March 3, 2017

By Hand Delivery

Mary Jo Rugwell
State Director
U.S. Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82003

Re: Protest of June 2017 Competitive Oil and Gas Lease Sale

Dear Ms. Rugwell:

Pursuant to 43 C.F.R. § 3120.1-3, WildEarth Guardians and the Center for Biological Diversity hereby protest the Bureau of Land Management's ("BLM's") proposal to offer 26 publicly owned oil and gas lease parcels covering 31,924.77 acres of land in the High Desert District Office of Wyoming for competitive sale on June 22, 2017. These lease parcels include the following, as identified by the BLM's in its Final June 2017 Oil and Gas Sale List:[1]

Lease Number	Acres	Field Office	County
WY-1705-001	534.00	Rawlins	Laramie
WY-1705-002	800.00	Rawlins	Carbon
WY-1705-003	145.81	Rawlins	Carbon
WY-1705-004	1437.08	Rawlins	Carbon
WY-1705-005	80.00	Rawlins	Carbon
WY-1705-006	2397.28	Rawlins	Sweetwater
WY-1705-007	1431.44	Rawlins	Sweetwater
WY-1705-008	640.00	Rawlins	Sweetwater
WY-1705-009	640.00	Rawlins	Sweetwater
WY-1705-010	640.00	Rawlins	Sweetwater
WY-1705-011	2480.00	Rawlins	Sweetwater
WY-1705-012	717.59	Pinedale	Sublette
WY-1705-013	599.18	Kemmerer	Uinta
WY-1705-014	2170.79	Kemmerer	Uinta
WY-1702-015	1522.40	Kemmerer	Uinta

[1] This list is available on the BLM's website at https://eplanning.blm.gov/epl-front-office/projects/nepa/65707/96349/116406/Sale_Notice.pdf.

WY-1705-016	2192.29	Kemmerer	Uinta
WY-1705-017	2560.00	Kemmerer	Uinta
WY-1705-018	1997.12	Kemmerer	Uinta
WY-1705-019	640.00	Kemmerer	Uinta
WY-1705-020	1269.50	Kemmerer	Uinta
WY-1705-021	2293.41	Kemmerer	Uinta
WY-1705-022	1912.81	Kemmerer	Uinta
WY-1705-023	1120.00	Kemmerer	Uinta
WY-1705-024	319.53	Kemmerer	Uinta
WY-1705-025	130.94	Kemmerer	Uinta
WY-1705-026	1253.60	Kemmerer	Uinta

STATEMENT OF INTEREST

WildEarth Guardians is a nonprofit environmental advocacy organization dedicated to protecting the wildlife, wild places, wild rivers, and health of the American West. On behalf of our members, Guardians has an interest in ensuring the BLM fully protects public lands and resources as it conveys the right for the oil and gas industry to develop publicly owned minerals. More specifically, Guardians has an interest in ensuring the BLM meaningfully and genuinely takes into account the climate implications of its oil and gas leasing decisions and objectively and robustly weighs the costs and benefits of authorizing the release of more greenhouse gas emissions that are known to contribute to global warming.

The Center for Biological Diversity is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center also works to reduce greenhouse gas emissions to protect biological diversity, our environment, and public health. The Center has over 1.1 million members and on-line activists, including those living in Wyoming who have visited these public lands in the High Desert District for recreational, scientific, educational, and other pursuits and intend to continue to do so in the future, and are particularly interested in protecting the many native, imperiled, and sensitive species and their habitats that may be affected by the proposed oil and gas leasing.

WildEarth Guardians and the Center for Biological Diversity have weighed in extensively on BLM management of federal oil and gas leasing, both in Wyoming and throughout the broader western United States. Over the last year alone, our organizations have submitted extensive comments, protests, and other correspondence to the BLM conveying our concerns over the impacts of oil and gas leasing to the climate, air quality, wildlife, and other important western values. The BLM is very aware of our concerns and has even chided our organizations for repeating arguments challenging the legal basis for the agency's oil and gas leasing.[2]

[2] *See e.g.*, BLM Wyoming State Office Response to WildEarth Guardians' December 9, 2016 Protest of February 2017 Oil and Gas Lease Sale (Feb. 6, 2017), in which the agency stated, "We note that the WEG [WildEarth Guardians] has *yet again* submitted substantially identical arguments to those submitted by WEG for previous lease sales, including the BLM Wyoming's august 2015 Competitive Oil and Gas Lease Sale (Aug 2015 Sale) where thee

BLM regulations at 43 C.F.R. § 3120.1-3 set forth no criteria governing who may file protests or under what circumstances. The BLM's Notice of Competitive Lease Sale similarly provides no criteria governing who may file protests, imposing only limited requirements on the content of protests and the deadline for filing. The Notice simply provides that a protest must be timely filed, include a statement of reasons, be filed in hardcopy form or by fax, must be signed, must "state the interest of the protesting party," must include the name and the address of the protesting party, and must reference the lease parcel number identified in the sale notice.[3] The BLM consistently reviews protests filed by interested parties.[4]

The mailing addresses to which correspondence regarding this protest should be directed is as follows:

WildEarth Guardians
2590 Walnut St.
Denver, CO 80205

Center for Biological Diversity
1536 Wynkoop St., Suite 421
Denver, CO 80202

STATEMENT OF REASONS

WildEarth Guardians and the Center for Biological Diversity protest the BLM's June 22, 2017 oil and gas lease sale over the agency's failure to adequately analyze and assess the climate impacts of the reasonably foreseeable oil and gas development that will result in accordance with the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4331, *et seq*., and regulations promulgated thereunder by the White House Council on Environmental Quality ("CEQ"), 40 C.F.R. § 1500, *et seq*.

NEPA is our "basic national charter for protection of the environment." 40 C.F.R. § 1500.1(a). The law requires federal agencies to fully consider the environmental implications of their actions, taking into account "high quality" information, "accurate scientific analysis," "expert agency comments," and "public scrutiny," prior to making decisions. *Id*. at 1500.1(b). This consideration is meant to "foster excellent action," meaning decisions that are well informed and that "protect, restore, and enhance the environment." *Id*. at 1500.1(c).

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arguments were addressed fully by the WSO [Wyoming State Office." Response at 4. This response is available at https://eplanning.blm.gov/epl-front-office/projects/nepa/65707/96629/116695/0217ProtestDecision.pdf.

[3] Notice of Competitive Lease Sale at x-xi.

[4] For example, the Wyoming BLM reviewed protests filed by the City of Casper and Wyoming Land Acquisition Partners over the inclusion of parcels in the agency's February 2016 Notice of Competitive Lease Sale, even though the BLM acknowledged, "the City of Casper and the WLAP did not submit written comments to the BLM on the EA." *See* Protest Response, *supra* Note 2 at 3. Although the BLM ultimately dismissed these protests as moot, the agency did not dismiss the protests for a failure to provide written comments or otherwise for a failure to meet criteria not explicitly set forth at 43 C.F.R. § 3120.3-1 or the Notice of Competitive Lease Sale.

To fulfill the goals of NEPA, federal agencies are required to analyze the "effects," or impacts, of their actions to the human environment prior to undertaking their actions. 40 C.F.R. § 1502.16(d). To this end, the agency must analyze the "direct," "indirect," and "cumulative" effects of its actions, and assess their significance. 40 C.F.R. §§ 1502.16(a), (b), and (d). Direct effects include all impacts that are "caused by the action and occur at the same time and place." 40 C.F.R. § 1508.8(a). Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." *Id*. at § 1508.8(b). Cumulative effects include the impacts of all past, present, and reasonably foreseeable actions, regardless of what entity or entities undertake the actions. 40 C.F.R. § 1508.7.

An agency may prepare an environmental assessment ("EA") to analyze the effects of its actions and assess the significance of impacts. *See* 40 C.F.R. § 1508.9; *see also* 43 C.F.R. § 46.300. Where effects are significant, an Environmental Impact Statement ("EIS") must be prepared. *See* 40 C.F.R. § 1502.3. Where significant impacts are not significant, an agency may issue a Finding of No Significant Impact ("FONSI") and implement its action. *See* 40 C.F.R. § 1508.13; *see also* 43 C.F.R. § 46.325(2).

The scope of an analysis under NEPA must include "[c]umulative actions" and "[s]imilar actions." 40 C.F.R. §§ 1508.25(a)(2) and (3). Cumulative actions include action that, "when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement." 40 C.F.R. § 1508.25(a)(2). Similar actions include actions that, "when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together." 40 C.F.R. § 1508.25(a)(3). Key indicators of similarities between actions include "common timing or geography." *Id*.

Here, the BLM fell short of complying with NEPA with regards to analyzing and assessing the potentially significant impacts of oil and gas leasing. In support of its proposed leasing, the agency prepared an EA, DOI-BLM-WY-D040-2016-0188-EA.[5] In the EAs, however, the BLM failed to analyze the reasonably foreseeable air quality impacts, greenhouse gas emissions, and climate impacts that would result from selling the oil and gas lease parcels, as well as failed to address potentially significant impacts to sage grouse and other wildlife. The agency's proposed FONSI are therefore unsupported and any decision to sell and issue the aforementioned lease parcels cannot be sustained. Either the BLM must prepare an EIS or it cannot proceed with the lease sale as proposed. Below, we detail how BLM's proposal fails to comply with NEPA.

I. The EA Fails to Adequately Disclose or Analyze the Leasing Decision's Harm to Air Quality.

Oil and gas operations emit numerous air pollutants, including volatile organic compounds ("VOCs"), nitrogen oxides ("NOx"), particulate matter, hydrogen sulfide, and

[5] This EA is available on the BLM's website at https://eplanning.blm.gov/epl-front-office/projects/nepa/65707/96353/116412/HDD_EA_for_May_2017_Lease_Sale_v.1_forposting.pdf.

methane. Hydraulic fracturing ("fracking") operations are particularly harmful, emitting especially large amounts of pollution, including air toxic air pollutants. Permitting fracking and other well stimulation techniques will greatly increase the release of harmful air emissions in these and other regions. BLM failed to analyze air quality impacts from new development in conjunction with the existing air quality landscape for the lease parcels. BLM must analyze increased emissions from foreseeable oil and gas development for these lease parcels in order to prevent further degradation of local air quality, respiratory illnesses, premature deaths, hospital visits, as well as missed school and work days.

The EA provides a cursory review of air monitoring for criteria pollutants to establish compliance with health-based federal Clean Air Act standards called the National Ambient Air Quality Standards ("NAAQS"), and state-based Wyoming Ambient Air Quality Standards ("WAAQS"). The EA does acknowledge that air emissions from future oil and gas development could increase, but provides absolutely no mitigation plan or additional analysis as to the impact these increased emissions will have on meeting the NAAQS and WAAQS in the future, especially on ozone non-attainment areas in the Upper Green River Basin. Studies have shown that oil and gas drilling activities, particularly fracking and horizontal drilling techniques, can pollute air hundreds of miles from the well pad. For example, ethane pollution in Baltimore, Maryland and Washington, D.C, has been attributed to the rapidly increasing natural gas production in the upwind, neighboring states of Pennsylvania and West Virginia.[6] The EA states that:

> There are no direct effects from the proposed oil and gas lease sale because it is primarily an administrative action that only conveys the mineral rights to the potential lessee. Subsequent development proposals by lease holders will require to submittal of plans for any exploration or development that may occur and a site specific EA would be prepared to identify mitigation measures necessary to avoid undue degradation to the environment prior to approval any development activities.

EA at 24. According to data collected between 2010-2014 at 10 southern Wyoming monitoring stations, ozone NAAQS/WAAQs were exceeded at a number of Upper Green River Basin monitoring stations that are representative of the existing air quality landscape for a number of lease parcels in this sale. EA at 21-24. Current development trends could lead to additional exceedances of the ozone standards, but BLM makes no attempt to quantify or forecast potential increased emissions from oil and gas development spurred by this leasing decision because "… it is unknown how many wells or what type (oil, gas or both)may be proposed for development, the types of equipment needed if a well were to be put into production (e.g., compressor, separator, dehydrator), or what technologies may be employed by a given company. The degree of impact will also vary according to the characteristics of the geologic formations from which production occurs." EA at 61.

Contrary to BLM's unsupported reasoning, forecasting air quality impacts from the leasing and resource management of fossil fuel development is required by well-established law. *WildEarth Guardians v. United States Office of Surface Mining Reclamation & Enforcement,*

[6] See Exhibit 1, Vinciguerra, Timothy et al, Regional Air Quality Impacts of Hydraulic Fracturing and Shale Natural Gas Activities: Evidence From Ambient VOC Observations. 110 Atmospheric Environment 144 (2015).

104 F. Supp. 3d 1208, 1227-1228 (D.Colo. 2015).[7] Further, such faulty logic would always circumvent a cumulative emissions analysis. Based on this flawed reasoning, the only time the cumulative impacts of oil and gas development projects could be analyzed is when the last oil and gas well in a given area is proposed—a result that contravenes NEPA's intent, to study and analyze potential significant and cumulative environmental effects of a proposed action before they occur.

BLM must review both (a) the foreseeable site-specific emission sources for ozone from the proposed lease parcels and (b) the sources of ozone emissions from existing, permitted, and other leased sources, and analyze how increased emissions from future oil and gas development will impact, cause or contribute to exceedances of the NAAQS.

Additionally, because a number of parcels are in or near the Upper Green River Basin ozone non-attainment area, BLM must perform a General Conformity analysis pursuant to the Clean Air Act (CAA) 42 U.S.C. § 7506(c)(1)(AB).[8] The "assurance of conformity" to a state implementation plan under the CAA "shall be an affirmative responsibility" of a federal agency. 42 U.S.C. § 7506(c)(1). BLM makes the argument that the administrative act of leasing is not subject to CAA Conformity requirements because the subsequent emissions from leasing are not reasonably foreseeable. EA at 24. BLM contradicts their own assertion by estimating direct and indirect greenhouse gas emissions based on the lease sale Reasonably Foreseeable Development scenario. EA at 64-66. The same kind of forecasting is possible for criteria pollutants such as ozone.

BLM can readily identify oil and gas volume estimates for lease parcels by utilizing their own EPCA Phase III spatial data and overlaying the lease parcel boundary map provided in the lease sale notice.[9] For the May 2017 Wyoming High Desert lease sale, this simple calculation yields an estimated oil volume of 3.878216 mmbbl and an estimated gas volume of 181.088422 bcf that could stem from development of these lease parcels. Estimating emissions from production of oil and gas wells per volume produced can be readily calculated using a number of EPA emissions inventory calculation tools.[10] The type, quantity and future impact of additional

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[7] "The question posed by the plaintiff is not whether the increased mining will result in a release of particulate matter and ozone precursors in excess of the NAAQS, but whether the increased emissions will have a significant impact on the environment. One can imagine a situation, for example, where the particulate and ozone emissions from each coal mine in a geographic area complied with Clean Air Act standards but, collectively, they significantly impacted the environment. It is the duty of OSM to determine whether a mining plan modification would contribute to such an effect, whether or not the mine is otherwise in compliance with the Clean Air Act's emissions standards."(internal citations omitted).

[8] See Exhibit 2, Center for Biological Diversity, Wyoming Upper Green River Basin Ozone Non-Attainment Area and WY May 2017 High Desert Lease Sale Parcel Map (2017).

[9] See Exhibit 3, United States Department of Agriculture, United States Department of Energy, United States Department of the Interior, Inventory of Onshore Federal Oil and Natural Gas Resources and Restrictions to Their Development ("EPCA Phase III Inventory") (2008) *available at* http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III.html.

[10] See Exhibit 4, Russell, James et al., An Emission Inventory of Non-point Oil and Gas Emissions Sources in the Western Region, ENVIRON International Corporation (2006) , available at https://www3.epa.gov/ttnchie1/conference/ei15/session12/russell.pdf. *See also*, Exhibit 5, Amnon Bar-Ilan, et al., A Comprehensive Emissions Inventory of Upstream Oil and Gas Activities in the Rocky Mountain States (2010) available at https://www3.epa.gov/ttnchie1/conference/ei19/session8/barilan.pdf.

air emissions from this new potential development can and must be analyzed in conjunction with the existing air quality landscape in this region. Failure to do so renders BLM's EA inadequate for purposes of NEPA review.

BLM should look no further than a recent interagency guidance outlining proper air quality analysis and modeling in lease sale decisions. In 2011, the Environmental Protection Agency ("EPA"), the Department of Interior, and the Department of Agriculture entered into a Memorandum of Understanding ("MOU") to establish a "a clearly defined, efficient approach to compliance with [NEPA] regarding air quality . . . in connection with oil and gas development on Federal lands."[11] The MOU "provides for early interagency consultation throughout the NEPA process; common procedures for determining what type of air quality analyses are appropriate and when air modeling is necessary; specific provisions for analyzing and discussing impacts to air quality and for mitigating such impacts; and a dispute resolution process to facilitate timely resolution of differences among agencies."[12] The goal of this process is to ensure that "[F]ederal oil and gas decisions do not cause or contribute to exceedances of the National Ambient Air Quality Standards (NAAQS)."[13] The MOU outlines recommended technical, quantitative procedures to follow, which include identifying the reasonably foreseeable number of oil and gas wells and conducting an emissions inventory of criteria pollutants. Further air quality modeling is required if certain criteria are met, based on the level of emissions impact and the geographic location of the action.[14] The MOU indicates that "[e]xisting reasonably foreseeable development scenarios can be used to identify the number of wells."[15]

Given the likelihood that fracking and other similarly harmful techniques would be employed in the exploration and development of the parcels, BLM has an obligation to analyze and disclose the potential impacts resulting from such frequently used practices. The purpose of an environmental assessment is for BLM to look at the impacts in total, and to take a hard look at all "reasonably foreseeable" impacts now, before leasing the land. NEPA regulations and case law clearly establish that uncertainty about the precise extent and nature of environmental impacts does not relieve an agency of the obligation to disclose and analyze those impacts utilizing the best information available. *See* 40 C.F.R. § 1502.22(a), (b).

BLM's analysis is further lacking because the agency also failed to identify environmental impact mitigation methods for controlling air pollution emissions,[16] which violates NEPA's requirement that the agency identify mitigation measures, 40 C.F.R. § 1508.25, and consider all reasonable alternatives. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008) (citing 40 C.F.R. § 1502.14(a)).

A. Types of Air Emissions.

[11] See Exhibit 6, Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act Process, Preamble (2011), available at: https://www.epa.gov/sites/production/files/2014-08/documents/air-quality-analyses-mou-2011.pdf
[12] *Id*. at 4.
[13] *Id*. at 1, 2.
[14] *Id.* § V.E.1., pg. 9.
[15] *Id*.
[16] EA at 52, 72.

BLM failed to provide any analysis of the type, extent, or source of emissions from unconventional oil and gas extraction methods, such as fracking; instead BLM arbitrarily and capriciously restricted its analysis to conventional oil and gas. The rapid expansion of unconventional oil and gas extraction makes the impacts associated with fracking foreseeable.

Unconventional oil and gas operations emit large amounts and a wide array of toxic air pollutants,[17] also referred to as Hazardous Air Pollutants, which are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.[18] Air pollutants emitted by unconventional oil and gas production include toxic BTEX compounds (benzene, toluene, ethylbenzene, and xylene); VOCs such as methylene chloride; NOx; particulate matter (including diesel exhaust); alkanes (methane, ethane, propane); formaldehyde; hydrogen sulfide; silica; acid mists; sulfuric oxide; and radon gas.[19] These toxic air contaminants and smog-forming chemicals (such as VOCs, NOx, methane and ethane) threaten local communities and regional air quality.

The reporting requirements recently implemented by the California South Coast Air Quality Management District ("SCAQMD") have shown that at least 44 chemicals known to be air toxics have been used in fracking and other types of unconventional oil and gas recovery in California.[20] Through the implementation of these new reporting requirements, it is now known that operators have been using several types of air toxics, including crystalline silica, methanol, hydrochloric acid, hydrofluoric acid, 2-butoxyethanol, ethyl glycol monobutyl ether, xylene, amorphous silica fume, aluminum oxide, acrylic polymer, acetophenone, and ethylbenzene. Many of these chemicals also appear on the U.S. EPA's list of hazardous air pollutants.[21] EPA has also identified six "criteria" air pollutants that must be regulated under the NAAQS due to their potential to cause primary and secondary health effects. As detailed below, concentrations of many of these pollutants—ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead—have been shown to increase in regions where unconventional oil and gas recovery techniques are permitted.

VOCs, from car and truck engines as well as the drilling and completion stages of oil and gas production, make up about 3.5 percent of the gases emitted by oil or gas operations.[22] The VOCs emitted include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which are listed as Hazardous Air Pollutants.[23] There is substantial evidence showing the grave

[17] See Exhibit 7, Sierra Club et al. comments on New Source Performance Standards: Oil and Natural Gas Sector; Review and Proposed Rule for Subpart OOOO (Nov. 30, 2011) ("Sierra Club Comments") at 13.
[18] See Exhibit 8, EPA, "About Hazardous Air Pollutants" at U.S. Environmental Protection Agency, Hazardous Air Pollutants, https://www.epa.gov/haps (accessed Jan 5, 2017)
[19] See Exhibit 9, McKenzie, Lisa M. et al., Human Health Risk Assessment of Air Emissions From Development of Unconventional Natural Gas Resources, 424 Science of the Total Environment 79 (2012) ("McKenzie 2012); See Exhibit 10, Shonkoff, Seth B.C. et al., Environmental Public Health Dimensions of Shale and Tight Gas Development, 122 Environmental Health Perspectives 787 (2014) ("Shonkoff 2014").
[20] Center for Biological Diversity, Air Toxics One Year Report (June 2014) at 1.
[21] 42 U.S.C. § 7412(b)(1).
[22] See Exhibit 11, Brown, Heather, Memorandum to Bruce Moore, U.S.EPA/OAQPS/SPPD re Composition of Natural Gas for use in the Oil and Natural Gas Sector Rulemaking, July 28, 2011 ("Brown Memo") at 3.
[23] 42 U.S.C. § 7412(b)(1).

harm from these pollutants.[24] Recent studies and reports confirm the pervasive and extensive amount of VOCs emitted by unconventional oil and gas extraction.[25] For example, a study covering sites near oil and gas wells in five different states including Colorado, Wyoming, Ohio, Pennsylvania, and Arkansas, found that concentrations of eight toxic volatile chemicals, including benzene, formaldehyde and hydrogen sulfide, exceeded federal health and safety standards, at times by several orders of magnitude.[26] Another study determined that vehicle traffic and engine exhaust were likely the sources of intermittently high dust and benzene concentrations observed near well pads.[27] Recent studies have found that oil and gas operations are likely responsible for elevated levels of hydrocarbons such as benzene downwind of the Denver-Julesburg Fossil Fuel Basin, north of Denver.[28] Another study found that oil and gas operations in this area emit approximately 55percent of the VOCs in northeastern Colorado. [29]

VOCs, NOx, methane, and ethane are potent ground-level (tropospheric) ozone precursors that are emitted by oil and gas drilling and fracking operations. Ozone can result in serious health conditions, including heart and lung disease and mortality.[30] Exposure to elevated levels of ozone is estimated to be cause ~10,000 premature deaths per year in the United States.[31] VOCs can form ground-level (tropospheric) ozone when combined with nitrogen oxides ("NO_X") from compressor engines, turbines, other engines used in drilling, and flaring,[32] in the presence of sunlight. This reaction can diminish visibility and air quality and harm vegetation. Many regions around the country with substantial oil and gas operations are now suffering from extreme ozone levels due to heavy emissions of these pollutants.[33] A recent study of ozone pollution in the Uintah Basin of northeastern Utah, a rural area that experiences hazardous tropospheric ozone concentrations, found that oil and gas operations were responsible for 98 to

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[24] Colborn, T. et al., Natural Gas Operations from a Public Health Perspective, 17 Human And Ecological Risk Assessment 1039 (2011) ("Colborn 2011"); McKenzie 2012.

[25] See Exhibit 12, McCawley, Michael., Air, Noise, and Light Monitoring Plan for Assessing Environmental Impacts of Horizontal Gas Well Drilling Operations (ETD-10 Project), West Virginia University School of Public Health, Morgantown, WV (2013) ("McCawley 2013"), available at http://www.dep.wv.gov/oil-and-gas/Horizontal-Permits/legislativestudies/Documents/WVU%20Final%20Air%20Noise%20Light%20Protocol.pdf; Center for Biological Diversity, Dirty Dozen: The 12 Most Commonly Used Air Toxics in Unconventional Oil Development in the Los Angeles Basin (Sept. 2013).

[26] See Exhibit 13, Macey, Gregg P. et al., Air Concentrations of Volatile Compounds Near Oil and Gas Production: A Community-Based Exploratory Study, 13 Environmental Health 82 (2014) at 1.

[27] McCawley 2013.

[28] See Exhibit 14, Pétron, G. et al., Hydrocarbon Emissions Characterization in the Colorado Front Range – A Pilot Study, 117 J. Geophysical Research D04304 (2012) at 8, 13 ("Pétron 2012).

[29] Gilman, Jessica B. et al., Source Signature of Volatile Organic Compounds from Oil and Natural Gas Operations in Northeastern Colorado, 47 Environmental Science & Technology 1297 (2013) at 1297, 1303 ("Gilman 2013").

[30] See Exhibit 15, U.S. Environmental Protection Agency, Integrated Science Assessment (ISA) for Ozone (O3) and Related Photochemical Oxidants (2013).

[31] See Exhibit 16, Caiazzo, Fabio et al., Air Pollution and Early Deaths in the United States. Part I: Quantifying the Impact of Major Sectors in 2005, 79 Atmospheric Environment 198 (2013).

[32] *See, e.g.*, U.S. Environmental Protection Agency, Oil and Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution: Background Technical Support Document for Proposed Standards at 3-6 (July 2011); Exhibit 17, Armendariz, Al, Emissions for Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements (2009) ("Armendariz 2009") at 24.

[33] Armendariz 2009 at 1, 3, 25-26; Koch, Wendy, *Wyoming's Smog Exceeds Los Angeles' Due to Gas Drilling*, USA Today (May 9, 2011); Craft, Elena, Environmental Defense Fund, Do Shale Gas Activities Play a Role in Rising Ozone Levels? (2012); Colorado Dept. of Public Health and Environment, Conservation Commission, Colorado Weekly and Monthly Oil and Gas Statistics (July 6, 2012) at 12.

99 percent of VOCs and 57 to 61 percent of NO_X emitted from sources within the Basin considered in the study's inventory.[34]

Ground-level ozone can also be caused by methane, which is leaked and vented at various stages of unconventional oil and gas development, as it interacts with nitrogen oxides and sunlight.[35] In addition to its role as a potent greenhouse gas, methane's effect on ozone concentrations can be substantial. One paper modeled reductions in various anthropogenic ozone precursor emissions and found that "[r]educing anthropogenic CH_4 emissions by 50% nearly halves the incidence of U.S. high-O_3 events . . . ."[36]

Ethane is also a potent precursor of ground-based ozone pollution as it breaks down and reacts with sunlight to create smog, as well as being a greenhouse gas. Ethane emissions have risen steeply in recent years due to U.S. oil and gas production. A recent study documented that ethane emissions in the Northern Hemisphere increased by about 400,000 tons annually between 2009 and 2014, with the majority coming from North American oil and gas activity, reversing a decades-long decline in ethane emissions.[37] Shockingly, about 60 percent of the drop in ethane levels that occurred over the past 40 years has already been made up in the past five years. At this rate, U.S. ethane levels are expected to hit 1970s levels in about three years. About two percent of global ethane emissions originate from the Bakken Shale oil and gas field alone, which emits 250,000 tons of ethane per year.[38] Because global ethane levels were decreasing until 2009, the U.S. shale gas boom is thought to be responsible for the global increase in levels since 2010.

Oil and gas operations can also emit hydrogen sulfide. The hydrogen sulfide is contained in the natural gas and makes that gas "sour."[39] Hydrogen sulfide may be emitted during all stages of operation, including exploration, extraction, treatment and storage, transportation, and refining. Long-term exposure to hydrogen sulfide is linked to respiratory infections, eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches.[40]

The oil and gas industry is also a major source of particulate matter. The heavy equipment regularly used in the industry burns diesel fuel, generating fine particulate matter[41]

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[34] See Exhibit 18, Lyman, Seth & Howard Shorthill, Final Report: 2012 Uintah Basin Winter Ozone & Air Quality Study, Utah Department of Environmental Quality (2013) ("Lyman 2013"); *see also* Gilman 2013.
[35] Fiore, Arlene et al., Linking Ozone Pollution and Climate Change: The Case for Controlling Methane, 29 Geophys. Res Letters 19 (2002) ("Fiore 2002"); U.S. Environmental Protection Agency, Oil and Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews Proposed Rule, 76 Fed. Reg 52,738 (Aug 23, 2011).
[36] Fiore 2002; *see also* Martin, Randal et al., Final Report: Uinta Basin Winter Ozone and Air Quality Study Dec 2010 - March 2011 (2011) at 7.
[37] Helmig, Detlev et al., Reversal of Global Atmospheric Ethane and Propane Trends Largely Due to US Oil and Natural Gas Production. 9 Nature Geoscience 490 (2016).
[38] Kort, Eric A. et al., Fugitive Emissions From the Bakken Shale Illustrate Role of Shale Production in Global Ethane Shift. 43 Geophysical Research Letters 4617 (2016).
[39] Sierra Club Comments.
[40] See Exhibit 19, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas (EPA-453/R-93-045) at i (Oct. 1993) ("USEPA 1993").
[41] Earthworks, Sources of Oil and Gas Pollution (2011).

that is especially harmful.[42] Vehicles traveling on unpaved roads also kick up fugitive dust, which is particulate matter.[43] Further, both NO_X and VOCs, which as discussed above are heavily emitted by the oil and gas industry, are also particulate matter precursors.[44] Some of the health effects associated with particulate matter exposure are "premature mortality, increased hospital admissions and development of chronic respiratory disease."[45]

Fracking results in additional air pollution that can create a severe threat to human health. One analysis found that 37 percent of the chemicals found at fracked gas wells were volatile, and that of those volatile chemicals, 81 percent can harm the brain and nervous system, 71 percent can harm the cardiovascular system and blood, and 66 percent can harm the kidneys.[46] The SCAQMD has identified three areas of dangerous and unregulated air emissions from fracking: (1) the mixing of the fracking chemicals; (2) the use of the silica, or sand, as a proppant, which causes the deadly disease silicosis; and (3) the storage of fracking fluid once it comes back to the surface.[47] Preparation of the fluids used for well completion often involves onsite mixing of gravel or proppants with fluid, a process which potentially results in major amounts of particulate matter emissions.[48] Further, these proppants often include silica sand, which increases the risk of lung disease and silicosis when inhaled.[49] Finally, as flowback returns to the surface and is deposited in pits or tanks that are open to the atmosphere, there is the potential for organic compounds and toxic air pollutants to be emitted, which are harmful to human health as described above.[50]

The EA should study the potential for oil and gas operations sites in the planning area to emit such air toxics and any other pollutants that may pose a risk to human health, paying particular attention to the impacts of air pollution on environmental justice communities that already bear the burden of disproportionately high levels of air pollution.

The EA should rely on the most up-to-date information regarding the contribution of oil and gas operations to air pollution levels. Numerous studies demonstrate that state and federal emissions inventories significantly underestimate the levels of hazardous air pollution coming from oil and gas drilling and fracking operations. For example, aerial surveys of more than 8,000 oil and gas wells in seven US regions found that well pads emit considerably more methane and

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[42] Bay Area Air Quality Management District, Particulate Matter Overview, Particulate Matter and Human Health (2012).
[43] See Exhibit 20, U.S. Environmental Protection Agency, Regulatory Impact Analysis for the Proposed Revisions to the National Ambient Air Quality Standards for Particulate Matter (June 2012), http://www.epa.gov/ttnecas1/regdata/RIAs/PMRIACombinedFile_Bookmarked.pdfat 2-2, ("EPA RIA")
[44] EPA RIA at 2-2.
[45] U.S. Environmental Protection Agency, National Ambient Air Quality Standards for Particulate Matter Proposed Rule, 77 Fed. Reg. 38,890, 38,893 (June 29, 2012).
[46] Colborn 2011 at 8.
[47] South Coast Air Quality Management District, Draft Staff Report on Proposed Rule 1148.2 - Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers (January 2013) at 15 ("SCAQMD Draft Staff Report PR1148-2").
[48] *Id.*
[49] See Exhibit 21, South Coast Air Quality Management District, Response to Questions re Air Quality Risks of Hydraulic Fracturing in California, Submission to Joint Senate Hearing (2013) at 3.
[50] SCAQMD Draft Staff Report PR1148-2 at 15.

VOCs that captured by existing inventories.[51] Recent studies in Weld County, Colorado, show that existing emissions inventories likely underestimate the contribution of oil and gas operations to VOC levels by at least a factor of two, and that benzene emissions are underestimated by four to nine times[52] These studies suggest that the health risk assessments conducted using these inventories are inaccurate and underestimate exposures and health risks.[53] Similarly, the assessment of fracking in California by the California Council on Science and Technology found that current inventory methods underestimate methane and VOC emissions from oil and gas operations.[54]

B. Sources of Air Emissions.

Harmful air pollutants are emitted during every stage of unconventional oil and gas development, including drilling, completion, well stimulation, production, and disposal, as well as from transportation of water, sand, chemicals, and to and from the well pad.[55] The well stimulation stage can emit diesel exhaust, VOCs, particulate matter, ozone precursors, silica, and acid mists.[56] Drilling and casing the wellbore require substantial power from large equipment. The engines used typically run on diesel fuel, which emits particularly harmful types of air pollutants when burned. Similarly, high-powered pump engines are used in the fracturing and completion phase. This too can amount in large volumes of air pollution. Flaring, venting, and fugitive emissions of gas are also a potential source of air emissions. Gas flaring and venting can occur in both oil and gas recovery processes when underground gas rises to the surface and is not captured as part of production. Emissions from flaring typically include carbon monoxide, nitrogen oxides, benzene, formaldehyde and xylene, but levels of these smog-forming compounds are seldom measured directly.[57]

Fugitive emissions can occur at every stage of extraction and production, often leading to high volumes of gas being released into the air. Methane emissions from oil and gas production are as much as 270 percent greater than previously estimated by calculation.[58] Recent studies show that emissions from pneumatic valves (which control routine operations at the well pad by venting methane during normal operation) and fugitive emissions are higher than EPA estimates.[59]

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[51] See Exhibit 22, Lyon, David R. et al., Aerial Surveys of Elevated Hydrocarbon Emissions From Oil and Gas Production Sites, 50 Environmental Science & Technology 4877 (2016).

[52] Pétron 2012 at 1, 18 (noting state and federal inventories likely underestimate hydrocarbon emissions from oil and gas operations by as much as factor of two); See Exhibit 23, Pétron, Gabrielle et al., A New Look at Methane and Non-Methane Hydrocarbon Emissions from Oil and Natural Gas Operations in the Colorado Denver-Julesburg Basin, 119 J. Geophysical Research: Atmospheres 6836 (2014) at 6836 ("Pétron 2014")..

[53] Pétron 2014.

[54] See Exhibit 24, Brandt, Adam et al., Ch 3: Air quality impacts from well stimulation, *An Independent Assessment of Well Stimulation in California*, Volume 2, California Council on Science and Technology (2015) ("CCST 2015").

[55] Shonkoff 2014.

[56] *Id.*

[57] See Exhibit 25, Physicians for Social Responsibility and Concerned Health Professionals of NY, Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking, Fourth Edition, November 17, 2016 ("PSR 2016").

[58] See Exhibit 26, Miller, Scot et al., Anthropogenic emissions of methane in the United States, 110 PNAS 50 (2013).

[59] See Exhibit 27, Allen, David et al., Measurements of Methane Emissions at Natural Gas Production Sites in The United States, 110 PNAS 17768 (2013) ("Allen 2013"); Harris, Robert et al., Using Multi-Scale Measurements to

Evaporation from pits can also contribute to air pollution. Pits that store drilling waste, produced water, and other waste fluid may be exposed to the open air. Chemicals mixed with the wastewater—including the additives used to make fracking fluids, as well as volatile hydrocarbons, such as benzene and toluene, brought to the surface with the waste—can escape into the air through evaporation. Some pits are equipped with pumps that spray effluents into the air to hasten the evaporation process. For example, evaporation from fracking waste pits in western Colorado was found to have added tons of toxic chemicals to the air, increasing air pollution in Utah.[60] In Texas, toxic air emissions from fracking waste pits are unmonitored and unregulated.[61] In California, unlined disposal pits for drilling and fracking waste are documented sources of contamination.[62] Even where waste fluid is stored in so-called "closed loop" storage tanks, fugitive emissions can escape from tanks.

As mentioned above, increased truck traffic will lead to more air emissions. Trucks capable of transporting large volumes of chemicals and waste fluid typically use large engines that run on diesel fuel. Air pollutants from truck engines will be emitted not only at the well site, but also along truck routes to and from the site.

The EA must provide an adequate analysis and disclosure of the effects the lease sale could have on air quality, including the impacts that would result from fracking. The EA cannot postpone the discussion of air pollution impacts until site-specific plans are proposed. Because BLM must analyze impacts at "the earliest practicable time," and no benefit would be gained from postponing the analysis, BLM must discuss these cumulative impacts before the lease sale.

C. Impact of Increased Air Pollution.

The potential harms resulting from increased exposure to the dangerous air pollutants from unconventional oil and gas development are serious and wide-ranging. A growing body of scientific research has documented adverse public health impacts from unconventional oil and gas development, including studies showing air pollutants at levels associated with reproductive and developmental harms and the increased risk of morbidity and mortality.[63] A comprehensive

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Improve Methane Emission Estimates from Oil and Gas Operations in the Barnett Shale Region, Texas, 49 Environ. Sci. Technol. 7524 (2015).

[60] See Exhibit 28, Maffly, Brian , *Utah grapples with toxic water from oil and gas industry*, The Salt Lake Tribune, August 28, 2014, available at http://archive.sltrib.com/story.php?ref=/sltrib/news/58298470-78/danish-flats-ponds-company.html.csp; The company responsible for the waste pits was found to have operated without a permit, underreported emissions and provided erroneous data to regulators.

[61] Center for Public Integrity. *Open Pits Offer Cheap Disposal for Fracking Sludge But Health Worries Mount,* October 2, 2014.

[62] See Exhibit 29, Stringfellow, William T. et al., Ch 2: Impacts of Well Stimulation on Water Resources, *An Independent Assessment of Well Stimulation in California,* Volume 2, California Council on Science and Technology (2015) ("CCST 2015") at 110-113.

[63] Hays, Jake & Seth B.C. Shonkoff , Towards an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 11 PLoS ONE e0154164 (2016); Shonkoff 2014; See Exhibit 30, Webb, Ellen et al., Developmental and reproductive effects of chemicals associated with unconventional oil and natural gas operations, 29 Rev Environ Health 307 (2014); McKenzie 2012; Clean Air Task Force, Fossil Fumes: A Public Health Analysis of Toxic Air Pollution From the Oil and Gas Industry, June 2016, available at http://www.catf.us/resources/publications/files/FossilFumes.pdf.

review of the risks and harms of fracking to public health came to several key findings related to air pollution: (1) "drilling and fracking emissions contribute to toxic air pollution and smog (ground-level ozone) at levels known to have health impacts," (2)"public health problems associated with drilling and fracking, including reproductive impacts and occupational health and safety problems, are increasingly well documented"; and (3)"fracking infrastructure poses serious potential exposure risks to those living near it."

Air toxics and hazardous air pollutants, by definition, can result in harm to human health and safety. Understanding the full extent of the health effects of exposure is still far from being complete, but already there are numerous studies that have found these chemicals to have serious health consequences for humans exposed to even minimal amounts. The negative effects of criteria pollutants are well documented and are summarized by the U.S. EPA's website:

> *Nitrogen oxides* (NOx) react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. NO_x and volatile organic compounds react in the presence of heat and sunlight to form ozone.
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> *Particulate matter* (PM) - especially fine particles - contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including: premature death in people with heart or lung disease, increased mortality, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.[64]
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> *Sulfur Dioxide* (SO_2) – has been shown to cause an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms.[65] Studies also show a connection between short-term exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.[66]
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> *Carbon Monoxide* (CO) can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.[67] Exposure to CO can reduce the oxygen-carrying capacity of the blood. People with several types of heart disease already have a reduced capacity for pumping

[64] U.S. Environmental Protection Agency, Particulate Matter, (PM) http://www.epa.gov/airquality/particlepollution/health.html (accessed July 30, 2015); See Exhibit 31, Ostro, Bart et al., Long-term Exposure to Constituents of Fine Particulate Air Pollution and Mortality: Results from the California Teachers Study, 118 Environmental Health Perspectives 3 (2010)
[65] U.S. Environmental Protection Agency, Sulfur Dioxide http://www.epa.gov/airquality/sulfurdioxide/health.html, available at (accessed July 29, 2015).
[66] *Id.*
[67] U.S. Environmental Protection Agency, Carbon Monoxide, available at http://www.epa.gov/airquality/carbonmonoxide/health.html (accessed July 29, 2015).

> oxygenated blood to the heart, which can cause them to experience myocardial ischemia (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising or under increased stress.[68] For these people, short-term CO exposure further affects their body's already compromised ability to respond to the increased oxygen demands of exercise or exertion.[69]
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> *Ozone* (O_3) can trigger or worsen asthma and other respiratory ailments.[70] Ground level ozone can have harmful effects on sensitive vegetation and ecosystems. Ozone may also lead to loss of species diversity and changes to habitat quality, water cycles, and nutrient cycles.

The range of illnesses that can result from the wide array of air pollutants from fracking were summarized in a study by Dr. Theo Colburn, which charts which chemicals have been shown to be linked to certain illnesses.[71] This study analyzed air samples taken during drilling operations near natural gas wells and residential areas in Garfield County, and detected 57 chemicals between July 2010 and October 2011, including 44 with reported health effects.[72] For example:

> Thirty-five chemicals were found to affect the brain/nervous system, 33 the liver/metabolism, and 30 the endocrine system, which includes reproductive and developmental effects. The categories with the next highest numbers of effects were the immune system (28), cardiovascular/blood (27), and the sensory and respiratory systems (25 each). Eight chemicals had health effects in all 12 categories. There were also several chemicals for which no health effect data could be found.[73]

The study found extremely high levels of methylene chloride, which may be used as cleaning solvents to remove waxy paraffin that is commonly deposited by raw natural gas in the region. These deposits solidify at ambient temperatures and build up on equipment.[74] While none of the detected chemicals exceeded governmental safety thresholds of exposure, the study noted that such thresholds are typically based on "exposure of a grown man encountering relatively high concentrations of a chemical over a brief time period, for example, during occupational exposure."[75] Consequently, such thresholds may not apply to individuals experiencing "chronic, sporadic, low-level exposure," including sensitive populations such as children, the elderly and pregnant women.[76] For example, the study detected polycyclic aromatic hydrocarbon (PAH) levels that could be of "clinical significance," as recent studies have linked low levels of exposure to lower mental development in children who were prenatally exposed.[77] In addition,

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[68] *Id.*
[69] *Id.*
[70] U.S. Environmental Protection Agency, Ground Level Ozone, available at http://www.epa.gov/airquality/ozonepollution/health.html (accessed July 29, 2015).
[71] Colborn 2011; Colborn 2012;*see* note 120 & accompanying text below.
[72] Colborn 2012 at pp. 21-22.
[73] Colborn 2012 at 11.
[74] *Id*. at 10.
[75] *Id*. at 11-12.
[76] *Id*. at. 12.
[77] *Id*. at 10-11.

government safety standards do not take into account "the kinds of effects found from low-level exposure to endocrine disrupting chemicals…, which can be particularly harmful during prenatal development and childhood.[78]

Adverse health impacts documented among residents living near drilling and fracking operations include reproductive harms, increased asthma attacks, increased rates of hospitalization, ambulance runs, emergency room visits, self-reported respiratory problems and rashes, motor vehicle fatalities, trauma, and drug abuse. A recent review concluded:

> By several measures, evidence for fracking-related health problems is emerging across the United States. In Pennsylvania, as the number of gas wells increase in a community, so do rates of hospitalization. Drilling and fracking operations are correlated with elevated motor vehicle fatalities (Texas), asthma (Pennsylvania), self-reported skin and respiratory problems (southwestern Pennsylvania), ambulance runs and emergency room visits (North Dakota), infant deaths (Utah), birth defects (Colorado), high risk pregnancies (Pennsylvania), premature birth (Pennsylvania), and low birthweight (multiple states). Benzene levels in ambient air surrounding drilling and fracking operations are sufficient to elevate risks for future cancers in both workers and nearby residents, according to studies. Animal studies show that two dozen chemicals commonly used in fracking operations are endocrine disruptors that can variously disrupt organ systems, lower sperm counts, and cause reproductive harm at levels to which people can be realistically exposed.[79]

A rigorous study by Johns Hopkins University, which examined 35,000 medical records of people with asthma in Pennsylvania, found that people who live near a higher number of, or larger, active gas wells were 1.5 to 4 times more likely to suffer from asthma attacks than those living farther away, with the closest groups having the highest risk.[80] Increased asthma risks occurred during all phases of well development. A recent Yale University study identified numerous fracking chemicals that are known, probable, or possible human carcinogens (20 air pollutants) and/or are linked to increased risk for leukemia and lymphoma (11 air pollutants), including benzene, 1,3-butadiene, cadmium, diesel exhaust, and polycyclic aromatic hydrocarbons.[81]

Numerous studies suggest that higher maternal exposure to fracking and drilling can increase the incidence of high-risk pregnancies, premature births, low-birthweight babies and birth defects. A study of 9,384 pregnant women in Pennsylvania found that women who live near active drilling and fracking sites had a 40 percent increased risk for having premature birth and a 30 percent increased risk for having high-risk pregnancies.[82] Another study found that pregnant

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[78] *Id*. at 12.
[79] PSR 2016 at 93.
[80] See Exhibit 32, Rasmussen, Sara G. et al., Association Between Unconventional Natural Gas Development in the Marcellus Shale and Asthma Exacerbations, 176 JAMA Internal Medicine 1334 (2016).
[81] Elliot, Elise G. et al., A Systematic Evaluation of Chemicals in Hydraulic-Fracturing Fluids and Wastewater for Reproductive and Developmental Toxicity, 27 Journal of Exposure Science and Environmental Epidemiology 90 (2016).
[82] Casey, Joan A., Unconventional Natural Gas Development and Birth Outcomes in Pennsylvania, USA, 27 Epidemiology 163 (2016).

women who had greater exposure to gas wells (measured in terms of proximity and density of wells) had a much higher risk of having low-birthweight babies; the researchers identified air pollution as the likely route of exposure.[83] In rural Colorado, mothers with greater exposure to natural gas wells were associated with a higher risk of having babies with congenital heart defects and possibly neural tube defects.[84]

Other studies have found that residents living closer to drilling and fracking operations had higher hospitalization rates[85] and reported more health symptoms, including upper respiratory problems and rashes.[86]

Workers suffer high risks from toxic exposure and accidents.[87] As summarized by a recent review:

> Drilling and fracking jobs are among the most dangerous jobs in the nation with a fatality rate that is five times the national average and shows no sign of abating. Occupational hazards include head injuries, traffic accidents, blunt trauma, burns, inhalation of hydrocarbon vapors, toxic chemical exposures, heat exhaustion, dehydration, and sleep deprivation. An investigation of occupational exposures found high levels of benzene in the urine of wellpad workers, especially those in close proximity to flowback fluid coming up from wells following fracturing activities. Exposure to silica dust, which is definitively linked to silicosis and lung cancer, was singled out by the National Institute for Occupational Safety and Health as a particular threat to workers in fracking operations where silica sand is used. At the same time, research shows that many gas field workers, despite these serious occupational hazards, are uninsured or underinsured and lack access to basic medical care.[88]

Methods of collecting and analyzing emissions data often underestimate health risks by failing to adequately measure the intensity, frequency, and duration of community exposure to toxic chemicals from fracking and drilling; failing to examine the effects of chemical mixtures; and failing to consider vulnerable populations.[89] Of high concern, numerous studies highlight

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[83] See Exhibit 33, Stacy, Shaina L. et al., Perinatal Outcomes and Unconventional Natural Gas Operations in Southwest Pennsylvania. 10 PLoS ONE e0126425 (2015).
[84] See Exhibit 34, McKenzie, Lisa M., Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado, 122 Environmental Health Perspectives 412 (2014).
[85] Jemielita, Thomas et al., Unconventional Gas and Oil Drilling Is Associated with Increased Hospital Utilization Rates. 10 PLoS ONE e0131093 (2015).
[86] See Exhibit 35, Rabinowitz, Peter M. et al., Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania, 123 Environmental Health Perspectives 21 (2015).
[87]Esswein, Eric J. et al., Occupational Exposures to Respirable Crystalline Silica During Hydraulic Fracturing, 10 Journal of Occupational and Environmental Hygiene 347 (2013); Esswein, Eric et al., Evaluation of Some Potential Chemical Exposure Risks during Flowback Operations in Unconventional Oil and Gas Extraction: Preliminary Results, 11 Journal of Occupational and Environmental Hygiene D174 (2013); Harrison, Robert J. et al., Sudden Deaths Among Oil and Gas Extraction Workers Resulting from Oxygen Deficiency and Inhalation of Hydrocarbon Gases and Vapors — United States, January 2010–March 2015. 65 MMWR Morb Mortal Wkly Rep 6 (2016); PSR 2016.
[88] PSR 2016 at 80
[89] See Exhibit 36, Brown, David et al., Understanding Exposure From Natural Gas Drilling Puts Current Air Standards to the Test. 29 Reviews on Environmental Health 277 (2014).

that health assessments drilling and fracking emissions often fail to consider impact on vulnerable populations including environmental justice communities[90] and children.[91] For example, a recent analysis of oil and gas development in California found that 14 percent of the state's population (5.4 million people) live within a mile of at least one oil and gas well. More than a third of these people (1.8 million) also live in areas most burdened by environmental pollution.[92]

The EA should incorporate a literature review of the harmful effects of each of these chemicals known to be used in fracking and other unconventional oil and gas extraction methods. Without knowing the effects of each chemical, the EA cannot accurately project the true impact of unconventional oil and gas extraction.

D. The EA Does Not Adequately Consider the Impact of Natural Gas and Oil Development on Ozone Formation in Wyoming Non-Attainment Regions.

In Wyoming, ground-level ozone concentrations that greatly exceed national ambient air quality standard levels regularly occur in the Upper Green River Basin during the winter, and have been linked to the extensive oil and gas operations in the region.[93] A 2009 study documented ground-level hourly ozone concentrations in the vicinity of the Jonah–Pinedale Anticline natural gas field that reached 140 ppb in winter.[94] Another study documented wintertime ozone hourly values above 150 ppb and maximum daily 8-hour averages over 120 ppb, linked to the high ozone precursors emitted by fracking and drilling operations.[95]

II. The EA Fails to Accurately Analyze the Leasing Decision's Impact on Climate Change.

A. The EA Fails to Analyze and Assess Reasonably Foreseeable Greenhouse Gas Emissions

Meaningful consideration of greenhouse gas emissions (GHGs) is clearly within the scope of required NEPA review. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*.,

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[90] See Exhibit 37, NRDC [Natural Resources Defense Council], Drilling in California: Who's At Risk?, October 2014 ("NRDC 2014"); Clough, Emily & Derek Bell, Just Fracking: A Distributive Environmental Justice Analysis of Unconventional Gas Development in Pennsylvania, USA, 11 Environmental Research Letters 025001 (2016); Exhibit 38, McKenzie, Lisa M. et al., Population Size, Growth, and Environmental Justice Near Oil and Gas Wells in Colorado, 50 Environmental Science & Technology 11471 (2016).

[91] See Exhibit 39, Webb, Ellen et al., Potential Hazards of Air Pollutant Emissions From Unconventional Oil and Natural Gas Operations on The Respiratory Health of Children And Infants. 31 Reviews on Environmental Health 225 (2016).

[92] NRDC 2014.

[93] See Exhibit 40, Wyoming Department of Health, Associations of Short-Term Exposure to Ozone and Respiratory Outpatient Clinic Visits — Sublette County, Wyoming, 2008–2011 (March 1, 2013).

[94] See Exhibit 41, Schnell, Russell C. et al., Rapid Photochemical Production of Ozone at High Concentrations in a Rural Site During Winter, 2 Nature Geoscience 120 (2009).

[95] See Exhibit 42, Oltsmans, Samuel et al., Anatomy of wintertime ozone associated with oil and natural gas extraction activity in Wyoming and Utah, 2 Elementa: Science of the Anthropocene 000024, doi: 10.12952/journal.elementa.000024 (2014).

538 F.3d 1172, 1217 (9th Cir. 2008). As the Ninth Circuit has held, in the context of fuel economy standard rules:

> The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct. Any given rule setting a CAFE standard might have an "individually minor" effect on the environment, but these rules are "collectively significant actions taking place over a period of time" *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1216 (9th Cir. 2008)(quoting 40 C.F.R. § 1508.7).

The courts have ruled that federal agencies consider indirect GHG emissions resulting from agency policy, regulatory, and leasing decisions. For example, agencies cannot ignore the indirect air quality and climate change impact of decisions that would open up access to coal reserves. *See Mid States Coal. For Progress v. Surface Transp. Bd*., 345 F.3d 520, 532, 550 (8th Cir. 2003); *High Country Conservation Advocates v. U.S. Forest Serv*., 52 F.Supp. 3d 1174, 1197-98 (D.Colo. 2014).

The EA fails to fully and accurately analyze the impacts of increased oil and gas development on greenhouse gas ("GHG") emissions and climate change based on this particular Wyoming High Desert lease parcel sale. While we commend BLM's attempt at quantifying potential downstream GHG emissions based on a Reasonably Foreseeable Development Scenario for this lease sale, the assumptions and methodology of this analysis leave much to be desired. EA at 61-62.

First, the EA's analyses of the direct and indirect GHG emissions lack clarity and transparency. The EA simply does not provide sufficient information and explanation of its analyses, assumptions, and underlying data for the public to understand or assess the GHG emissions estimates. Instead the EA cursorily refers to a number of EIS documents to provide the basis for its estimates, and these documents, in turn, lack sufficient explanation of the analyses, data and assumptions. Second, it is unclear whether the EA's estimates of direct and indirect GHG emissions encompass all potential sources of emissions during the lifecycle of the wells projected under a RFD scenario, such as well pad preparation, carbon loss due to vegetative disruption, well drilling, hydraulic fracturing, well completion, production, processing, transmission and storage, distribution and combustion. Finally, the EA fails to provide an accounting of the total lifecycle GHG emissions that will be produced over the lifespan of the wells projected to be developed under a RFD scenario. Instead, the EA only provides point estimates of the GHG emissions will result in one year or a handful of years, although the wells will be generating GHG emission over many years. The EA should estimate the cumulative direct and indirect GHG emissions that will be generated over the lifespan of the wells.

As an illustration of some of these deficiencies, the EA estimates direct emissions "from construction through the production of the wells" only for year 2020 for the proposed lease sale parcels within the High Desert District, which does not represent the cumulative GHG direct emissions burden that will result from the proposed lease sale. EA at 64.

The EA presents estimates of the indirect emissions from the combustion of produced oil and gas in Table 4-2. However, the EA only provides emissions estimates for a 5-year period (2016-2020) instead of estimating the total indirect emissions from oil and gas that will be produced by the wells over their lifespan. The EA states that these estimates are based on production information provided by the RMG and BLM field and district office staff, including "the number of wells drilled each year by alternative for each field office or planning unit (from the RFD), the percent of wells that were oil versus gas, the percent of wells completed, production decline curves for oil and gas wells, and estimates of cross production from both oil and gas wells." EA at 65, 66. However, this production information is never presented anywhere, preventing the public from understanding or evaluating these estimates.

NEPA requires "reasonable forecasting," which includes the consideration of "reasonably foreseeable future actions…even if they are not specific proposals" *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted). That BLM cannot "accurately" calculate the total emissions expected from full development is not a rational basis for cutting off its analysis. "Because speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry." *Id*. Indeed, the EA for a recent lease sale in Utah undercuts BLM's assertion here that GHGs cannot be quantified at the leasing stage[96]. *See High Country Conservation Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1196 (D. Colo. 2014) (decision to forgo calculating mine's reasonably foreseeable GHG emissions was arbitrary "in light of the agencies' apparent ability to perform such calculations").

The final CEQ *Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA review* is dispositive on the issue of federal agency review of greenhouse gas emissions as foreseeable direct and indirect effects of the proposed action. 81 Fed. Reg. 51,866 (Aug. 5, 2016). The CEQ guidance provides clear direction for BLM to conduct a lifecycle greenhouse gas analysis because the modeling and tools to conduct this type of analysis are readily available to the agency:

> If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action. Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties. To compare a project's estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management Program, or Office of Fossil Energy of the Department of Energy. In the absence of such analyses, agencies should use other available information. 81 Fed. Reg. 51,866 at 16 (Aug. 5, 2016)(citations omitted).

CEQ's guidance even provides an example of where a lifecycle analysis is appropriate in a leasing context at footnote 42:

[96] See Exhibit 43, U.S. Bureau of Land Management, Environmental Assessment for West Desert District, Fillmore Field Office, August 2015 Oil and Gas Lease Sale, pp. 57-58 (Dec. 2015).

> The indirect effects of such an action that are reasonably foreseeable at the time would vary with the circumstances of the proposed action. For actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal. *Id*.

On January 12th 2017, BLM adopted the CEQ guidance as permanent agency policy by issuing instruction memorandum, IM 2017-003, "[T]he Council on Environmental Quality Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews."[97] IM 2017-003 clearly establishes a quantitative methodology for analyzing direct and indirect greenhouse gas emissions from leasing decisions and resultant oil and gas development.[98]

As described above and outlined in BLM's latest climate IM, the volume of potential oil and gas from these lease parcels is knowable and calculating the direct emissions impact from development of these lease parcels is also quantifiable. Utilizing BLM's own potential volume data for the May 2017 Wyoming High Desert lease sale, the estimated oil volume of 3.878216 mmbbl represents lifecycle greenhouse gas emissions of up to 1,358,507.97 tons of CO2e and the estimated gas volume of 181.088422 bcf represents lifecycle greenhouse gas emissions of up to 13,492,533.63 tons of CO2e. Potential lifecycle greenhouse gas emissions for resultant oil and gas volumes can be generated using the Center's peer-reviewed carbon calculator and lifecycle greenhouse gas emissions model developed by EcoShift consulting.[99] This model is not novel in its development or methodology. Numerous greenhouse gas calculation tools exist to develop lifecycle analyses, particularly for fossil fuel extraction, operations, transport and end-user emissions.[100] Indeed, the Department of Energy has historically utilized these types of lifecycle emissions analyses in NEPA review of oil and gas infrastructure projects.[101] Other federal

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[97] See Exhibit 44, U.S. Department of the Interior, Bureau of Land Management, IM 2017-003, The Council on Environmental Quality Guidance on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (January 12, 2017).

[98] *Id*.

[99] *See* Exhibit 45, Ecoshift Consulting, The potential Greenhouse Gas Emissions of U.S. Federal Fossil Fuels, Center for Biological Diversity and Friends of the Earth (2015), http://www.ecoshiftconsulting.com/wp-content/uploads/Potential-Greenhouse-Gas-Emissions-U-S-Federal-Fossil-Fuels.pdf.

[100] *See* Council on Environmental Quality, Revised draft guidance for greenhouse gas emissions and climate change impacts (2014), https://ceq.doe.gov/current_developments/GHG-accounting-tools.html.

[101] See Exhibit 46, U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States, DOE/NETL-2014/1649 (May 29, 2014) *available at* http://energy.gov/sites/prod/files/2014/05/f16/Life%20Cycle%20GHG%20Perspective%20Report.pdf. *See also,* Exhibit 47, U.S. Department of Energy National Renewable Energy Laboratory, Life Cycle Greenhouse Gas Emissions from Electricity Generation Fact Sheet, Pub No. NREL/FS-6A20-57817 (2013) *available at* http://www.nrel.gov/docs/fy13osti/57187.pdf; Exhibit 48, U.S. Department of Energy National Energy Technology Laboratory Role of Alternative Energy Sources: Natural Gas Technology Assessment, Pub No. DOE/NETL-2012/1539 (2012) (NETL, 2012) *available at* https://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Life%20Cycle%20Analysis/LCA-2012-1539.pdf; Exhibit 49, U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production, Pub No. DOE/NETL-2011/1522 (2011) (NETL, 2011) *available at* http://www.fossil.energy.gov/programs/gasregulation/authorizations/2013_applications/sierra_club_13-69_venture/exhibits_44_45.pdf; Exhibit 50, U.S. Department of Energy National Energy Technology Laboratory,

agencies have begun to employ upstream, downstream and lifecycle greenhouse gas emissions analyses for NEPA review of energy-related projects.[102] Courts have upheld the viability and usefulness of lifecycle analyses, and adoption of this trend is clearly reflected in the CEQ Guidance on Climate Change . 81 Fed. Reg. 51, 866 at 11 (Aug. 5, 2016) ("This guidance recommends that agencies quantify a proposed agency action's projected direct and indirect GHG emissions. Agencies should be guided by the principle that the extent of the analysis should be commensurate with the quantity of projected GHG emissions and take into account available data and GHG quantification tools that are suitable for and commensurate with the proposed agency action").[103]

It is reasonably foreseeable, as opposed to speculative, that this lease sale will induce oil and natural gas production, transmission and ultimate end-user climate change impacts. The effects of this induced production must be considered in the EA, and in fact, necessitate a more robust review under an EIS. *See*, *e.g.*, *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1081-82 (9th Cir. 2011) (finding that NEPA review must consider induced coal

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Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant, Pub No DOE/NETL-403-110509 (Sep 10, 2012) (NETL, 2010) *available at* https://www.netl.doe.gov/energy-analyses/temp/FY13_LifeCycleAnalysisNaturalGasCombinedCycle(NGCC)PowerPlantFinal_060113.pdf.

[102] See Exhibit 51, U.S. Bureau of Land Management, Final Supplemental Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract, UTU-84102, 287 (Feb 2015) (BLM expressly acknowledged that "the burning of the coal is an indirect impact that is a reasonable progression of the mining activity" and quantified emissions from combustion without any disclaimer about other sources of coal. *Id* at 286. In that same EIS, BLM also acknowledged that truck traffic to haul coal would be extended as a result of the proposed lease approval, and this would generate additional emissions.) *See also*, Exhibit 52, U.S. Forest Service, Record of Decision and Final Environmental Impact Statement, Oil and Gas Leasing Analysis, Fishlake National Forest, 169 (Aug 2013) (Table 3.12-7: shows GHG emissions from transportation, offsite refining and end use; and total direct and indirect emissions. *See also id*., Exhibit 53, Appendix E/SIR-2 (more detailed calculations of direct and indirect emissions.)) U.S. Army Corps of Engineers, Final Environmental Impact Statement: Alaska Stand Alone Gas Pipeline, Volume 2 Sec. 5.20-70–71 (Oct. 2012) The Corps, in a 2012 EIS for an intrastate natural gas pipeline in Alaska, estimated downstream emissions from combustion of the natural gas that would be transported, and also discussed the potential for natural gas to displace other, dirtier fuel sources such as coal and oil.), Exhibit 54, U.S. Department of State, Final Supplemental Environmental Impact Statement for the Keystone XL Project, § 4.14.3, Appendix U (Jan. 2014)(The Department of State, as lead agency on the Keystone XL Pipeline Review conducted a relatively comprehensive life-cycle greenhouse gas analysis for the proposed pipeline, alternatives, and baseline scenarios that could occur if the pipeline was not constructed.) Exhibit 55, U.S. Environmental Protection Agency Region X, Letter from Dennis McLerran, Regional Administrator, to Randel Perry, U.S. Army Corps of Engineers Seattle District, re Gateway Pacific Projects (Jan 22, 2013) *available* at http://www.eisgatewaypacificwa.gov/sites/default/files/content/files/EPA_Reg10_McLerran.pdf#overlay-context=resources/project-library. (EPA submitted comments on the scope of impacts that should be evaluated in the coal terminal EIS that the Corps is preparing, in which it urged the Corps to conduct a lifecycle emissions analysis of GHG emissions from the coal that would be transported via the terminal.)

[103] *High Country Conservation Advocates v. United States Forest Serv*., 52 F. Supp. 3d 1174 (D. Colo. 2014) (Court held that the agencies' failure to quantify the effect of greenhouse gas (GHG) emissions from the mining lease modifications was arbitrary in violation of NEPA because the social cost of carbon protocol tool existed for such analysis under 40 C.F.R. § 1502.23 but the agencies did not provide reasons in the final EIS for not using the tool; and that the agencies' decision to forgo calculating the foreseeable GHG emissions was arbitrary in light of their ability to perform such calculations and their decision to include a detailed economic analysis of the benefits.) See also, *Dine Citizens Against Ruining Our Env't v. United States Office of Surface Mining Reclamation & Enf't*, 82 F. Supp. 3d 1201, 1213-1218 (D. Colo. 2015) (Court held that the agency failed to adequately consider the reasonably foreseeable combustion-related downstream effects of the proposed action. Also held that that combustion emissions associated with a mine that fed a single power plant were reasonably foreseeable because the agency knew where the coal would be consumed).

production at mines, which was a reasonably foreseeable effect of a project to expand a railway line that would carry coal, especially where company proposing the railway line anticipated induced coal production in justifying its proposal); *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549-50 (8th Cir. 2003) (environmental effects of increased coal consumption due to construction of a new rail line to reach coal mines was reasonably foreseeable and required evaluation under NEPA). The development of an area for lease and subsequent oil and gas production would certainly result in combustion of the extracted product, which the EA acknowledges. As courts have held in similar contexts, combustion emissions resulting from opening up a new area to development are "reasonably foreseeable," and therefore a "proximate cause" of the leasing. *See Mid States Coal. for Progress v. Surface Transp. Bd*., 345 F.3d 520, 549 (8th Cir. 2003) (holding that agency violated NEPA when it failed to disclose and analyze the future coal combustion impacts associated with the agency's approval of a railroad line that allowed access to coal deposits); *High Country Conserv'n Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1197 (D. Colo. 2014) (same with respect to GHG emissions resulting from approval of coal mining exploration project).

In both *Mid States Coalition* and *High Country*, the courts rejected the government's rationale that increased emissions from combustion of coal was not reasonably foreseeable because the same amount of coal would be burned without opening up the areas at issue to new coal mining. Both courts found this argument "illogical at best" and noted that "increased availability of inexpensive coal will at the very least make coal a more attractive option to future entrants into the utilities market when compared with other potential fuel sources, such as nuclear power, solar power, or natural gas." See *High Country*, 52 F. Supp. 3d at 1197 (quoting *Mid States Coalition*, 345 F.3d at 549). "On similar grounds, the development of new wells over the proposed areas for lease will increase the supply of [oil and natural gas]. At some point this additional supply will impact the demand for [oil and gas] relative to other fuel sources, and [these minerals] that otherwise would have been left in the ground will be burned. This reasonably foreseeable effect must be analyzed, even if the precise extent of the effect is less certain." *Id. See also WildEarth Guardians v. United States Office of Surface Mining, Reclamation & Enf't*, 104 F. Supp. 3d 1208, 1229-30 (D. Colo. 2015) (coal combustion was indirect effect of agency's approval of mining plan modifications that "increased the area of federal land on which mining has occurred" and "led to an increase in the amount of federal coal available for combustion.")[104]

Even if it were true that potential emissions cannot reasonably be estimated, or estimated with a high degree of accuracy, it is possible for BLM to identify significant sources of greenhouse gas emissions, which would enable the identification of specific measures to reduce emissions and an understanding of the extent to which certain emissions are avoidable. The extreme urgency of the climate crisis requires BLM to pursue all means available to limit the

[104] *See also*, CEQ's Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, 81 Fed. Reg. 51,866 at 14 (Aug. 5, 2016)(For example, NEPA reviews for proposed resource extraction and development projects typically include the reasonably foreseeable effects of various phases in the process, such as clearing land for the project, building access roads, extraction, transport, refining, processing, using the resource, disassembly, disposal, and reclamation. Depending on the relationship between any of the phases, as well as the authority under which they may be carried out, agencies should use the analytical scope that best informs their decision making.)

climate change effects of its actions. Any emissions source, no matter how small, is potentially significant, such that BLM should fully explore mitigation and avoidance options for all sources.

BLM suggests that accurate quantification of GHGs would occur when actual drilling is proposed. EA at 67. But by delaying quantification until after a lease is issued, BLM may prejudice the consideration of alternatives or leasing stipulations that would avoid or reduce greenhouse gas emissions to an extent not otherwise available after leasing. BLM has long (but incorrectly) maintained that leasing stipulations can only be imposed with the issuance of the lease. Thereafter, purportedly, its authority to condition drilling is limited to "reasonable measures" or "conditions of approval" that may not be "[in]consistent with lease rights granted." 43 C.F.R. § 3101.1-2. Cost-prohibitive measures could therefore potentially be barred. Further, measures to "minimize" impacts may be imposed, but those may not necessarily avoid impacts altogether. *Id*. Waiting until the drilling stage could also be too little too late, as various other actions may occur between leasing and drilling, such as the execution of unit agreements, or construction of roads or pipelines, all of which may narrow mitigation options available at the drilling stage. *See William P. Maycock et al.*, 177 I.B.L.A. 1, 20-21 (Dec. Int. 2008) (holding that unit agreements limit drilling-stage alternatives).

The EA's failure to accurately quantify reasonably foreseeable GHG emissions that could result from new leasing within the Wyoming High Desert region—including lifecycle emissions from construction, operating fossil-fuel powered equipment during production, reclamation, transportation, processing and refining, and combustion of the extracted product—is unlawful and unsupported by evidence or reasoned analysis.

B. The BLM Failed to Analyze the Costs of Reasonably Foreseeable Carbon Emissions Using Well-Accepted, Valid, Credible, GAO-Endorsed, Interagency Methods for Assessing Carbon Costs that are Supported by the White House

Compounding the failure of the BLM to make any effort to estimate the greenhouse gas emissions that would result from reasonably foreseeable oil and gas development is that the agency also rejected analyzing and assessing these emissions in the context of their costs to society. It is particularly disconcerting that the agency refused to analyze and assess costs using the social cost of carbon protocol, a valid, well-accepted, credible, and interagency endorsed method of calculating the costs of greenhouse gas emissions and understanding the potential significance of such emissions.

The social cost of carbon protocol for assessing climate impacts is a method for "estimat[ing] the economic damages associated with a small increase in carbon dioxide (CO2) emissions, conventionally one metric ton, in a given year [and] represents the value of damages avoided for a small emission reduction (i.e. the benefit of a CO2 reduction)."[105] The protocol was developed by a working group consisting of several federal agencies.

[105] See Exhibit 56, U.S. Environmental Protection Agency ("EPA"), "Fact Sheet: Social Cost of Carbon" (Nov. 2013) at 1, available online at https://www.epa.gov/climatechange/social-cost-carbon.

In 2009, an Interagency Working Group was formed to develop the protocol and issued final estimates of carbon costs in 2010.[106] These estimates were then revised in 2013 by the Interagency Working Group, which at the time consisted of 13 agencies.[107] This report and the social cost of carbon estimates were again revised in 2015.[108] Again, this report and social cost of carbon estimates were revised in 2016.[109]

Most recently, as an addendum to previous Technical Support Documents regarding the social cost of carbon, the Department of the Interior joined numerous other agencies in preparing estimates of the social cost of methane and other greenhouse gases.[110]

Depending on the discount rate and the year during which the carbon emissions are produced, the Interagency Working Group estimates the cost of carbon emissions, and therefore the benefits of reducing carbon emissions, to range from $10 to $212 per metric ton of carbon dioxide. *See* Chart Below. In its most recent update to the Social Cost of Carbon Technical Support Document, the White House's central estimate was reported to be $36 per metric ton.[111] In July 2014, the U.S. Government Accountability Office ("GAO") confirmed that the Interagency Working Group's estimates were based on sound procedures and methodology.[112]

[106] See Exhibit 57, Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866" (Feb. 2010).
[107] See Exhibit 58, Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866" (May 2013).
[108] See Exhibit 59, Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866" (July 2015).
[109] See Exhibit 60, Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Technical Update of the Social Cost of Greenhouse Gases for Regulatory Impact Analysis Under Executive Order 12866" (Aug. 2016).
[110] See Exhibit 61, Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, "Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide" (Aug. 2016).
[111] See Exhibit 62, White House, "Estimating the Benefits from Carbon Dioxide Emissions Reductions."
[112] See Exhibit 63, GAO, "Regulatory Impact Analysis, Development of Social Cost of Carbon Estimates," GAO-14-663 (July 2014), available online at http://www.gao.gov/assets/670/665016.pdf.

Table ES-1: Social Cost of CO_2, 2010 – 2050 (in 2007 dollars per metric ton of CO_2)

Year	5% Average	**3% Average**	2.5% Average	High Impact (95th Pct at 3%)
2010	10	**31**	50	86
2015	11	**36**	56	105
2020	12	**42**	62	123
2025	14	**46**	68	138
2030	16	**50**	73	152
2035	18	**55**	78	168
2040	21	**60**	84	183
2045	23	**64**	89	197
2050	26	**69**	95	212

Most recent social cost of carbon estimates presented by Interagency Working Group on Social Cost of Carbon. The 95th percentile value is meant to represent "higher-than-expected" impacts from climate change. *See* Exhibit 60.

Although often utilized in the context of agency rulemakings, the protocol has been recommended for use and has been used in project-level decisions. For instance, the EPA recommended that an EIS prepared by the U.S. Department of State for the proposed Keystone XL oil pipeline include "an estimate of the 'social cost of carbon' associated with potential increases of GHG emissions."[113]

More importantly, the BLM has also utilized the social cost of carbon protocol in the context of oil and gas approvals. In other recent Environmental Assessments for oil and gas leasing, the agency estimated "the annual SCC [social cost of carbon] associated with potential development on lease sale parcels."[114] In conducting its analysis, the BLM used a "3 percent average discount rate and year 2020 values," presuming social costs of carbon to be $46 per metric ton. *Id*. Based on its estimate of greenhouse gas emissions, the agency estimated total carbon costs to be "$38,499 (in 2011 dollars)." *Id*. In Idaho, the BLM also utilized the social cost of carbon protocol to analyze and assess the costs of oil and gas leasing. Using a 3% average discount rate and year 2020 values, the agency estimated the cost of carbon to be $51 per ton of annual CO_2e increase.[115] Based on this estimate, the agency estimated that the total carbon cost of developing 25 wells on five lease parcels to be $3,689,442 annually. *Id*. at 83.

To be certain, the social cost of carbon protocol presents a conservative estimate of economic damages associated with the environmental impacts climate change. As the EPA has

[113] See Exhibit 64, EPA, Comments on Supplemental Draft EIS for the Keystone XL Oil Pipeline (June 6, 2011).
[114] See Exhibit 65, BLM, "Environmental Assessment for October 21, 2014 Oil and Gas lease Sale," DOI-BLM-MT-0010-2014-0011-EA (May 19, 2014) at 76, available online at http://www.blm.gov/style/medialib/blm/mt/blm_programs/energy/oil_and_gas/leasing/lease_sales/2014/oct__21_2014/july23posting.Par.25990.File.dat/MCFO%20EA%20October%202014%20Sale_Post%20with%20Sale%20(1).pdf.
[115] See Exhibit 66, BLM, "Little Willow Creek Protective Oil and Gas Leasing," EA No. DOI-BLM-ID-B010-2014-0036-EA (February 10, 2015) at 81, available online at https://www.blm.gov/epl-front-office/projects/nepa/39064/55133/59825/DOI-BLM-ID-B010-2014-0036-EA_UPDATED_02272015.pdf.

noted, the protocol "does not currently include all important [climate change] damages."[116] As explained:

> The models used to develop [social cost of carbon] estimates, known as integrated assessments, do not currently include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages and because the science incorporated into these models naturally lags behind the most recent research.[117]

In fact, more recent studies have reported significantly higher carbon costs. For instance, a report published this month found that current estimates for the social cost of carbon should be increased six times for a mid-range value of $220 per ton.[118] In spite of uncertainty and likely underestimation of carbon costs, nevertheless, "the SCC is a useful measure to assess the benefits of CO2 reductions," and thus a useful measure to assess the costs of CO2 increases.[119]

That the economic impacts of climate change, as reflected by an assessment of social cost of carbon, should be a significant consideration in agency decisionmaking, is emphasized by a recent White House report, which warned that delaying carbon reductions would yield significant economic costs.[120] As the report states:

> [D]elaying action to limit the effects of climate change is costly. Because CO_2 accumulates in the atmosphere, delaying action increases CO_2 concentrations. Thus, if a policy delay leads to higher ultimate CO_2 concentrations, that delay produces persistent economic damages that arise from higher temperatures and higher CO_2 concentrations. Alternatively, if a delayed policy still aims to hit a given climate target, such as limiting CO_2 concentration to given level, then that delay means that the policy, when implemented, must be more stringent and thus more costly in subsequent years. In either case, delay is costly.[121]

The requirement to analyze the social cost of carbon is supported by the general requirements of NEPA, specifically supported in federal case law. Courts have ordered agencies to assess the social cost of carbon pollution, even before a federal protocol for such analysis was adopted. In 2008, the U.S. Court of Appeals for the Ninth Circuit ordered the National Highway Traffic Safety Administration to include a monetized benefit for carbon emissions reductions in an Environmental Assessment prepared under NEPA. *Center for Biological Diversity v. National Highway Traffic Safety Administration*, 538 F.3d 1172, 1203 (9th Cir. 2008). The Highway Traffic Safety Administration had proposed a rule setting corporate average fuel economy standards for light trucks. A number of states and public interest groups challenged the rule for,

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[116] Exhibit 56.
[117] *Id*.
[118] See Exhibit 67, Moore, C.F. and B.D. Delvane, "Temperature impacts on economic growth warrant stringent mitigation policy," *Nature Climate Change* (January 12, 2015) at 2
[119] Exhibit 56.
[120] See Exhibit 68, Executive Office of the President of the United States, "The Cost of Delaying Action to Stem Climate Change" (July 2014).
[121] *Id.* at 1.

among other things, failing to monetize the benefits that would accrue from a decision that led to lower carbon dioxide emissions. The Administration had monetized the employment and sales impacts of the proposed action. *Id*. at 1199. The agency argued, however, that valuing the costs of carbon emissions was too uncertain. *Id*. at 1200. The court found this argument to be arbitrary and capricious. *Id*. The court noted that while estimates of the value of carbon emissions reductions occupied a wide range of values, the correct value was certainly not zero. *Id.* It further noted that other benefits, while also uncertain, were monetized by the agency. *Id*. at 1202.

More recently, a federal court has done likewise for a federally approved coal lease. That court began its analysis by recognizing that a monetary cost-benefit analysis is not universally required by NEPA. *See High Country Conservation Advocates v. U.S. Forest Service*, 52 F.Supp. 3d 1174 (D. Colo. 2014), citing 40 C.F.R. § 1502.23. However, when an agency prepares a cost-benefit analysis, "it cannot be misleading." *Id*. at 1182 (citations omitted). In that case, the NEPA analysis included a quantification of benefits of the project. However, the quantification of the social cost of carbon, although included in earlier analyses, was omitted in the final NEPA analysis. *Id*. at 1196. The agencies then relied on the stated benefits of the project to justify project approval. This, the court explained, was arbitrary and capricious. *Id*. Such approval was based on a NEPA analysis with misleading economic assumptions, an approach long disallowed by courts throughout the country. *Id*.

A recent op-ed in the New York Times from Michael Greenstone, the former chief economist for the President's Council of Economic Advisers, confirms that it is appropriate and acceptable to calculate the social cost of carbon when reviewing whether to approve fossil fuel extraction.[122]

The social cost of carbon provides a useful, valid, and meaningful tool for assessing the climate consequences of the proposed leasing, and the BLM's failure to utilize this method of assessing climate impacts is wholly inappropriate under NEPA. This is underscored by the fact that the BLM disclosed in the EA numerous monetary economic benefits that the agency claims would result from the proposed leasing.[123] While we do not suggest that a comprehensive cost-benefit analysis is required, the fact that purported economic benefits are disclosed in the EA indicates that costs and benefits are useful for assessing the significance of the proposed leasing. To this end, the BLM must disclose carbon costs in order to fully assess the significance of climate impacts and support any FONSI.

[122] See Exhibit 69, Greenstone, M., "There's a Formula for Deciding When to Extract Fossil Fuels," *New York Times* (Dec. 1, 2015), available online at http://www.nytimes.com/2015/12/02/upshot/theres-a-formula-for-deciding-when-to-extract-fossil-fuels.html?_r=0.

[123] See EA at 56-57 and 85.

III. BLM has failed to consider site-specific impacts to sensitive species and other wildlife species of concern.

A. The EA fails to disclose basic information, acknowledge scientific information or conform to governing RMPs regarding conservation of Greater Sage-Grouse (Lease sale notice parcels WY-1705-002, WY-1705-003, WY-1705-004, WY-1705-007, WY-1705-008, WY-1705-009, WY-1705-010, WY-1705-011, and WY-1705-013).

Wyoming supports 35-40% of the entire population of greater sage-grouse and is a source population for the more isolated grouse populations in Montana and the Dakotas.[124] Since 2007, there has been an increase in the number of known inactive leks statewide, while the number of active leks has remained constant. At the same time, there has been a 60% decrease in the average number of males counted per lek statewide, indicating an overall statewide population decline of 60% from 2007 to 2013. This is cause for extreme concern, especially given the fact that there have been many wet springs during this period with above-average forb and cover production, which should have resulted in increases in sage grouse population numbers. This inadequacy is confirmed by Copeland et al. (2013), who projected further statewide declines across Wyoming with the implementation of current conservation strategies.[125]

Despite the fact that highly sensitive sage-grouse habitat would be threatened by new leasing, the EA fails in four major respects to disclose or analyze indirect and cumulative impacts of leasing on greater sage-grouse. It fails to meaningfully inform the reader or the decision-maker of the extent of new leasing within Sagebrush Focal Areas and priority habitat management areas, both in this lease sale and cumulatively in lease sales since the finalization of the sage-grouse RMP amendments. Second, it tiers to and relies on RMP decisions for management of Wyoming greater sage-grouse habitat that fail to follow the best available science regarding measures necessary to ensure the survival and recovery of the species. Third, the proposed leasing action, violates FLPMA by failing to conform to a key management prescription of those plans – the obligation to "prioritize the leasing and development of fluid mineral resources outside GRSG habitat." Fourth, because the proposed leases are not in conformance with the 2015 RMP amendments and undermine significant assumptions of their accompanying FEISs (i.e., that new oil and gas development will be prioritized outside of greater sage-grouse habitat), the EA cannot tier to or rely on those EISs.

1. The EA fails to disclose basic information regarding impacts to Greater Sage-Grouse.

The proposed lease sale, however, is particularly damaging to the future viability of greater sage-grouse because it would allow for new leasing of sage-grouse habitat both without site-specific analysis of impacts, and without complying with the revised Rawlins RMP's mandate to prioritize leasing outside of both priority and general habitat. As the EA

[124] *See* Upper Snake River Basin Sage-Grouse Conservation Plan. 2014 (draft), available at http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SG_USRBASIN_DRAFT0005199.pdf.
[125] Copeland, H. E., A. Pocewicz, D. E. Naugle, T. Griffiths, D. Keinath, J. Evans, J. Platt. 2013. Measuring the effectiveness of conservation: a novel framework to quantify the benefits of sage-grouse conservation policy and easements in Wyoming. PLoS ONE 8(6): e67261. doi:10.1371/journal.pone.0067261.

acknowledges, "This policy clarifies that the intent of prioritization is to ensure consideration of the lands outside of GHMAs and PHMAs for leasing and development before considering lands within GHMAs and, thereafter, to ensure consideration of lands within GHMAs for leasing and development before considering any lands within PHMAs for leasing and development in an effort to focus future surface disturbance outside of the most important areas for sage-grouse conservation consistent with the conservation objectives and provisions in the GRSG Plans.." EA at 47.

Although BLM proposes to defer forty-six parcels "consistent with the BLM's sage-grouse conservation plans and strategy, which direct the BLM to prioritize oil and gas leasing and development in a manner that minimizes resource conflicts in order to protect important habitat and reduce development time and costs," EA at 1 to 2, the proposed lease sale still includes six parcels encompassing "priority habitat management area" (PHMA) and Sagebrush Focal Areas, and another 21 parcels affecting General Habitat Management Areas. EA at 7.

The EA further fails completely to acknowledge or disclose the Rawlins Field Office's ongoing pattern of large-scale leasing of greater sage-grouse habitat, including priority habitat management areas, since and in contravention of the adoption of the Wyoming sage-grouse RMP amendments. In order both to disclose the effects of the proposed action and to comply with the revised RMPs and their implementing memoranda, BLM must disclose the cumulative extent and effects of these leasing practices.

2. The EA fails to acknowledge new and relevant scientific information.

Recent peer-reviewed scientific publications have reviewed Greater Sage-Grouse population response to oil and gas management measures in Wyoming, and re-confirmed lek attendance by male sage-grouse declines approximately 2.5% per year in response to oil and gas development, and that attendance declines as development increases, even where well pad density is limited.[126] In light of this information, BLM cannot continue to assume, against scientific evidence, that the management measures in the 2015 RMP amendments will be sufficient to stem sage-grouse population decline.

Recent scientific study confirms the established finding that sage-grouse lek attendance is negatively related to oil and gas density, regardless of sagebrush cover and participation.[127] Green et al. examined greater sage-grouse lek attendance ,oil and gas well, and habitat and precipitation data from Wyoming over the period 1984 to 2008, and, consistent with numerous prior studies, that lek attendance declines are closely associated with the density of oil and gas development:

> Oil and gas development correlates well with sage-grouse population declines from 1984 to 2008 in Wyoming, which is supported by other findings (Doherty et al. 2010b, Harju et al. 2010, Hess and Beck 2012, Taylor et al. 2013, Gregory and Beck 2014). As with other studies, we also found support for 4-year lag effects of

[126] Green 2016.
[127] See Exhibit 70, Green, Adam et al., Investigating Impacts of Oil and Gas Development on Greater Sage-Grouse, Journal of Wildlife Management (2016), DOI: 10.1002/jwmg.21179.

> oil and gas development on lek attendance (Walker et al. 2007, Doherty et al. 010a, Harju et al. 2010, Gregory and Beck 2014). This result suggests that development likely affects recruitment into the breeding population rather than avoidance of wells by adult males or adult survival. Adult sage-grouse are highly philopatric to lek sites (Dalke et al. 1963, Wallestad and Schladweiler 1974, Emmons and Braun 1984, Dunn and Braun 1985, Connelly et al. 2011a), and males typically recruit to the breeding population in 2–3 years. We would expect a delayed response in lek attendance if development affects recruitment, either by reducing fecundity or avoidance of disturbance by nesting females, as adult males die and are not replaced by young males.

On average, lek attendance was stable when no oil and gas development was present within 6,400m (Fig. 4). However, attendance declined as development increased. [128] Importantly, Green et al. confirmed that declines in sage-grouse populations may continue even within Wyoming's "core areas," where density of wells is limited to approximately one pad per square mile. Based on this new information, BLM cannot continue to forego site-specific analysis and rely on the unsubstantiated assumption that "areas containing the parcels addressed in this EA would be satisfactorily mitigated through the required stipulations." EA at 46.

3. BLM's proposed alternative does not conform to the Amended Wyoming Resource Management Plans.

Even under the BLM's own determinations, the proposed action is directly in conflict with a core provision of the 2015 sage-grouse RMP amendments. The Rocky Mountain Region RMPs—including the Rawlins RMP—are subject to the following measure for both priority and general habitat management areas:

> *Prioritization Objective*—In addition to allocations that limit disturbance in PHMAs and GHMAs, the ARMPs and ARMPAs prioritize oil and gas leasing and development outside of identified PHMAs and GHMAs. This is to further limit future surface disturbance and encourage new development in areas that would not conflict with GRSG. This objective is intended to guide development to lower conflict areas and as such protect important habitat and reduce the time and cost associated with oil and gas leasing development by avoiding sensitive areas, reducing the complexity of environmental review and analysis of potential impacts on sensitive species, and decreasing the need for compensatory mitigation.[129]

The EA explicitly acknowledges its greater sage-grouse conservation plans and strategy that "direct the BLM to prioritize oil and gas leasing and development in a manner that minimizes resource conflicts in order to protect important habitat and reduce development time and costs," EA at 1 to 2, but completely fails to address the fact that the proposed lease sale

[128] Green et al. at 9.
[129] 2015 Rocky Mountain RMP ROD at 1-25.

would open up approximately 8,000 acres of the highest-quality and highest-priority sage-grouse habitat – Sagebrush Focal Areas – to surface-disturbing oil and gas development.

The BLM is subject to clear direction in the RMP amendments that its greater sage-grouse RMP plans and conservation strategy rely not only on stipulations within designated habitats (stipulations acknowledged as insufficient, in Wyoming, to result in a net conservation gain for general habitat, *see* 2015 RMPA ROD at 1-30 to 1-31, but also on a larger strategy of prioritizing development outside of all sage-grouse habitats. Despite its acknowledgement of the prioritization requirement, two parcels contain priority habitat.

An apparent BLM policy of leasing virtually all nominated parcels within sage-grouse habitat is not only inconsistent with the RMPs and FLPMA's consistency requirement, it also undermines a fundamental assumption of the RMP Amendment EISs – as well as the U.S. Fish and Wildlife Service's determination that listing the greater sage-grouse under the Endangered Species Act was "not warranted." That assumption is that the measures adopted in the RMP Amendments will result in oil and gas development tending to occur outside of greater sage-grouse habitat. The Worland and Lander FOs' ongoing pattern of offering leases encompasses Priority sage-grouse habitat shortly following the finalization of the sage-grouse RMPs strongly undermines that assumption. It further undermines the assumption in the Fish and Wildlife Service's "not warranted" finding for the greater sage-grouse that federal and state implementation of the "Wyoming Plan" for fluid minerals will continue the 2012-15 pattern of reduced drilling within core areas. If BLM is not actually going to give meaningful content to its plan direction to prioritize leasing outside of sage-grouse habitats, it cannot rely on FEISs, such as the Wyoming Sage Grouse RMP FEIS, that assume the effectiveness of that plan direction.

4. The EA fails to disclose effects on Sagebrush Focal Areas (Lease Sale Notice Parcels WY-1705-006, WY-1705-007, WY-1705-008, WY-1705-009, WY-1705-010, and WY-1705-011).

The Parcels listed above are located not only within Priority Habitat Management Areas, but also within Sagebrush Focal Areas. EA at Table 3-1.[130] Sagebrush Focal Areas are recognized "strongholds" for the species that support the greatest remaining density of breeding birds, and, in the amended land use plans, are to be "prioritized" for conservation efforts. As the FEIS for nine Wyoming RMP Amendments, including Rawlins, finds:

> SFAs are a subset of PHMA and represent recognized "strongholds" for the species that have been noted and referenced as having the highest densities of the species and other criteria important for the species' persistence. Portions of SFAs that are located BLM-administered lands and National Forest System lands would be petitioned for withdrawal from mineral entry, and are prioritized for management and conservation actions, including, but not limited to, review of livestock grazing permits/leases.]

BLM, Wyoming Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement 4-515 (May 2015). Although the Wyoming plan amendments,

[130] Center for Biological Diversity, *Wyoming May 2017 Lease Sale* Map 2, attached as Exhibit 71.

unlike their Montana counterparts, do not require that all Sagebrush Focal Areas be subject to No Surface Occupancy Requirements, *see* BLM/USFS, Record of Decision for the Rocky Mountain Region GRSG Sub-Regions 1-18 to 1-19 (Sept. 2015), they are nevertheless subject to the requirement (and analytical assumption) that BLM will "[e]liminate most new surface disturbance in the most highly valued sagebrush ecosystem areas identified as Sagebrush Focal Areas." *Id.* at S-1.

Lease sale parcels 6, 7, 8, 9, 10, and 11 are all located within the Southwestern/South Central Wyoming Sagebrush Focal Area.[131] Apart from an acknowledgment buried deep within Table 3-1, the May 2017 leasing EA fails to provide any disclosure of this significant impact, and contains no analysis whatsoever of what this leasing decision, particularly considered together with BLM's pattern of leasing actions since 2015, will mean for density of oil and gas development within Sagebrush Focal Areas and the persistence of sage-grouse breeding populations within those areas.

5. The BLM fails to consider reasonable alternatives prioritizing leasing outside of Sage-Grouse Core Areas, Priority Habitat and/or Sagebrush Focal Areas.

The "heart" of NEPA is an agency's obligation, in evaluating the environmental impacts of its actions, whether by EA or EIS, to consider all reasonable alternatives to those actions. *See Center. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008) (citing 40 C.F.R. § 1502.14(a)). The High Desert District May 2017 leasing EA fails to meet this core NEPA obligation by erroneously arbitrarily excluding from consideration any alternative that could meaningfully preserve BLM Wyoming offices' authority to adopt effective and scientifically credible conservation measures for greater sage-grouse.

The High Desert May 2015 EA appears to, without explanation, eliminated an alternative that would have deferred parcels, potentially including parcels within Sagebrush Focal Areas, to avoid conflicts with greater sage-grouse habitat conservation. The EA's Table of Contents refers to an "Alternative C – Defer Parcels for Sage Grouse" at page 7. EA at iii. The body of the EA, however, including page 7, contains no mention whatsoever of such an alternative, even within "Alternatives Considered But Not Analyzed in Detail." EA at 7. The High Desert May 2017 leasing EA considers only the no-action and proposed alternatives. EA at 6-7. The EA does not even consider an alternative, regularly considered and adopted by other field offices, would defer all remaining parcels located within sage grouse Sagebrush Focal Areas and Priority Habitat Management Areas, consistent with the prioritization objective of its amended RMPs. NEPA's alternatives requirement requires that BLM give consideration to such a reasonable habitat prioritization alternative.

Agencies may not reject an otherwise reasonable alternative out of hand simply because it shares some characteristics with the no-action alternative. *See Colorado Environmental*

[131] EA Table 3-1 acknowledges that parcels 8, 9, 10, and 11 (EA Parcels 49, 50, 51, and 52) will affect Sagebrush Focal Areas. Superimposition of BLM's ARMP and lease parcel GIS data, however, shows that Parcels 6 and 7 (EA Parcels 45 and 48) also contain Sagebrush Focal Areas.

Coalition v. Salazar, 875 F. Supp.2d 1233, 1248-50 (D. Colo. 2012). Such an alternative would be consistent with BLM Instruction Memorandum IM WY-2012-019 at 8, which states:

> This policy does not preclude the development and immediate implementation of new, or innovative mitigation, or other conservation measures that would be expected to reduce activity/project impacts to sage-grouse and their habitats.

B. Big Game Habitat and Migration Routes – WY-1705-013, WY-1705-023, WY-1705-012.

The above-listed parcels overlap with well-documented mule deer and pronghorn migration routes.[132] As the Wyoming Game and Fish Department has emphasized, recent research conclusively shows that oil and gas development in these areas is interfering with these important migration corridors and reduce overall habitat available to these species. Recent tracking collar research on the mule deer herd utilizing the Dad Winter Range and through the Dry Cow Creek development found that, "[i]n migration routes exposed to a larger, more concentrated development (i.e. Dry Cow Creek), mule deer use declined by 53% and movement rates nearly doubled."[133] Thus, as highlighted by the Sawyer et al. (2013) study, this population has already experienced impacts from development in migration corridors and winter range.

Another recent study shows that oil and gas development causes significant habitat loss in the Piceance Basin of Colorado:

> Energy development drove considerable alterations to deer habitat selection patterns, with the most substantial impacts manifested as avoidance of well pads with active drilling to a distance of at least 800 m. Deer displayed more nuanced responses to other infrastructure, avoiding pads with active production and roads to a greater degree during the day than night. In aggregate, these responses equate to alteration of behavior by human development in over 50% of the critical winter range in our study area during the day and over 25% at night.[134]

While the EA acknowledges the potential for habitat loss, it erroneously concludes that stipulations provided in the governing RMPs would be sufficient to offset these impacts. EA at 74. Other than No Surface Occupancy stipulations for a few parcels, the only protections are timing limitation stipulations, which prohibit surface disturbance during the winter months [unclear]. But this measure does nothing to offset the impacts of the substantial habitat loss that may occur with increased oil and gas infrastructure throughout the region which the mere presence of new well pads and other infrastructure will inflict. BLM's proposed finding of "no significant impact" is baseless.

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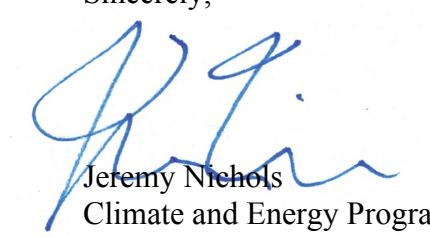
[132] *See* Exhibits 72 and 73 for Big Game migration routes and habitats. (Exhibit 72: Center for Biological Diversity, Big Game Migration and Habitat map 1 (Parcels WY-1705-013, WY-1705-023) (2017); Exhibit 73: Center for Biological Diversity, Big Game Migration and Habitat map 2 (Parcel WY-1705-012) (2017).

[133] See Exhibit 74Sawyer, Hall et al., A Framework for Understanding Semi-Permeable Barrier Effects on Migratory Ungulates, 50 J. Applied Ecol. 74 (2013), doi: 10.1111/1365-2664.12013.

[134] See Exhibit 75, Northrup, J. M. et al. Quantifying spatial habitat loss from hydrocarbon development through assessing habitat selection patterns of mule deer, Global Change Biology (Aug. 2015), available at http://onlinelibrary.wiley.com/doi/10.1111/gcb.13037/epdf.

Sincerely,



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