the Ranch. Weeds flourish in the warmer weather and inhibit the growth of essential native grasses. Changes in temperature and weather patterns, including drought, increased wind, severity of rainstorms, and increased erosion, have required a shift in the timing of ranch operations, such as when cows should be bred. Other conventional wisdom that has informed practices for generations is no longer applicable. For example, when I first started ranching in 1999, my neighbor, whose family has been ranching in Rio Arriba for nearly a century, taught me that on September 28th of each year, I would need to begin breaking the ice on our cows' water sources in the mornings. Otherwise the water would freeze deeply and the cows would not be able to drink. However, this date, passed down for decades, has become obsolete—in recent years, we have not had to break ice until much later in the season. This year, we did not have to begin to break ice until mid-December.

15. I anticipate that BLM's waste prevention standards would help to minimize waste and to reduce harmful air pollution near my home and in the state where my family and I live, work, and recreate: there are over 100 active oil and gas wells on my Ranch subject to BLM's standards, and more than 30,000 oil and gas wells, compressors, and processors subject to the standards on public lands in New Mexico. Protective waste prevention standards for oil and gas facilities on

public lands would help reduce harmful pollution throughout Rio Arriba County and the surrounding San Juan Basin region, which is currently disproportionately impacted by dangerous air pollution from methane, VOCs, air toxics and other airborne contaminants.

16. I am concerned that the suspension of the standards will result in BLM-managed sources continuing to emit high levels of harmful pollution and that the resulting emissions from the oil and gas operations on my land will continue to threaten my health and well-being and that of my family. The stay of these requirements is particularly concerning given that New Mexico lacks any state-level emissions standards for oil and gas production.

17. As an American and as a New Mexican, my interests as a taxpayer will also be harmed by the stay of requirements in the waste prevention rule. The rule requires an increase in the capture and containment of natural gas, enabling the sale of gas that otherwise would be lost. When natural gas from federal lands, a public resource, is wasted through leaks, venting, and flaring, production companies do not have to make royalty payments on that wasted gas to the federal and state governments. BLM estimates that an additional 41 billion cubic feet of natural gas per year will be saved and used due to the rule, resulting in additional royalties of up to $14 million per year. If the waste prevention rule is suspended,

these royalties will be forgone and unavailable to help fund important public services for my community.

I declare under penalty of perjury that the foregoing is true and correct.

Francis Don Schreiber

Dated December 14, 2017

# Attachment 21

**Declaration of John Stith**, Environmental Defense Fund

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

**DECLARATION OF JOHN STITH**
**Submitted In Support of Environmental Defense Fund**

I, John Stith, declare as follows:

1. I am Director of Database Marketing and Membership Analytics at the Environmental Defense Fund (EDF). I have had this position for more than 11 years.

2. My duties include maintaining an accurate list of members. My colleagues and I provide information to members, acknowledge gifts and volunteer actions, and manage the organization's member databases. My work requires me to be familiar with EDF's purposes, staffing, activities, and membership.

3. EDF is a membership organization incorporated under the laws of the State of New York. It is recognized as a not-for-profit corporation under section 501(c)(3) of the United States Internal Revenue Code.

4. EDF relies on science, economics, and law to protect and restore the quality of our air, water, and other natural resources. EDF employs more than 150 scientists, economists, engineers, business school graduates, and lawyers to help solve challenging environmental problems in a scientifically sound and cost-effective way.

5. It is my understanding that the Bureau of Land Management (BLM) has promulgated waste prevention standards for oil and natural gas production on federal and tribal lands ("waste prevention standards"). These standards are crucial to minimizing the waste of publicly-owned natural gas and will also reduce emissions of volatile organic compounds (VOCs), which form smog; methane, a potent greenhouse gas; and hazardous air pollutants, including benzene, a known human carcinogen. I further understand that BLM has published a rule suspending and delaying the January 2018 compliance dates of all of the key waste prevention provisions in the waste prevention standards. I understand that the rule suspends and delays these dates for one year, until January 2019.

6. EDF has a strong organizational interest, based in its members' recreational, aesthetic, professional, educational, public health, environmental, and economic interests, in protecting public lands and reducing harmful air pollution from the oil and gas sector, including the sources addressed by BLM's waste prevention standards.

7. Through its programs aimed at protecting human health and the environment, EDF has long pursued initiatives at the state and national levels designed to reduce emissions of health-harming and climate-altering air pollutants from all major sources, including the oil and natural gas sector. This work has addressed emissions of methane, as well as VOCs and other harmful pollutants.

EDF participated as a stakeholder during the public comment period for BLM's waste prevention standards, filing comments on the proposed rule.[1] EDF also participated in BLM's Forums on Venting and Flaring of Gas Produced on Public Lands in 2014.[2] After the waste prevention standards were promulgated, EDF intervened to defend the standards in litigation challenging BLM's authority to issue the standards.[3] When BLM issued a notice indefinitely postponing the compliance dates of several key sections of the waste prevention standards, EDF successfully challenged that postponement in this Court.[4]

8. When an individual becomes a member of EDF, his or her current residential address is recorded in our membership database. The database entry reflecting the member's residential address is verified or updated as needed. The database is maintained in the regular course of business and each entry reflecting a member's residential address and membership status is promptly updated to reflect

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[1] Comments of Environmental Defense Fund on BLM Proposed Rule: Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 6616 (April 22, 2016), Document ID No. BLM-2016-0001-8857.

[2] *See* Comments of Environmental Defense Fund on BLM Forum on Venting and Flaring from Oil and Gas Operations on Public and Indian Trust Lands (May 30, 2014), *available at* https://www.blm.gov/style/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.31165.File.dat/BLM_VF_CommentsAll.pdf.

[3] Resp.-Intervenors' Mot. to Intervene, *Wyoming v. U.S. Dep't of the Interior*, No. 2:16-cv-285 (D. Wyo. Dec. 2, 2016).

[4] *California v. U.S. Bureau of Land Mgmt.*, Nos. 17-cv-3804-EDL & 17-cv-3885-EDL, 2017 U.S. Dist. LEXIS 176620, at *7, *13–14 (N.D. Cal. Oct. 4, 2017).

changes. I obtained the information about our membership discussed below from our membership database.

9. EDF currently has over 420,000 members in the United States, and we have members in all 50 states and the District of Columbia. These members likewise have a strong interest in protecting human health and the environment from air pollution. Many live on and near public lands affected by air pollution from oil and gas production. EDF currently has over 135,000 members in the 13 states with significant proportions of BLM-managed lands (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah, Washington, and Wyoming). Over 70,000 of these members are located in California, with over 25,000 located within the jurisdiction of the U.S. District Court for the Northern District of California.

10. I worked with geographic information system (GIS) specialists at EDF to compare the geographic coordinates of members' addresses to those of affected wells using EDF membership data; well location data from the data analytics company Drillinginfo; and ESRI ArcGIS software. EDF's GIS specialists determined that EDF has 39 members who live within a quarter of a mile of a well that is covered by the BLM standards, 398 members who are within a mile of one of these wells, and 14,227 members who are within 10 miles of a covered well.

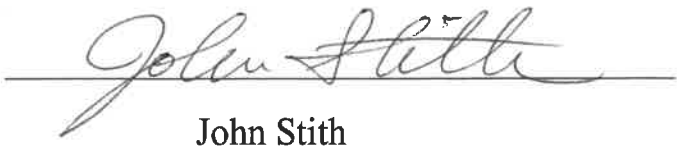
11. I also understand that VOC emissions from oil and gas facilities contribute to ozone formation, which causes and aggravates respiratory diseases such as asthma. EDF has over 34,000 members who live in counties that have oil and gas development subject to the BLM standards, and are designated nonattainment for the 2008 national ambient air quality standards (NAAQS) for ozone. I understand that, in a separate declaration, Dr. Renee McVay and Hillary Hull identified counties that are designated nonattainment for the 2008 NAAQS for ozone and contain wells that are subject to the BLM standards only, and not any state or EPA leak detection and repair requirements.[5] EDF has over 5,400 members who live in those counties. These members, who live in areas already overburdened by unhealthy smog pollution, are particularly vulnerable to the ill effects of oil and gas pollution.

12. I further understand that EDF's members in states with BLM-managed lands benefit from public services funded by royalty revenues from oil and gas production on those lands.

13. If BLM suspends and delays the compliance dates for key provisions of the waste prevention standards, EDF's members will be harmed by the continued waste of public resources, as well as by the continued emission of harmful air pollutants from oil and gas production on federal and tribal lands.

[5] Decl. of Renee McVay & Hillary Hull ¶ 19 & n.5.

I declare that the foregoing is true and correct.



John Stith

Dated: December 15, 2017

# Attachment 22

**Declaration of Dr. Ilissa Ocko**, Environmental Defense Fund

IN THE UNITED STATES COURT OF APPEALS
FOR THE NORTHERN DISTRICT OF CALIFORNIA

**DECLARATION OF DR. ILISSA B. OCKO**

I, Ilissa B. Ocko, declare as follows:

1. I am a Climate Scientist at the Environmental Defense Fund (EDF). I earned a Ph.D. in Atmospheric and Oceanic Science from Princeton University, where I studied the impact of human-emitted greenhouse gases (including methane) and aerosols on Earth's radiative balance and the climate using observational and global climate model-derived datasets. I have written several peer-reviewed papers on the impacts of short-lived climate pollutants on radiative forcing, air temperature, hydrological patterns, and atmospheric and oceanic circulation. My curriculum vitae is attached as Exhibit A.

2. I joined EDF in 2013. At EDF, my work focuses on analyzing the temperature impacts of various climate change mitigation strategies. I use all forms of analytical tools to evaluate climate effects, and I lead an effort to improve simple metrics (i.e. Global Warming Potential) to make clearer the near- and longer-term impacts associated with different types of greenhouse

gas emissions.[1] I work with scientists, government agencies, industries, and nonprofits to advance this effort. I specifically aim to enhance public understanding of climate impacts over all timescales, both near- and long-term.

3. Methane is a considerable driver of near-term climate change, responsible for a quarter of the warming we are experiencing today.[2] Globally, a quarter of human-emitted methane comes from the oil and gas sector.[3] The oil and gas sector is the largest industrial source of methane emissions in the United States, accounting for nearly one-third of U.S. methane emissions.[4] My research includes determining the impacts that methane emission reductions will have on slowing the rate of global warming. Of all methane sources from human activities, reducing waste of gas from oil and gas operations—whether that waste is through venting, flaring, or leaking—presents an

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[1] Ocko, I.B., Hamburg, S.P., Jacob, D.J., Keith, D.W., Keohane, N.O., Oppenheimer, M., Roy-Mayhew, J.D., Schrag, D.P. and Pacala, S.W., *Unmask temporal trade-offs in climate policy debates*, 356(6337) SCIENCE 492-493 (2017).
[2] Calculation from Shindell et al. 2009 of fraction of total positive radiative forcing that methane emissions are responsible for; Shindell, D.T., Faluvegi, G., Koch, D.M., Schmidt, G.A., Unger, N. and Bauer, S.E., *Improved attribution of climate forcing to emissions*, 326(5953) SCIENCE 716-718 (2009).
[3] EPA GLOBAL ANTHROPOGENIC NON-CO2 GREENHOUSE GAS EMISSIONS: 1990-2030, https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases/global-anthropogenic-non-co2-greenhouse-gas-emissions.
[4] *Overview of Greenhouse Gases: Methane Emissions,* EPA.GOV, https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane (last visited Dec. 12, 2017).

important opportunity considering its cost-effectiveness, technological availability, and immediate impacts on climate.

4. For the same mass of carbon dioxide ($CO_2$) and methane emissions, methane can trap 120 times more energy than $CO_2$, both directly from methane as a greenhouse gas and indirectly from the creation of further greenhouse gases: tropospheric ozone, stratospheric water vapor, and $CO_2$.[5] Over a twenty-year period, this number drops to 84 as methane dissipates from the atmosphere more quickly than $CO_2$.[6] The latest science suggests that methane absorbing shortwave radiation in addition to longwave significantly increases its radiative potency by nearly 25%.[7] Including the shortwave component in calculations, the twenty-year number jumps from 84 to 96.

5. Further, through the creation of tropospheric ozone, methane contributes to ground-level ozone, which is harmful to humans and is linked to short- and long-term negative health effects, including shortness of breath, decreased lung function, and chronic obstructive pulmonary disease (COPD). Ozone

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[5] Myhre, Gunnar et al., *Anthropogenic and Natural Radiative Forcing*, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2013), http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf

[6] *Id.*

[7] Etminan, M., Myhre, G., Highwood, E. J., & Shine, K. P. (2016). Radiative forcing of carbon dioxide, methane, and nitrous oxide: A significant revision of the methane radiative forcing. Geophysical Research Letters, 43(24).

also aggravates existing cardiovascular and respiratory conditions, such as asthma, emphysema, and bronchitis, with long-term exposure increasing the risk of death from these conditions.

6. Methane only lasts for approximately a decade in the atmosphere (though its effects can last much longer),[8] because it is oxidized on average after 12.4 years, breaking down and forming other chemical species.[9] Methane reductions, therefore, can rapidly slow the rate of warming.[10]

7. It is crucial to limit both the rate of warming and long-term warming, in order to reduce warming impacts during our lifetimes and for generations to come. Both near-term and long-term warming are associated with specific sets of damages, and all must be reduced. Near-term warming impacts infrastructure, plant and animal species survival rates,[11] extreme events, and

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[8] For example, as discussed below, oceans absorb 90% of the excess heat trapped by greenhouse gases. Therefore, even though the methane is gone and no longer trapping additional heat in the atmosphere, the warming that it had caused is now in the oceans, contributing to sea level rise decades to come. Hu, A., Xu, Y., Tebaldi, C., Washington, W.M. and Ramanathan, V., *Mitigation of short-lived climate pollutants slows sea-level rise*, 3 NATURE CLIMATE CHANGE 730 (2013).

[9] Myhre, *supra* note 5.

[10] Shoemaker, J.K., Schrag, D.P., Molina, M.J. and Ramanathan, V., *What role for short-lived climate pollutants in mitigation policy?,* 342(6164) SCIENCE 1323-1324 (2013); Shindell, D., Kuylenstierna, J.C., Vignati, E., van Dingenen, R., Amann, M., Klimont, Z., Anenberg, S.C., Muller, N., Janssens-Maenhout, G., Raes, F. and Schwartz, J., *Simultaneously mitigating near-term climate change and improving human health and food security*, 335(6065) SCIENCE 183-189 (2012).

[11] Settele, J. et al., *Terrestrial and Inland Water Systems,* CLIMATE CHANGE 2014: IMPACT, ADAPTATION, AND VULNERABILITY. CONTRIBUTION OF WORKING GROUP II

sea level rise.[12] Long-term warming impacts glacial melt, permafrost melt, tipping points, shifts in biomes, and more. Carbon dioxide is the main driver of long-term warming because of its long atmospheric lifetime.[13] Methane emissions are an important driver of near-term warming, and so taking immediate steps to reduce methane emissions can help to immediately impact warming rates.[14] Conversely, allowing near-term methane emissions to persist will accelerate this harmful warming.[15]

8. Warming to date has already negatively impacted every continent and every ocean,[16] and resulted in tropical island villages disappearing,[17] Arctic houses sinking,[18] coral reefs dissolving and dying,[19] mosquito seasons growing

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TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap4_FINAL.pdf.

[12] Hu et al., *supra* note 8.

[13] Myhre et al., *supra* note 5.

[14] Shindell et al., *supra* note 10.

[15] *Id.*

[16] IPCC, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY, SUMMARY FOR POLICY MAKERS, http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5_wgII_spm_en.pdf.

[17] Albert, S., Leon, J.X., Grinham, A.R., Church, J.A., Gibbes, B.R. and Woodroffe, C.D., *Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands*, 11(5) ENVIRONMENTAL RESEARCH LETTERS 054011 (2016).

[18] ALASKA CLIMATE CHANGE IMPACT MITIGATION PROGRAM, https://www.commerce.alaska.gov/web/dcra/planninglandmanagement/accimp.aspx.

[19] Muehllehner et al., *Dynamics of carbonate chemistry, production, and calcification of the Florida Reef Tract (2009-2010): Evidence for seasonal*

weeks longer,[20] and worsened extreme heat events yielding high death tolls.[21] Continuing methane emissions will likely result in more pronounced impacts in the future. Further warming also enhances the risk that the climate surpasses irreversible tipping points that could render long-term climate stabilization difficult or impossible.[22]

9. Reducing emissions of methane will also help to limit sea level rise. Ninety percent of heat that is trapped in the atmosphere gets absorbed by the oceans.[23] While methane only lasts for about a decade in the atmosphere, a substantial fraction of the atmospheric heating that methane causes during

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*dissolution,* 30(5) GLOBAL BIOGEOCHEMICAL CYCLES 661, 661-688 (2016); ONLY 7% OF THE GREAT BARRIER REEF HAS AVOIDED CORAL BLEACHING, http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching.

[20] Muehllehner et al., *Dynamics of carbonate chemistry, production, and calcification of the Florida Reef Tract (2009-2010): Evidence for seasonal dissolution,* 30(5) GLOBAL BIOGEOCHEMICAL CYCLES 661, 661-688 (2016); ONLY 7% OF THE GREAT BARRIER REEF HAS AVOIDED CORAL BLEACHING, http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching.

[21] EXPLAINING EXTREME EVENTS FROM A CLIMATE PERSPECTIVE, https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/; WORLD WEATHER ATTRIBUTION, https://wwa.climatecentral.org/analyses/.

[22] Lenton, T.M., Held, H., Kriegler, E., Hall, J.W., Lucht, W., Rahmstorf, S. and Schellnhuber, H.J., *Tipping elements in the Earth's climate system*, 105(6) PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 1786-1793 (2008).

[23] IPCC, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, SUMMARY FOR POLICY MAKERS (2013), http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf.

this period is absorbed by the oceans, where the warming signal lasts far longer than in the atmosphere. Accordingly, near-term methane emissions can cause sea level rise for decades to come.[24]

10. I am aware that the Bureau of Land Management's (BLM) 2016 rule, "Waste Prevention, Production Subject to Royalties, and Resource Conservation," 81 Fed. Reg. 83,008 (Nov. 18, 2016) ("waste prevention standards"), was projected to reduce waste of natural gas while also reducing methane emissions by 175,000 to 180,000 tons per year through 2026. I am likewise aware that BLM has now issued a rule suspending for one year the compliance dates for key provisions in the waste prevention standards (Suspension Rule).

11. I am also aware that BLM has estimated that the Suspension Rule will lead to the emission of an additional 175,000 tons of methane during the one-year suspension. This is equivalent to the 20-year[25] climate impact of over 3,000,000 passenger vehicles driving for one year or over 16 billion pounds of coal burned. These impacts will be even greater if BLM rescinds the waste prevention standards, as its statements in the Suspension Rule indicate

[24] Hu et al., *supra* note 8.
[25] Calculation uses the IPCC AR5 WGI 20-year GWP. The latest science (see footnote 7, *supra*) suggests that this GWP is 14% higher than what is reported in the IPCC and therefore the number of vehicles would be over 3.5 million and the number of pounds of coal burned would be over 18 billion.

it may do. Once released, methane emissions cannot be removed from the atmosphere and will contribute to both near- and longer-term climate damages, including impacts associated with an increased rate of warming, sea level rise, and others.

I declare that the foregoing is true and correct.

Ilissa B. Ocko

Dated December 15, 2017

# EXHIBIT A

# ILISSA OCKO

**CLIMATE SCIENTIST**
**ENVIRONMENTAL DEFENSE FUND**

Email: iocko@edf.org | Phone: 212-616-1228 | Website: ilissaocko.com | Twitter: @ilissaocko

## OVERVIEW

Ilissa Ocko (married name Seroka) is a climate scientist who is passionate about presenting climate change information in an accessible manner. Her research focuses on understanding the temporal tradeoffs of short- lived and long-lived climate pollutant emissions and mitigation actions. Ilissa is currently a Climate Scientist at Environmental Defense Fund in NYC, where she works with attorneys, economists, and other scientists to find the most practical, long-lasting solutions to climate change.

## EDUCATION

| | |
|---|---|
| Ph.D. | Atmospheric & Oceanic Sciences, Princeton University, 2013 |
| M.A. | Atmospheric & Oceanic Sciences, Princeton University, 2010 |
| B.S.E | Earth System Science & Engineering, magna cum laude, University of Michigan, 2008 |

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| 2015— | Climate Scientist, Environmental Defense Fund (EDF), New York, NY<br>Support all climate-related activities at EDF and pursue scientific research |
| 2014-2015 | Kravis Postdoctoral Science Fellow (with Dr. Steven Hamburg), EDF, New York, NY<br>Conducted research on short-lived climate pollutant mitigation strategies |
| 2013-2014 | High Meadows Postdoctoral Fellow (with Dr. Steven Hamburg), EDF, New York, NY<br>Framed EDF's long-term climate vision and convened expert workshops |
| 2012-2013 | Research Assistant (with Dr. V Ramaswamy), Princeton University<br>Studied aerosol radiative forcings and climate responses using climate models |
| 2009-2012 | NSF Graduate Research Fellow (with Dr. V Ramaswamy), Princeton University<br>Studied aerosol radiative forcings and climate responses using climate models |
| 2008-2009 | AMS Industry/Gov't Graduate Fellow (with Dr. V Ramaswamy), Princeton University<br>Studied transport of aerosols to the Arctic |
| 2007-2008 | Research Assistant (with Dr. Christiane Jablonowski), University of Michigan<br>Analyzed how small-scale atmospheric eddies interact with large-scale circulation |
| 2007 | NOAA Hollings Scholar (with Taneil Uttal), NOAA ESRL, Boulder, CO<br>Researched historical air-flow patterns for Arctic locations using HYSPLIT model |
| 2006-2007 | Research Assistant (with Dr. Mary Anne Carroll), University of Michigan<br>Explored the linkage between ozone levels and air flow in northern Michigan |
| 2006 | Field Researcher (with Drs. Perry Samson & Robert Clauer), Greenland<br>Set up instruments to measure atmospheric conditions in Greenland locations |
| 2006 | REU Participant (with Dr. Mary Anne Carroll), UMBS, Pellston, MI<br>Examined the climatology of northern Michigan to determine pollution exposure |
| 2005-2006 | Research Assistant (with Dr. Daniel C. Fisher), Undergrad Research Opp. Program, UM<br>Casted models of mastodon skeletons and pieced together excavated tusks |

## SCIENCE COMMUNICATIONS EXPERIENCE

2017— Founder, Good Climate News
Manage a Twitter account that collates all of the good climate change news

2016— Founder, @theclimatepicture
Manage and develop daily original climate infographics for social media (Instagram)

2016 Climate Science Consultant, UCAR Center for Science Education
Provided guidance and content for climate change exhibit

2015— Reviewer, Climate Feedback
Review the scientific integrity of climate change media articles

2015 Contributor, More Than Scientists
Contributed several videos with 15-30 second climate change snippets

2014— Speaker, Climate Voices
Speak with different local communities about climate change causes, impacts, solutions

2011— Graphic Designer, freelance
Develop science infographics to for blogs, research articles, news stories
*Select clients*: Stanford University, Princeton University, Climate Central

2009-2010 Conference Organizer, High Meadows, Princeton University
Co-organized a daylong environmental sustainability conference for students and public

2007-2008 Chief Meteorologist, WOLV-TV, University of Michigan
Managed weather anchors of student-run television network news program

2006-2008 Weather Anchor, WOLV-TV, University of Michigan
Forecasted and broadcasted weather on student-run television network news program

## FIELDS OF SPECIALIZATION

Radiative Forcing, Short-Lived Climate Pollutants, Climate Modeling, Climate Metrics

## HONORS AND AWARDS

| | |
|---|---|
| Finalist, International Famelab Competition, Cheltenham UK | 2016 |
| Winner & Audience Favorite, NASA FameLab USA Finals, Washington DC | 2016 |
| Winner & Audience Favorite, NASA FameLab USA Semi-Finals, San Francisco CA | 2015 |
| Wildcard, NASA FameLab Regional Heat, San Francisco CA | 2014 |
| Aspen Ideas Festival Scholar, Aspen Ideas Festival, Aspen CO | 2014 |
| Emerging Alumni Scholars Award, Princeton University—given to three graduate students | 2013 |
| Award for Outstanding Poster Presentation, World Climate Research Programme | 2011 |
| Outstanding Student Poster Presentation, American Meteorological Society (AMS) | 2011 |
| National Science Foundation Graduate Research Fellowship | 2009-2012 |
| AMS Industry/Government Graduate Fellowship, NOAA Climate Program Office | 2008-2009 |
| Order of Omega National Honor Society | 2008 |
| First Place Winner, UM Best Student Paper on Environmental Issues & Climate Change | 2007 |
| Weather Underground Inc. Scholarship, AOSS Department, Univ. of Michigan | 2007 |
| Delta Epsilon Iota Academic Honor Society | 2007 |
| Eliza Ann Roark Scholarship, Chi Omega Fraternity, Univ. of Michigan | 2006 |
| Marian Sarah Parker Scholarship, College of Engineering, Univ. of Michigan | 2006-2008 |
| Ernest F. Hollings Scholarship, National Oceanic and Atmospheric Administration | 2006-2008 |

## PROFESSIONAL ASSOCIATIONS

Union of Concerned Scientists
Climate Access
Earth Science Women's Network
American Meteorological Society
American Geophysical Union

## SERVICE

American Geophysical Union Sharing Science Advisory Board, 2016—
Climate Feedback reviewer, 2016—
More Than Scientists participant, 2015—
Climate Voices Science Speakers Network, 2013—

## CERTIFICATES

Science, Technology, and Environmental Policy Certificate, Woodrow Wilson School, Princeton, 2012
Co-authored climate change mitigation strategies report for U.S. DOE and EPA, attended 22nd UN Montreal Protocol Meeting, wrote policy memos/reports, researched how climate metrics impact policy

Arctic Climate Change Certificate, Summer School, University Centre in Svalbard, Svalbard, 2009

Physics of the Climate System Certificate, Summer School, Utrecht Univ., Utrecht, Netherlands, 2008

## PUBLICATIONS

Ocko, IB, V Naik, D Paynter. Towards rapid yet credible assessment of methane impacts on climate, in preparation for Environmental Research Letters (2017)

Ocko, IB, SP Hamburg, DJ Jacob, DW Keith, NO Keohane, M Oppenheimer, JD Roy-Mayhew, DP Schrag, SW Pacala, Unmask temporal trade-offs in climate policy debates, Science, 356, 6337, p.492-493 (2017)

Ocko, IB, P Ginoux, Comparing multiple model-derived aerosol optical properties to spatially collocated ground-based and satellite measurements, Atmos. Chem. Phys., 17, 4451-4475, doi:10.5194/acp-17-4451-2017 (2017)

Ocko, IB, V Ramaswamy, Y Ming, Contrasting climate responses to the scattering and absorbing features of anthropogenic aerosol forcings, J. Climate, 27, doi:10.1175/JCLI-D-13-00401.1 (2014)

Ocko, IB, V Ramaswamy, PA Ginoux, Y Ming, LW Horowitz, Sensitivity of scattering and absorbing aerosol direct radiative forcing to physical climate factors, J. Geophys. Res., 117, doi:10.1029/2012JD018019 (2012)

Ocko, IB, Hot Seat in Our Warming World, Science, 337, 6092, p. 296, doi:10.1126/science.1224878 (2012)

Bankuti, M, B Ellis, M Frades, D Kanter, J Losh, I Ocko, J Roy-Mayhew, P Shevlin, C Sierawski, A Wasserman, J Zuckerman, D Mauzerall, Complements to carbon: Opportunities for near-term action on non-CO2 climate forcers, Policy Report, Princeton University (2011)

## CONFERENCE PRESENTATIONS

Ocko, IB, SP Hamburg, S Pacala, Balancing short- and long-lived climate pollutant mitigation: Clearer metrics are critical, AGU Fall Meeting, San Francisco, CA (2015)

Ocko, IB, How to be more attractive… when communicating science, invited, AGU Fall Meeting, San Francisco, CA (2015)

Ocko, IB, SP Hamburg, S Pacala, Balancing short- and long-lived climate pollutant mitigation: Clearer metrics are critical, Our Common Future Under Climate Change, Paris, France (2015)

Ocko, IB, V Ramaswamy, Climate responses to gases and aerosols from 1860 to 2000, AGU Fall Meeting, San Francisco, CA (2012)

Ocko, IB, V Ramaswamy, Offsetting roles that black carbon and sulfate play in climate change, Princeton Graduate Student Symposium, Princeton, NJ (2011)

Ocko, IB, V Ramaswamy, Offsetting roles that black carbon and sulfate play in climate change, World Climate Research Program Open Science Conference, Denver, CO (2011)

Ocko, IB, V Ramaswamy, Offsetting and complementary characteristics of sulfate and soot direct radiative forcings, 90th Annual AMS Meeting, Seattle, WA (2011)

## INVITED TALKS

Climate Corps Professional Development Webinar Series, Climate Change: What The Science Really Says About Skeptic Arguments, invited presenter, April 4 2017

COP-22 Side Event, 21st Century Regional Climate in a Warming World, invited speaker, November 7 2016

Old Bridge Public Library, Inquire Science Series, invited speaker, July 31 2016

Georgetown University, Mathematics and Climate Change, guest lecturer, July 27 2016

Baba Brinkman's Rap Guide to Climate Chaos, invited talkback guest, Soho Playhouse, New York, NY, July 23 2016

AGU Fall Meeting, Sharing Science in Plain English panel, invited panelist, San Francisco, CA, December 15 2015

Saddle River Day School, School Assembly, invited speaker, Saddle River, NJ, December 2 2015

Clearwater's Great Hudson River Revival, Climate Change is here; Climate Change is now, invited speaker, Croton-on-Hudson, NY, June 20-21 2015

Stony Brook University, School of Marine and Atmospheric Sciences, Department Seminar, "Contrasting Climate Responses of Absorbing and Scattering Aerosol Radiative Forcings," May 6 2015

Trinity Episcopal, GreenFaith Day, speaking with husband about climate change, April 26 2015

KidSpirit Table Talk, Climate Change: Tending Our Planet, invited panelist, "What we know about the science of climate change," New York, NY, April 19 2015

Miller's Run School, 8th Grade classroom, Teacher Patricia Norsworthy, "Climate Change: Causes, Impacts, Solutions," January 22 2015

American Meteorological Society Student Conference, Annual Meeting, "Experiences Beyond the Classroom," "Getting the word out: Science Policy and Communication," invited panelist, January 3 2015

Rutgers University, SEBS International Programs, Career Panel, invited panelist, November 14 2014

Princeton University, Atmospheric and Oceanic Sciences, Student Seminar, invited speaker, "Bridging Science and Advocacy as a Career," October 23 2014

Wells Fargo, Overview of Intergovernmental Panel on Climate Change 2013/2014 reports, May 8 2014

Watkinson High School, 9th Grade classroom, Teacher Jennifer O'Brien "A young climate scientist's professional journey," February 21 2014

Rutgers University, SEBS International Programs, Career Panel, invited panelist, November 8 2013

## MEDIA

Thomson Reuters TV, television interview, November 22 2016

Powerful Conversations, VoiceAmerica, invited guest, radio show, http://www.sparkpluglabs.co/powerful-conversations/episode50, June 21 2016

KXRY-FM in Portland, OR, invited guest, radio interview, "Hope for the Climate," December 24 2014

## BLOG POSTS

As a non-political scientist I don't march – until now, April 25 2017 | EDF Voices

Take these first steps to lower your impact on climate change, April 21 2017 | Climate411

How Do We Know That Humans Are Causing Climate Change? These Nine Lines of Evidence, March 23 2017 | Climate411

Brutal Southeast fire season may not be freak event. That's why taxpayers should care, December 8 2016 | EDF Voices

Climate change is messing with clouds – and it's a really big deal, August 24 2016| EDF Voices

How Hot It Gets Vs. How Fast: Understanding The Two Kinds Of Climate Pollution, May 17 2016 | EDF Energy Exchange

How Hot It Gets Vs. How Fast: Understanding The Two Kinds Of Climate Pollution, May 16 2016 | Energy Exchange

The Impacts of Climate Change on Human Health – a Sobering New Report, April 5 2016 | Climate411

3 reasons the Zika outbreak may be linked to climate change, February 16 2016 | EDF Voices

Human emissions just cancelled the next ice age. Here's why we should care, February 11 2016 | EDF Voices

Why we can't blame El Niño for the hottest year on record, January 5 2016 | EDF Voices

Scientist fact-checkers join new push to call out climate errors in news media, December 10 2015 | EDF Voices

9 million acres and counting: Will wildfires keep spreading with climate change?, September 30, 2015 | EDF Voices

Why a "Godzilla" El Niño won't end California's drought, August 27 2015 | EDF Voices

Methane and CO2: Why climate action means addressing both, August 12 2015 | EDF Voices

Sobering climate science: Extreme weather on the rise, July 23 2015 | EDF Voices

6 climate tipping points: How worried should we be?, May 28 2015 | EDF Voices

On El Niño, snowballs and real climate science, March 6 2015 | EDF Voices

Giant pandas face greatest threat yet: A hotter world, February 4 2015 | EDF Voices

This is how climate scientists should talk, December 17 2014 | EDF Voices

Climate hope amid melting ice, rising temps, December 10 2014 | EDF Voices

Why California thirsts for rain and the East Coast gets soaked, October 14 2014 | EDF Voices

How scientists linked the California drought to climate change, October 2 2014 | EDF Voices

Why "slowed" global warming is not what it seems, September 16 2014 | EDF Voices

Why those huge craters in Siberia are a climate wake-up call, August 11 2014 | EDF Voices

Why offshore wind energy should be on our radar, August 6 2014 | Global CCS Institute (Decarboni.se)

Moral Optimism of Climate Change, July 23 2014 | Global CCS Institute (Decarboni.se)

Bundle up, the polar vortex returns - but is it climate change?, July 15 2014 | EDF Voices

Taking the Earth's Historical Temperature, July 4 2014 | The Toast

Study: Climate change may push hurricanes farther north, south, June 2 2014 | EDF Voices

Crafting Your Own Visuals for Science Communication: Part I, May 7 2014 | The Plainspoken Scientist

New report: How climate change is impacting where you live, May 6 2014 | EDF Voices

Top takeaways from the latest IPCC report, April 14 2014 | EDF Voices

6 key insights from the latest IPCC climate report, March 31 2014 | EDF Voices

Crafting Your Own Visuals for Science Communication: Part II, May 22 2014 | The Plainspoken Scientist

Four reasons why the climate is still changing, despite the cold, March 18 2014 | EDF Voices

How an EDF scientist explains climate change in 30 seconds, March 13 2014 | EDF Voices

Why your car is covered with an inch of ice, instead of a foot snow!, March 8 2014 | Dan's Wild Wild Science Journal

Slowed global warming? New data suggests otherwise, December 23 2013 | EDF Voices

Geoengineering: A cure worse than the disease?, December 11 2013 | EDF Voices

Disinformation Spreads Confusion about the Reality of Climate Change, October 21 2013 | EDF Voices

New study projects when and where radically warmer temps will hit first, October 11 2013 | EDF Voices

Seven Things You Should Know about the U.N.'s New IPCC Climate Change Report, September 27 2013 | EDF Voices

# Attachment 23

**Declaration of Wade Sikorski**, Montana Environmental Information Center

# DECLARATION OF WADE SIKORSKI

I, Wade Sikorski, PH.D., hereby state as follows:

1. I am over eighteen years of age and a citizen of the United States. The facts and opinions set forth in this declaration are based on my personal knowledge and experience. If called as a witness in these proceedings, I could and would testify competently to these facts and opinions.
2. I live on my family's ranch approximately 20 miles south of Baker, Montana. My great-grandfather homesteaded the land where I live in 1911. I have lived on the ranch for my entire life, except my years spent in college and graduate school and one year working in New Mexico. I expect to live in Montana the rest of my life.
3. I am a member of Montana Environmental Information Center ("MEIC"). I have been a member of MEIC since the early 1990s. I first became involved with MEIC because of concerns I had about a PCB incinerator moving to my community and the risks it posed to human health and the environment.
4. I have an undergraduate degree from the Montana State University at Bozeman and a Ph.D. in political science from the University of Massachusetts at Amherst. My academic specialty is in contemporary political theory and political ecology, subjects on which I have published books and articles.
5. I work on my family's ranch from spring to fall, and write books and articles during the winter. We raise wheat, lentils, safflower, corn, canola, and peas on our farmland. And we raise several hundred head of cattle on our pastures.
6. The earth-sheltered house that I built as I was finishing my dissertation is just below a hill that is one of the highest points between Baker and Ekalaka. From my house, as a result,

I can see to the Ekalaka Hills, about 15 miles to the south. To the west, I can see the pine covered hills outside of Miles City—perhaps 50 miles away. To the southwest, I can also see a good part of the distance to Broadus. I have no idea how far away the horizon is, but I imagine that if I went to the last ridge that I can see, I might be looking down into the valley where Broadus is. To the northeast, I can see the Diamond Willow wind farm outside of Baker. At night I can see the lights flashing on the wind farms near Rhame in North Dakota. Much of this land is managed by BLM and is open to oil and gas development.

7. There is a long history of oil development in our area. My family ranch has about half a section of BLM land. When I was a child, an oil well was drilled on our property, and several others were drilled in our immediate area, though none of them were ever put into production. Since then, we have had different seismograph crews on our place, trying to find oil. We are about 10 miles south of where a substantial oil field near Baker is producing oil, and which I have been told was one of the first fields to use horizontal drilling and fracking.

8. My property overlooks a large area that is open to oil and gas development under the Miles City Resource Management Plan ("RMP") and is deemed to have "medium" potential for such development. *See* Miles City Proposed RMP/Final Environmental Impact Statement ("EIS"), Map 5, "Oil and Gas Development Potential." Under the RMP, significant portions of this area will not have any oil and gas leasing restrictions. *See* Miles City Proposed RMP/Final EIS, Map 12, "Oil and Gas Leasing Restrictions Proposed Plan."

9. Given the long history of oil development in our area, the still-undeveloped oil reserves nearby, and the fact that the Miles City RMP makes available a large area for oil and gas development nearby, I am concerned about the impacts of oil and gas development on my family's land and my community. Drilling and fracking continues north of our place, and I hear talk from people working in the oilfield about exploring a deeper formation than the one producing oil now, and I see from maps that it might extend beneath our land. There are also leases near me in Custer and Carter counties that impact the area I live in.
10. I travel throughout Fallon, Custer, and Carter Counties on an almost daily basis and will do so well into the future, sometimes for work, sometimes just to meditate on the shifting seasons, the wandering wildlife, the shape and contour of the land. Seeing vast areas of undisturbed BLM land in my area is one of the greater joys in my life. They are also an opening into philosophical and spiritual meditation for me.
11. Although my family ranch does not have any operating oil wells, I live close enough to the Baker oil field to know what the consequences of fossil fuel development are—noise, pollution, harm to the land, disruption of wildlife behavior, and economic cost.
12. The BLM's recently-promulgated waste prevention and resource conservation rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016), would reduce the harmful impacts of oil and gas development to my family's land and my community.
13. I understand that the BLM has finalized a rule suspending the most significant requirements of the Waste Prevention Rule, including a provision that requires operators to meet monthly capture targets for methane waste from oil and gas wells on BLM-administered leases (Section 3179.7), a provision that requires operators to measure or estimate flared or vented gas (Section 3179.9), provisions that address gas losses from

pneumatic controllers and venting from storage vessels, which "vent" and "bleed" methane gas into the atmosphere (Sections 3179.201 and 3129.203), and provisions that address methane leak detection and repair (Sections 3179.301-305). I understand that the Suspension Rule leaves BLM with no national regulations or guidance limiting waste from federal or tribal leases.

14. If not suspended, the Rule's waste prevention measures would decrease volatile organic compound emissions (VOCs), one of the primary components of natural gas, and thus will reduce ozone formation. The Rule would benefit me because it would reduce ozone, and ozone has been shown to inhibit the growth of vegetation, including crops. The suspension of the Rule would harm me because it would allow the formation of ozone, which would damage my family's farmland.

15. If not suspended, the Rule would also benefit my health through reductions in ozone. I typically run 15 to 20 miles a week on the gravel road leading to my house to protect my health. I do aerobic exercise because I have a chronic infection of Lyme disease that I caught when I was going to graduate school in Massachusetts. The bacteria, which scientists have proven can survive even massive doses of antibiotics, are anaerobic, so aerobic exercise, which increases the flow of oxygen through my body, helps keep my chronic Lyme infection under control. I know that ozone has long been recognized to cause adverse health effects. Exposure to ozone can cause or exacerbate respiratory health problems—including shortness of breath, asthma, chest pain and coughing, can decrease lung function, and can even lead to long-term lung damage. Short-term exposure to ozone causes multiple adverse respiratory effects, from inflammation of airways to more serious respiratory effects that can lead to use of medication, hospital admissions,

emergency room visits, and chronic obstructive pulmonary disease ("COPD"). According to a recent report by the National Research Council ("NRC"), short-term exposure to current levels of ozone in many areas is likely to contribute to premature deaths. Long-term exposure may also increase risk of death from respiratory problems. Short- and long-term exposure to elevated levels of ozone can also harm people's hearts and cardiovascular systems. By helping me breathe easier when I exercise, lower levels of ozone help me keep my chronic Lyme disease infection under control. The suspension of the Rule would harm me because it would allow the formation of ozone, which would negatively impact my health when I run, or discourage me from running as often as I should to best control my chronic Lyme disease.

16. If not suspended, the Rule would also decrease emissions of hazardous air pollutants, including carcinogens like benzene, and particulate matter and nitrogen oxides, providing additional health benefits to me. The suspension of the Rule would harm me because it would allow the release of air pollutants that negatively impact my health.

17. If not suspended, the Rule would also reduce venting and flaring, which would improve visibility by reducing ozone, nitrogen oxides, and particulate matter emissions, improving my opportunity to see and enjoy the landscape that surrounds my family's ranch. The suspension of the Rule would harm me because it would decrease visibility, marring the beauty of the clear skies and natural landscape surrounding my family's ranch, which I treasure.

18. If not suspended, the Rule would also provide additional royalties which would be allocated to Montana and other states to spend in areas impacted by mineral development for planning, public facility construction and maintenance, and public service provision. I

would benefit from these expenditures in my community. The suspension of the Rule would harm me by reducing these expenditures in my community.

19. By reducing the release of methane, a potent greenhouse gas, the Rule would also ameliorate the global warming that is threatening my family's farm and ranch operation. As a result of my experiences with changing weather patterns and hydrological cycles on my family's ranch, I am increasingly alarmed by the impact that global warming is having on our ecosystems, our economy, our political system, our health, and our spiritual well-being. As climate scientists have long been warning us, global warming is happening, is human caused, and will threaten our civilization if we continue using fossil fuels as we have.

20. As a farmer, I have the deepest reservations about my family's ability to operate our ranch, producing the food we all need, unless BLM continues to take the sort of action that it took in the Rule to reduce greenhouse gas emissions. I am 61 years old now, and well enough experienced with how drought, heat, and extreme weather events like hail can impact crop production to know how global warming is going to turn out. I know how insects like grasshoppers thrive when it is hot and dry, and how extreme weather events like drought, heat waves, tornadoes, and hail storms are becoming more common and disruptive. And I know that we just cannot continue as we have if the children of today are going to have the life they deserve to have. The suspension of the Rule would harm me by contributing to the global warming that threatens my livelihood as a farmer.

21. The state of Montana does not do enough to control methane waste. I understand that Montana places only limited restrictions on venting, flaring, and liquids unloading, while failing to address methane waste caused by major maintenance activities for oil or gas

wells, gas-driven controllers, compressors, and storage tanks. Montana also does not require leaks to be located and repaired, and does not require drillers to submit plans showing how they will get the methane they produce to market or use it to power their operations. Federal standards are urgently needed to control the venting, flaring, and leaking of natural gas in Montana.

22. The Suspension Rule will harm my health, recreational, and aesthetic interests by allowing oil and gas operators to continue to vent, flare, and leak large amounts of natural gas, which degrades my local air quality as well as contributes to climate change that affects my farming and ranching operations.

23. If the Suspension Rule is not preliminarily enjoined, I will experience immediate harms to my interests, as detailed above. For example, suspension of the Rule will allow the formation of more ozone, which is of special concern to me because I am getting older—I am now in my sixties—and ozone has been shown to be particularly harmful to the health of people my age. Additionally, I am worried that the increased ozone caused by suspension of the Rule will decrease the amount of time that I can spend exercising outdoors, thereby worsening my chronic Lyme disease. Hazardous air pollutants caused by poorly controlled venting, flaring, and leaks from development near my family's ranch pose an additional health risk to me. Reduced visibility from increased methane waste from nearby development will also decrease my enjoyment in viewing the landscape that surrounds my family's ranch, from which I currently derive both aesthetic pleasure and spiritual sustenance.

I declare, under penalty of perjury, that the foregoing is true and correct.

DATED: 12/15/2017

Wade Sikorski

# Attachment 24

**Declaration of Michael A. Saul**, Center for Biological Diversity

# DECLARATION OF MICHAEL A. SAUL

I, Michael A. Saul, hereby declare as follows:

1. I have personal knowledge of the matters stated herein and, if called as a witness, could and would competently testify thereto.

2. I have been both a member and employee of the Center for Biological Diversity ("Center") since 2014. I am currently employed as Senior Attorney for the Center's Public Lands Program. In this role, I engage in administrative and legal advocacy to protect wildlife and wildlife habitat on public lands and work towards mitigating adverse impacts of public lands fossil fuel development.

3. The Center is a membership based 501(c)(3) non-profit corporation incorporated in California, with a principal place of business at 1212 Broadway, St. #800 Oakland, CA 94612. In addition to our California headquarters in Oakland, the Center has several other offices in the Northern District of California, including offices in San Francisco, Petaluma, and Shelter Cove, and throughout the state in Los Angeles, Joshua Tree, Sacramento, and Mount Shasta. In total, the Center has 48 employees living and working in California.

4. The Center's primary mission is to protect threatened and endangered species and their habitats in both the United States and abroad. Although we pursue these objectives nationwide, much of our work is in California. The Center specifically works to protect public lands administered by the Bureau of Land Management in the Northern District of California from the harmful impacts of oil and gas development, including methane emissions.

5. The Center is a membership-based nonprofit that relies upon the voluntary contributions of members, supporters, and donors to support its operations. Based on review of the Center's membership database, as of August 4, 2017, the Center has over 58,500 members, including

13,295 in California, and more than 1.3 million online supporters worldwide. 4,158 of these members reside in the Northern District of California. Specifically we have 1,235 members in Alameda County, 560 members in Contra Costa County, 18 members in Del Norte County, 191 members in Humboldt County, 27 members in Lake County, 549 members in Marin County, 128 members in Mendocino County, 176 members in Monterrey County, 77 members in Napa County, 11 members in San Benito County, 735 members in San Francisco County, and 453 members in San Mateo County.

6. Center members live adjacent to and/or have visited public lands affected by oil and gas development in California, Colorado, Wyoming, New Mexico, Utah, and other states for recreational, scientific, educational, and other pursuits and intend to continue to do so in the future. The Center advocates on behalf of members interested in protecting the many native, imperiled, and sensitive species and their habitats that may be affected by oil and gas development, and in protecting the quality of the air we breathe.

7. The Center has been engaged in a campaign to research, document, and raise awareness of environmental consequences of oil and gas development and hydraulic fracturing in California. This campaign includes, among other efforts, publication of reports on aquifer contamination and seismic risks from oil and gas activities; a statewide campaign to rally local governments, including Monterey County, to prohibit hydraulic fracturing; and litigation over Bureau of Land Management oil and gas leasing activities on California public lands.

8. In 2011, the Center sued the Bureau of Land Management over its oil and gas leasing activities in the Northern District of California, including its failure to consider the impacts of hydraulic fracturing. In that case, the district concluded that the Bureau had failed to consider how hydraulic fracturing could affect public lands in the Northern District, *Center for Biological Diversity v. Bureau of Land Management,* 937 F. Supp.2d 1140 (N.D. Cal. 2013).

9. In September 2012, the Center, along with Clean Air Task Force and the Western Environmental Law Center, petitioned the Secretary of the Interior update BLM regulations, notices to lessees (NTLs), and orders governing oil and natural gas leases on federal leases to minimize the significant leakage of methane that currently occurs during oil and natural gas activities on federal oil and gas leases.

10. In 2016, the BLM finalized its updated rules on waste prevention, production subject to royalties, and resource conservation, adopting in part although not in total certain rule changes requested in the 2012 Petition. The BLM's final rule ("Waste Prevention Rule") is codified at 81 Fed. Reg. 83,008 (Nov. 18, 2016).

11. On April 20, 2016, the Center, along with Friends of the Earth, submitted written comments on the BLM's then-proposed regulations to reduce waste of natural gas from venting, flaring and leaks during oil and natural gas production.

12. The Center also participated in joint technical comments on the proposed rule submitted on behalf of numerous conservation groups by the Western Environmental Law Center.

13. Although the BLM's final methane waste prevention rule does not fully address the Center's concerns with waste of methane, it represents a significant step forward in addressing the rampant waste of methane from oil and gas operations on public and tribal lands. The rule is a much-needed update to waste guidance that was adopted 36 years ago.

14. Numerous provisions of the Waste Prevention Rule, including monthly capture targets for capture of methane waste from BLM-administered oil and gas leases, are due to take effect in January 2018 under the final rule.

15. Opponents of the Rule attempted to prevent it from being implemented by seeking a preliminary injunction in the U.S. District Court for the District of Wyoming and lobbying Congress to repeal the Rule using the Congressional Review Act. The court denied the preliminary injunction on January 16, 2017. Thus, the Rule went into effect as scheduled on January 17, 2017. On May 10, 2017, the Senate rejected a motion to proceed with a vote to repeal the Rule under the Congressional Review Act, effectively ending efforts to repeal the Rule under that Act.

16. On June 15, 2017, the Secretary of the Interior issued a stay notice, 82 Fed. Reg. at 27,430, delaying the deadline for oil and gas operators on public land to enter into compliance with the January 2018 compliance deadlines in the Waste Prevention Rule. This stay was later found unlawful by the U.S. District Court for the Northern District of California.

17. One day after the Court reinstated the Waste Prevention Rule, the Secretary of the Interior proposed a new rule (the "Compliance Revision Rule") to delay the Waste Prevention Rule's compliance dates for a year. The Compliance Revision Rule was adopted and finalized December 8, 2017. 82 Fed. Reg. 58050 (Dec. 8, 2017).

18. If the Compliance Revision Rule is not enjoined, implementation of the standards of the Waste Prevention Rule would have a significant benefit in mitigating the impacts from BLM-administered oil and gas development on my and Center members' health, recreational opportunity, and interest in mitigating the worst impacts of climate change.

19. The Center's members have diverse interests including natural history, ecology, conservation, wildlife and native plant observation, nature photography, hiking, camping, backpacking, quiet and solitude in nature, dark skies, fishing, and a love of public lands and natural landscapes. The Center's members enjoy and use BLM-managed federal land, including

in California, Colorado, New Mexico, and Wyoming, as places to pursue these activities now and into the future. The Center's members expect and rely upon the BLM to protect the species, habitats, viewsheds, and air and water quality of these lands.

20. The updated waste rule will better protect the interests of the Center and its members. Center members live in states, including but not limited to California, Colorado, Montana, New Mexico, Utah and Wyoming where oil and gas is currently being developed, or may be developed in the future on federal public lands and/or minerals.

21. Numerous Center members, including myself, recreate, observe wildlife, conduct scientific research, and take photographs on public lands near where oil and gas development is occurring or has been proposed. Other members reside on "split estate" lands where the federal government owns the minerals underlying the property, or live in close proximity to federal lands where oil and gas development has been proposed.

22. In addition to the Center's institutional interest in public lands, I personally for many years have hiked, taken photographs, and observed wildlife on BLM lands affected by oil and gas development. Since 2002, I have regularly visited the Atlantic Rim area of Southern Wyoming, an area of public land administered by the BLM's Rawlins Field Office. In the Atlantic Rim area, I have personally observed and photographed wildlife including Greater Sage-Grouse, pronghorn, and mule deer. I intend to return to visit Atlantic Rim again in the future, and to share this area with my children. My aesthetic enjoyment of the area has been impaired by vegetation removal, noise, light, odor, and loss of natural character due to BLM-administered oil and gas development in the area.

23. BLM's Waste Prevention Rule will require or incentivize oil and gas operators to take measures to reduce natural gas waste from BLM-administered mineral leases. The Rule's

reductions in venting, leaking, and flaring will decrease volatile organic compound emissions that contribute to the formation of ozone. Ozone contributes to asthma, emergency room visits, and premature mortality, and its reduction will improve the health of the Center's members.

24. In October of 2015, EPA revised the health-based ambient air quality standard for ozone pollution to 70 parts per billion. I and my family personally live in an area, the Denver/Northern Front Range nonattainment air that has ozone levels well above 70 parts per billion, and above even the earlier standard of 75 parts per billion.

25. Numerous provisions of the rule that would reduce venting, flaring, and leaking of methane, and resultant ozone formation, will be delayed by the Secretary's suspension rule. These include Section 3179.7, requiring monthly methane capture targets; Section 3179.9, requiring measurement or estimation and reporting of flared and vented methane; Section 3179.201, regulating gas losses from pneumatic controllers; and Sections 3179.301 to 3179.305, addressing leak detection and repair. Delay of these sections will, in addition to permitting wasteful and needless waste of publicly-owned gas during the period of delay, result in additional emission of ozone precursors in the Denver/Northern Front Range nonattainment area, adversely affecting the health, recreational opportunity, and quality of life of Center members, myself, and my family and friends.

26. I personally reside within the Denver metro/northern Front Range ozone nonattainment area for Colorado. Ozone levels above national air quality standards, caused in significant part by Front Range oil and gas development, contribute to unhealthy levels of atmospheric ozone. Based on the Denver area's elevated ozone, I have substantial concern for the respiratory health of my family and children.

27. In addition to reducing the risk to the health of our members, the Rule will also protect and enhance plant life. Ozone also inhibits vegetation growth. Reduced ozone levels as a result of the Rule's limits and incentives will benefit Center members who farm, ranch, and observe and study native plants, as well as protect local ecosystems that our members enjoy for hiking, camping, and other recreation.

28. The Rule will also decrease emissions of hazardous air pollutants, including carcinogens like benzene, and particulate matter and nitrogen oxides, providing additional health benefits to Center members and local ecosystems.

29. The Rule would also have additional co-benefits, including preventing the emission of volatile organic compounds ("VOCs"), which make up about 3.5 percent of the volume of natural gas emissions, and include the particularly harmful BTEX compounds—benzene, toluene, ethyl benzene, and xylene. VOCs cause a wide range of harms, including damage to the brain and nervous system. Thus, the Rule would provide substantial environmental, health, and economic benefits to Center members.

30. Reduced venting and flaring as a result of the Rule will also improve visibility by reducing ozone, nitrogen oxides, and particulate matter emissions, improving recreational opportunities for the Center's members. Likewise, flaring reductions will benefit the Center's members who experience noisy and unsightly flares throughout the day and night near their homes or in the areas where they enjoy recreating.

31. If industry compliance with the Waste Prevention Rule is delayed, the aforementioned benefits will be delayed and reduced. Center members would face increased health risks posed by ozone, hazardous air pollutants, and particulate matter. Damage from these pollutants to the landscape and the environment also would diminish those members'

enjoyment0020from recreating on federal public lands. The Center's members will lose the increased royalties paid under the Rule that would benefit their communities.

32. If compliance with the Waste Prevention Rule is delayed, I will also suffer personal harm due to increased health risks and reduced outdoor recreational opportunity for myself and my family due to BLM-administered oil and gas operations affecting ozone levels within the Denver/Northern Front Range ozone nonattainment area.

33. The benefits to the public of reducing methane emissions through compliance with the Rule can and have been monetized. These monetary benefits are based on estimates of the social cost of carbon and methane that have been developed by the Interagency Working Group on Social Cost of Carbon and recent work on the social cost of methane. Given limitations in the models used to derive these estimates, such as underestimating the warming potential of methane, the exclusion of catastrophic impacts and other unqualified damages, and lack of consideration of feedback effects, these models are likely to substantially underestimate the benefits of avoiding methane emissions. On the basis of the social cost of methane and other (overly) conservative assumptions, the BLM estimates that the Rule's net benefits could range from $46 to $204 million per year. These figures incorporate both the social benefits of reducing methane emissions and additional revenues for operators from sale of recovered natural gas. If the Waste Prevention Rule is delayed, these benefits, including significant social benefits, would be foregone during the period of delay.

34. The Rule has numerous other social benefits in addition to the social benefits of reducing climate change impacts, such as the reduction of volatile organic compounds and therefore the reduction of ozone. Ozone reductions provide numerous public health benefits. For example, a 2012 study found that annual numbers of avoided ozone-related premature deaths

would range from 1,410 to 2,480 at 75 ppb to 2,450 to 4,130 at 70 ppb, and 5,210 to 7,990 at 60 ppb.

35. My five-year-old son has experienced chronic respiratory illness, and we forego outdoor activities on reported high-ozone days in order to avoid potential respiratory difficulties. Acute respiratory symptoms could have been reduced by 3 million cases and school-loss days by 1 million cases annually if only the then-current 75-ppb standard had been attained. If the Waste Prevention Rule is delayed, the public health and recreational benefits of reduced ozone formation, including within the Denver/Northern Front Range Ozone Nonattainment area, will be delayed and lost.

36. I have knowledge that the Center has a least one member residing in the Uintah Basin of northeast Utah in the vicinity of Vernal, Utah, whose respiratory health is adversely affected by high levels of ozone caused in large part by public lands oil and gas operations.

37. If the Compliance Revision Rule is not enjoined, the delay of compliance dates for the standards of the Waste Prevention Rule will foreseeably adversely effect ozone levels in in the Uintah Basin.

38. The Uintah Basin in northeastern Utah has experienced hazardous ozone levels exceeding federal standards (National Ambient Air Quality Standards or "NAAQS") during multiple recent winters. Winter maximum 8-hour daily average ozone concentrations have exceeded federal standards at all stations in the basin with exceedances lasting up to 39 days at individual stations, and topping summertime ozone levels reported for the Los Angeles region.

39. Numerous studies show that the majority of ozone precursor emissions come from oil and gas operations in the region with prodigious emissions of VOCs and methane coming from equipment both on and off the well pad including condensate tanks, compressors,

dehydrators, pneumatic devices, pumps, and tank flashings. One recent study of ozone pollution in the Uintah Basin, Lyman, Seth & Trang Tran, Inversion Structure and Winter Ozone Distribution in the Uintah Basin, Utah, U.S.A., 123 Atmospheric Environment 156 (2015), 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. Another study, Edwards, Peter M. et al., High Winter Ozone Pollution from Carbonyl Photolysis in an Oil and Gas Basin, 514 Nature 351 (2014), concluded that the "exceedingly high VOC concentrations" from fracking and drilling operations in the Uintah Basin lead to extreme wintertime ozone events in excess of federal air quality standards: "It is the exceedingly high VOC concentrations, and the radicals produced during their oxidation, in the oil and gas region that leads to highly efficient $O_3$ production."

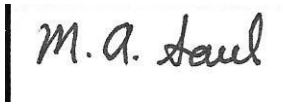
40. The Utah Department of Environmental Quality does not regulate oil and gas facilities under their Clean Air Act implementing regulations for major sources (New Source Review/Prevention of Significant Deterioration permitting programs) but under a different set of state regulations which establish a Permit by Rule (PBR). Utah State Rule R307-501-504: Oil and Gas Industry. These regulations include a number of activities related to the development of oil and gas including fugitive emission sources (e.g., equipment leaks, pneumatic controllers, etc.), flares, tanker truck loading, and non-road mobile sources, including drilling rigs.

41. Utah's oil and gas air quality permitting program has failed in meeting federally mandated NAAQS, as required by the Clean Air Act. This failure is underscored by the fact that the U.S. EPA will soon approve the Governor of Utah's recommendation that counties in the Uintah Basin be designated as "non-attainment" for the more stringent and health-protective 70 ppb ozone NAAQS promulgated in 2015.

42. Because of the excessively high VOC and NOx emissions over the last five years, the Uintah Basin is facing a growing public health crisis due wholly and exclusively to oil and gas industry emissions. Utah state air quality regulatory programs are not preventing or mitigating emissions to a degree sufficient enough to stave-off a non-attainment designation.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed in Denver, Colorado on December 15, 2017.



Michael A. Saul

Senior Attorney, Center for Biological Diversity

Denver, Colorado

# Attachment 25

**Declaration of Herm Hoops**, Center for Biological Diversity

# DECLARATION OF HERM HOOPS

I, Herm Hoops, hereby state as follows:

1. I am over eighteen years of age and a citizen of the United States. The facts and opinions set forth in this declaration are based on my personal knowledge and experience. If called as a witness in these proceedings, I could and would testify competently to these facts and opinions.

2. I am a member of the Center for Biological Diversity ("CBD").

3. I live in Jensen, Utah, which is about 15 miles east of Vernal, Utah in the Uintah Basin. I have lived here since 1987. At the time I moved to Jensen, I was working for the National Park Service at Dinosaur National Monument.

4. Jensen is a rural, agricultural community backdropped by a huge, open landscape where you can see miles and miles, typical of the Colorado Plateau. It's a beautiful place, with open sage brush plains, table-lands, uplifts and the Green River.

5. Many residents of Jenson have small farms—a typical spread is approximately 20 acres—and work in the oil patch. The cropland in this area is typically irrigated alfalfa.

6. Vernal, our closest big town, is a boom and bust oil town. I bought my house after a bust—for $35,000, when there were over 800 HUD repossessed properties on the market—and I have seen several booms and busts since then. I have seen the wreckage that this kind of boom-and-bust economy leaves on a community.

7. There are three primary sources of community income in the Uintah Basin. During the boom cycle, the primary source of income is the oilfield. But, over the past forty-five years, agriculture and outdoor recreation—especially river running—vie for second or first place depending on whether oil is being produced at the time. Notably, people come here to get away from it all. Then they see the oil wells. The oil industry is not good for the tourism and outdoor recreation industry.

8. I live on a quarter-acre parcel in a house that was built in 1982. To the east, I have a sweeping view of Split Mountain in Dinosaur National Monument. To the south, I have a big picture

window that looks down toward the Green River and the Book Cliffs—the largest undeveloped area in the United States. To the north, I can look out to the Uintah Mountains. And to the west, I have a view of an industrial park and the Ashley Creek Oilfield two miles away. The Ashley Creek Oilfield, drilled in 1939, is one of the oldest oilfields in Utah.

9. When I first moved to Jensen, we would get a strong smell of hydrogen sulfide about once or twice a month. I'm familiar with that smell because I used to work on the outer banks of North Carolina. I drove out to the oilfield to investigate the smell and discovered that one of the oilfield's overflow ponds was being drained into a tributary of Ashley Creek. I complained, and in response to my complaints, that problem has since been resolved.

10. However, during more recent boom years, I began to smell hydrogen sulfide more frequently—about 2-3 times per week. I began recording when the smells came and how powerful they were. I also noticed that, as you drove across Ashley Creek, the smell became stronger and stronger. I contacted TriCounty Health Department, and in response to my concerns, they instituted air quality monitoring. Dinosaur National Monument also instituted air quality monitoring. However, when the county commissioners heard that TriCounty Health Department had air quality monitors out, they hired a different company, which subsequently moved the air monitors away from Ashley Creek and up higher, where the air quality was better. I suspect that the air quality is worse than the levels that the air monitors are recording.

11. I am now 71 years old, and my respiratory health is compromised. I smoked for 50 years. About 5 or 6 years ago, a car caught on fire in front of my house, and, in an effort to avoid a house fire, I jumped into the car and backed it away from the house. I inhaled a lot of smoke and burning plastic doing that. Since then, I have had serious Chronic Obstructive Pulmonary Disease (COPD).

12. I have been a commercial river raft guide for many years. I don't row commercial river trips anymore, but I drive and do warehouse work for a rafting company during the summer.

13. When ozone levels are high, I notice it because I can't walk far. I have to sit down and rest frequently. When ozone is high, it's also difficult for me to do ordinary tasks—for example, walk up and down the aisles at Lowe's. After a recent hip replacement surgery, my oxygen levels dipped and have not come up as expected. I am currently on supplemental oxygen, and it is a toss-up whether I will have to continue on oxygen indefinitely. If ozone levels do not decrease, it will cause me to continue to curtail my ordinary activities and the kind of work I can do.

14. The severity of my COPD fluctuates based on the amount of gas extraction occurring. Because we are in a basin, the air pollution gets trapped, especially during wintertime. Air quality declines can be drastic then. Wintertime inversions can make it foggy for a month and a half at times.

15. When I am driving, I see the consequences of oil and gas development. Much of this development is on federal land or Ute tribal land; some is on state land. As you drive out through these areas, there are pump jacks, pipelines, and other oil field infrastructure. If you go out to an oilfield at nighttime, it looks like a military encampment, with all the flares.

16. Because I live adjacent to oilfields, I know well what the consequences of fossil fuel development are—air pollution, water pollution, economic cost, and noisy, bright flares. I am concerned about the continued impacts of oil and gas development on my health and my community.

17. The BLM's recently-promulgated waste prevention and resource conservation rule, 81 Fed. Reg. 83,008 (Nov. 18, 2016), would reduce the harmful impacts of oil and gas development to my health and my community.

18. I understand that the Uintah Basin in northeastern Utah has experienced hazardous ozone levels exceeding federal standards during multiple recent winters. I further understand that the majority of ozone-forming compounds in the Basin come from oil and gas operations, leading to wintertime ozone levels exceeding federal air quality standards.

19. I understand that existing Utah regulatory efforts have been unsuccessful in reducing Uintah Basin ozone levels below federal standards, and that the Governor of Utah has recommended that counties

in the Uintah Basin be designated as "non-attainment" under the EPA's 2015 ozone standards.

20. I understand that the BLM has finalized a rule suspending the most significant requirements of the Waste Prevention Rule, including a provision that requires operators to meet monthly capture targets for methane waste from oil and gas wells on BLM-administered leases (Section 3179.7), a provision that requires operators to measure or estimate flared or vented gas (Section 3179.9), provisions that address gas losses from pneumatic controllers and venting from storage vessels, which "vent" and "bleed" methane gas into the atmosphere (Sections 3179.201 and 3129.203), and provisions that address methane leak detection and repair (Sections 3179.301-305). I understand that the Suspension Rule leaves BLM with no national regulations or guidance limiting waste from federal or tribal leases.

21. If not suspended, the Rule's waste prevention measures would decrease volatile organic compound emissions (VOCs), one of the primary components of natural gas, and thus will reduce ozone formation. I know and have personally experienced that exposure to ozone can exacerbate respiratory health problems—including by causing shortness of breath, chest pain, and coughing, and exacerbating lung damage. According to a recent report by the National Research Council ("NRC"), exposure to ozone is likely to contribute to premature deaths. The suspension of the rule would harm me because it would allow the formation of ozone, which would negatively impact my health and cause me to continue to curtail my usual activities.

22. If not suspended, the Rule would also decrease emissions of hazardous air pollutants, including carcinogens like benzene, and particulate matter and nitrogen oxides, providing additional health benefits to me. The suspension of the Rule would harm me because it would allow the release of air pollutants that further negatively impact my health.

23. If not suspended, the Rule would also reduce venting and flaring, which would improve visibility by reducing ozone, nitrogen oxides, and particulate matter emissions, reducing wintertime fog and improving my opportunity to see and enjoy the landscape that surrounds my home. The suspension of the Rule would harm me because it would decrease visibility, contributing to the clouding of the skies

surrounding my home.

24. If the Suspension Rule is not preliminarily enjoined, BLM oil and gas operations in the Uintah Basin will remain subject only to state permitting rules that have been unsuccessful, to date, in maintaining health-protective ozone levels within the Basin.

25. If the Suspension Rule is not preliminarily enjoined, I will experience immediate and irreparable harm to my health given my chronic respiratory disease. I will also experience aesthetic harm to my enjoyment of the skies and plant life surrounding my home, which are damaged by ozone and other air pollutants associated with the venting and flaring of natural gas.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated: 12/15/2017

Herman Hoops

Herm Hoops

# Attachment 26

**Declaration of Ava C. Farouche**, Earthjustice

# DECLARATION OF AVA C. FAROUCHE

I, Ava C. Farouche, declare as follows:

1. The facts and opinions set forth in this declaration are based on my personal knowledge and experience. If called as a witness in any future proceedings, I could and would testify competently to these facts and opinions.

2. This Declaration is submitted in support of the three maps attached to this Declaration. These are Exhibit A, "California", Exhibit B, "Kern County", and Exhibit C, "Sherman Property."

3. I have worked as a Litigation Assistant for Earthjustice since March 2008, transitioning into my role as a Geographic Information Systems (GIS) and Research Analyst in 2009. My work at Earthjustice includes the use of GIS and other database management and query software. GIS software uses geospatial data to create maps and perform analyses. GIS is recognized as an important tool for communication and problem solving by government, industry, and conservation organizations throughout the country. I perform a variety of research and mapping tasks as part of my job.

4. I have a Bachelor of Arts degree in Political Science from Indiana University at Bloomington.

5. I have completed coursework in ArcGIS Desktop I, II and III: Tools and Functionality, and Performing Analysis, using ArcMap, a GIS software program.

6. I have been involved with numerous legal and administrative actions through my work at Earthjustice. I have prepared analyses, maps, and documents similar to the work presented here for filings in these actions.

7. As a salaried employee of Earthjustice, I have received no extraordinary compensation for the work presented here.

8. I prepared the attached Exhibits using ESRI's ArcGIS, an industry standard software package. There are two main datasets, or layers, that are displayed in, and/or inform the content of all three maps. These layers are the "Federal surface/ minerals", and the "Active federal well[s]".

9. To create the layer depicting "Federal surface/ minerals", I took the following actions:

a. The Bureau of Land Management provides some surface land ownership GIS datasets to the public through its website. I downloaded a dataset showing national surface agency from the BLM in March 2016.[1]

b. This data includes a field or attribute indicates by which agency each parcel is managed. All federal entities are included. State, local, trust and private administration are indicated, though specific ownership is not always included. From this dataset, I selected all land tracts managed or held by a federal entity, and removed all other parcels, to create a dataset of only federal lands.

c. I located a subsurface mineral rights dataset through the U.S. Department of Agriculture's Forest Service, which I downloaded on Nov. 6, 2017[2]. It is dated Jan. 1, 2016. According to the metadata, this set depicts "ownership parcels of the subsurface estate, representing mineral rights; it is collected only if the subsurface estate is different than the overlying surface estate." From this dataset, I selected all parcels reflecting federal mineral ownership, and removed all other parcels, to create a new dataset of only federal subsurface parcels.

[1] The BLM has since reconfigured all of its websites, and the address from which I downloaded it is no longer valid.
[2] https://data.fs.usda.gov/geodata/edw/datasets.php?xmlKeyword=mineral

d. Through a merge process, I combined the dataset showing federal surface agency, with the dataset depicting federal mineral rights, to create one layer representing federal surface and subsurface ownership. This is the layer seen on the accompanying maps.

10. To select the wells shown on the attached maps categorized and shown as "Active federal wells," I took the following steps:

a. The California Oil and Gas Commission ("CA OGC") provides GIS data for all oil and gas wells in the state.[3] The most recent of these data were posted on June 14, 2017, and I downloaded these on June 22, 2017. Using a process called "clipping", I 'cut out' all of these wells that are located on areas of federal surface or subsurface agency, as represented by the map layer entitled "Federal surface/ minerals." In other words, this process eliminates all wells not located on federal tracts, and shows only wells that are considered to be federal, based on their location on federal lands or federal mineral estate. For the purposes of this investigation, I called these simply "federal wells."

b. From this set of federal wells, I created a further subset, based on the operational status of the well. These well data include a field or attribute indicating whether the well is either: active, new, idle, buried, plugged and abandoned, or unknown. Of these, I selected only those wells described as active or new. These wells represent a portion of the "Active federal well" layer on the attached maps.

c. The CA OGC also includes in its oil and gas well dataset an attribute indicating whether or not any well is a BLM well. This is a simple 'yes' or 'no' category.

[3] http://www.conservation.ca.gov/dog/maps/Pages/GISMapping2.aspx

In addition to those wells I had selected as "Active federal wells," through the above-described processes, I included wells that were indicated to be BLM wells according to this category. Of these, I also selected only those wells that have an operational status of active or new for display. Therefore, the wells shown on the attached maps should be considered "Active federal wells" either due to their location on federal land or mineral estate, or through virtue of being designated a BLM well by the CA OGC; and having an active operational status.

11. The above-described data layers were used for Exhibits A, B and C.

12. To create the shape that describes the "Sherman property boundary", displayed on Exhibit C, I took the following steps:

a. I located the general location of the property using GoogleEarth. Mr. Sherman provided an aerial image of his property with the property boundary included.

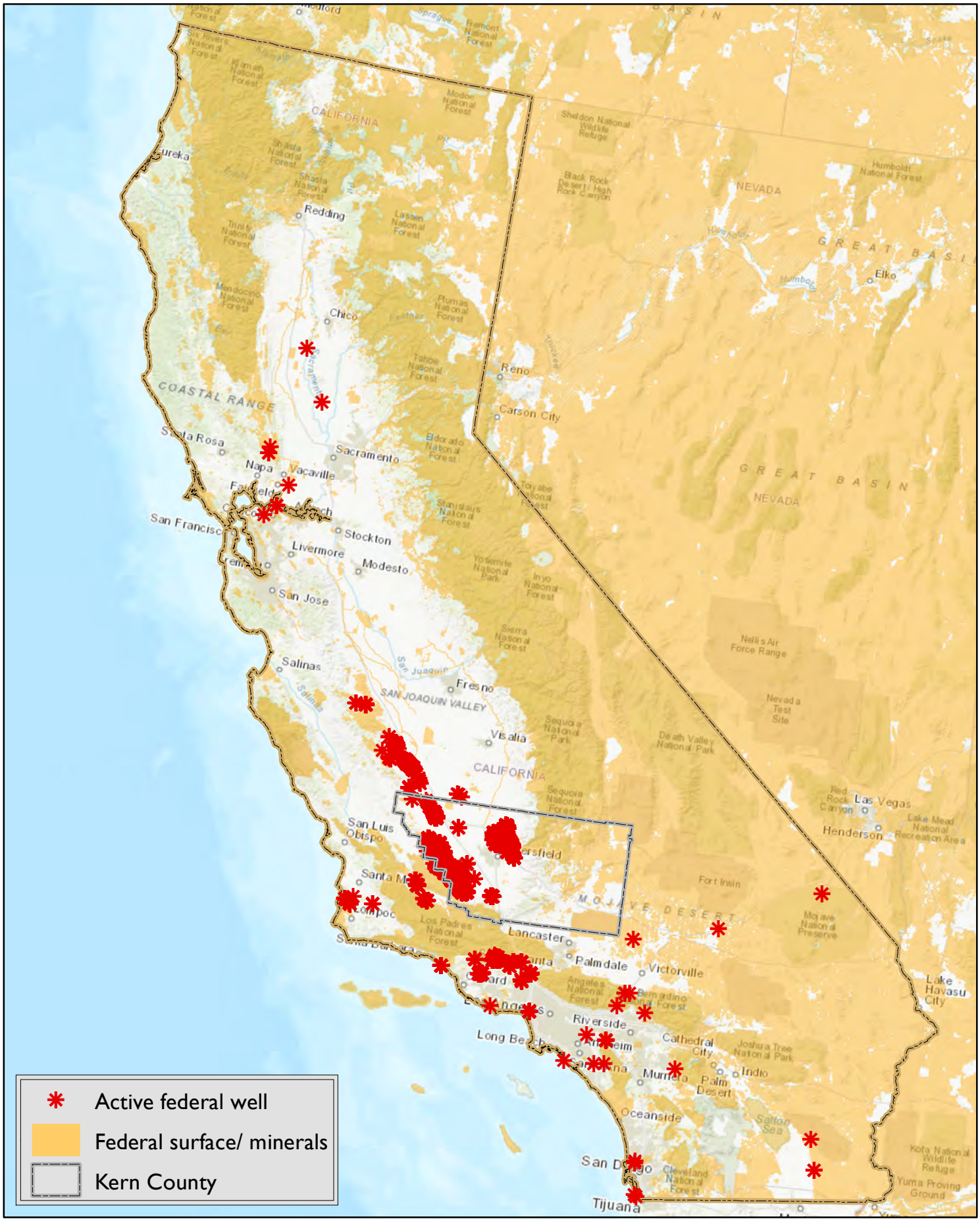
I declare that the foregoing is true and correct to the best of my knowledge, information, and belief.

Executed in Denver, Colorado on December 15, 2017.

Ava C. Farouche

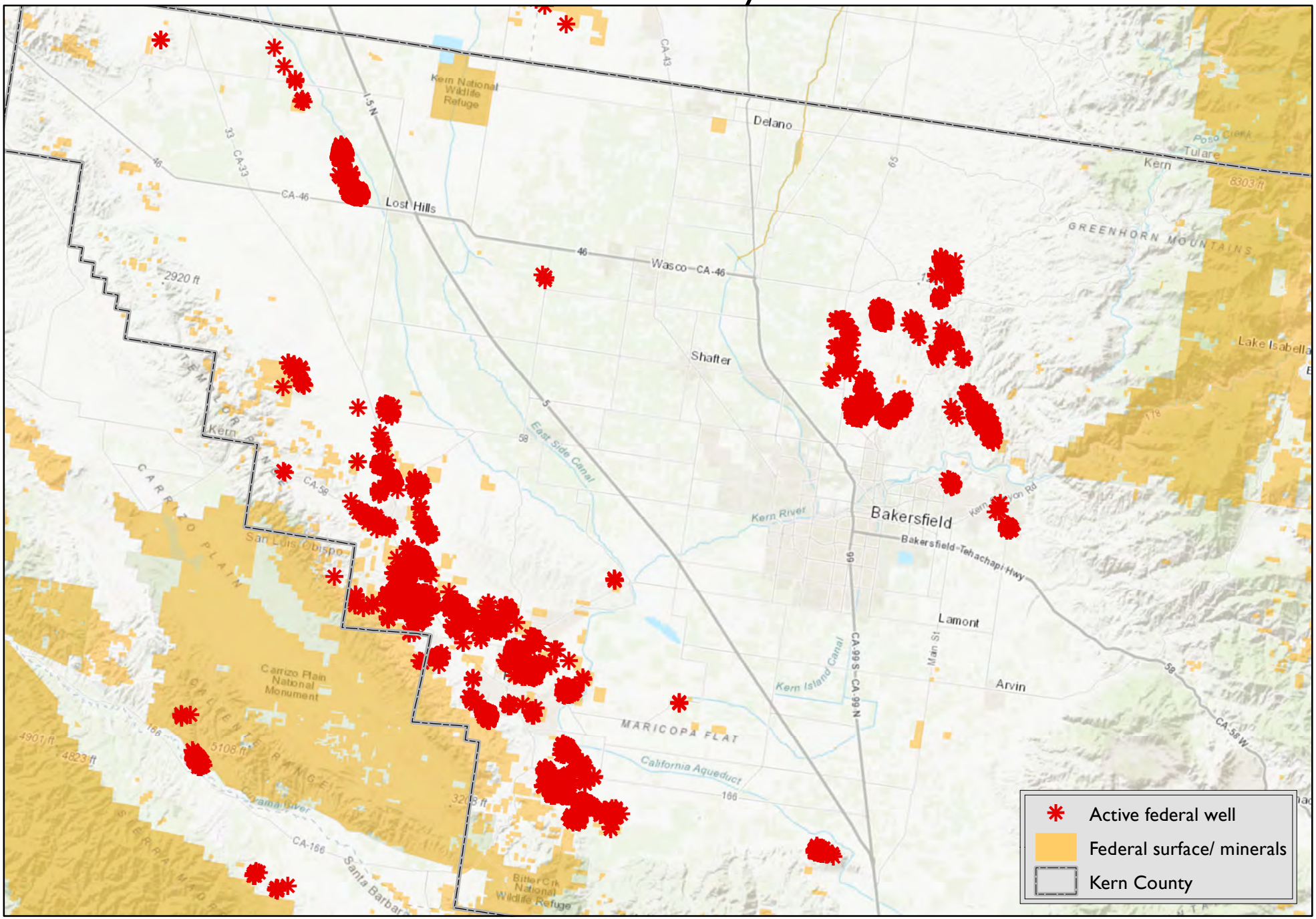
# EXHIBIT A

# California


Active federal well
Federal surface/ minerals
Kern County
0
50
100
150
200
Miles
CALIFORNIA
NEVADA
GREAT BASIN
COASTAL RANGE
SAN JOAQUIN VALLEY
MOJAVE DESERT
Redding
Chico
Reno
Carson City
Elko
Sacramento
Napa
Vacaville
Stockton
Livermore
Modesto
San Jose
Salinas
Fresno
Visalia
Bakersfield
San Luis Obispo
Lancaster
Palmdale
Victorville
Riverside
Cathedral City
Indio
Palm Desert
Oceanside
San Diego
Tijuana
Las Vegas
Henderson
Lake Havasu City

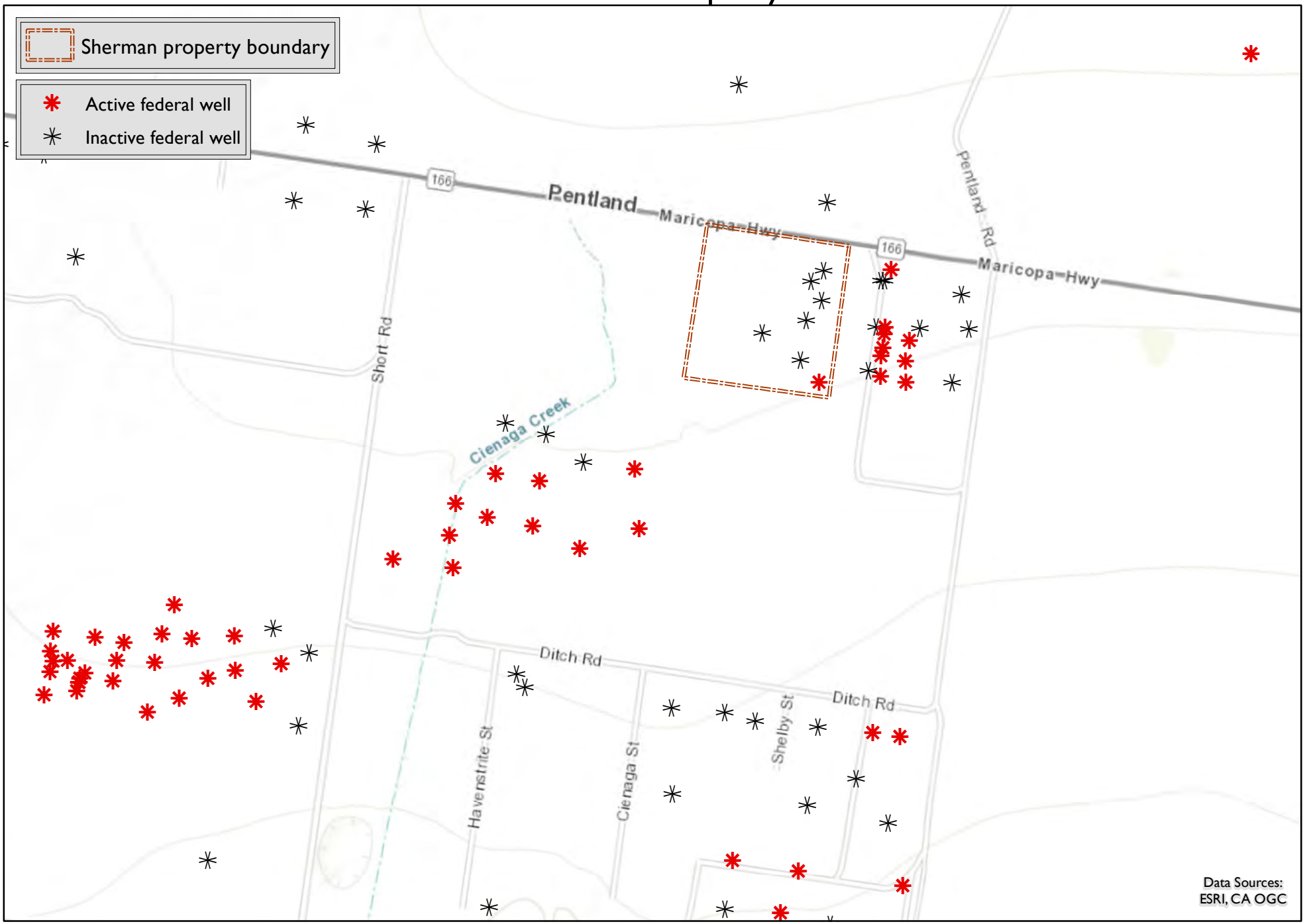
# EXHIBIT B

# Kern County


Kern National Wildlife Refuge
Delano
Lost Hills
Wasco—CA-46
Shafter
Bakersfield
Bakersfield-Tehachapi Hwy
Lamont
Arvin
Kern River
East Side Canal
Kern Island Canal
California Aqueduct
Carrizo Plain National Monument
MARICOPA FLAT
Bitter Crk National Wildlife Refuge
GREENHORN MOUNTAINS
Lake Isabella
Active federal well
Federal surface/ minerals
Kern County
0 5 10 15 20
Miles

# EXHIBIT C

# Sherman Property



# Attachment 27

**Declaration of Jennifer Krill**, Earthworks

# DECLARATION OF JENNIFER KRILL

I, Jennifer Krill, declare as follows:

1. I submit this declaration in support of Earthworks' standing in the challenge to BLM's rule suspending certain requirements of its Methane Waste Prevention Rule. I have personal knowledge of the matters stated herein and, if called as a witness, could competently testify thereto.
2. I am the Executive Director for Earthworks, a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of oil and gas development while promoting sustainable solutions. Earthworks collaborates with communities and grassroots groups to reform government policies to better protect air, water, public lands and communities.[i]
3. Earthworks is incorporated as a 501(c)(3) nonprofit organization in Washington, D.C. and is registered in California. We employee three full time staff in the Northern District of California with a principle place of business in Berkeley, California. Earthworks expects to hire a fourth California-based staff person in the first quarter of 2018. Earthworks has 70,387 nationwide members with 9,215 members in California and approximately 4,211 living within the Northern District of California.
4. The Suspension Rule would suspend the Waste Prevention Rule's most significant requirements—those regarding waste minimization plans, gas capture, the measurement and reporting of venting and flared gas, royalty-free flaring, well drilling and completion, pneumatic controllers, pneumatic diaphragm pumps, storage vessels, downhole well maintenance and liquids unloading, and leak detection and repair. In short, the Suspension Rule guts the Methane Waste Prevention Rule, rendering it ineffective at reducing waste, and causing harmful impacts to public health and the environment. Moreover, the Suspension Rule leaves BLM with no national regulations or guidance limiting waste from federal or tribal leases.
5. I live in Alameda County, California, a relatively short distance from Monterey and San Benito Counties, which have seen significant levels of oil and gas drilling on public lands. I last visited these counties and the oil and gas facilities there in October 2014. I plan to return there in August 2018. I also enjoy wine tasting in the Central Coast region

and pass through the San Ardo oil field in Monterey County, smelling the oil and gas odors en route to wine tasting regions. I'm planning a wine tasting trip there in the Fall 2018

6. I have visited public lands in California to enjoy some of the most scenic views anywhere; including the beautiful state highway 46, connecting Paso Robles with Lost Hills, passing through lovely orchards and the enormous Lost Hills oil field, or Panoramic Park in Bakersfield overlooking a Chevron oil field. I like to hike and camp and value my time there for the aesthetic, cultural, recreational, and spiritual benefits I receive. I'm looking forward to visiting Pinnacles National Park in San Benito County next year, and I am concerned about the expansion of oil and gas development there. My experience is that oil and gas development, including its associated infrastructure, fouls the air, adds noise and light pollution and harms my enjoyment of California's landscapes, air, and natural beauty and deters my desire to visit them.
7. The Methane Waste Prevention Rule can help reduce air and noise pollution. I have visited oil and gas facilities on public lands in California and have smelled noxious odors from these operations.
8. The flaring and venting of "wasted" methane from oil and gas development in Kern and Monterey Counties also contributes to ozone pollution. The Volatile Organic Compounds that hitch hike along with this "wasted" methane increase ozone pollution leading to more smog and poor air quality days in and around my community. Wind patterns in my region tend to bring air inland from the ocean. Yet, my region does have Spare the Air Days—days when we are alerted that ozone pollution has reached an unhealthy level. Capturing more methane from pneumatic controllers, storage vessels, and leak detection and repair (LDAR) programs on public lands as required by the Methane Waste Prevention Rule in Kern and Monterey Counties would improve ozone pollution in my community.
9. Capturing more methane also reduces the greenhouse gas emissions that contribute to climate change. My region of California continues to experience the adverse impacts from climate change in the form of devastating wild fires, storm surges, and severe water shortages. The Methane Waste Prevention Rule benefits me by reducing emissions that worsen the climate crisis.

10. Numerous Earthworks members also recreate on public lands near where oil and gas development is occurring or has been proposed.
11. Other members reside on "split estate" lands where the federal government owns the minerals underlying their property, or they live in close proximity to federal lands where oil and gas development has been proposed.
12. While the BLM's Methane Waste Prevention Rule is not perfect, it will protect my interests and those of Earthworks' members better than if there is no methane regulation, as is the case under the Suspension Rule. Earthworks members live in many of the states where significant oil and gas development occurs on federal lands (or may occur in the future). Earthworks has 962 members in New Mexico, 2,014 members in Colorado, 133 members in Wyoming, 370 members in Utah, 364 members in Montana, 84 members in North Dakota, 380 members in Idaho and 559 members in Nevada.
13. Earthworks members also have an economic interest in the Methane Waste Prevention Rule. Because their homes are in close proximity to federal oil and gas development, flaring and venting of methane can directly impact their property values and require significant expenditures in the event of an accident.
14. One of the chief programs at Earthworks is our Community Empowerment Project (CEP), a partnership with neighborhoods affected by oil and gas development. Key regions within CEP's focus include shale plays in Monterey County and the oil fields of Kern County. We currently operate two FLIR (Forward Looking Infrared) cameras (also known as Optical Gas Imaging or OGI), which allow us to film incidents of venting and flaring to serve notice to operators, file complaints with regulators, protect nearby communities, and drive policy change including the promulgation and implementation of the Methane Waste Prevention Rule.[ii] We expect to purchase a third camera and hire a thermographer in the first quarter of 2018, whose principle focus will involve documenting oil and gas methane pollution in California and on BLM lands. We have filed several complaints with regulators for violations that the Methane Waste Rule is intended to rectify. These include complaints of venting and flaring in the San Joaquin Valley upon which the local Air Resources Board took administrative action. We expect to
15. In 2017, Earthworks conducted 6 CEP trips that included FLIR camera investigations of

oil and gas sites on BLM lands. This includes two trips to New Mexico, two more to Utah, and one trip each to North Dakota and Oklahoma. In total, we visited 20 separate sites under BLM's jurisdiction, 15 of which showed egregious emissions viewable on our BLM FLIR video Youtube channel.

16. Earthworks also submitted comments to the Bureau of Land Management (BLM) on the Methane Waste Prevention Rule. Our comments focused primarily on one of the suspended provisions, programs for Leak Detection and Repair (LDAR). In particular, Earthworks commented upon the benefits community monitoring ("third-party verification") brings to regulators, the oil and gas industry, and the public.[iii] Third-party verification in LDAR programs can add tremendous value – easing the reporting burden on industry, providing valuable information to state regulators, BLM, and the public, while also aiding compliance and enforcement. Allowing Earthworks' trained monitors to assist in the leak detection process helps ensure the effectiveness of the LDAR provisions of the rule. Finally, Earthworks members receive public health benefits from more responsive operators and regulators incentivized to fix leaks and reduce emissions.
17. Suspending the BLM's LDAR provisions adversely affects many of these policy and public health goals Earthworks seeks to achieve through our own monitoring. Working in concert with regulators and industry, LDAR-related activities comprise a substantial portion of Earthworks' programmatic focus.
18. BLM's Methane Waste Prevention Rule creates regulatory certainty and uniformity on public lands across state lines. Many Earthworks members live near state borders, especially in the Four Corners region, and state laws can vary considerably from one state to the next. Yet, Earthworks members living near state borders do not get to choose which state's air to breathe.
19. In August 2016, the National Aeronautic and Space Administration (NASA) issued a follow up to its 2014 study that discovered a methane "hotspot" over the Four Corners region of the United States.[iv] This study revealed the oil and gas industry as the hotspot's cause. In response, Earthworks sent our CEP team to the Four Corners region to document some of the venting and flaring activities causing the hotspot that would be regulated by the Methane Waste Prevention Rule.[v]
20. The Methane Waste Prevention Rule also sets a benchmark for state rules designed to

accomplish the same goals of preventing resource waste while protecting climate and health. The Methane Waste Prevention Rule supplants a patchwork of state regulations with a minimum standard that establishes a basic level of protection for our public lands. National public lands need national standards that are not subject to the vagaries of state politics, enforcement budgets and varying levels of expertise. The Methane Waste Prevention Rule sets the standard while providing certainty and consistency for operators.

21. If BLM is permitted to suspend key provisions of the rule—such as Section 3179.7, which requires operators to meet monthly capture targets for methane waste from oil and gas wells on BLM-administered leases and thereby reduces routine flaring; sections 3179.201 and 3129.203, which reduce gas lost/vented from pneumatic controllers and storage vessels, respectively; and sections 3179.301-.305, which require leak detection and repair—Earthworks members will lose these benefits.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Jennifer Krill,

Executive Director, Earthworks

Executed on December 8, 2017.

[i] For more information, please see https://www.earthworksaction.org/about

[ii] For more information, please see https://www.earthworksaction.org/voices/detail/citizens_empowerment_project_-.WFw4jrYrIcg

[iii] For Earthworks comments, please see https://www.earthworksaction.org/library/detail/comments_on_waste_prevention_production_subject_to_royalties_and_resource_c - .WFxBObYrIch

[iv] See NASA Study Analyzes Four Corners Methane Sources http://www.jpl.nasa.gov/news/news.php?feature=6591

[v] To see the footage, please visit https://www.youtube.com/playlist?list=PL9BS7nDf-8tpfUiJ8-jDt0C8kprJLKry

# Attachment 28

**Declaration of Bruce Baizel**, Earthworks

## DECLARATION OF BRUCE BAIZEL

I, Bruce Baizel, declare as follows:

1. I submit this declaration in support of Earthworks' participation in the challenge to BLM's rule suspending certain requirements of its Methane Waste Prevention Rule. I have personal knowledge of the matters stated herein and, if called as a witness, could competently testify thereto.
2. I am the Energy Program Director for Earthworks, a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of oil and gas development while promoting sustainable solutions. Earthworks collaborates with communities and grassroots groups to reform government policies to better protect air, water, public lands and communities.[ii]
3. The Suspension Rule would suspend the Waste Prevention Rule's most significant requirements—those regarding waste minimization plans, gas capture, the measurement and reporting of venting and flared gas, royalty-free flaring, well drilling and completion, pneumatic controllers, pneumatic diaphragm pumps, storage vessels, downhole well maintenance and liquids unloading, and leak detection and repair. In short, the Suspension Rule guts the Methane Waste Prevention Rule, rendering it ineffective at reducing waste, and causing harmful impacts to public health and the environment. Moreover, the Suspension Rule leaves BLM with no national regulations or guidance limiting waste from federal or tribal leases.
4. I live in La Plata County, Colorado within the San Juan Basin. La Plata County and the surrounding San Juan Basin have experienced significant levels of oil and gas development, especially on Federal lands. Over the last two years, I have developed asthma I believe linked to these oil and gas activities.
5. The flaring and venting of "wasted" methane from oil and gas development in La Plata County and the San Juan Basin also contributes to ozone pollution and releases benzene. These constituents have an adverse impact on the health of Earthworks members and the public.
6. Although the Bureau of Land Management's (BLM) methane waste prevention regulations are not perfect, they will better protect the interests of Earthworks and its members. Earthworks' members live in many of the states where significant oil and gas development occurs on federal lands (or may occur in the future). For example, Earthworks has 962 members in New Mexico, 2,014 members in Colorado, 133 members in Wyoming, 370

members in Utah, 364 members in Montana, 9,215 members in California, 84 members in North Dakota, 380 members in Idaho and 559 members in Nevada.

7. Numerous Earthworks members recreate on public lands near where oil and gas development is occurring or has been proposed. Other members reside on "split estate" lands where the federal government owns the minerals underlying their property, or they live in close proximity to federal lands where oil and gas development has been proposed.

8. Earthworks members also have an economic interest in the Methane Waste Prevention Rule. Because their homes are in close proximity to federal oil and gas development, flaring and venting of methane can directly impact their property values and require significant expenditures in the event of an accident.

9. Earthworks runs the Community Empowerment Project (CEP), a partnership with neighborhoods affected by oil and gas development. We currently operate two FLIR (Forward Looking Infrared) cameras which allow us to film incidents of venting and flaring to serve notice to operators, file complaints with regulators, protect nearby communities, and drive policy change including the promulgation and implementation of the Methane Waste Prevention Rule.[iii]

10. In 2017, Earthworks conducted 6 CEP trips that included FLIR camera investigation of oil and gas sites on BLM lands. This includes two trips to New Mexico, two more to Utah, and one trip each to North Dakota and Oklahoma. In total, we visited 20 separate sites under BLM's jurisdiction, 15 of which showed egregious emissions viewable on our Youtube channel.

11. Earthworks submitted comments to the Bureau of Land Management (BLM) on the Methane Waste Prevention Rule. Our comments focused on programs for Leak Detection and Repair (LDAR)—in particular, the benefits community monitoring ("third-party verification") brings to regulators, the oil and gas industry, and the public.[iv]

12. Third-party verification in LDAR programs can add tremendous value – easing the reporting burden on industry, providing valuable information to state regulators, BLM, and the public, while also aiding compliance and enforcement. Allowing Earthworks' trained monitors to assist in the leak detection process helps ensure the effectiveness of the LDAR provisions of the Methane Waste Prevention Rule. Third party verification can relieve industry's compliance costs by helping to find leaks, allowing the industry to capture more natural gas to bring to market. It will help BLM fulfill its ninety-six-year-old Mineral Leasing Act mandate to "use all reasonable precautions to prevent waste of oil or gas developed in the land."[v] Finally, Earthworks members receive public health benefits from

more responsive operators and regulators incentivized to fix leaks and reduce emissions.

13. The Methane Waste Prevention Rule provided an opportunity for Earthworks to apply to BLM for approval of our LDAR protocol.[vi]

14. The Suspension Rule would substantially foreclose this opportunity.

15. BLM's Methane Waste Prevention Rule creates regulatory certainty and uniformity across state lines. This is critical for my home in La Plata County situated on the border between

Colorado and New Mexico. While Colorado has strong rules regulating venting and flaring, New Mexico lacks the same protections. Yet, I breathe the air from both states.

16. In August 2016, the National Aeronautic and Space Administration (NASA) issued a follow up to its 2014 study that discovered a methane "hotspot" over the Four Corners region of the United States.[vii] This study revealed the oil and gas industry as the hotspot's cause. In response, Earthworks sent our CEP team to the Four Corners region to document some of the activities causing the hotspot that would be regulated by the Methane Waste Prevention Rule.[viii]

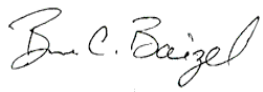
17. The Suspension Rule would result in BLM being unable to implement reasonable measures that not only benefit public health and the climate, but also save taxpayers money.

18. The Methane Waste Prevention Rule also sets a benchmark for state rules designed to accomplish the same goals of preventing resource waste while protecting climate and health.

19. The Methane Waste Prevention Rule supplants a patchwork of state regulations with a minimum standard that establishes a basic level of protection for our public lands. National public lands need national standards that are not subject to the vagaries of state politics, enforcement budgets and varying levels of expertise. The Methane Waste Prevention Rule sets the standard while providing certainty and consistency for operators. If the Suspension Rule is allowed to stand, these benefits will be lost.

20. The Suspension Rule also results in an abdication of federal authority, substantially reducing protections not just for federal lands, but also for surrounding areas affected by the venting and flaring that occurs on federal lands.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.



Bruce Baizel, Earthworks Energy Program Director

Executed December 15, 2017

[ii] For more information, please see https://www.earthworksaction.org/about

[iii] For more information, please see https://www.earthworksaction.org/voices/detail/citizens_empowerment_project-.WFw4jrYrIcg

[iv] For Earthworks comments, please see https://www.earthworksaction.org/library/detail/comments_on_waste_prevention_production_subject_to_royalties_and_resource_c-.WFxBObYrIch

[v] 30 U.S.C. 225

[vi] See Fed Reg. Vol. 81, No. 223 83008- 83089 (Friday, November 18, 2016). Section 3179.302 allows anyone to seek BLM's approval for an alternative monitoring device or protocol.

[vii] See NASA Study Analyzes Four Corners Methane Sources http://www.jpl.nasa.gov/news/news.php?feature=6591

[viii] To see the footage, please visit https://www.youtube.com/playlist?list=PL9BS7nDf-8tpfUiJ8-jDt0C8kprJLKry

# Attachment 29

**Declaration of Camille King**, Ft. Berthold POWER

**DECLARATION OF CAMILLE KING**

1) **My name is Camille King and I am over the age of 18 and competent to testify as to the facts contained herein.**

2) **I am an enrolled member of the Three Affiliated Tribes and I reside on the Fort Berthold Reservation in Shell Creek, which is located approximately eleven (11) miles south of New Town, ND. I am a Licensed Social Worker and a member of Fort Berthold POWER (Protectors of Water, Earth Rights). I am married and I currently have legal guardianship over my grandchildren, ages nine and twelve. I also have two German Shepard dogs that are two and a half years old.**

3) **I live on my family's homeland where my father and grandfather farmed and ranched since the 1950's. I inherited my father's homesite in the year 2000 and I have since rebuilt the home thinking I would be retiring here. Much time, labor and money was put into this home by upgrading the home, building a garage, fencing the yard, constructing a patio and deck and planting over one hundred trees. Now my fear is I have to leave my home with the onslaught of the power mongering, money hungry oil companies that want to continue to rape our land and destroy what natural habitat is left. With all not acknowledging what irreparable harm that is being committed against the health and welfare of mankind.**

4) **Numerous oil wells surround our property in every direction with more wells being drilled as I write this. Daily, I witness flares burning constantly on oil wells that are on tribal and fee land. At night, the landscape is glowing with numerous flares and the chemicals burn into toxic gas that is breathed in by man and animals.**

5) **My older brother built a home near my grandparent's home site. It is approximately a ¼ of a mile from my home and he continues to maintain livestock. A couple years ago, he began to find dead horses. He said he found two dead horses in the fall of 2015 and only told me after he found four more dead horses in early 2016. No open flesh wounds existed on these young horses that could have explained their deaths. Authorities were contacted and help was requested from the BIA, Tribal Fish and Game and Fort Berthold**

**Environment. No one could assist in helping us find out the cause of death. One horse was transported by Tribal Homeland Security to the Watford City Veterinarian Clinic who performed an autopsy and was unable to determine how the horse died. The report states that the horse was healthy when he was alive. Upon request, the internal organs of the horse were sent to the State Lab in Fargo, ND to possibly determine cause of death. They also were unable to determine the cause of death. In early 2017, another horse fell dead. My brother declined to pursue any action. The local vet told me that if it was related to fracking, we would never be able to prove it due to the dissipation of any chemicals the horse could have inhaled. It is frustrating to know that the only changes that have occurred here is the oil and gas activity that surrounds our homelands and yet we can't prove the deadly consequences of what occurred.**

6) **In September of this year, I was diagnosed with COPD and I am currently on medication to assist in my breathing. My doctor has also referred me for a CT scan to determine if there are additional concerns, to include lung cancer. She stated that she has referred several others in the community with the same concerns. My health is failing and I am scared. Knowing I could possibly have a shorter life than anticipated. Do I have to move out of my homelands where I grew up and where my family has lived for the past 65 years?**

7) **Within the last year, my husband has had ear infections. My twelve year old grandson has developed allergies and my nine year old granddaughter gets frequents colds and ear infections. My two dogs breathe heavily and actually pant while in a resting state. I fear they have developed asthma.**

8) **I testified at the Bureau of Land Management (BLM) hearing in March of 2016 on the Waste Prevention Rule in Dickinson, ND.**

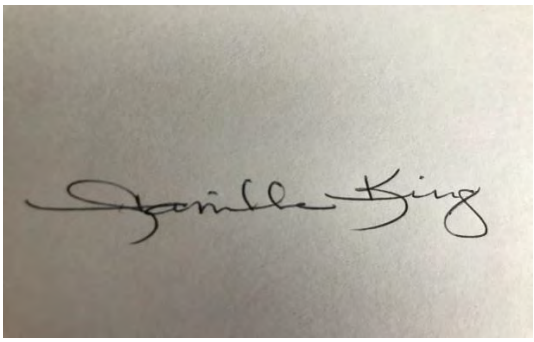
9) **In April of 2017, I wrote a letter to Senator Heidi Heitkamp pleading for her to vote against the congressional review act resolution to overturn the Waste Prevention Rule.**

10) **The land has been disrupted to a point where it will never be the same. What is in the air that we breathe? What makes up the fracking chemicals? No one is monitoring the air. We have no studies from an environmental review before the oil industry arrived and we don't have one now. The Waste Prevention Rule will help**

**end any toxic chemicals that we may be breathing in. We cannot delay the Waste Prevention Rule for another year. It needs to be done now. The oil companies can afford to cap all the flares and venting that is occurring and they need to compensate the individual land owners what is due.**

11) **The medical problems my family is experiencing is only the beginning. We are a burden to the oil and gas industry in their efforts to pollute the land, water and air that we breathe, all for the extraction of oil and the mighty dollar. They don't want to know or acknowledge the effects or the consequences of what the industry is doing to mankind in oil country.**

**s/Camille King**



**December 14, 2017**

# Attachment 30

**Declaration of Carol Ventsch**, Ft. Berthold POWER

DECLARATION OF CAROL VENTSCH

1) My name is Carol Ventsch and I am over the age of 18 and competent to testify as to the facts contained herein.

2) I live near the Van Hook Arm of Lake Sakakawea, approximately nine miles east of New Town, North Dakota on the Fort Berthold Reservation. I am a registered nurse and a member of Fort Berthold POWER (Protectors of Water & Earth Rights).

3) I reside on land that was homesteaded by my grandmother's sister and her husband, and it is where I spent my early childhood years. My family purchased the land in the year 2000, we moved my grandparents' house to the site, and I have lived there since 2002. This was my peaceful refuge to come home to after working long hours in a busy ER.

4) Oil drilling with concomitant flaring of natural gas has affected the area where I live for approximately eight years. Drilling of an eleven well pad at Van Hook is currently in progress. There are oil sites north, south, east, and west of my home.

5) For the past four to five years, I have experienced episodes of coughing and chest tightness. When I have spent the day away from home and out of the area of oil activity, I have been symptom-free. There was a noticeable increase in coughing upon returning to my home area. Studies have shown chronic stress leads to inflammation which contributes to heart disease. The stress of oil activity in general as well as the stress of witnessing continuous flaring will put my cardiovascular system at risk.

6) Flaring assaults the senses. A natural gas flare produces a roar that is audible from over a mile away. At times the air smells of ammonia and burning rubber. Flares create flickering light visible at night through window coverings. The night sky is no longer dark, and the visibility of

stars is diminished. On windy days, flares at the tops of tall pipes are perpendicular to the ground, vigorously dispersing toxic substances.

7) As a child, I was trained not to waste natural resources. From my home, I can see thirty flares burning off natural gas daily. The flaring continues day after day, week after week, month after month. The number of flares occasionally increases from thirty, up to fifty or sixty. This natural gas could benefit millions of people. The oil industry believes the gas is not worth enough monetarily to spend the money to capture it. The North Dakota oil and gas regulators grant exemptions allowing companies to continue flaring.

8) I understand the BLM Methane and Waste Prevention Rule would require the oil industry to reduce flaring through gas capture, and would prohibit venting of gas into the air. These steps will help to limit pollutants released into the air we breathe every day. There must be no delay in the implementation of the Waste Prevention Rule. The expectation is for many more wells to be drilled on the reservation. The risks to health will only increase.

/s/Carol Ventsch

Carol Ventsch

December 14, 2017

# Attachment 31

**Declaration of Lisa DeVille**, Ft. Berthold POWER

# DECLARATION OF LISA DEVILLE

1). My name is Lisa DeVille. I am an enrolled member of the Mandan Hidatsa Arikara (MHA) Nation also known as the Three Affiliated Tribes. I live with my husband, five children and two grandchildren. We have lived our whole lives in Mandaree, North Dakota, the most extracted community on the Fort Berthold Reservation. I am also a member of Fort Berthold Protectors of Water and Earth Rights (Fort Berthold POWER).

2). Mandaree and Fort Berthold Reservation are special to me because this where I was raised and where I choose to raise my family. My family and my ancestors are buried here along the shores of Lake Sakakawea. Being Native American, this is the only land that we have left that is our own. We were relocated several times in our history as a people. Once when my ancestors were intentionally infected by small pox and then forced to move from Missouri River, second when much of Fort Berthold Reservation was flooded to build Garrison Dam as part of the Pick Sloan project.

3). We are connected to the Earth we are taught in the story of our creation, we are created from the Earth. We are taught that the Earth is our Mother so we must protect it.

4). Three Affiliated Tribes and the State of North Dakota have entered into a tax agreement that allows the State of North Dakota to take over 51% of all tax revenues. From 2008 to 2015, the State of North Dakota has taken more than $450 million in tax revenues from energy production on our Reservation. Tribal royalties fund a large part of our infrastructure upkeep that the state no longer covers. In 2011, the state collected about $82 million in taxes from tribal energy development but spent less than $2 million on state roads on the reservation and zero on tribal and BIA roads. Our tribe has been responsible for repairing tribal roads that have been destroyed by oil and gas traffic.

5). BLM's regulations governing waste of natural gas were nearly 40 years old and should be updated to keep in pace with growing technology. The Rule grants a variance for tribal governments like mine to meet or exceed the federal benchmark. We are losing a precious natural resource that is being burned within a less than a mile from our homes.

6). Members of Fort Berthold POWER and I have worked on these protections for over 3 years. We've been living with oil and gas for nearly a decade and we did not know that there would be so much environmental destruction with fracking. There are over 1,000 oil and gas wells on the Fort Berthold Reservation. Through my education in environmental science, I am trained in using Geographic Information System (GIS) technology. I have worked with Professor Tanya Driver at the Nueta, Hidatsa, Sahnish College to create a map of the oil and gas wells on the Fort Berthold Reservation, which is attached to my Declaration as Exhibit A.

7). In November 2015, my husband Walter and I attended a fly-in in Washington DC to meet with our delegates to gain support of the Waste Prevention Rule. We also attended meetings at the EPA, BLM, the Office of Management and Budget, and a morning briefing for delegates to hear about our oil and gas issues. I presented images of FLIR cameras catching harmful emissions in the Bakken oilfields.

8). In February 2016, I joined hundreds of others who packed the room at the Dickinson, North Dakota BLM public comment hearing regarding the proposed rule. We are directly impacted by flaring, venting, and leaking.

9). I am very concerned about the physical effects of oil and gas flaring and venting. My children and grandchildren breathe in this air. How is this going to affect our health? We need the rules in place NOW to prevent further illness. Also, our tribe and people are losing royalties that should be paid to the rightful owners.

10). My husband and my mother own mineral allotments. We all receive royalty checks on oil but not the gas.

11). Each enrolled member (15,500 enrolled members) of the Three Affiliated Tribes has received $1,000 every quarter since 2015.

12). If my Tribe received additional royalty payments from gas captured as required by the Waste Prevention Rule, I would like to see Mandaree and the Fort Berthold Reservation address many things such as infrastructure, roads, education, new schools, drug abuse treatment, health care, homes, and promote healthy life styles. The impact from oil and gas has changed our way life and our quality of life.

13). For the past 8 years I have witnessed the increase of oil and gas industrialization along with the environmental impacts. In 2015, I worked with researchers from Duke University to document one of those environmental impacts—the chemicals found in oil and gas wastewater spills. The results of this study were peer reviewed and published in the Environmental Science and Technology journal, and are attached as Exhibit B.

14). We are very much affected by the light pollution from flares. Every direction you look there are gas flares that sound like a roaring jet plane that rumbles the ground like a train passing by. At night the sky is lit up like it is still day. Our land once was lush with natural grasses, wildlife, June berries and plum trees. Our way of life has been changed because of the interruption by the oil industry.

16). I can feel the earth rumble at night time when everything is quiet. So do other members of my family.

17). In August of 2017, both my husband, Walter and I got ill from respiratory infections. We first went to Indian Health Service where we received medication, but did not get any better for several weeks. We then went to the McKenzie County Clinic, where a physician told us that we had the same symptoms as oil field workers who had come to the clinic. Walter was given a steroid shot, but I took medication again. It took about 8 weeks for Walter and I to fully heal from the infection. Asthma and respiratory infections are on the increase on Fort Berthold Reservation. I am very concerned about the air pollution from oil and gas near my home.

18). Through my education in environmental science, I have learned that methane is the second largest contributor to human-caused global warming after carbon dioxide. It has a global

warming potential that is 25 times greater than carbon dioxide. It also contains volatile organic compounds such as benzene, a known carcinogen. Long term exposure to methane emissions result in health impacts such as: asthma, cancer, neurological damage, pulmonary reduction, coronary problems, endocrine disruptive, and headaches. The impact can be devastating if we're breathing in carcinogenic material that is a result of the oil and gas production.

19). The air pollution is visible. What goes up in the air has to land somewhere, you then have heavy rains, then seepage and leakage. This environmental impact that happening today will take affect years from now.

20). I am concerned about the harmful health and environmental effects from the methane and other air pollutants that are released from well sites. This is an unmeasurable cost to tribal members on Ft. Berthold and those down wind. Fort Berthold POWER values our health, our lands and our future generations.

21). Creating environmental laws and policies on oil and gas development that must be strictly enforced is very important. Otherwise, we risk the unrepairable consequences of the environmental damage. We need monitoring, research, testing, and studies that show the environmental and human health impacts of exposure. Our health and the health of our children and mother Earth should not continue to be sacrificed.

22). I live with oil and gas. I see the health and environmental impacts every day. Mandaree is the biggest producing oil and gas community on Fort Berthold Reservation. Fort Berthold POWER members, including myself, worked with Earthworks to study the flaring and emissions coming off well locations using the infrared imaging.

23). Specifically, my husband Walter and I collaborated with Dakota Resource Council and Earthworks to examine the Buffalo wellpad on the Fort Berthold Reservation using an infrared camera (FLIR). The results of this investigation are summarized in the attached case study (Exhibit C). In 2016, Walter and I participated in a fly-in to Washington, D.C., where we presented the Buffalo wellpad case study to executive branch staff. During July 2017, Walter and I collaborated again with Dakota Resource Council and Earthworks to examine existing wellpads on the Fort Berthold Reservation using an FLIR camera. The results of this investigation are summarized in the attached case study (Exhibit D), and in YouTube videos available at the links provided in the case study.

24). We can constantly smell hydrocarbons in the air, a pungent smell of rotten eggs of sulfur. Every direction you look there is flare.

25). Air pollution is visible in all directions on the Reservation.

26). Nothing will improve as long that North Dakota state and MHA Nation are influenced by oil and gas. The industry has much too much influence with our decisions makers that work against protections like the Methane Rule. That is why having protections against wasteful processes that pollute our air and create noisy and ugly flares at the federal level is so important.

27). I live here so I have no choice but to deal with the impacts of oil and gas development. I do not plan to move this is the only land we have left.

28). I do not trust the state of North Dakota in regulating oil and gas. We have seen that the state puts profit before people. We have oil and gas industry propaganda in the school system, so our kids are learning that fracking and all harmful practices are safe.

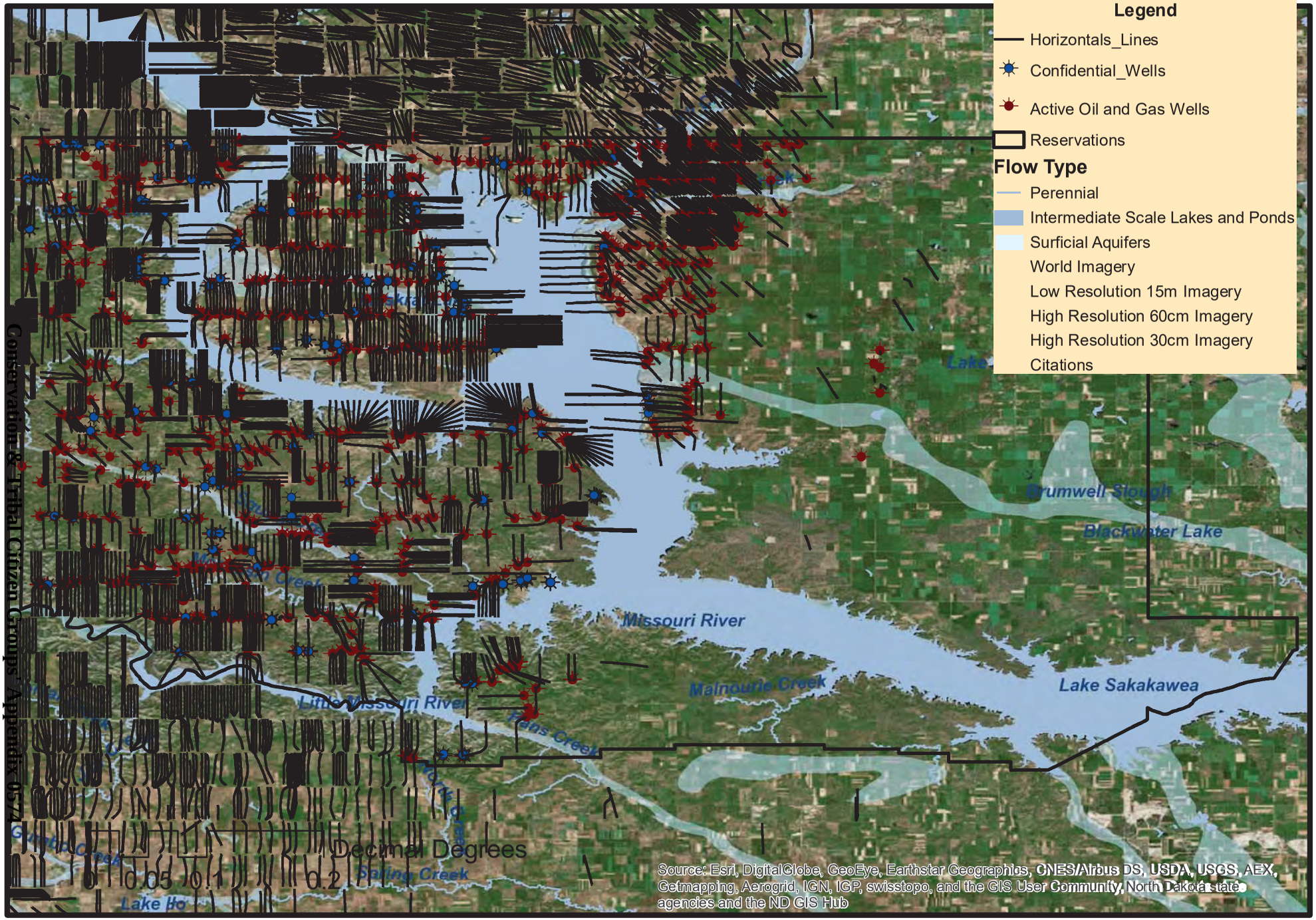
29). I support the BLM Waste Prevention Rule because every year the oil and gas industry releases millions of tons of methane into the air. Between 2009 and 2014, oil and gas producers on public and tribal lands vented, flared and leaked about 375 billion cubic feet of natural gas. That's enough to supply over 5 million homes for one year. Why should this matter? Because our state and tribal tax dollars are being burned or vented into the atmosphere. In North Dakota, oil development has overwhelmingly outpaced gas capture due to lack of infrastructure, a major oversight that has left reservations and public lands open to unnecessary flaring; and the oil industry has been given a free pass to willfully waste a valuable, finite resource.

30). It is important to me that the BLM's Rule be implemented as originally scheduled, because if companies comply it would curb the intentional release of methane into the atmosphere and ensure that royalties are paid to fuel our state's economy as well as ensure cleaner air quality. Revising and delaying the compliance dates of the BLM Rule is not in the best interest of the people living with oil and gas. We choose to live on our ancestral lands, but we cannot choose to not breathe polluted air. Fort Berthold POWER opposes delay, revision, or rescind these common sense rules for the benefit of the industry by not requiring them to pay for the cost of responsible production.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 14, 2017.

# EXHIBIT A

# Active Oil and Gas Producing Wells
# Fort Berthold Indian Reservation




Conservation & Tribal Citizen Groups' Appendix 0572

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*Map Done By: Tanya Sand-Driver & Lisa Deville*

# EXHIBIT B

Environmental Science & Technology

Article

pubs.acs.org/est

# Brine Spills Associated with Unconventional Oil Development in North Dakota

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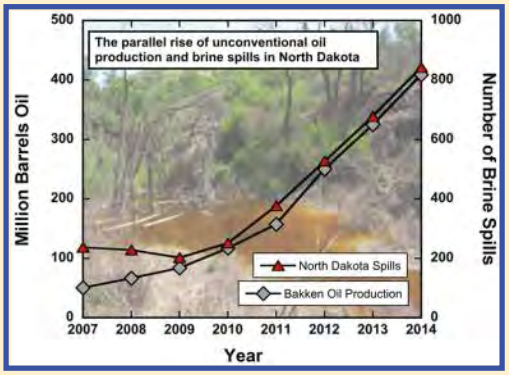
Supporting Information

**ABSTRACT:** The rapid rise of unconventional oil production during the past decade in the Bakken region of North Dakota raises concerns related to water contamination associated with the accidental release of oil and gas wastewater to the environment. Here, we characterize the major and trace element chemistry and isotopic ratios ($^{87}Sr/^{86}Sr$, $\delta^{18}O$, $\delta^{2}H$) of surface waters ($n$ = 29) in areas impacted by oil and gas wastewater spills in the Bakken region of North Dakota. We establish geochemical and isotopic tracers that can identify Bakken brine spills in the environment. In addition to elevated concentrations of dissolved salts (Na, Cl, Br), spill waters also consisted of elevated concentrations of other contaminants (Se, V, Pb, $NH_4$) compared to background waters, and soil and sediment in spill sites had elevated total radium activities ($^{228}Ra$ + $^{226}Ra$) relative to background, indicating accumulation of Ra in impacted soil and sediment. We observed that inorganic contamination associated with brine spills in North Dakota is remarkably persistent, with elevated levels of contaminants observed in spills sites up to 4 years following the spill events.




## INTRODUCTION

With the discovery of new oil fields and advances in drilling technology, notably hydraulic fracturing and horizontal drilling, unconventional oil and gas production from the Bakken region in North Dakota has been rising significantly since 2007. In 2014, the Bakken region was producing an average of over 1 million barrels of oil per day, compared to production levels that consistently lingered at approximately 100 thousand barrels per day before 2007.[1] This rapid rise in production has been made possible by intense development of oil and gas infrastructure in western North Dakota, including approximately 9700 unconventional wells that have produced an estimated 31.4 × $10^9$ gallons (118.9 × $10^9$ L) of oil and gas wastewater (OGW).[2]

OGW includes highly saline produced and flowback waters that, in the Bakken region, can exceed 300 g/L of total dissolved solids (TDS).[3,4] In addition to high salinity, OGW often contains a number of toxic trace elements and naturally occurring radioactive materials (NORM) in elevated concentrations that can be threatening to local water quality if released to the environment.[5−11] Previous studies have shown contamination of local surface water resources from unconventional oil and gas development due to the release of OGW to the environment in the form of (1) effluents to local streams and rivers following inadequate treatment by water treatment facilities,[5−7,9] (2) dust suppressants and deicing agents,[11] and (3) leaks and spills.[8,12] The release of OGW to the environment has been linked to salt, trace metal, and NORM contamination of local surface water, shallow groundwater, and stream sediments.[8,13−15]

In North Dakota, the high occurrence of OGW spills is potentially threatening the quality of surface and drinking water resources. Since the beginning of the rise of unconventional oil extraction and hydraulic fracturing in 2007, there have been approximately 3900 brine spills reported to the North Dakota Department of Health by well operators (Figure 1); brine spills are defined as the accidental release of brine that may potentially impact groundwater or surface water.[16] In North Dakota, OGW is primarily transported by pipes or trucks and stored in enclosed containers onsite prior to disposal via deep well injection. Reported spills often occur during transport to injection sites via pipelines or during filling or emptying of storage tanks. Unlike other areas in the U.S. where decades of conventional oil and gas exploration have generated a legacy of contamination, the exploration rates of conventional oil and gas in North Dakota were significantly lower than recent unconventional operations. Therefore, recent OGW spills are directly associated with recent unconventional oil extraction. Previous research on the impact of hydraulic fracturing in the Bakken region has been limited to two studies showing groundwater contamination from one site[17] and temporal changes in surface water and shallow groundwater quality from

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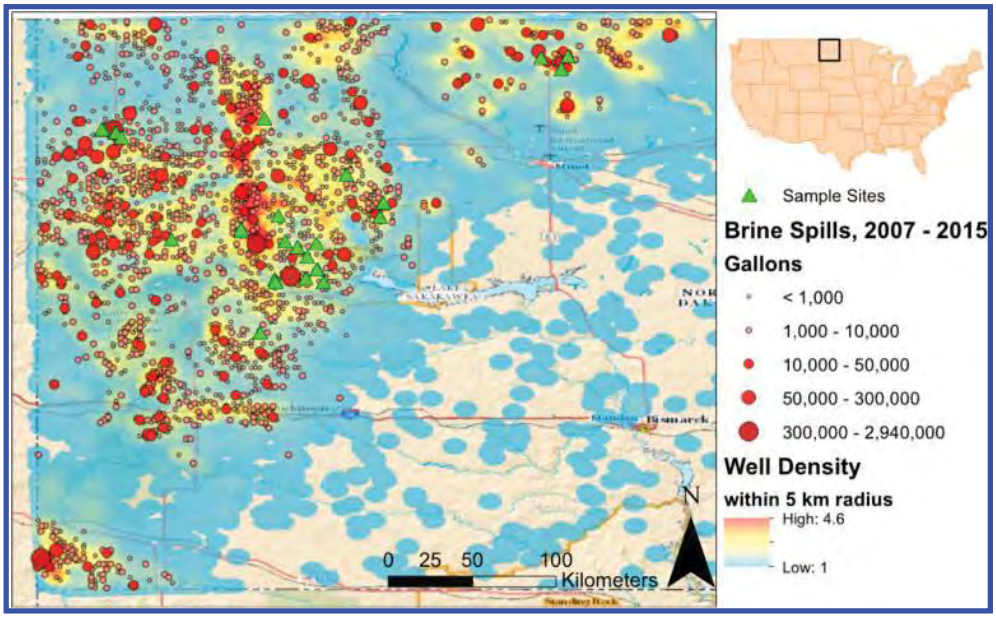


**Figure 1.** Map of western North Dakota that includes well density (number of wells per 5 km radius), reported brine spills from 2007 to 2015 (red circles), and sampling sites of samples collected in July 2015 (green triangles). Note the association between spill locations and well density, with higher occurrences of spills in areas of high well density. Spill data were compiled from the North Dakota Department of Health and include both contained and uncontained brine spills.[16] Oil well data were downloaded from the North Dakota Industrial Commission, Oil and Gas Division.[37]

three sites.[18] Both studies found evidence of OGW contamination in surface water and groundwater, highlighting the need for a comprehensive understanding of the dynamics of brine spill water chemistry and the potential for long-term impacts.

Here, we evaluate the impact of OGW spills on the inorganic water quality of surface water and NORM levels in soil from spill sites in North Dakota. The study is based on chemical and isotopic analyses of (1) the Bakken produced water ($n$ = 4), (2) surface waters impacted by recent brine spills ($n$ = 10) associated with unconventional energy development in the Bakken region of North Dakota, and (3) background surface water in western North Dakota ($n$ = 19). Previous studies have shown that surface water in North Dakota is typically saline with elevated levels of sodium and sulfate relative to other areas in the U.S.[18−20] The highly mineralized background water could mask the identification of brine spills. Consequently, in this study we used multiple geochemical tracers to characterize the OGW spills and identify their occurrence in the environment. We hypothesize that the chemistry of the Bakken brines is sufficiently different from the local background saline surface water and that geochemical tracers such as Br/Cl and $^{87}Sr/^{86}Sr$ could be used to detect the OGW source in spill sites. The objectives of this study are to (1) characterize the geochemistry of spill water associated with unconventional oil production in the Bakken region, (2) establish geochemical tools to identify spill water in the environment, and (3) assess the environmental implications of brine spills and the fate of spill-water contaminants in impacted areas.

## MATERIALS AND METHODS

**Sample Collection.** Twenty-nine surface water samples and 37 grab sediment and soil samples were collected in western North Dakota (Figure 1) in July 2015, as well as 4 produced water samples from the Bakken formation of the Williston Basin. In the sampling campaign, we collected water samples from surface waters impacted by reported spill events as well as samples from surface waters possibly impacted by the release of brine due to proximity of these waters to well pads or disposal sites with the aim of identifying contamination. Reported spills sampled include the two largest spill events in North Dakota's history, the Bear Den Bay Spill (referred to as samples ND102 and ND103) and the Blacktail Creek Spill (ND123 and ND126). In the Bear Den Bay Spill, an underground pipeline leak in July 2014 caused approximately 24000 barrels (3.8 million L) of brine to flow down a ravine and into the Bear Den Bay, approximately a quarter mile (0.4 km) upstream of the drinking water intake in Lake Sakakawea. The Blacktail Creek Spill, also resulting from a pipeline leak, occurred in January 2015 and released nearly 70000 barrels (11 million L) of brine near Blacktail Creek, which flows into the Little Muddy River, a tributary of the Missouri River. We also collected water samples from surface waters impacted by smaller spills. These include a 300 barrel (48,000 L) brine spill that occurred in February 2011 (ND128) and another 300 barrel brine spill that occurred in July 2011 (ND129), both in Bottineau County in northern North Dakota. Additional information on sample collection protocols, sample site locations, and sample descriptions is provided in the Supporting Information (Figures S1 and S2; Table S1).

**Data Analyses.** Major anions were measured by ion chromatography (IC) using a Thermo Fisher Dionex IC, major cations were measured by direct current plasma optical emission spectrometry (DCP-OES), and trace elements were measured by VG PlasmaQuad-3 inductively coupled plasma mass spectrometry (ICP-MS). Alkalinity was measured by titrating the sample with HCl to pH 4.5. Total organic carbon (TOC) measurements were conducted on a Shimadzu TOC-V CPH total carbon analyzer with a TNM-1 nitrogen module (Shimadzu Scientific Instruments). Stable oxygen and hydrogen isotopes ($\delta^{18}O$ and $\delta^{2}H$) were measured at the Duke Environmental Isotope Laboratory (DEVIL) by continuous flow isotope ratio mass spectrometry using a ThermoFinnigan





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Table 1. Major Chemistry and Isotopic Ratios of Bakken Produced Waters, Spill Waters, and Background Waters

| sample | Cl (mg/L) | Br (mg/L) | $SO_4$ (mg/L) | $HCO_3$ (mg/L) | Ca (mg/L) | Mg (mg/L) | Sr (mg/L) | Na (mg/L) | $NH_4$ (mg/L) | $^{87}Sr/^{86}Sr$ | $\delta^{18}O$ | $\delta^{2}H$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type A Spills | | | | | | | | | | | | |
| ND102 | 14795 | 72.5 | 1713 | 279 | 1953 | 684 | 52.6 | 6003 | 9.14 | 0.70973 | −10.6 | −82.5 |
| ND103 | 16032 | 74.0 | 3210 | 247 | 1773 | 902 | 51.1 | 6754 | 42.4 | 0.70960 | −5.9 | −73.8 |
| ND113 | 996 | 5.5 | 4090 | 668 | 576 | 376 | 5.67 | 1513 | 0.62 | 0.70787 | −14.3 | −109.0 |
| ND123 | 1487 | 5.2 | 3025 | 880 | 156 | 235 | 3.48 | 2029 | 21.0 | 0.70968 | −7.5 | −90.5 |
| ND126 | 1900 | 5.9 | 3117 | 941 | 212 | 258 | 4.70 | 2282 | 17.0 | 0.70971 | −8.9 | −97.8 |
| **avg** | **7042** | **32.6** | **3031** | **603** | **934** | **491** | **23.5** | **3716** | **18.0** | **0.70932** | **−9.5** | **−90.7** |
| Type B Spills | | | | | | | | | | | | |
| ND120 | 207 | 0.22 | 464 | 306 | 111 | 101 | 0.46 | 102 | 0.76 | 0.70980 | −6.3 | −66.6 |
| ND128 | 269 | 0.56 | 946 | 466 | 187 | 148 | 0.89 | 298 | 0.40 | 0.70999 | −3.3 | −74.9 |
| ND129 | 5833 | 5.8 | 856 | 116 | 1225 | 475 | 5.94 | 1876 | <0.01 | 0.70923 | −2.4 | −54.8 |
| ND130 | 189 | 0.17 | 387 | 345 | 109 | 91 | 0.49 | 99.3 | 0.19 | 0.71029 | −6.7 | −67.9 |
| ND131 | 18703 | 20.5 | 2739 | 110 | 1381 | 2220 | 8.53 | 6829 | 0.32 | 0.71011 | −6.8 | −71.9 |
| **avg** | **5040** | **5.5** | **1078** | **268** | **603** | **607** | **3.26** | **1841** | **0.42** | **0.70989** | **−5.1** | **−67.2** |
| Produced Water | | | | | | | | | | | | |
| PW1 | 119989 | 558 | 128 | 35.0 | 12033 | 1001 | 774 | 47217 | 2110 | 0.71044 | | |
| PW2 | 75892 | 384 | 102 | 169 | 8573 | 741 | 551 | 34745 | 1200 | 0.71046 | | |
| PW3 | 21728 | 91.6 | 0.0 | 856 | 372 | 118 | 33.1 | 12271 | 44.8 | 0.70939 | | |
| PW4 | 136220 | 601 | 293 | | 15346 | 1299 | 970 | 60571 | 2520 | 0.71044 | | |
| **avg** | **88457** | **409** | **131** | **353** | **9081** | **790** | **582** | **38701** | **1469** | **0.71018** | | |
| Background Sites | | | | | | | | | | | | |
| **avg**[a] | **21.0** | **0.73** | **1658** | **687** | **121** | **104** | **1.41** | **733** | **0.93** | **0.70820** | **−10.5** | **−101** |

[a]Reflects the average of data from 19 samples.

TCEA and Delta + XL mass spectrometer. Strontium isotopes ($^{87}Sr/^{86}Sr$) were measured by thermal ionization mass spectrometry (TIMS) using a Thermo Fisher Triton. The average $^{87}Sr/^{86}Sr$ of NIST SRM-987 was 0.710264 ± 5.8 × $10^{-6}$ (1$\sigma$) over the course of this study.

Radium isotopes ($^{226}Ra$ and $^{228}Ra$) were measured in spill waters, produced waters, and grab soil and sediment samples at the Duke University Laboratory for Environmental Analysis of Radionuclides (LEARN) using a Canberra broad energy germanium gamma detector calibrated with a standard reference ore (DL-1a). Ra was extracted from spill waters (2−25 L) and concentrated on ∼10 g of MnO fiber.[21] Prior to $\gamma$ analysis, fibers, filtered brines, and oven-dried soils and sediments were packed in 40 mL snap lid Petri style dishes that were then wrapped with electrical tape and coated with wax to prevent the escape of gaseous $^{222}Rn$ ($t_{1/2}$ = 3.8 days). Samples then incubated for at least 21 days in order for $^{226}Ra$ to reach radioactive secular equilibrium with its short-lived daughter $^{214}Pb$ ($t_{1/2}$ = 27 min). $^{226}Ra$ was analyzed through the $^{214}Pb$ (351 kEv) peak and $^{228}Ra$ was analyzed through the $^{228}Ac$ (911 kEv) peak. Samples were counted for 12−24 h to minimize statistical counting error, which was typically less than 5% (1$\sigma$).

## RESULTS AND DISCUSSION

**Chemical Characterization of Water Sources.** Evaluation of the chemical data reveals background water and two types of spill water (defined as type A and type B spills) in the study area. Background water is highly saline (mineralized) water (TDS up to 5000 mg/L) with Na-$SO_4$−$HCO_3$ composition, high pH (up to 9.3), high TOC (300 mg/L), low Cl (typically <35 mg/L), high Br/Cl (∼3 × $10^{-2}$ molar ratio), and relatively low $^{87}Sr/^{86}Sr$ ∼0.70824 ± 0.0006 ($n$ = 19) (Table 1). The high salinity observed in background waters in the study area cannot be explained by halite dissolution, given the low Cl concentrations and high Br/Cl ratios. Additionally, the chemical composition of the saline surface water is different from the composition of the Bakken brines, ruling out the possibility of naturally occurring brine seeps. $HCO_3$ is highly correlated to TOC concentrations (Figure S3), suggesting that the majority of the DIC in the highly mineralized background water is derived from oxidation of organic matter. This is consistent with low $\delta^{13}$C-DIC values (mean = −11 ± 2.9‰) that reflect oxidation of C4 type plants that are typical in arid environments (Table S4). Saline waters with elevated sulfate were previously reported for surface waters and wetlands in North Dakota,[18−20] and Sr isotope ratios measured in background waters in this study are consistent with Sr isotope ratios previously reported for uncontaminated North Dakota groundwaters.[17]

USGS data[22] and new data generated in this study (Tables 1 and 2) indicate that produced water from the Bakken formation is highly saline (TDS of 35000−330000 mg/L) and characterized by a typical Na−Ca−Cl composition. The Bakken brines have high Br/Cl (∼2 × $10^{-3}$ molar ratio; Figure 2, Table 1) and high $^{87}Sr/^{86}Sr$ (0.71018 ± 0.0005; Figure 3). Although the number of produced water samples analyzed in this study is relatively limited ($n$ = 4), our data are consistent with previously unpublished Bakken produced water data from the USGS ($n$ = 12; mean $^{87}Sr/^{86}Sr$ = 0.71039; Br/Cl ∼ 2 × $10^{-3}$; mean $\delta^{18}O$ = +3‰ and mean $\delta^{2}H$ = −44‰)[22] as well as isotope data reported by Rostron and Holmden (mean $^{87}Sr/^{86}Sr$ = 0.70956; mean $\delta^{18}O$ = +5‰ and mean $\delta^{2}H$ = −40‰).[23] In addition to the elevated concentrations of major elements (Na, Cl, Br), our data show that the Bakken brines are enriched in metals, metalloids, and other potential contaminants (Se, V, Sr, B, Mn, Ni, Cd, Cu, Zn, Ba, Pb, Ra, $NH_4$) that have human and ecological health implications (Figure 2, Table 2).



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**Table 2. Trace Metals in Bakken Produced Waters, Spill Waters, and Background Waters**

| sample ID | Li (μg/L) | B (μg/L) | Al (μg/L) | V (μg/L) | Mn (μg/L) | Co (μg/L) | Ni (μg/L) | Cu (μg/L) | Zn (μg/L) | Se (μg/L) | Rb (μg/L) | Tl (μg/L) | Fe (μg/L) | Ba (μg/L) | Pb (μg/L) | Cd (μg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type A Spills | | | | | | | | | | | | | | | | |
| ND102 | 3244 | 13140 | 202 | 148 | 3418 | 8.8 | 44 | 21 | 88 | 95 | 211 | 5.9 | 2673 | 392 | 8.3 | 2.5 |
| ND103 | 3490 | 15501 | 137 | 171 | 839 | 4.9 | 25 | 25 | 52 | 132 | 236 | 4.7 | 2468 | 274 | 8.0 | 3.4 |
| ND113 | 478 | 511 | 28 | 12 | 1924 | 0.7 | 4.3 | 4.4 | 10 | 8.4 | 22 | 0.0 | 771 | 54 | 0.5 | 0.0 |
| ND123 | 476 | 3217 | 26 | 22 | 598 | 0.7 | 0.7 | 2.6 | 12 | 6.8 | 56 | 0.1 | 211 | 62 | 0.8 | 0.0 |
| ND126 | 542 | 3995 | 41 | 25 | 811 | 0.7 | 0.0 | 2.8 | 25 | 7.2 | 71 | 0.0 | 79 | 70 | 1.0 | 0.5 |
| **avge** | **1646** | **7273** | **87** | **76** | **1518** | **3.2** | **15** | **11** | **38** | **50** | **119** | **2.2** | **1240** | **171** | **3.7** | **1.3** |
| Type B Spills | | | | | | | | | | | | | | | | |
| ND120 | 67 | 224 | 12 | 4.9 | 107 | 0.6 | 2.7 | 2.3 | 15 | 1.1 | 4.0 | 0.0 | 161 | 110 | 0.2 | 0.0 |
| ND128 | 213 | 193 | 9 | 10 | 1555 | 1.5 | 5.2 | 1.5 | 4.0 | 1.2 | 7.9 | 0.0 | 271 | 78 | 0.3 | 0.1 |
| ND129 | 804 | 5358 | 17 | 73 | 1984 | 2.4 | 14 | 4.9 | 12 | 49 | 44 | 0.1 | 1517 | 512 | 2.6 | 0.0 |
| ND130 | 79 | 39 | 9 | 4.7 | 306 | 0.4 | 0.8 | 0.5 | 3.4 | 1.4 | 3.2 | 0.0 | 148 | 117 | 0.0 | 0.0 |
| ND131 | 1196 | 1155 | 86 | 218 | 725 | 2.9 | 28 | 28 | 24 | 172 | 5.3 | 0.3 | 1901 | 194 | 6.0 | 1.4 |
| **avg** | **472** | **1394** | **27** | **62** | **935** | **1.5** | **10** | **7.5** | **12** | **45** | **13** | **0.1** | **800** | **202** | **1.8** | **0.3** |
| Produced Water | | | | | | | | | | | | | | | | |
| PW1 | 31476 | 225275 | 196 | 962 | 16672 | 95 | 533 | 114 | 12512 | 859 | 11746 | 198 | 19162 | 9210 | 558 | 21 |
| PW2 | 19726 | 142843 | 861 | 602 | 13129 | 153 | 613 | 15 | 3786 | 630 | 7438 | 124 | 30236 | 12438 | 144 | 22 |
| PW3 | 2910 | 24996 | 292 | 148 | 216 | 2.9 | 9.0 | 13 | 19 | 141 | 342 | 1.7 | 687 | 26252 | 4.8 | 0.5 |
| PW4 | 37003 | 260078 | 1100 | 1020 | 15839 | 169 | 834 | 366 | 17122 | 969 | 12916 | 213 | 22304 | 6351 | 3481 | 31 |
| **avg** | **22779** | **163298** | **612** | **683** | **11464** | **105** | **497** | **127** | **8360** | **650** | **8111** | **134** | **18097** | **13563** | **1047** | **19** |
| Background Sites | | | | | | | | | | | | | | | | |
| **avg**[a] | **103** | **502** | **87** | **3.6** | **304** | **0.9** | **4.3** | **3.6** | **6.8** | **1.1** | **3.5** | **0.0** | **335** | **52** | **0.2** | **0.1** |

[a]Reflects the average of data from 19 samples.



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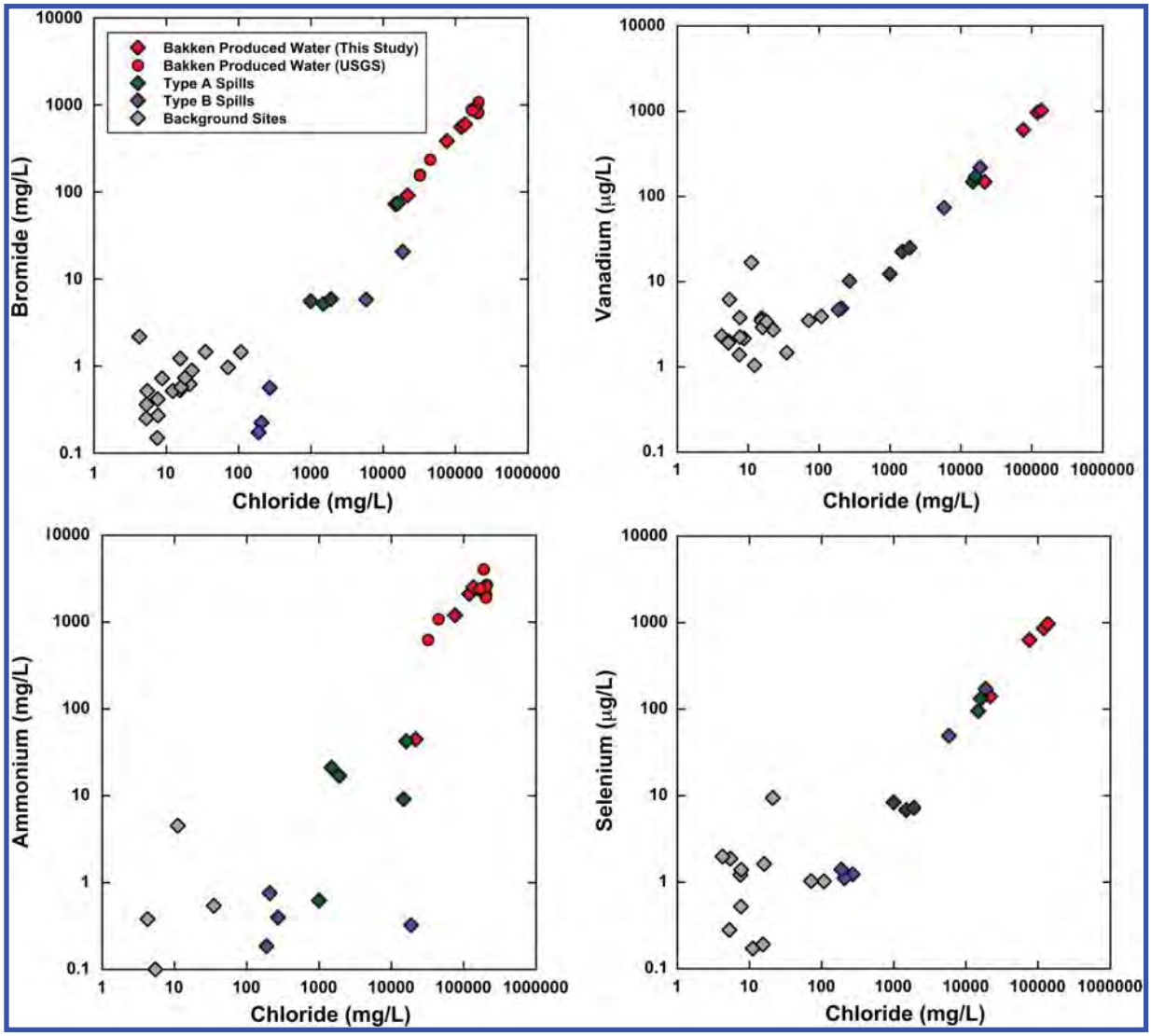


**Figure 2.** Bromide, selenium, vanadium, and ammonium versus chloride concentrations (log scale) in Bakken produced waters, spill waters, and background waters. Spill waters were defined on the basis of their chemical composition and resemblance to the Bakken brines (type A spills) relative to chemical fractionation induced from recycling of the Bakken brines (type B spills). Note that type A spills show linear correlations between bromide, vanadium, and selenium to chloride, indicating a conservative mixing relationship between the Bakken brines and background water.

The type A spills include the large spills at Bear Den Bay and Blacktail Creek. Type A spill water has a chemical composition that reflects the mixing of the Bakken brines with the saline background water and has relatively high Br/Cl ($1.9 \times 10^{-3}$ molar ratio; Figure 2) and relatively high B/Cl, Sr/Cl, and Li/Cl ratios (Figure S4). In type A spills, the magnitude of contamination depends on the relative mixing proportions of the brine and local surface water. Type B spills were generally much smaller and isolated from other water sources, which would likely promote more intense evaporation and the subsequent precipitation of minerals. Based on the distinctively low Br/Cl ($5.5 \times 10^{-4}$ molar ratio) of the type B spills, we propose that they originated from evaporation of the brines, followed by secondary mineral precipitation, and redissolution. As a result, type B spill water has a chemical composition that is different from simple mixing of the Bakken brines with background saline water.

We simulated the evaporation of type A spill water and evaluated the saturation index (SI) of minerals using PHREEQC software.[24] The SI is defined as SI = log(IAP/$K_{sp}$), where IAP is the ionic activity product and $K_{sp}$ is the apparent equilibrium solubility product. Our simulation shows that calcite and barite minerals are supersaturated for the Type A spill waters (samples ND102 and ND103), and 5-fold and 30-fold evaporation would generate solutions that are supersaturated for gypsum and halite, respectively. We therefore suggest that extensive evaporation of spill water would result in supersaturation and secondary mineral precipitation. Redissolution of these minerals would generate Na−Cl saline water with relatively low Br/Cl ratios compared to the Bakken brines that is consistent with the chemistry of type B spill water.

**Identification of Spill Water in the Environment.** Surface waters defined as background waters in this study are relatively saline, which is consistent with previous studies of North Dakota surface waters.[18−20] As a result, high salinity alone cannot necessarily reveal the presence of OGW in the environment. Additionally, we identified two types of spill water, one that mimics the Bakken brines (type A) and another



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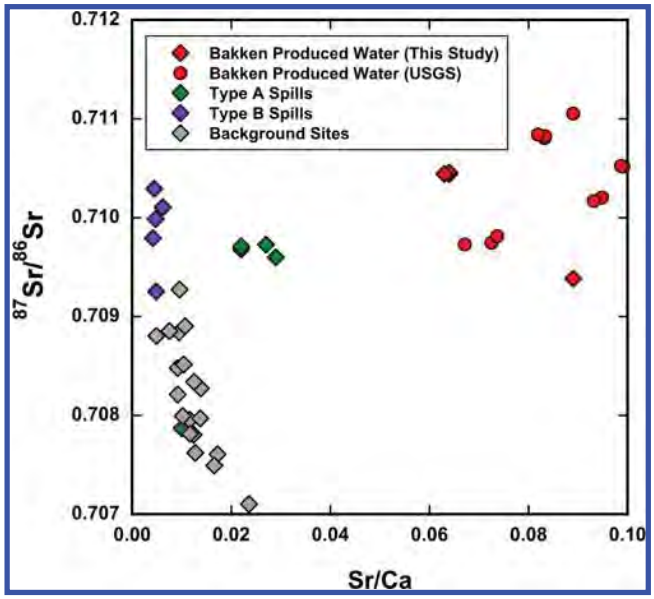


**Figure 3.** $^{87}Sr/^{86}Sr$ vs Sr/Ca (mass) ratios in Bakken produced waters, spill waters, and background waters. Note the large Sr isotopic and Sr/Ca ratio differences between the Bakken brines and background surface water in the study area. The $^{87}Sr/^{86}Sr$ ratio of the highly mineralized background water decreases with Sr/Ca, indicating a Sr source with a conspicuously lower $^{87}Sr/^{86}Sr$ signature as opposed to the relatively high $^{87}Sr/^{86}Sr$ ratios of the Bakken brines and spill waters. This distinction verifies that both type A and type B spill waters originated from the Bakken oil and gas wastewater.

(type B) that has a different chemical composition. Consequently, we posit that accurate identification of OGW in the environment in North Dakota requires several independent geochemical tracers.

While the chemical composition of type A spill water reflects the composition of Bakken brines diluted with local surface water, type B water had relatively lower Br/Cl ratios. Mean Br/Cl in type A spill water was not statistically different from the Bakken brines, while mean Br/Cl in type B spill water was statistically lower than both the Bakken brines and Type A waters ($p < 0.01$). Type A spill water also contained several elements (Li, B, Sr) that were positively correlated with Cl, and their ratios to Cl (Li/Cl, B/Cl, Sr/Cl) in the spill waters were similar to the ratios measured in the Bakken brines (Figure S4). We suggest that these elements behave conservatively like Cl, and thus, their concentrations in the spill water reflect the mixing relationships between the Bakken brines and background water.

The Sr isotope composition of type A spill water ($^{87}Sr/^{86}Sr$ = 0.70932 ± 0.0008) is similar to that of type B ($^{87}Sr/^{86}Sr$ = 0.70989 ± 0.0004). The differences in mean $^{87}Sr/^{86}Sr$ among type A spill, type B spill, and the Bakken produced water samples are not statistically significant, while differences in mean $^{87}Sr/^{86}Sr$ in type A spill, type B spill, and Bakken produced water compared to background surface water are highly statistically significant ($p < 0.01$). This confirms the salt recycling model and that type B spills originated initially from the Bakken OGW. Consequently, the use of Sr isotopes as an independent tracer for the origin of the spills is important because Sr isotope ratios are not affected by precipitation and dissolution of secondary minerals, while ionic ratios like Br/Cl could be affected by salt dissolution and differ from the expected Bakken brine composition.

The $\delta^2H-\delta^{18}O$ slope of 5.4 ($r = 0.92$) in background waters was similar to the $\delta^2H-\delta^{18}O$ slope of the spill waters (Figure S5). The mixing of the background water with the Bakken brines ($\delta^{18}O > +5‰$, $\delta^2H > -40‰$)[23] would therefore result in a similar slope resulting from naturally occurring evaporation of surface waters. Furthermore, the relative mixing relationship based on the chloride mass-balance suggests that type A spills contain ~10% brine, which would not change the overall stable isotope composition of the spill water. We conclude that the stable water isotopes cannot be used as sole indicators for brine contamination in highly evaporative areas in North Dakota. The $\delta^{18}O$ and $\delta^2H$ of type B spills are relatively higher than those of type A, although the salinity of type B water is lower. This apparent discrepancy reflects the different origins of the two spill types; type A spills originated from mixing of the Bakken brines with background waters with lower salinity and lower $\delta^{18}O$ and $\delta^2H$, while type B likely originated from recycling of salts from evaporation, salt precipitation, and dissolution that resulted in further enrichment of $^{18}O$ and $^2H$ in the residual saline water. We conclude that Sr isotopes are the most effective tracer of OGW in the environment in North Dakota, as they are not impacted by evaporation and cycles of salt precipitation and dissolution.

**NORM in the Bakken Brines and Impact on Spill Sites.** Produced waters can have elevated levels of naturally occurring radioactive materials (NORM), primarily the long-lived radium isotopes $^{228}Ra$ ($t_{1/2}$ = 5.75 years) and $^{226}Ra$ ($t_{1/2}$ = 1600 years).[10,25−28] Bakken produced and flowback waters analyzed in this study were found to have total Ra activities ($^{228}Ra$ + $^{226}Ra$) up to 64 Bq/L and an average $^{228}Ra/^{226}Ra$ activity ratio of 0.45 (Table S6). $^{228}Ra/^{226}Ra$ activity ratios in the Bakken produced waters reported in this study are consistent with ratios reported for scale, sludge, and filter socks in North Dakota, with average $^{228}Ra/^{226}Ra$ activity ratios of 0.6, 0.3, and 0.4, respectively.[29]

Following a spill event, Ra retention to the sediments or soil can be obtained by (1) Ra adsorption to solids, and (2) Ra incorporation into secondary Ra-rich minerals (e.g., barite), which could result in accumulation of Ra in the soil and legacy of radium contamination in spill sites even after the brine has been removed.[30] The saturation index (SI) of minerals for both background and spill waters was modeled using PHREEQC software.[24] Using the chemical data obtained in this study, the model indicates that background waters in North Dakota are supersaturated with respect to aragonite, barite, calcite, and dolomite, and under-saturated with respect to gypsum (Table S8). The high concentrations of sulfate in the background surface water, as well as the high saturation state with respect to barite minerals (SI ~ 1.5), suggests that Ra could precipitate out of solution with the formation of secondary barite minerals,[31] although no actual barite measurements in soil were conducted. Radium removal from spill water either by adsorption or coprecipitation with barite resulted in low activities of Ra in the spill water but elevated activities of Ra in the impacted soil (Figure 4).

In the Blacktail Creek spill, we found relatively low total Ra activities in the spill water itself (total Ra= 0.33 Bq/L) compared to the brines (up to 64 Bq/L), which is 190-fold lower radium activity, despite only the 8.5-fold dilution suggested by the chloride mass balance. The apparent Ra depletion in the spill water is consistent with highly elevated activities of total Ra and relatively lower $^{228}Ra/^{226}Ra$ activity ratios in the stream sediments (total Ra= 553−4684 Bq/kg;



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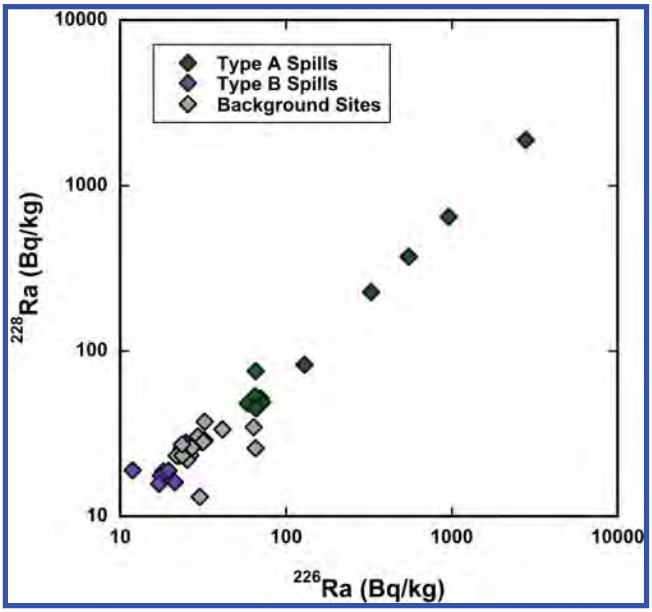


**Figure 4.** $^{228}$Ra vs $^{226}$Ra activities in sediments and soils from spill sites and away from spill areas in ND. The greatest accumulation of Ra in soils was found in the large magnitude spills of Bear Den Bay (3.8 million L) and the Blacktail Creek (11 million L) that are defined as type A spills. The high correlation of $^{228}$Ra and $^{226}$Ra and their ratio (~0.6) in the soils from the spill sites reflect the NORM composition of the Bakken brines and the relatively young age of the spills. Note the high accumulation of radium in the contaminated soil, several orders of magnitude greater relative to the radium level in soil from background sites.

$^{228}$Ra/$^{226}$Ra = 0.67−0.69), compared to upstream sediments (45 Bq/kg; 1.1). We also found elevated Ra activities and relatively low $^{228}$Ra/$^{226}$Ra activity ratios in soil samples collected at the Bear Den Bay spill site (total Ra = 106−211 Bq/kg; $^{228}$Ra/$^{226}$Ra = 0.64−0.82) compared to average background soils (58 Bq/kg; 0.85).

The effectiveness of Ra adsorption to sediment or soil depends on several factors such as the relative water to sediment ratio, water salinity, water chemistry (i.e., distribution of bivalent cations), soil type, cation exchange capacity (CEC) on clay minerals, organic matter content, oxide content, and grain size.[27,30,32,33] The high salinity of the Bakken brines may effectively inhibit Ra adsorption to the sediment or soil at the spill site itself; instead, Ra adsorption may be more effective downstream of the spill, when the brine becomes diluted with meteoric water. This phenomenon was observed in the Bear Den Bay site, where total Ra activities increased from ~100 Bq/kg at the original spill site to ~200 Bq/kg at approximately 0.4 km downstream from the original spill site (Figure S1). Parallel to the increase in total Ra activity, the $^{228}$Ra/$^{226}$Ra activity ratios decreased with distance along the flow path of the spill water. We conclude that the impact of the high NORM in the Bakken brines will be reflected in accumulation of Ra in soil, indicated by elevated levels of total Ra and relatively lower $^{228}$Ra/$^{226}$Ra activity ratios in soils and sediments from spill sites compared to background soils and sediments.

**Environmental Implications of Brine Spills.** In addition to elevated levels of salts, the Bakken brines contain elevated levels of trace elements and other toxic contaminants such as Ba (up to 9 mg/L), $NH_4$ (2,500 mg/L), Pb (3480 μg/L), Tl (231 μg/L), Cd (31 μg/L), Se (970 μg/L), Cu (365 μg/L), Ni (833 μg/L), V (1020 μg/L), and Mn (16 mg/L). Spill waters and surface waters impacted by spills identified in this study were found to have trace metal concentrations often 1 to 2 orders of magnitude greater than average concentrations in background surface waters (Table 2 and Figure 2). Additionally, these levels exceeded national ecological and drinking water regulations for multiple elements in some spill sites. Environmentally toxic selenium was measured in the majority of spill waters at elevated concentrations up to 172 μg/L, 35 times the National Recommended Criterion Continuous Concentration (CCC) for freshwater aquatic life (5 μg/L).[34] Likewise, high levels of $NH_4$ in spill waters (up to 42 mg/L) far exceed the US Environmental Protection Agency (EPA) acute and chronic ambient water quality criteria for protecting freshwater organisms from potential effects of Total Ammonium Nitrogen (TAN) of 17 mg/L and 1.9 mg/L, respectively (at pH = 7).[35] Additionally, certain elements were measured at concentrations above the National Maximum Contaminant Level (MCL) Drinking Water (Se, Tl, Ra) and Secondary Drinking Water (Cl, Fe, Mn) standards in some spill waters.[36] Given that spills can be located upstream from drinking water sources, as is the case in the Bear Den Bay spill, long-term monitoring of the waters downstream of spills is necessary in order to assess impacts on drinking water quality. Overall, our data show that the Bakken brines are enriched in numerous toxic elements and their release to the environment could directly affect the quality of the impacted water.

The results of this study indicate that the water contamination from brine spills is remarkably persistent in the environment, resulting in elevated levels of salts and trace elements that can be preserved in spill sites for at least months to years (up to 4 years for ND 128 and 129 samples) following the original spill. The concentrations of Br, V, Se, Li, B and Sr had strong linear correlations with Cl (Figure 2 and S4), which suggests that they behave conservatively and natural remediation is only due to dilution. Other constituents such as $NH_4$, $SO_4$, Ba and Mn, had ratios with Cl that are not consistent with those in the Bakken brines (Figure 2 and S6), and could reflect the retention of these elements to the soil or sediment at the spill sites or biological uptake. Additionally, we also observed the accumulation of long-lived isotopes of Ra in the sediments and soils of spill sites. The relatively long half-life of $^{226}$Ra (~1600 years) suggests that Ra contamination in spill sites will remain for thousands of years.

The increase in the occurrence of brine spills in North Dakota parallels the rapid rise of unconventional oil production from tight oil in the Bakken region since 2007 (Figure 5). We found that the occurrence of brine spills in North Dakota is correlated with oil well density (Figure 1, Figure S7), indicating that areas of high oil well density are relatively more likely to be impacted by spills. Analysis of the ~3900 documented brine spills in North Dakota[16] shows that spills generally ranged in volume from 200 to 10000 L (Figure S8). Pipeline leaks made up 18% of the spill events and were responsible for 47% of the spilled water by volume. The spatial distribution of oil, gas, and brine pipelines is not currently available in the public domain at the resolution needed to accurately assess the spatial relationship between pipeline network distribution and spill occurrence. Following pipeline leaks were valve/piping connection leaks (20.5% of volume, 24.8% of frequency) and tank leaks and overflows (14.5% of volume, 22.4% of frequency) (Figure S9). In sum, we find that the release of



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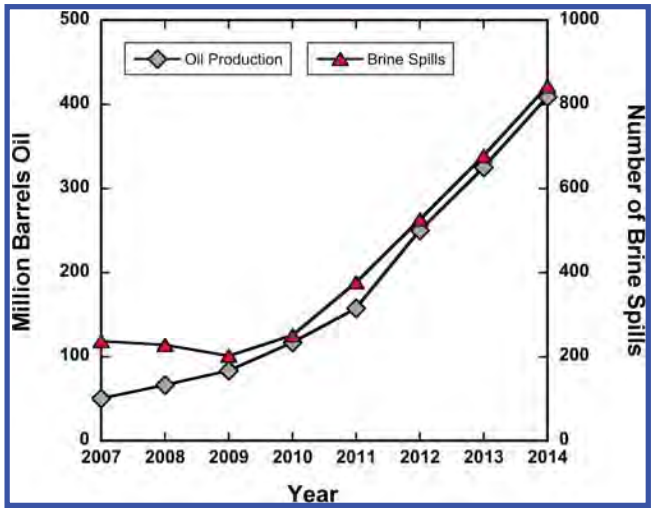


**Figure 5.** Graph depicting the parallel rise of annual Bakken oil production ($\times 10^6$ barrels) and number of brine spills in North Dakota from 2007 to 2014. Spill data were compiled from the North Dakota Department of Health.[16] Bakken oil production data were compiled from the Energy Information Administration.[38]

OGW to the environment since 2007 from accidental spills is largely due to infrastructure failures.

Overall, the establishment of the geochemical and isotopic ($^{87}Sr/^{86}Sr$) fingerprints of the Bakken brines enabled us to identify OGW spills, in spite of the highly saline background waters in areas of unconventional oil and gas development in North Dakota. The data show that, in addition to the high levels of dissolved salts such as Br and Cl, the spills are enriched in several contaminants such as $NH_4$, Se, V, B, and Mn relative to background water. The resistance of inorganic contamination to biodegradation and its consequential persistence in the environment suggest that contamination from brine spills in North Dakota will continue to impact nearby water resources for years to come. To fully understand the impacts of brine spills in North Dakota, future research should evaluate additional spill sites, analyze organic contamination in addition to inorganic elements, assess the impacts downstream of spill sites, including risks to drinking water sources, and conduct a comprehensive assessment of long-term ecological and possible human health impacts. The findings of this study are important for the identification of OGW in the environment and assessment of the environmental implications associated with OGW spills in other regions undergoing intense development of unconventional oil and gas infrastructure.

## ■ ASSOCIATED CONTENT

### Supporting Information

The Supporting Information is available free of charge on the ACS Publications website at DOI: 10.1021/acs.est.5b06349.

Further information on the sampling techniques, sample site locations, and sample descriptions; additional figures and tables (PDF)

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### Notes

The authors declare no competing financial interest.

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DOI: 10.1021/acs.est.5b06349
Environ. Sci. Technol. XXXX, XXX, XXX−XXX

# EXHIBIT C

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**Case Studies:**
In order to highlight the need for strong waste minimization plans that emphasize preventing waste as soon as a well is producing we investigated two examples of out of control flaring that are presently occurring in North Dakota. Case example one is the Buffalo Pad in Mandaree North Dakota on the Fort Berthold Reservation and Case example two is the Mollet well located near Tioga, ND. Both case examples will emphasize the need for waste minimization planning, but also help counter the industry argument that oil and gas operators are doing everything imaginable to capture gas.

**Case Example 1: Buffalo Pad (Mandaree, ND Fort Berthold)**

At present oil and gas wells are flaring in some cases continuously for years on public and tribal lands. In order to illustrate this problem we investigated a leasehold on the Fort Berthold Indian Reservation, which has ten producing oil wells. For the purposes of this section we will call this leasehold the "Buffalo Pad". Buffalo Pad has ten producing wells, five of which were drilled in February of 2013, and five of which were drilled in September 2013[1]. The reason we decided to highlight Buffalo Pad was because locals alerted us about it as a leasehold that had been flaring since it was first drilled.

By searching through production data on the North Dakota Department of Mineral Resources website corresponding to the wells on the leasehold we were able to ascertain what months wells on the leasehold were flaring and how much they were flaring. The Buffalo Pad began drilling for oil and gas in February 2013 when the first five wells were drilled. This means that between February 2013-February 2016 there are 36 months where the Buffalo Pad was producing oil and associated gas. We found that since the leasehold was first drilled in February 2013 there was only one month where all the wells on the leasehold were capturing 100 percent of their associated gas, that month was November 2014. This means that flaring/venting has occurred on at least one well on the leasehold for the other 35 of 36 months in which the Buffalo Pad has been producing oil and gas. We also also found that flaring occurred continuously on at least one well on the Buffalo Pad for the first 21 months of its existence based on the production data we looked at from the Department of Mineral Resources[2].

This finding is alarming and highlights the need for waste minimizations plans, which force companies to show how they are going to capture as soon as production occurs. In our comments regarding waste minimization plans we advocate for waste minimization plans that show that at worst a company will maximize gas capture.

Buffalo Pad also further highlights the need for the provision in the rule under section 3179.10(b), which allows the BLM to delay APDs or put conditions on ADPs including production restrictions on APDs if gas-gathering capacity is not available for a given leasehold. In the case of Buffalo Pad it is clear that when the wells were drilled there was

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not sufficient gas gathering capacity to ensure the gas on the leasehold was captured. If the BLM was given the discretion under 3179.10(b) to delay APDs until sufficient gas capture infrastructure is in place when prior to the permitting of the the Buffalo Pad, the BLM could have delayed the approval of the majority of the ten wells on Buffalo Pad until sufficient gas capture infrastructure was in place, or put production restrictions on the wells until sufficient gas gathering infrastructure was put in place.
Table showing when wells are flaring/venting on Buffalo Pad:

**Key to chart:**
**Red- flaring,**
**Green-no flaring**
**Blank- well not drilled yet**

| Month of Production | NDIC # 23093 | NDIC # 23094 | NDIC# 23095 | NDIC# 23096 | NDIC# 23097 | NDIC# 23098 | NDIC# 23099 | NDIC# 23100 | NDIC# 23101 | NDIC# 23102 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-2013 | | | | | | | | | | |
| 3-2013 | | | | | | | | | | |
| 4-2013 | | | | | | | | | | |
| 5-2013 | | | | | | | | | | |
| 6-2013 | | | | | | | | | | |
| 7-2013 | | | | | | | | | | |
| 8-2013 | | | | | | | | | | |
| 9-2013 | | | | | | | | | | |
| 10-2013 | | | | | | | | | | |
| 11-2013 | | | | | | | | | | |
| 12-2013 | | | | | | | | | | |
| 1-2014 | | | | | | | | | | |
| 2-2014 | | | | | | | | | | |
| 3-2014 | | | | | | | | | | |
| 4-2014 | | | | | | | | | | |
| 5-2014 | | | | | | | | | | |
| 6-2014 | | | | | | | | | | |
| 7-2014 | | | | | | | | | | |
| 8-2014 | | | | | | | | | | |
| 9-2014 | | | | | | | | | | |
| 10-2014 | | | | | | | | | | |

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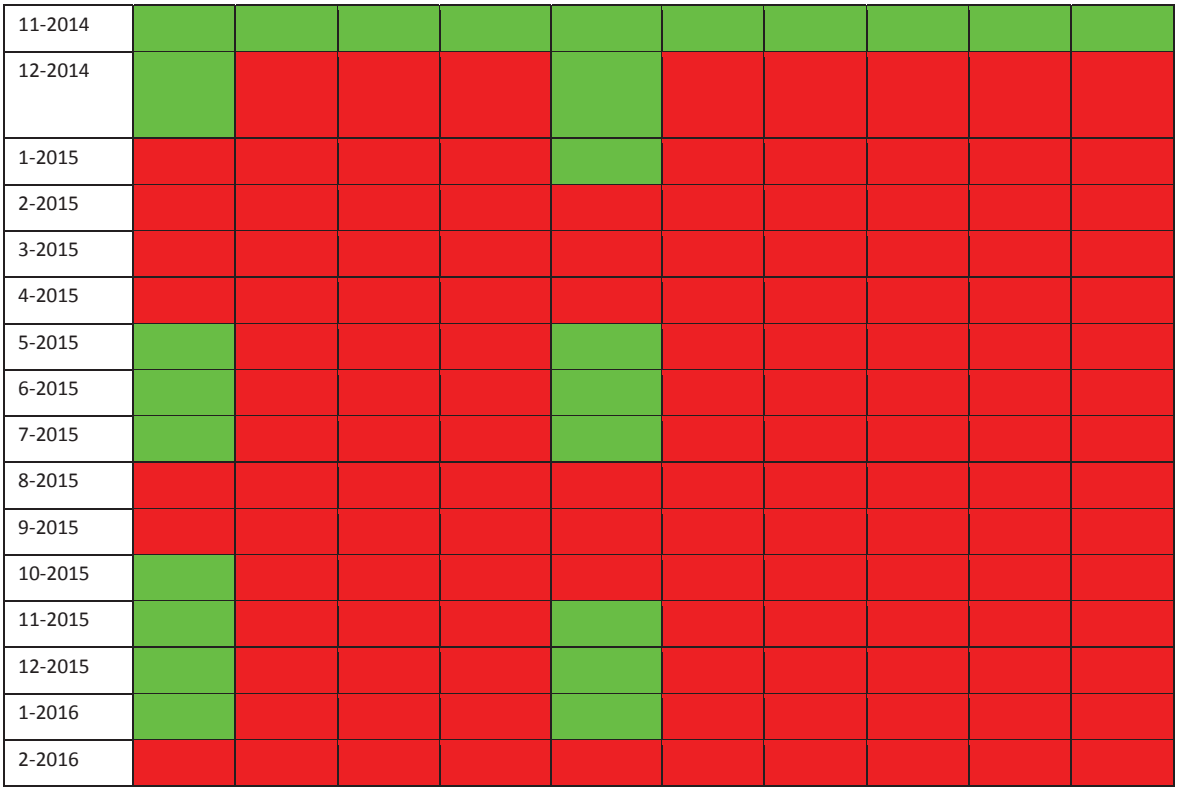


**Case Example Two: Mollet Well (East Tioga Field North Dakota):**

We were given another tip from a local in North Dakota that had to do with a well that had been flaring for more than 7 years near Tioga in the East Tioga Oil Field. The well named the Mollet well is owned by Hess Corporation and was drilled in May of 2008. Since May 2008 the Mollet well has been flaring almost non-stop. There are many similarities to the Buffalo Pad wells and the Mollet well in that flaring in both instances is occurring in almost every month since the leasehold was drilled. The Mollet well like the Buffalo Pad is in an established field and though it is not under the jurisdiction of the BLM, if it were it would not meet the criteria for a flaring exemption because it is in close proximity to the Tioga Gas Processing plant, which is less than 10 miles away from the well[3]. Interestingly this well has been continually given flaring exemptions even with the existing North Dakota flaring policy in effect, which allows the North Dakota Industrial Commission to curtail offenders that have been flaring 100 percent of their associated gas. Though this well is not under the jurisdiction of BLM, it highlights why requiring waste minimization plans is effective. If the Mollet well were under the jurisdiction of the BLM, and the BLM required the submission of detailed waste minimization plans, which require companies to provide a methane capture strategy, which contained detailed actions and timetables for capture infrastructure, the use methane emissions reduction equipment, and detailed operating practices to minimize waste, as we set out in our comments, there is no way that the Mollet well would have been permitted because

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clearly there has been zero thought about the possibility of gas capture by the wells operator since the well was drilled in 2008.

Below showing the months of production associated with the Mollet well and when the well was flaring or not.

**Key to chart:**
**Red-flaring**
**Purple- No Oil Production**
**Blue-Less than 10 Barrels of Oil Production**
**Green- no flaring**

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| Month of Production | Mollet Well (NDIC # 17074) | Month of Production | Mollet Well (NDIC # 17074) |
|---|---|---|---|
| 2/16 | | 3/12 | |
| 1/16 | | 2/12 | |
| 12/15 | | 1/12 | |
| 11/15 | | 12/11 | |
| 10/15 | | 11/11 | |
| 9/15 | | 10/11 | |
| 8/15 | | 9/11 | |
| 7/15 | | 8/11 | |
| 6/15 | | 7/11 | |
| 5/15 | | 6/11 | |
| 4/15 | | 5/11 | |
| 3/15 | | 4/11 | |
| 2/15 | | 3/11 | |
| 1/15 | | 2/11 | |
| 12/14 | | 1/11 | |
| 11/14 | | 12/10 | |
| 10/14 | | 11/10 | |
| 9/14 | | 10/10 | |
| 8/14 | | 9/10 | |
| 7/14 | | 8/10 | |
| 6/14 | | 7/10 | |
| 5/14 | | 6/10 | |
| 4/14 | | 5/10 | |
| 3/14 | | 4/10 | |
| 2/14 | | 3/10 | |
| 1/14 | | 2/10 | |
| 12/13 | | 1/10 | |
| 11/13 | | 12/9 | |
| 10/13 | | 11/9 | |
| 9/13 | | 10/9 | |
| 8/13 | | 9/9 | |
| 7/13 | | 8/9 | |

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| | | | |
|---|---|---|---|
| 6/13 | | 7/9 | |
| 5/13 | | 6/9 | |
| 4/13 | | 5/9 | |
| 3/13 | | 4/9 | |
| 2/13 | | 3/9 | |

| | | | |
|---|---|---|---|
| 1/13 | | 2/9 | |
| 12/12 | | 1/9 | |
| 11/12 | | 12/8 | |
| 10/12 | | 11/8 | |
| 9/12 | | 10/8 | |
| 8/12 | | 9/8 | |
| 7/12 | | 8/8 | |
| 6/12 | | 7/8 | |
| 5/12 | | 6/8 | |
| 4/12 | | 5/8 | |

# EXHIBIT D

EARTHWORKS

## MEMO

**From:** Pete Dronkers, Certified Optical Gas Imaging Thermographer & Southwest Circuit Rider

**Subject:** Statement on FLIR video evidence featured in Dakota Resource Council report "Oil & Gas Pollution's Impacts on North Dakota Families"

Between July 11th and July 13th, 2017, Earthworks traveled to Dunn and Williams counties, ND to investigate and document emissions from active oil and gas sites using a FLIR GF320 infrared camera. Working together with the Dakota Resource Council, we identified and visited 12 recently well sites in residential areas drilled in the last 2 years. I recorded visible and concerning emissions at 5 of these sites near Williston and the Fort Berthold Reservation.

The FLIR GF320 is the oil and gas industry standard in leak detection and repair, and is utilized by state regulatory agencies across the country to monitor emissions from the oil and gas sector. This technology does not speciate or quantify pollutants, but it does make visible hydrocarbons and volatile organic compounds (VOCs) that are normally invisible to the naked eye. As an Infrared Training Center (ITC) certified OGI thermographer (certification #86618), my specific observations on the emissions seen in these videos can be found below.

**HRC Operating Fort Berthold 1H Well Site (Fort Berthold Reservation)**
Video: https://youtu.be/cY3mfnZEd6o
*Tank vapor emissions from a tank battery containing hydrocarbons. These emissions are an unknown blend of hydrocarbons and VOC's. There is likely a significant amount of methane.*

**HRC Operating Fort Berthold 8-12H Well Site (Fort Berthold Reservation)**
Video: https://youtu.be/UEpah9g2JDc
*Tank vapor emissions from a tank battery containing hydrocarbons. These emissions are an unknown blend of hydrocarbons and VOC's. There is likely a significant amount of methane.*

**HRC Operating Fort Berthold 13H Well Site (Fort Berthold Reservation)**
Video: https://youtu.be/753lojkdVD0
*Tank vapor emissions from a tank battery containing hydrocarbons. These emissions are an unknown blend of hydrocarbons and VOC's. There is likely a significant amount of methane.*

EARTHWORKS

**Statoil & Gas LP Lougheed 2-11 XE #1TFH Well Site (Williston)**
Video: https://youtu.be/o6ayGWltHCo
*Emissions showing hydrocarbon exhaust from what is likely a large generator or other large engine. These emissions are likely low in methane but high in hydrocarbons and VOC's that escape complete combustion through the engine.*

**Zavanna LLC Arrowhead 10-3 Well Site (Williston)**
Video: https://youtu.be/bLT8CBytwAM
*Tank vapor emissions from a tank battery containing hydrocarbons. These emissions are an unknown blend of hydrocarbons and VOC's. There is likely a significant amount of methane.*

**Independent laboratory (third party) testing confirms that the GasFindIR cameras can see the following gases at the minimum detected leak rate (MDLR):**

1-Pentene - 5.6g/hr
Benzene - 3.5g/hr
Butane -0.4g/hr
Ethane - 0.6g/hr
Ethanol - 0.7g/hr
Ethylbenzene - 1.5g/hr
Ethylene - 4.4g/hr
Heptane - 1.8g/hr
Hexane - 1.7g/hr
Isoprene - 8.1g/hr
MEK - 3.5g/hr
Methane - 0.8g/hr
Methanol - 3.8g/hr
MIBK - 2.1g/hr
Octane - 1.2g/hr
Pentane - 3.0g/hr
Propane - 0.4g/hr
Propylene - 2.9g/hr
Toluene - 3.8g/hr
Xylene - 1.9g/hr

*For more information on the FLIR GF320 camera, please visit: http://www.flir.co.uk/ogi/display/?id=55671*

*For more information on Earthworks' Community Empowerment Project, please visit http://www.cep.earthworksaction.org*

# Attachment 32

**Declaration of Joletta Bird Bear**, Ft. Berthold POWER

**Declaration of Joletta Bird Bear**

1). My name is Joletta Bird Bear. I am a Mandan and Hidatsa grandmother, a landowner and mineral owner of federal trust property, and an enrolled member of the Three Affiliated Tribes. I am retired after twenty eight years working for the U.S Postal Service for my community and I am a member of the citizen concerned group Fort Berthold Protectors of Water and Earth Rights.

2). My home is located east of Mandaree in a what used to be a rural setting of prairie grasses and rolling hills and the natural solitude with an occasional vehicle passing by on the nearby Bureau of Indian Affairs (BIA) Route #12.

3) The Missouri River located five miles to the north of my home is a significant part of my cultural and spiritual identity as is my land. My reservation was geographically divided by the Missouri River after the Army Corp of Engineers constructed the Garrison Dam in the early 1950's and created a reservoir from the backed up waters which flooded the majority of families who lived along the Missouri River.

4). My drinking water source in my home was from my private water well from a shallow aquifer. Now, my home is connected to the tribal municipal and rural water distribution system which draws water from the Missouri River, treats and filters the water and then distributes it to the residents of the West Segment. The West Segment is one of the six segments created after the flooding from the creation of the flood project Garrison Dam. Regarding my private water well, I was then and continue to have great concern about the quality of underground water in the Mandaree community due to the highly probable migration of methane gases from the surrounding hydraulic drilling sites all around my home.

5) Just prior to the BIA approval of the federal Oil & Gas Hydraulic Fracturing Program on Fort Berthold, my tribe contracted with the Bureau of Land Management (BOR) and created the water distribution system which pipes the drinking water to all homes in all segments on Fort Berthold.

6). I have lived most of my life in the West Segment and expect to live the rest of my life here. I am raising my nine year old grandson and have legal custody. I have provided care for my grandson for the majority of his life and he will grow up in our home with me and our pets.

7). At the onset of my tribal councils proposal to the BIA agency for approval of the federal BIA & BLM Hydraulic Fracturing Drilling Program on Fort Berthold, I was adamantly vocal to representatives of the BIA, BLM, EPA and my tribal council that all federal agencies involved in this proposed action adhere to the requirements of the NEPA act and conduct an Environmental Impact Statement (EIS) of an extensive science based study on the multiple anticipated environmental, social, economic, cultural and health impacts prior to the final decision in the federal application proposal process.

8) I testified at the EPA public hearing held at the Four Bears Casino and I verbally requested and provided in written form that EPA require the federal agencies involved to conduct an EIS prior to making a final decision on the proposal.

9) I wrote a letter to the BIA Superintendent requesting that the BIA comply to the requirements of the NEPA act and conduct an EIS prior to the final decision on the proposed hydraulic fracking program.

10) At a public hearing held in Mandaree at the Waterchief Hall where BIA and BLM officals came to promote the proposed hydraulic fracking program as a significant major federal action, I requested that BIA and BLM comply to the requirements of NEPA and conduct an EIS prior to the final decision.

11) I wrote a letter to the EPA Region 8 director requesting EPA require the BIA to conduct the extensive EIS when the BIA and BLM officials did not provide a direct answer to my requests for their compliance to conduct an EIS.

12) At that same public hearing held in Mandaree, my own tribal council representative chided me for speaking so strongly and clearly on the BIA and BLM's responsibility and their need to comply to NEPA act. He actually wanted me to publically apologize to the federal officials for making them uncomfortable. I reminded my council representative that this was a public hearing for him and them to hear my concerns and take my concerns into the federal application process and further, he should be greatly concerned that no EIS was being discussed by either federal agency as needed in this major federal action.

13) I took these efforts of writing letters, public comments, testifying of the specific need of the EIS on the then federal Oil & Gas Hydraulic Fracturing Drilling Program on Fort Berthold because I knew it was a federal requirement and that

political forces were ‘fast tracking’ this proposal at my expense. I knew that with out the extensive science based study, my tribe would not benefit from studies that created hydrologic baseline, from air quality baseline, from soil baseline, from projected water usage for fracking and its effect on our surface and ground water, from projected tonnage of methane and all the other toxic and carcinogenic gas particles that would be dumped into our airshed and into our lungs, from the projected respiratory illness resulting from exposure to hydraulic fracked gases; from the projected changes to our cultural norms, from the projected rates of mortality this would bring to our population, nor the projected financial and emotional strains the enacted proposal would place on families from the new arrival of heroin, methamphetamine, and human sexual trafficking. Instead, the federal officials and tribal council leadership only expounded on the new found wealth everyone would benefit from.

14). The anticipated environmental and health impacts from the federal BIA & BLM Hydraulic Fracturing Drilling Program on Fort Berthold were never presented nor addressed in any public meeting held here on Fort Berthold by any federal agency involved in this federal project.

15). The BLM agency did not hold any public meetings on Fort Berthold on the anticipated environmental impacts of a BIA & BLM proposed application to conduct a major hydraulic drilling action.

16). After the Three Affiliated Tribal council received approval from the BIA & Blm on the proposed major frack program, the BLM held several public hearings off the Fort Berthold Indian Reservation in a town located 70 miles travelling distance from my home and over hundred miles from tribal members who lived in Newtown who also drove the great distance to participate. I testified in BLM’s Waste Prevention Rule on Federal and Indian Lands in Dickinson, ND, in May 2014 and in February 2016. My testimony was a statement of support of the proposed BLM language that would require oil operators to capture the natural gas, to market the natural gas, to pay the mineral owner royalty for the natural gas, to inspect and more importantly fix all oil industry infrastructure leaks of natural gas and to reduce flaring and eliminate the outright dumping of natural gas into our airshed.

17). On June 18, 2013, I and my sister travelled again to Dickinson to attend the BLM Hydraulic Fracturing on Tribal Lands hearing. We brought this question to the BLM Director for Minerals and Realty, Mr. Michael Nedd: "Does the BLM have a federal trust responsibility to the individual Indian allottee who owns land and minerals located on the Fort Berthold Indian Reservation?" We continued to ask this question until Mr. Nedd answered in the affirmative and publically stated several times, "Yes, BLM has a trust responsibility not only to tribal governments, but, also, to the allottee." This is important because federal agencies meet with tribal council governments but do not meet with the allottees, even though the BLM regulations have jurisdiction over allottee land and minerals in oil leasing.

18).The Fort Berthold Indian Reservation is about 1 million acres within its boundaries and is comprised of approximately 400,000 acres of trust lands owned by individual allottees, and about 70,000 acres of trust lands owned by the Three Affiliated Tribal government, and the rest approximately 500,000 acres are fee patent acres. Of trust lands, it is the individual tribal members who own allotted land or mineral interests—they individually hold the majority and the tribal government is the minority holder in comparision of trust acres.

19). For this record, I will state that due to the BIA's and BLM's failing to conduct an EIS on this federal proposal prior to the final decision to grant approval, those agencies' negligence has caused an continues to cause irreparable harm to water quality, air quality, soil quality, and irreparable harm to all humans and wildlife that breath the air laden with the chemical components of natural gas and methane gas being flared and dumped and leaked into our airshed on Fort Berthold, especially in the West Segment and concentrated around my residence.

20). My home was once in an area surrounded by natural beauty. My grandson and I could go outside and tend to our chores in gardening and yardwork and enjoy the quietude interspersed by the singing of birds or a buzzing of an insect flying by. As I developed my homesite on my land in the late 1990's, I had the forethought to plant hundreds of trees to provide not only wind break but natural habitat for birds and other wildlife and visual beauty from the variety of tree species. My big yard became a nesting place for birds and stepping out doors was a welcome auditory treat of birds chirping and singing during the warmer months of Spring through late Summer. My yard was full of wild life, natural life, birds of

many species, deer, antelope, coyotes, frogs, toads, bats, bumble bees, hummingbirds, and monarch butterflies. Today my big yard is devoid of natural sounds. The beauty has been replaced with industrial noises of metal parts scraping, high pressurized mechanical loud noises, noises that sound like a major metro airport is located over the hill from me. Now industrial noise pollution fills the air, these noises occur at all times of day and night. Oil tanker semis pass by my home constantly going in both directions on BIA HWY 12, semi trucks hauling dirt and gravel to new locations, semi trucks hauling frack sand to new locations, semi trucks hauling water to frack sites, semi trucks hauling contaminated soil from spill sites, semi trucks hauling heavy construction equipment, semi trucks hauling oil rig components, and all the ancillary oil industry companies that work with the fracking process. Sounds of sirens of emergency vehicles speeding by my home in both directions are a frequent occurrence responding to accidents, spills, fires, or explosions. Sometimes I smell something like burning rubber when I step outside, sometimes diesel exhaust, sometimes odors I cannot identify.

21). I often wonder at night what valves are opened to flush out chemical gases at these oil sites. In the morning there is always a bluish plume on the horizon. It is not a cloud but a plume of gases. When I look into the distance I see haze that I have never seen before except in a major metropolitan area. It is incredible to seen the dramatic changes in the air. I can see the air I breathe. I used to dislike windy days of North Dakota, but I am glad for them now because maybe it disburses the concentration of chemical gases.

22). One day my grandson and I came home from a trip to neighboring town to get groceries and when we stepped out of my car, the air in our yard was pungent of an intense chemical odor. We quickly went into our home and stayed indoors for the rest of the day. I immediately called the BIA Environmental Compliance officer located 1 hour away from my home to report the awful smell. I was frightened of that intense acrid smell and the harm it might do to my grandson's lungs and my health. Hours past and someone showed up but by that time the odor had cleared out. I thought an oil truck might have spilled chemicals along the ditch of BIA Hwy 12 and the fumes drifted into my yard. The compliance officer said he would check for spills but I never heard from him again.

23). From my kitchen window I can see three oil jacks pumping to the west, from my front steps I can see a battery of tanks and flaring visible to the northwest. Directly north, I can see the orange night sky from flaring just over the hill and further north on the ridge, I can see two drilling rigs. To the east I can see at least four visible flares, to the northeast I can see the orange night sky of flaring beyond the hill, to the southwest I see the orange hue of flaring in the night and to the southwest of my home a new hydraulic rig is drilling and I hear there are to be six wells drilled on that pad. My home is surrounded all the way around by flares, battery tanks, drilling rigs. My land contains no drilling rigs, tanks, nor oil or gas pipelines.

24) A few years ago I went to the BIA Environmental Compliance office and made a request for a map of all oil and gas structures within a five mile radius of my home and requested the safety emergency response contingency plans for all the identified oil and gas structures within a five mile radius of my home. I was told there is none available at the BIA and that I should call the oil companies directly, but I have no information to identify which oil company operates within a five mile radius of my home. I plan to make the same request to the BLM agency.

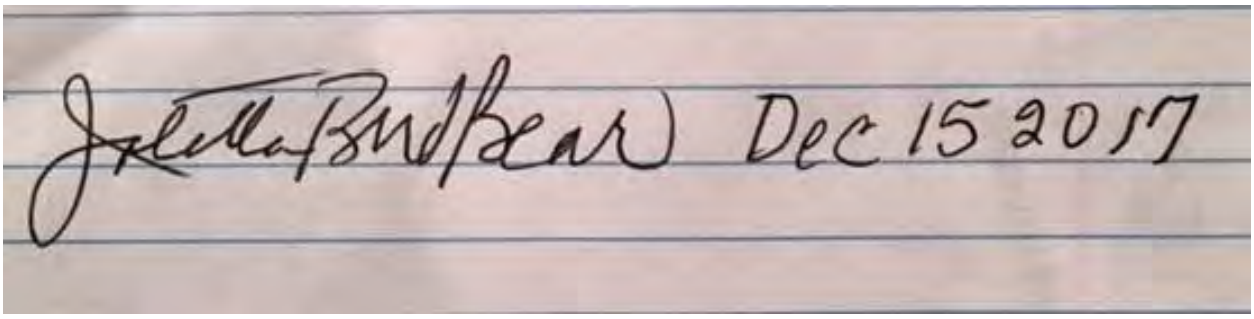
25) Over the past year, the flaring volume and height of flares within the federal BIA & BLM Oil and Gas Hydraulic Fracturing Drilling Program on Fort Berthold have become unprecedented. The flaring is gross. The volume of waste of natural gas is abhorrent. Driving on any of the highways through the West segment, the Four Bears segment, or the North segment at night is astounding. The extreme in wast of natural gas is occurring in the West segment because every inch of what used to darkness is filled with flares, likened to oil fields of Saudi Arabia except this is my home.

26) My grandson has experienced frequent nose bleeds since the BIA & BLM fracking program started. This is worrisome to me and I have reported this to the Elbowoods Clinic and his primary care provider. He has been diagnosed as highly allergic to substances and is undergoing treatment. I worry for his health and healthy body development because I have read how living close to fracking pads does effect the endocrine system. I have read about peer reviewed science and medical studies that report the link of exposure to hazardous gases to bone cancers and respiratory diseases.

27) My grandson goes to the Elbowoods Clinic frequently for his allergy treatments and one day I causally asked a nurse who was taking his vitals if she was seeing more people come in complaining of respiratory problems. She excitedly told me that they were seeing an increase of Three Affiliated tribal members come into the clinic complaining of lung problems and people who were never close to being asthmatic now being diagnosed with asthma. It is hard to obtain data from any tribal program, but that bit of general information she shared does indicate that the quality of air and the flaring going on is causing greater lung issues than with just one person.

28) My grandson is a smart young boy who worries about all the flaring. He repeatedly states to me that he wants to see the flaring stopped and has even suggest to me, “let’s go to a judge and ask the judge to make it stop”. He says he wants the oil flaring to stop so that he can breathe cleaner air. He has asked me “why don’t they use the gas instead of burning the gas because that gas could be used to heat our home and use for all homes in the community” and he says “ it is just stupid that they burn gas into our air.”

29) The BLM has the jurisdictional authority and responsibility to implement the Waste Prevention Rule to reduce waste of natural gas on federal and Indian lands. The BLM’s decision to delay the Rule does place my grandsons health and my health at high risk of further exposure to air quality degradation from the continued unregulated hydraulic frack flaring, methane venting, and natural gas leaks in my community within the Fort Berthold Indian Reservation. There is no justification to withhold the final BLM Waste Prevention Rule that will curtail the waste of natural gas, the uncontrolled flaring, the dumping of methane directly into my airshed and the ongoing leaks of natural gas on oil infrastructure on Fort Berthold. We simply cannot wait another year of BLM’s arbitrary delay.



# Attachment 33

**Declaration of Kent Salazar**, National Wildlife Federation

# DECLARATION OF KENT SALAZAR

I, Kent Salazar, declare and state as follows:

1. I am of legal age and competent to give this declaration. All information herein is based on my own personal knowledge unless otherwise indicated.

2. I am sixty-nine (69) years old and I live in Albuquerque, New Mexico.

3. I am also currently a dues-paying member of the National Wildlife Federation ("NWF"), and have been since 1989. I offer this declaration for myself and for National Wildlife Federation.

4. I generally enjoy and value being outside on Federal and Indian lands. In particular, I greatly enjoy visiting and sightseeing at the many national historical landmarks located on or near Federal and Indian lands, including Chaco Canyon and Mesa Verde in my home state. Additionally, for most of my life, I have taken great enjoyment and have valued hunting mule deer and elk, and fishing on Federal and Indian lands.

5. I am currently a board member of the National Wildlife Federal, and I also serve as the Western Vice Chair, a position I have held for the last three years. Prior to serving as the Western Vice Chair, I was a regional board member of NWF for nine (9) years. I am also a past president and former board member for the New Mexico Wildlife Federation, a NWF affiliate organization.

6. As a result of my position at NWF, I am aware of NWF's history and core mission. NWF is America's largest conservation organization with a mission to all Americans to ensure wildlife thrive in a rapidly-changing world. NWF has a strong history of protecting public lands for wildlife and outdoor recreation by its members and is known among conservation groups for its ability to combine strong science, federal and state policy

development, education, litigation, and grassroots organizing.

7. As a result of my position with NWF, I am aware that NWF has more than six million members and supporters and has affiliate organizations in 50 states, including California. The organization and its affiliates have members that live in states where oil and gas is currently being developed, or may be developed in the future, on Federal and Indian lands. This includes 57,556 members and 3,500 affiliate members in California, 25,273 members in the Northern District of California, 4,013 members and 82,500 affiliate members in New Mexico, 10,978 members and 1,222 affiliate members in Colorado, 1,037 members and 1,613 affiliate members in Wyoming, 2,204 members and 8,370 affiliate members in Montana, 2,449 members in Utah, and 846 members and 1,421 affiliate members in North Dakota.

8. As a result of my position with NWF, I am aware that numerous NWF members and members of NWF affiliates, like myself, also recreate on Federal and Indian lands near where oil and gas development is occurring or has been proposed, including sightseeing of historic landmarks, hiking, hunting, and fishing. Many of those members also reside in close proximity to federal lands where oil and gas development is occurring or has been proposed.

9. As a result of my position with NWF, I am aware that the Bureau of Land Management's final rule entitled "Waste Prevention, Production Subject to Royalties, and Resource Conservation" and published in the Federal Register at 81 Fed. Reg. 83,008 (Nov. 18, 2016) (hereinafter "the Rule") represents a significant step forward in addressing the rampant waste of natural gas from oil and gas operations on Federal and Indian lands, by requiring or creating incentives for oil and gas operators to take steps to reduce natural gas waste from operations at BLM-administered mineral leases, including by capturing the natural gas (methane and other impurities) that would otherwise be released or flared off. I am aware that the Rule is a

much-needed update to decades-old guidance last adopted over 35 years ago.

10. I am aware, as a result of my position at NWF, that the Rule will reduce flaring on Federal and Indian lands, benefiting NWF's, and its affiliates', members who experience noisy and unsightly flares at all hours of the day and night near their homes or while they are recreating and/or enjoying wildlife on Federal and Indian lands.

11. Reducing natural gas waste from venting, leaking, and flaring activities at oil and gas development sites on Federal and Indian lands, including by capturing that gas as required under the Rule, has the benefit also of capturing and thus decreasing emissions of all the constituents of natural gas. In addition to methane, these include volatile organic compound ("VOC") emissions and nitrogen oxides emissions ("NOx") that together form ground-level ozone, commonly referred to as smog. Ozone contributes to and exacerbates asthma, and respiratory symptoms, increases emergency room visits, and can even cause premature mortality, and inhibits vegetation growth. Healthy vegetation is essential for healthy wildlife and health ecosystems that NWF's members enjoy for hiking, hunting, camping, wildlife observation and other recreational activities.

12. Capturing fugitive emissions of natural gas will also capture its other constituents, including numerous hazardous air pollutants like benzene, toluene, and xylene. These hazardous air pollutants cause serious adverse human health effects and include substances that are carcinogenic, mutagenic, teratogenic, neurotoxic, and that are acutely or chronically toxic.

13. The Rule's requirement to reduce flaring also will reduce particulate matter. Reductions of particulate matter, and ozone-forming emissions of NOx and VOCs, will improve visibility, thereby improving recreational opportunities on and enjoyment of Federal and Indian lands for NWF's and its affiliates' members.

14. Because of my position at NWF, I am aware that because it requires otherwise wasted natural gas to be captured, that gas can be sold, and so the Rule will provide financial benefits in the form or royalty payments on the additional collected natural gas, some of which are allocated to states to spend in areas economically impacted by oil and gas development, or to help enhance wildlife habitat and ecosystem health on Federal and Indian lands. It is my understanding when gas is wasted, as it currently is in New Mexico, there has been a real drop in revenue to these communities. I am aware that NWF's and its affiliates' members live in communities that are impacted by oil and gas development on Federal and Indian lands and would benefit from additional royalty monies invested in their communities or to improve the Federal or Indian lands where they enjoy recreation.

15. I am further aware that on December 8, 2017, BLM published a final rule, entitled "Waste Prevention, Production Subject to Royalties, and Resource Conservation; Delay and Suspension of Certain Requirements", that suspends or delays compliance deadlines for many provisions of the Waste Prevention Rule, including the submission of waste minimization; gas capture requirements; flaring measurement and reporting requirements; determinations regarding royalty-free flaring; well drilling and completion requirements; pneumatic controller requirements; pneumatic diaphragm pumps requirements; storage vessel requirements; downhole well maintenance and liquids unloading requirements; and leak detection and repair (LDAR) requirements. 82 Fed. Reg. 58,050 (Dec. 8, 2017) ("Compliance Revision Rule"). It is my further understating that the Compliance Revision Rule will become effective on January 7, 2018 and will last until January 17, 2019.

16. I am concerned that, as a result of the Compliance Revision Rule, NWF's and its affiliates' members will be deprived of the benefits they would have otherwise realized from the

reductions of emissions of VOCs, hazardous air pollutants, NOx and particulate matter, and the cessation or reduction in flaring activities that would be achieved if all the provisions of the Rule remained in effect during the duration of the Compliance Revision Rule.

17. Additionally, I am concerned that due to the Compliance Revision Rule additional ozone, hazardous air pollutants, and particulate matter will damage the landscape, including visibility, and the environment of Federal and Indian lands on which NWF's, and its affiliates', members recreate or otherwise enjoy wildlife-related activities, and that such prolonged damage would not occur if the provisions of the Rule that are suspended or delayed by the Compliance Revision Rule remained in effect

18. Moreover, I am concerned that as a result of the Compliance Revision Rule, NWF's, and its affiliates', members will be deprived of the financial benefits to their local communities of royalty payments that otherwise would have been made to Federal, state, and/or Tribal governments if the provisions of the Rule that are stayed by the Notice of Postponement remained in effect. Those payments would be used to benefit communities impacted by oil and gas development, including by enhancing wildlife habitat and ecosystem health on Federal and Indian lands.

19. In addition, the Compliance Revision Rule will affect me personally. I would again enjoy hunting mule deer and elk on Federal and state BLM lands that are now impacted by oil and gas development, were flaring reduced and emissions and noise curtailed. I currently do not enjoy this activity anymore, however, as the noise from flares that burn off natural gas are intolerable and reduce the numbers of mule deer and elk, though I have plans to visit the areas in a sightseeing capacity in the future. The Rule's requirements to minimize the flaring and pollution would improve that situation and increase my enjoyment of the land when I return, but

postponing compliance deadlines for those provisions will prolong the loss of pleasure I experience due to the continued venting, and flaring of natural gas that would be captured under the Rule.

20. Additionally, my own enjoyment of sightseeing historic landmarks like Chaco Canyon and Mesa Verde has been increasingly diminished in recent years as a result of flares and pollution from oil and gas development that occurs near these majestic and extremely fragile historical landmarks. I value greatly my ability to visit these historical areas, and have plans to visit regularly in the future. Suspending or delaying requirements to minimize waste of natural gas by capturing natural gas releases and limiting flaring from oil and gas development on these lands will prolong both damage to the landscape and wildlife, as well as my diminished enjoyment of activities, including hunting, fishing, and sightseeing I formerly loved to do on Federal and Indian lands.

21. I am furthermore concerned that I will personally be adversely impacted by the Compliance Revision Rule because it will subject me to unnecessary levels of ozone caused by VOCs and NOx, hazardous air pollutants, and particulate matter associated with wasted natural gas and flaring activities at oil and gas development sites on Federal and Indian lands, whenever I am recreating on those lands. Such exposure subjects me to increased health risk that would not be present if the provisions of the Rule that are suspended or delayed by the Compliance Revision Rule remained in effect.

22. Additionally, I am concerned that as a result of the Compliance Revision Rule, my own community will be deprived of royalty-related revenue that it would otherwise receive if the provisions of the Rule that are suspended or delayed by the Compliance Revision Rule remained in effect.

23. I declare under the penalty of perjury that to the best of my knowledge, the foregoing is true and correct.

Executed on December 15, 2017, at Albuquerque, New Mexico.

/s/ Kent Salazar
Kent Salazar

# Attachment 34

**Declaration of Gina Trujillo**, Natural Resources Defense Council

# DECLARATION OF GINA TRUJILLO

I, Gina Trujillo, declare as follows:

1. I am the director of Membership at the Natural Resources Defense Council, Inc. ("NRDC"). I have been the director of membership since January 1, 2015 and have worked at NRDC in the membership department for more than 25 years.

2. My duties include supervising the preparation of materials that NRDC distributes to members and prospective members. Those materials describe NRDC and identify its mission.

3. NRDC is a membership organization incorporated under the laws of the State of New York. It is recognized as a not-for-profit corporation under section 501(c)(3) of the United States Internal Revenue Code.

4. NRDC has helped spur California's environmental leadership since opening our San Francisco office in 1972, joined by a Los Angeles office in 1989. Our San Francisco office is located at 111 Sutter Street, 21st floor, San Francisco, CA 94104. Our Los Angeles office is located in Santa Monica.

5. NRDC's mission statement declares that "The Natural Resources Defense Council's purpose is to safeguard the Earth: its people, its plants and animals, and the natural systems on which all life depends." The mission statement goes on to declare that NRDC works "to restore the integrity of the elements that sustain life – air, land, and water – and to defend endangered natural places." NRDC's mission includes the prevention and mitigation of global warming in order to protect and maintain NRDC's

members' use and enjoyment of natural resources threatened by climate change, as well as members' own health and safety.

5. Through its Climate and Clean Air Program, NRDC pursues federal and state policies to curb air pollution, particularly the pollutants that are causing climate change. NRDC seeks to reduce emissions of methane from the oil and gas sector, which is responsible for over a third of the nation's methane pollution.

6. Through its Land and Wildlife Program, NRDC also seeks to limit the impacts on communities, wildlife and ecosystems from oil and gas development.

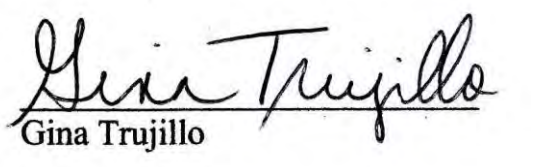
7. As a part of these efforts to protect our climate, communities, wildlife and ecosystems, NRDC joined our colleagues in submitting comments on the Bureau of Land Management's ("BLM") February 2016 proposed rule regarding Waste Prevention, Production Subject to Royalties, and Resource Conservation. NRDC is also a part of the group of organizations that successfully sued BLM over its June 2017 stay of the Waste Prevention Rule, and that commented on BLM's second attempt to stay this Rule, the action at issue in this case.

8. When an individual becomes a member of NRDC, his or her current residential address is recorded in NRDC's membership database. When a member renews his or her membership or otherwise makes a contribution to NRDC, the database entry reflecting the member's residential address is verified or updated.

9. NRDC currently has more than 408,000 members. There are NRDC members residing in each of the fifty United States and in the District of Columbia, including in states with significant oil and gas operations and development on public and tribal lands, with 79,566 members in California, 347 in North Dakota, 1,911 in Montana, 724 in Wyoming, 12,692 in Colorado, 4,237 in New Mexico, 2,630 in Utah, and 1,616 in Oklahoma.

10. Specifically in California, NRDC has 6,430 members in Alameda County, 2,964 members in Contra Costa County, 52 members in Del Norte County, 605 members in Humboldt County, 119 members in Lake County, 2,805 members in Marin County, 616 members in Mendocino County, 873 members in Monterrey County, 488 members in Napa County, 47 members in San Benito County, 5,047 members in San Francisco County, 4,108 members in San Mateo County, 4,711 members in Santa Clara County, 1,790 members in Santa Cruz County, and 2,684 members in Sonoma County.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief. Executed on December 15, 2017.




Gina Trujillo

# Attachment 35

**Declaration of Joseph Tuomey**, Natural Resources Defense Council

# DECLARATION OF JOSEPH TUOMEY

I, Joseph Tuomey, do hereby affirm and state:

1. I currently am a member of the Natural Resources Defense Council (NRDC). I have been a member since November 1987.

2. I support NRDC's work to protect public health and the environment from the hazards associated with air pollution from oil and gas development. I am concerned about the air pollution caused by oil and gas production and the effects of that pollution on the health and welfare of nearby communities, including my own community.

3. In particular, I understand firsthand that oil and gas wells may vent, flare, or leak methane and other gases. Such venting, flaring, and leaking can contribute to climate change and release air pollutants that harm the lungs and heart and that can cause cancer. I am concerned about the health and welfare effects that venting, flaring, and leaking from oil and gas infrastructure may have on myself and on other people in the region.

4. I am a sixty-six-year-old retiree who formerly worked for the federal government. I reside at 947 Mud Lane, Ignacio, Colorado. This property, which I have owned since 2000, is located in an unincorporated area of La Plata County about ten miles from Ignacio. My property is located well within the boundaries of the Southern Ute Indian Reservation.

5. My home is surrounded by extensive oil and gas development. Both of my immediate neighbors to the southwest and north have wellpads on their properties. Both wellpads are within 500 meters of my home.

6. There has been extensive oil and gas development in this area since before I purchased my property in 2000. However, the oil and gas development seems to have

gradually increased over time. For example, the wellpad on my southwestern neighbor's property was recently expanded from one well to multiple wells.

7. There are at least three compressor stations near my home. These are large facilities that compress gas so that the gas can travel through pipelines. One is about 2.5 miles north-northwest of my home, one is about 1.5 miles south of my home, and the other is about 4 miles north-northwest of my home.

8. There are numerous gas pipelines in the area. In fact, there is a new 16-inch-diameter pipeline under construction about a half-mile from my home. A 200-foot wide swath of land has been cleared to accommodate this pipeline.

9. In the past, I have accessed Google Earth to count the wellpads and other oil and gas facilities near my home. Simply put, there are too many to count. From a satellite image, numerous wellpads appear as pockmarks throughout the landscape. This is part of a larger pattern of extensive oil and gas development in the Southern Ute Indian Reservation and in southwest Colorado and northwest New Mexico.

10. My partner and I, who both live in my home and recreate extensively in surrounding lands in the San Juan Basin, have been deeply affected by nearby oil and gas development. These problems include foul odors, unexplained headaches, loud noises, bright flaring at night, and heavy truck traffic.

11. I am not necessarily opposed to oil and gas development. I believe that it can provide a valuable source of energy. But I believe that oil and gas can and should be extracted in more sensible ways that move us toward a cleaner energy system.

12. In fact, during my time as a federal employee, I spent several years as an archaeologist for the Bureau of Land Management ("BLM"). In this role, I was frequently responsible for providing archaeological approvals for oil and gas projects.

My general impression is that BLM tries to do the right thing with respect to oil and gas development, but BLM often struggles to say "no" to projects—even when they impose unreasonable burdens on health and welfare. I think that the Waste Prevention Rule is a laudable effort on BLM's part to limit wasteful and harmful venting, flaring, and leaking. I believe that the Waste Prevention Rule should come into effect.

13. I have experienced these unreasonable burdens firsthand.

14. I frequently notice strange petroleum-like or chemical-like odors in the air. Several times a year, the smell becomes so bad that I shut my windows and stay indoors for the entire day, or I drive into town and spend my day there to escape the smell.

15. My partner and I wake up with unexplained headaches about once a week. I am concerned that these headaches may be caused by our exposure to air pollutants from oil and gas facilities in the area.

16. These oil and gas facilities also make loud noises that affect my quality of life. For example, the compressor station located about 2.5 miles north-northwest of my home flares gases continuously. On days when the compression station flares large volumes of gas, (about once a month), the flare may reach about two hundred feet from the ground.

17. The flare is loud. But louder still are other sounds that come from the compressor station, which I believe might come from releases of compressed gas. My house is located under the flight path for the Durango-La Plata Airport, a small commercial airport about 2.5 miles north-northeast of my home. The compression station can be as loud as the passenger jets that fly over my home.

18. During the day, I have noticed vapor coming out of the flares, causing a shimmering appearance in the sky. I am worried that this reflects air pollution that is

released as the flare incompletely burns the gas.

19. During night, the flare sometimes lights up my bedroom, making it difficult to sleep.

20. I also experience noise from other oil and gas equipment. For example, there are many diesel compressors in the area that compress natural gas for smaller pipelines. These make loud engine and mechanical noises that can be heard from my home.

21. The oil and gas development in the area also leads to heavy truck traffic. Oil and gas companies occasionally block county roads to move large equipment, forcing me to take alternative routes or schedule my activities to avoid road closures.

22. My partner and I spend a lot of time outdoors. In fact, I retired in southwestern Colorado because I enjoy the area's natural amenities: it is a beautiful area surrounded by mountains. I frequently hike and walk around my property and local trails. Whenever I hike in the area, I constantly come across oil and gas equipment.

23. It is my understanding that the BLM has issued regulations to control the venting, flaring, and leaking of methane from oil and gas equipment, that these regulations were scheduled to come into full effect on January 17, 2018, and that these regulations would have applied to wells around my home on BLM lands and possibly apply on the Southern Ute Indian Reservation as well. I support these regulations and believe they should be fully implemented to limit wasteful and unnecessary air pollution from the oil and gas industry, protect human health, and ensure a high quality of life in southwestern Colorado. I have also observed numerous flared wells along Hwy. 550 on the Navajo Nation in New Mexico, to the south of my home.

24. As a taxpayer, I am very concerned about the loss of revenue to the federal

government when companies choose to flare rather than capture this wasted gas. I have inquired about this practice and been told it is not economical to capture this gas. I feel that if it is not economical the well should not have been put into production. In addition to the economic loss, I am also very concerned about the effects of this wasted and leaking gas in contributing to global warming.

25. I understand that the BLM has attempted to suspend these requirements a second time, and that NRDC has filed another lawsuit to challenge this suspension. I support this lawsuit, because these requirements would reduce harmful and unnecessary venting, flaring, and leaking in my community and in the lands where I recreate. I believe that my health and the health of other community members will be better protected, and that my community would experience a better quality of life.

26. I fully support NRDC in this action.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information, and belief.

Executed on December 15, 2017

# Attachment 36

**Declaration of Tweeti Blancett**, Sierra Club

**DECLARATION OF TRECIAFAYE (TWEETI) BLANCETT**

I, Tweeti Blancett, declare as follows:

1. My name is Tweeti Blancett. I am 72 years old. The information in this declaration is based on my personal experience and my review of publicly available information.

2. My primary residence is County Road 2125, #36, Aztec, New Mexico. I have lived at my current address since 1971.

3. I am self-employed. I am a rancher and I have a small hotel in Aztec. The ranch is in the County of San Juan. The ranch headquarters are located on the Animas River, and are surrounded by natural gas wells, pipelines and roads. There is no oil and gas infrastructure on our property; our business is in livestock and agriculture.

4. I have been a member of the Sierra Club since 2004. Although I didn't agree with the Sierra Club on every issue, I joined because we were in total agreement regarding the degradation of air, water, and other resources by oil and gas activities.

5. My property where I work borders oil and gas infrastructure. It is surrounded by the Animas River on three sides, and directly adjacent to a bluff on the east side that is part of BLM land. We are surrounded by oil and gas infrastructure. We sold our BLM allotment adjacent to the ranch in 2010 because of contamination resulting from oil and gas development.

6. There is much more oil and gas development on the reservations. Our ranch borders the Ute reservation, and the ranch that we used to own south of town bordered the Navajo reservation. Oil and gas infrastructure can be found all over the Ute reservation.

7. My husband and I are the sixth generation on the ranch. Our family has been here for parts of three centuries. Our ancestry was here before New Mexico was a territory, making them pioneers. My son is seventh generation, and our grandchildren - in college now - are eighth

generation. Our son is a consultant for oil and gas wells. He grew up at the ranch headquarters on the river.

8. We enjoy working outdoors, farming and working cattle. We work on conservation of the land and improvements to the land, primarily dealing with agriculture and livestock. We are fascinated by the history of the western United States, and we enjoy exploring the land in our state and nearby states. We used to work on the BLM land, and we would venture out occasionally to hunt.

9. Much of the land where we live and work has been destroyed environmentally. It was the largest natural gas producing location in North America, and was over-drilled. It's a high desert area, and problems caused by erosion and watershed pollution are compounded daily. The grounds have been fragmented and the roads are not well maintained by the oil and gas industry. Noxious weeds grow, and they don't hold the subsoil.

10. The combination of erosion, pipelines, and roads make the amount of draining in the area overwhelming. The watershed drains off of the mesas and into the San Juan and Animas rivers.

11. I am very concerned by leaking well heads, pipes, and storage compressors. The wildlife and livestock get into the contaminated areas. Though we have attempted to make some progress in getting industry to clean things up, for many areas it is too late.

12. The oil and gas industry started exploring in our area in the 1950s. When the methane leaks started, the situation seemed impossible. It seems like all of the wells leak.

13. There used to be a lot of flaring around our ranch headquarters, but industry drilled everything up and moved on. We had the title to some BLM land and private state land, but we sold it because of the contamination from oil and gas development.

14. When we had our title my husband and I would visit BLM land at least three times a week. These days, we usually visit BLM land for one week every spring, summer, fall and winter, helping our neighbor move cattle. I visit the tribal lands as well because I have been helping them collect documentation on contamination from oil and gas operations near the Chaco World Heritage Center. Methane affects the air quality in Shiprock, Bloomington and Aztec (where I live) in addition to other places in the San Juan Basin. I am concerned about the effects of these emissions on my health, as well as on the health of the children in the schools and public places that the infrastructure surrounds. I understand that children and the elderly are more vulnerable.

15. I understand that Sierra Club is challenging BLM's attempt to suspend the compliance dates of BLM's methane rule for one year. I support timely implementation of regulations to reduce the pollution and harms caused by venting, leaking, and flaring gas. This will improve air quality in the basin. I also know that methane is affecting the climate, and I am concerned by the effects of global warming. In addition, the people of America deserve the royalties from that gas. I declare under penalty of perjury that, to the best of my knowledge, the foregoing is true and correct.

I declare under the penalty of perjury under the laws of the United States that, to the best of my knowledge, the foregoing is true and correct. 28 U.S.C. § 1746.

Executed this 8th day of December, 2017.

/s/ Tweeti Blancett
Tweeti Blancett

# Attachment 37

**Declaration of Thomas Frantz**, Sierra Club

# DECLARATION OF THOMAS FRANTZ

I, Thomas Frantz, declare as follows:

1. My name is Thomas Frantz. I am 68 years old. The information in this declaration is based on my personal experience and my review of publicly available information.

2. I live in Shafter, CA, located in Kern County. I have lived in Kern County since my birth.

3. I joined the Sierra Club because the local Sierra Club chapter was involved with local air quality issues and preserving the local farm land. I've been a member since 2007. I have been on the Kern-Kaweah Chapter Executive Committee for the last year.

4. I have been both a primary and secondary school teacher in California for 23 years. I am also a self-employed farmer. Since the 80s I have been an almond farmer.

5. I live with my wife. I have a couple of daughters who have left home. My mother is a couple of miles away. My brother and sister farm independently and are also nearby. I'm a fourth generation farmer. My great grandfather started farming 2 miles from where I live currently. My family is pretty tied to the land locally.

6. When I can I like to exercise—I ride a bicycle and go hiking. I also garden a lot in addition to my farming. Unfortunately, my outdoor activities have been affected by the poor air quality in Kern County. It is well recognized that Kern County has the worst air quality in the nation. PM2.5 and ozone levels are both extremely high. I cannot exercise outdoors on half of the days of the year because of the pollution in the air. I have exercise machines that I have to keep inside my home.

7. I am aware that there is a great deal of BLM land in the oil fields west of my residence. This starts maybe 15-20 miles west of me. I see the flares on the west side. It's a negative thing to see. Knowing that it pollutes my air is also very alarming. I frequently drive through the fields. This morning I drove to Morro Bay. I went through the Belridge oil field, and some of that is BLM land. Bell Ridge is along Highway 33 between the Missouri triangle and Highway 46. It's a huge oil field, and when I look at the BLM map I see a checkerboard of squares going through at least parts of that oil field. I see the oil field steam generators, the trucks, the pipes, and I am very aware of the emissions from the oil field, from every type of activity adding

significantly to our air pollution. I see directly where the air pollution is coming from.

8. I have asthma, which I developed as an adult. It's not severe (I've never been hospitalized) and I do not have an inhaler, but I can feel it. It limits my outdoor activity. My asthma is directly related to the sources of air pollution in Kern County. It is self-evident what is happening on BLM land is effecting my health. In the summer when ozone levels are high, it is difficult to breathe. In the winter it is even worse. It's a big part of the reason I have the place in Morro Bay; I have to get out of the valley in the winter when pm2.5 levels are high. A big source of that is NOx emission from oil field operations including flaring and steam generation.

9. I've seen great changes in the climate and wildlife in my area over the course of my lifetime. As far as climate change goes, that is extremely important. I have direct observations of that in the sense that I am a farmer who has an orchard. I am aware that high ozone concentrations also suppress vegetation and crop growth. A tree needs to go dormant every year. It is very important that you have several hundred cooling hours during the winter months. Since the 60s these cooling hours have been cut in half. Year after year, we

see the winters aren't as cold as they used to be. The trees don't lose their leaves until almost a month later. We have insects that we never used to have as a kid. We have mosquitos that carry dengue fever and malaria that never used to be in this area when I was young. It's a warm weather mosquito. I have observed birds that never used to be around. I can't give all the reasons for this change, but I believe climate change is a reason. It doesn't freeze as much as it used to. We don't have the fog that we used to have. Even the winter humidity seems to have changed. Farmers get a bad rap for trying to make money and ruining the environment with pesticides, but they're also very good observers of the environment.

10. I am aware that the Bureau of Land Management (BLM) is trying to suspend its Methane and Waste Prevention Rule. I believe that the rule would have the benefit of reducing methane in the air for climate change, but also the co-benefits of improving my air quality. A postponement of the rule is a postponement of the day that I can breathe clean air.

11. I am aware that Sierra Club is seeking to file a lawsuit challenging BLM's one year suspension of compliance dates for the Rule. I

support the lawsuit and I also believe that if Sierra Club is successful, there would be benefits to air quality and climate change.

12. In general in terms of air pollution and climate change no one can afford to not do their part. No industry and no individual. It will take the whole society to solve this very serious issue. I don't like to see one step forward and one step back. We need to keep moving forward. This was a good rule that Obama tried to implement and there's no good reason to move back on it.

I declare under penalty of perjury that, to the best of my knowledge, the foregoing is true and correct.

Executed this 8 day of December, 2017.

Thomas Frantz

# Attachment 38

**Declaration of Huda Fashho**, Sierra Club

# DECLARATION OF HUDA FASHHO

I, Huda Fashho, hereby declare as follows:

1. I am Associate Director of Membership Services for Sierra Club.

2. I have been employed by the Sierra Club since 2011.

3. Sierra Club, founded in 1892, is the nation's oldest and largest grassroots environmental organization. Sierra Club is incorporated and headquartered in California, with a principal place of business at 2101 Webster St., Suite 1300, Oakland, CA 94612.

4. The Sierra Club is a national non-profit environmental organization founded in 1892. The Club's purposes are is to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; to educate and enlist humanity to protect and restore the quality of the natural and human environment; and to use all lawful means to carry out these objectives. We pursue these objectives nationwide, including in California. Sierra Club California, our statewide organization, has thirteen local chapters, including five chapters in northern California that collectively have about 96,600 members: the Loma Prieta, Mother Lode, Redwood, San Francisco Bay, and Ventana Chapters.

5. The Sierra Club and its local chapters in California work to protect public lands in California, including public lands administered by the Bureau of

Land Management in northern California, from the harmful impacts of oil and gas development and the associated methane emissions.

6. Sierra Club is an organization driven by our members. Sierra Club has more than

7. Sierra Club has about 250 employees who work in California, including about 200 employees who work at its headquarters in Oakland. Sierra Club currently has more than 830,000 members nationwide, including 182,353 in California. About 71,160 of these members reside in Northern California. Specifically, we have 13,911 members in Alameda County, 7,851 members in Contra Costa County, 97 members in Del Norte County, 1214 members in Humboldt County, 416 members in Lake County, 5,365 members in Marin County, 1,160 members in Mendocino County, 2,324 members in Monterey County, 1,177 members in Napa County, 144 members in San Benito County, 8,167 members in San Francisco County, 6,630 members in San Mateo County, 11,395 members in Santa Clara County, 3,978 members in Santa Cruz County, and 6,019 members in Sonoma County.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed in Oakland, CA on December 13, 2017,

Huda Fashho

# Attachment 39

**Declaration of Camilla Feibelman**, Sierra Club

# DECLARATION OF CAMILLA FEIBELMAN

I, Camilla Feibelman, hereby state as follows:

1. I am of legal age and am competent to give this declaration. All information herein is based on my own personal knowledge unless otherwise indicated. I give this declaration for use by the Sierra Club concerning the Bureau of Land Management (BLM) Waste Prevention Rule and the Sierra Club's lawsuit challenging BLM's decision to postpone compliance dates for several of the Rule's provisions.
2. I am an employee of the Sierra Club and act as Director of the Rio Grande Chapter which is comprised of about 9,800 members across New Mexico and West Texas. I have been in this position for approximately four years, although I've worked for the Sierra Club as a full-time employee in different capacities since 2000. I worked as the Director of the Sierra Club's student arm nationally. I served in the Sierra Club Media and Partnerships departments working on environmental justice issues. And I helped to found a new chapter of the Sierra Club in Puerto Rico. My involvement with the Sierra Club began, however, while I was attending Columbia University as an undergraduate. I was a member of a campus environmental group which became affiliated with the Sierra Student Coalition in 1996. After graduating college in 1998, I held an internship with the Sierra Club.
3. Beginning in these college years I realized that the Sierra Club was a national organization but was also active at the local level. Having grown up in New Mexico and witnessed a lot of damage from drought and suppression of natural forest fire, I felt that the Sierra Club was a good place to try to do something about those and other environmental issues.

4. I have resided in Albuquerque, NM since July 2013, though I was born and raised here.

5. I live with my husband, my stepdaughter, and my son. Both of my parents, my aunt, uncle, and cousin also live in Albuquerque.

6. As an outings leader trained and certified with the Sierra Club, I both participate in and lead outings to public lands in New Mexico. I help train new outings leaders throughout New Mexico and West Texas. I help our volunteer leaders plan, publicize and carry out their outings to nature for members of the public.

7. I also enjoy hiking and camping on public lands with my family. We sometimes stay at a friend's cabin that abuts the Santa Fe National Forest, where some oil and gas leasing is being proposed.

8. The BLM Waste Prevention Rule limits some waste of natural gas, a publicly held natural resource, and the release of methane that results from leaking, venting, and flaring on public lands by private oil and gas interests. This waste is of particular concern for New Mexico because the state is losing out on royalties from lost natural gas, so we have both an environmental interest and a monetary interest in the rule.

9. I have served as the Rio Grande Chapter Director for four years. The oil and gas industry, and its impacts on our public lands and our communities, has always been of particular concern in this region. I became aware of this particular rule when news came out that New Mexico is home to the country's largest methane hotspot. I wanted to understand what the source of such a large concentration of this potent greenhouse gas was.

10. A little over two years ago, coinciding with the news of the methane cloud, I attended a meeting of a coalition of environmental groups that gathered to discuss the BLM Waste

Prevention Rule and the EPA Methane Rule—and became more involved. I was then asked by a coalition member to form and facilitate the New Mexico Methane Table, a coalition of individuals and organizations that includes people who are concerned about the environmental, health, and cultural impacts of methane and other gases released during oil and gas industry activities, and are working on how to mitigate these impacts, such as supporting the proposed rule.

11. In my role as Director of the Rio Grande Chapter of the Sierra Club, I have convened our New Mexico Methane Table for a little over a year. This group of nonprofit organizations from around the state advocate in favor of both the EPA Methane Rule and the BLM Waste Prevention Rule. The participating organizations include environmental, community, and sportsmen groups. We put on events all over New Mexico to help educate the public. We convene weekly to discuss the status of the rules and discuss actions we might take to see them implemented. We communicate to the public about the rules and with our elected officials to seek their support for implementation.

12. As Director of the Rio Grande Chapter, I submitted comments supporting the proposed Waste Prevention Rule, attended a public hearing in New Mexico to testify in favor of the proposed Rule, and contacted my federal Congressional Representatives and Senators to encourage them not to repeal the Rule using the Congressional Review Act.

13. While there is not a lot of flaring or venting currently where I live in Albuquerque, there have been proposals just over the river in Sandoval County. Our members there are deeply concerned about the expansion of oil and gas and the related environmental quality issues. I also represent members all throughout the state. Our members in the

Four Corners area are currently impacted by venting, flaring, and leaking. I help to provide them with tools to deal with the environmental, cultural, and health impacts to their community, including supporting rules and regulations that might benefit them because of their proximity to drill sites.

14. Our chapter has dozens of outings leaders who lead several hundred outings per year to public lands throughout New Mexico, and plan to continue doing so in the future. There are visual, climate, and health impacts to those public lands from oil and gas extraction. For example, we take trips to the Chaco Culture National Park; I am aware that over the last several years, BLM has authorized drilling permits for more than 350 wells in the Greater Chaco region. We are concerned about leasing new wells when existing wells are venting, flaring, and leaking methane, the primary component of natural gas – the very substance industry seeks to capture and sell. Continued leasing of wells impacts the quality of the Chaco Culture National Park and thus our members' enjoyment of these trips and their visits to other impacted public lands. For example, seeing the night sky and learning about Ancestral Puebloan astronomy is a very special part of visiting Chaco. Implementing the BLM Waste Prevention Rule would help reduce visual impacts of flaring so that all users of public lands can better enjoy them.

15. Throughout New Mexico the oil and gas industry has asked for ever increasing permits and leases to drill, and at the same time they are known to be venting and flaring, wasting a natural resource that belongs to all Americans. Implementation of the BLM's Waste Prevention Rule would benefit me, but more importantly the members of my chapter by helping the industry to reduce its waste and capture escaping methane, which can be sold on the market by industry, and would also be subject to royalties

which would benefit the state. The New Mexico state government had to have a special session over the summer to deal with budgetary short falls; royalties would increase the amount of money coming into the state budget at a time when it is sorely needed.

16. Oil and gas operations, in both southeast New Mexico and the Four Corners area, are not just wasting resources, but are also impacting community health. There are oil and gas facilities within short distances of schools and neighborhoods. Methane is leaked, vented, and flared from these facilities, but volatile organic compounds (VOCs) are also emitted. VOCs are one of the key components of smog, which can lead to respiratory disease and is associated with other health impacts including cancer. The technology that captures methane also captures VOCs and could thus improve public health in these communities. In addition, members of my staff and some of our volunteers participate in citizen monitoring of water and air quality at many of these wells. Uncontrolled VOCs could pose a health risk to them and is of concern to us. The BLM Waste Prevention Rule would help limit their exposure to these emissions.

17. I understand that on October 5, 2017, BLM announced plans to suspend the rule's compliance dates for one year so that BLM would have time to revise or rescind the methane rule, as the Trump administration directed. Comments on the proposed rule were due November 6, and BLM recently indicated, in the Wyoming district court, that the delay rule will be finalized by December 8, so that the delay would take effect before the January 2018 compliance dates.

18. It is my understanding that the Sierra Club has filed a lawsuit challenging BLM's decision to suspend for one year compliance deadlines for certain provisions of its Waste Prevention Rule. I strongly support that action. The oil and gas industry has

supported similar rules at the state level in Colorado, and such requirements could easily be implemented in the rest of the country, especially in New Mexico where many Colorado companies are also operating. There is overwhelming public support for these rules, especially here in New Mexico, and the government has an obligation to all Americans to take care of their natural resources. I believe that if the rule is fully implemented, my community and members of the Rio Grande Chapter of the Sierra Club will benefit greatly from improvement of public health and the environment.

I declare under the penalty of perjury under the laws of the United States that, to the best of my knowledge, the foregoing is true and correct.

Dated this 12th day of December, 2017.

Camilla Feibelman

# Attachment 40

**Declaration of Lena Moffitt**, Sierra Club

# DECLARATION OF LENA MOFFITT

I, Lena Moffitt, hereby declare as follows:

1. I am currently Senior Campaign Director of the Sierra Club's Our Wild America program. I currently reside in Washington, D.C. From April 2015 to April 2017, I served as the Director of Sierra Club's Beyond Dirty Fuels Campaign. In these capacities, I have overseen the Club's advocacy and supply side-efforts in moving beyond fossil fuels to a clean energy economy. I hold a B.A. in Environmental Biology from Columbia University and a Masters of Environmental Science and Management from the Donald Bren School of the Environment at the University of California, Santa Barbara.

2. From 2010 through 2013, I served as the Washington Representative for Sierra Club's Beyond Oil program, which shared similar goals to the Dirty Fuels Campaign. More recently, I led the National Wildlife Federation's Climate and Energy Program, and have also worked for the Union of Concerned Scientists, the Clean Energy Works campaign, and Voices for Progress. In addition, I previously served as board member of Sierra Club's Washington, D.C. Chapter and chaired that organization's Energy Committee, where I helped to advance local clean energy efforts.

3. Founded in 1892, Sierra Club is the nation's oldest and largest grassroots environmental organization. The Sierra Club's mission is to explore, enjoy, and

protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; to educate and enlist humanity to protect and restore the quality of the natural and human environment; and to use all lawful means to carry out these objectives. In addition to helping people from all backgrounds explore nature and our outdoor heritage, the Sierra Club works to promote clean energy, safeguard the health of our communities, protect wildlife, and preserve our remaining wild places through grassroots activism, public education, lobbying, and legal action. The Sierra Club currently has more than 830,000 members nationwide.

4. The Beyond Dirty Fuels Campaign is a top priority for the Sierra Club and is a key initiative in its Our Wild America program. Our Wild America carries on Sierra Club's long legacy of protecting America's beautiful wildlands. Through this campaign, Sierra Club seeks to preserve our nation's wild heritage in the face of threats from mining, drilling, and climate disruption.

5. The Beyond Dirty Fuels Campaign works to reduce and mitigate the risks and harms that result from fossil fuel extraction. Much of our advocacy focuses on procuring robust standards for the oil and gas industry at both state and federal levels, including limitations on methane, a powerful greenhouse gas, from oil and gas sources.

6. Sierra Club members work to protect our federal public lands from all forms of commercial exploitation and to protect rare wildlife, habitat, and biodiversity. Oil and gas development on these public lands threatens Sierra Club members' use and enjoyment of these areas. In addition, Sierra Club has members who reside in communities that are threatened by drilling and fracking activities on federal and tribal lands, including air and water pollution associated with these activities. I grew up in New Mexico and have personally witnessed the devastating impacts of unchecked oil and gas development on public and tribal lands in the state.

7. Flaring, venting, and leaks on federal and tribal leases contribute to climate change, smog pollution, toxic air pollution and other environmental problems. I am aware that BLM estimated that between 2009 and 2015, oil and gas producers on public and tribal lands vented, flared and leaked approximately 462 billion cubic feet of natural gas.

8. Sierra Club has been actively engaged in securing strong and effective methane standards from the Bureau of Land Management ("BLM"), and has devoted significant resources toward that effort.

9. On April 22, 2016, the Sierra Club, along with other environmental groups, submitted comprehensive legal and technical comments on BLM's proposed Waste Prevention, Production Subject to Royalties, and Resource Conservation rule ("BLM Waste Prevention Rule"), 81 Fed. Reg. 6,616 (Feb. 8, 2016). In those

comments, the Sierra Club and other environmental commenters expressed support for BLM's proposed rule but also recommended improvements to ensure that the rule would meet critical objectives such as minimizing waste, protecting public health and welfare, and reducing emissions of greenhouse gases and other air pollutants.

10. The Sierra Club has chapters and members in the states with federal public lands that would be most impacted by the BLM Waste Prevention Rule (and therefore by a delay in implementing the rule). For example, the Sierra Club currently has more than 182,000 members in California; and approximately 9,583 members in New Mexico; 3,147 members in Montana; 5,619 members in Utah; 24,057 members in Colorado; and 1,256 members in Wyoming. These members use public lands that could be impacted by this rule for a variety of recreational, business, scientific, environmental, and spiritual activities, including camping, hiking, backpacking, climbing, fishing, hunting, canoeing, kayaking, birdwatching, wildlife viewing, photography, and other pursuits.

11. Sierra Club members and supporters were active in commenting on the BLM Waste Prevention Rule. For example, more than 50,000 Sierra Club members and supporters submitted written comments to BLM regarding the rule. Many Sierra Club members also testified regarding the rule at the public hearings held by BLM in New Mexico, Oklahoma, Colorado, and North Dakota.

12. I am aware that BLM promulgated the final Waste Prevention Rule on November 16, 2016, and that this rule requires oil and gas producers to take cost-effective measures to reduce the waste of natural gas from venting, flaring, and leaks from oil and gas development on federal and tribal lands. I am aware that, according to BLM, the rule will reduce flaring by approximately 49 percent and venting and leaks by approximately 35 percent (as compared to 2014 rates). Moreover, according to BLM, the rule could avoid approximately 175,000-180,000 tons of methane emissions per year.

13. The Sierra Club intervened defensively in pending litigation challenging the Waste Prevention Rule, and helped secure an order denying a preliminary injunction against the Rule. The Sierra Club also worked hard to ensure that Congress would not repeal the Waste Prevention Rule under the Congressional Review Act. Our advocates in DC met with the staff of nearly every Senate Democrat in the early months of 2017, and our members and supporters made more than 3,000 calls into Senate offices and sent nearly 70,000 emails since January. Our field staff in New Mexico, Colorado, North Dakota, California, Arizona, Idaho, Maine and many more states met with their Senators or their staff to educate them on the importance of maintaining strong methane limits. Earlier this year, the Sierra Club submitted a Freedom of Information Act request for

documents related to BLM Waste Prevention Rule requirements with January 2017 compliance dates.

14. I am aware that on June 15, 2017, BLM, without any prior notice or opportunity for public comment, issued a notice indefinitely postponing the compliance dates of several key provisions of the Waste Prevention Rule. On October 4, 2017, the district court invalidated BLM's stay. The following day, BLM announced plans to suspend the rule's compliance dates for one year so that BLM would have time to revise or rescind the methane rule, as the Trump administration directed. Comments on the proposed rule were due November 6, and BLM recently indicated, in the Wyoming district court, that the delay rule will be finalized by December 8, so that the delay would take effect before the January 2018 compliance dates.

15. BLM's one-year suspension of the implementation of this Rule adversely affects the interests of the Sierra Club and its members. For example, delaying the compliance dates for leak detection and repair standards, flaring reductions, and reducing storage tank emissions harms Sierra Club members who use and enjoy federal and tribal lands where oil and gas operations exist.

16. I am aware that in 2011, the Sierra Club sued the BLM over its oil and gas leasing activities in the Northern District of California, including the agency's failure to consider the impacts of hydraulic fracturing before committing resources

to oil and gas activities. The court ruled that the BLM failed to adequately consider the potential impact of hydraulic fracturing on the environment and nearby communities. *Ctr. For Biological Diversity v. Bureau of Land Mgmt.*, 937 F. Supp. 2d 1140 (N.D. Cal. 2013). In April 2017, the Sierra Club submitted comments to BLM on the Draft Resource Management Plan Amendment/Environmental Impact Statement for oil and gas leasing and development within the BLM's Central Coast Field Office.

17. 8. I am also aware that, in 2012, the Sierra Club filed a lawsuit in the Superior Court of Alameda County challenging the state's practice of issuing permits for oil and gas wells without analyzing public health and environmental impacts, including impacts of hydraulic fracturing. At the state level, the Sierra Club also has commented on regulations pertaining to oil and gas development. These comments have explained the significant risks that oil and gas activities pose to communities, public health, the climate, and the environment. For example, the Sierra Club submitted comments on the California Air Resources Board's ("CARB") draft regulations for methane pollution from oil and gas facilities.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge.

This _15th__ day of December, 2017.

/s/ Lena Moffitt
Lena Moffitt