CENTER for BIOLOGICAL DIVERSITY Because life is good.

August 18th, 2016

VIA FACSIMILE AND FEDERAL EXPRESS OVERNIGHT MAIL

Jamie Connell
State Director
BUREAU OF LAND MANAGEMENT
Montana State Office
5001 Southgate Drive
Billings, Montana 59101

Re: Protest of BLM October 18, 2016 Montana HiLine Competitive Oil and Gas Lease Sale

Dear Director Connell:

The Center for Biological Diversity, Great Old Broads for Wilderness, the Natural Resources Defense Council, and the Sierra Club, hereby file this Protest of the Bureau of Land Management's ("BLM") planned October 18, 2016 oil and gas lease sale, Environmental Assessment and Finding of No Significant Impact DOI-BLM-MTM 0020-2016-0006-EA pursuant to 40 CFR § 1508.27.

We formally protest the inclusion of each of the 91 parcels of federal minerals for oil and gas leasing, covering 19,790.175 acres administered by the Glasgow, Havre, Malta, and Miles City Field Offices. The parcels are located in the Hiline District of northern Montana, including Glacier, Toole, Choteau, Liberty, Hill, Phillips, and Valley Counties. Parcels included in this protest are listed as follows:

Glasgow Field Office:

10-16-01 MTM 108853 MTM 102757-QH	10-16-02 MTM 108854 MTM 102757-QJ	10-16-03 MTM 108855 MTM 102757-QK	10-16-04 MTM 108856 MTM 102757-QL	10-16-05 MTM 108857 MTM 102757-QM
10-16-06 MTM 108858 MTM 102757-QN	10-16-07 MTM 108859 MTM 102757-QQ	10-16-08 MTM 108860 MTM 102757-J7	10-16-09 MTM 108861 MTM 102757-J8	10-16-10 MTM 108862 MTM 102757-J9
10-16-11 MTM 108863 MTM 102757-KA	10-16-12 MTM 108864 MTM 102757-KB	10-16-13 MTM 108865 MTM 102757-KC	10-16-14 MTM 108866 MTM 102757-KE	10-16-15 MTM 108867 MTM 105431-Q3
10-16-16 MTM 108868 MTM 102757-GW	10-16-17 MTM 108869 MTM 102757-G4	10-16-18 MTM 108870 MTM 102757-G6	10-16-19 MTM 108871 MTM 102757-QU	10-16-20 MTM 108872 MTM 79010-ZR
10-16-21 MTM 108873 MTM 79010-ZS	10-16-22 MTM 108874 MTM 79010-7J	10-16-23 MTM 108875 MTM 102757-RM	10-16-24 MTM 108876 MTM 102757-6K	

Havre Field Office:

10-16-25 MTM 108877 MTM 102757-WC	10-16-26 MTM 108878 MTM 105431-K8	10-16-27 MTM 108879 MTM 105431-FG	10-16-28 MTM 108880 MTM 105431-LA	10-16-29 MTM 108881 MTM 105431-K9
10-16-30 MTM 108882 MTM 105431-LB	10-16-31 MTM 108883 MTM 105431-LC	10-16-32 MTM 108884 MTM 79010-Q2	10-16-33 MTM 108885 MTM 97300-4G	10-16-34 MTM 108886 MTM 79010-BV
10-16-35 MTM 108887 MTM 105431-J4	10-16-36 MTM 108888 MTM 105431-J5	10-16-37 MTM 108889 MTM 105431-J6	10-16-38 MTM 108890 MTM 105431-J8	10-16-39 MTM 108891 MTM 79010-BX
10-16-40 MTM 108892 MTM 105431-J9	10-16-41 MTM 108893 MTM 79010-P7	10-16-42 MTM 108894 MTM 97300-4M	10-16-43 MTM 108895 MTM 97300-4N	10-16-44 MTM 108896 MTM 79010-P5
10-16-45 MTM 108897 MTM 97300-4V	10-16-46 MTM 108898 MTM 97300-4W	10-16-47 MTM 108899 MTM 79010-FB	10-16-48 MTM 108900 MTM 105431-H3	10-16-49 MTM 108901 MTM 105431-LG

10-16-50 MTM 108902 MTM 105431-LH	10-16-51 MTM 108903 MTM 105431-LJ	10-16-52 MTM 108904 MTM 105431-LK	10-16-53 MTM 108905 MTM 97300-BO	10-16-54 MTM 108906 MTM 105431-KA
10-16-55 MTM 108907 MTM 105431-HU	10-16-56 MTM 108908 MTM 105431-HV	10-16-57 MTM 108909 MTM 105431-LD	10-16-58 MTM 108910 MTM 105431-K5	10-16-59 MTM 108911 MTM 105431-LE
10-16-60 MTM 108912 MTM 97300-CC	10-16-61 MTM 108913 MTM 105431-KB	10-16-62 MTM 108914 MTM 105431-KC	10-16-63 MTM 108915 MTM 105431-KD	10-16-64 MTM 108916 MTM 105431-LL
10-16-65 MTM 108917 MTM 105431-LF	10-16-66 MTM 108918 MTM 79010-F4	10-16-67 MTM 108919 MTM 105431-KE	10-16-68 MTM 108920 MTM 105431-KF	10-16-69 MTM 108921 MTM 79010-F6
10-16-70 MTM 108922 MTM 105431-K6	10-16-71 MTM 108923 MTM 79010-F5			
Malta Field Office:				
10-16-72 MTM 108924 MTM 79010-A9	10-16-73 MTM 108925 MTM 79010-B2	10-16-74 MTM 108926 MTM 105431-FK	10-16-75 MTM 108927 MTM 105431-FL	10-16-76 MTM 108928 MTM 105431-FM
10-16-77 MTM 108929 MTM 105431-FN	10-16-78 MTM 108930 MTM 105431-FP	10-16-79 MTM 108931 MTM 79010-A2	10-16-80 MTM 108932 MTM 105431-K4	10-16-81 MTM 108933 MTM 105431-FQ
10-16-82 MTM 108934 MTM 105431-FT	10-16-83 MTM 108935 MTM 105431-FU	10-16-84 MTM 108936 MTM 105431-FV	10-16-85 MTM 108937 MTM 105431-FW	10-16-86 MTM 108938 MTM 105431-FR
Miles City Field Office:				
10-16-87 MTM 108939 MTM 105431-MN	10-16-88 MTM 108940 MTM 105431-MT	10-16-89 MTM 108941 MTM 105431-QB	10-16-90 MTM 108942 MTM 105431-QC	10-16-91 MTM 108943 MTM 105431-MJ

PROTEST

I. Protesting Parties: Contact Information and Interests:

This Protest is filed on behalf the Center for Biological Diversity, the Great Old Broads for Wilderness, the Natural Resources Defense Council, and the Sierra Club, by:

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The Center is a non-profit environmental organization with 47,955 members, many of whom live and recreate in Montana. The Center uses science, policy and law to advocate for the conservation and recovery of species on the brink of extinction and the habitats they need to survive. The Center has and continues to actively advocate for increased protections for species and their habitats in Montana. The lands that will be affected by the proposed lease sale include habitat for listed, rare, and imperiled species that the Center has worked to protect including rare and endangered riparian species like the pallid sturgeon, least tern, piping plover, whooping crane, red knot, black-footed ferret, Sprague's pipit and Greater sage grouse. The Center's board, staff, and members use the public lands in Montana, including the lands and waters that would be affected by actions under the lease sale, for quiet recreation (including hiking and camping), scientific research, aesthetic pursuits, and spiritual renewal.

Great Old Broads for Wilderness is a national organization that engages and ignites the activism of elders to preserve and protect wilderness and wild lands. Broads gives voice to the millions of older Americans who want to protect their public lands as Wilderness for this and future generations. We bring experience, commitment, and humor to the movement to protect the last wild places on Earth.

Natural Resources Defense Council (NRDC) is a non-profit environmental membership organization that uses law, science, and the support of more than two million members and activists throughout the United States, including 6,000 members and activists in Montana, to protect wildlife and wild places and to ensure a safe and healthy environment for all living things. NRDC has a long-established history of working to protect public lands and clean air in Montana and addressing climate change by promoting clean energy and reducing America's reliance on fossil fuels.

The Sierra Club is a national nonprofit organization of approximately 625,000 members dedicated to exploring, enjoying, and protecting the wild places of the earth; to practicing and promoting the responsible use of the earth's ecosystems and resources; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Montana Chapter of the Sierra Club has approximately 2,200 members, including members who live and recreate in the HiLine District. Sierra Club members use the public lands in Montana, including the lands and waters that would be affected by actions under the lease sale, for quiet recreation, aesthetic pursuits, and spiritual

renewal. These areas would be threatened by increased oil and gas development that could result from the proposed lease sale.

II. Statement of Reasons as to Why the Proposed Lease Sale Is Unlawful:

BLM's proposed decision to lease the parcels listed above is procedurally and substantively flawed for the reasons discussed below.

A. BLM failed to provide the public with consistent and accurate information and notice in violation of the National Environmental Policy Act and BLM's leasing regulations.

BLM failed to provide the public with consistent and correct information to adequately notice the leasing action for the October 18th, 2016 Montana HiLine lease sale, in violation of NEPA. Incorrect and inconsistent data files of the final lease sale parcels were posted on July 20th 2016, along with the final lease sale notice and Environmental Assessment.[1] The lease sale GIS sharefile provided with the final notice letter inaccurately contained *all* the preliminary lease parcels totaling 236 lease parcels or just over 80,000 acres of BLM land.[2] This GIS sharefile does not reflect non-deferred parcels listed in the final lease sale notice (91 lease parcels or 19,790.175 acres of land).[3] We cannot meaningfully protest the scope of the lease sale if we are not provided with the accurate data that reflects the *actual* parcels being *leased* on October 18th 2016 for the HiLine region.

BLM must re-issue their final lease sale notice with the correct data, and extend the protest period to allow all interested and affected parties an opportunity to review and meaningfully protest prior to the final agency action of leasing the parcels on October 18th, 2016, as is the public's right under BLM regulations. 43 CFR 3120.1-3.

NEPA regulations repeatedly emphasize the need for effective and accurate public notice and involvement. NEPA procedures must ensure "environmental information is available to public officials and citizens before decisions are made and before actions are taken." 40 C.F.R. § 1500.1(b). NEPA regulations make it crystal clear that "[T]he information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." *Id*. Accordingly, "agencies shall to the fullest extent possible…encourage and facilitate public involvement in decisions." *Id*. § 1500.2(d) (emphasis added).

Courts interpret these regulations as requiring a high level of accuracy in the information provided to the public, and the burden falls on the agency to meet this high standard. "[W]ith respect to public involvement, the way in which the information is provided is less important than that a sufficient amount of environmental information -- *as much as practicable* -- be

[1] *See* Final BLM lease sale notice data files posted on July 20th, 2016 available at https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=80008.
[2] *See Id.*
[3] *See Id.*

provided so that a member of the public can weigh in on the significant decision that the agency will make in preparing the EA. . . [T]he significant decision the Corps makes when preparing an EA is the FONSI, which allows the project to proceed without further environmental review and/or conditions." *Bering Strait Citizens for Responsible Res. Dev. v. U.S. Army Corps of Eng'rs*, 524 F.3d 938, 953 (9th Cir. 2008). "Thus, under *Bering Strait,* sufficient information has not been provided to afford the public an adequate opportunity to weigh in on a FONSI unless and until as much environmental information as practicable concerning the FONSI has been disseminated and commented upon." *Ohio Valley Envtl. Coal. v. United States Army Corps of Eng'rs*, 674 F. Supp. 2d 783, 810 (S.D. W. Va. 2009) (internal quotations omitted); *see also Bering Strait Citizens for Responsible Res. Dev. v. U.S. Army Corps of Eng'rs*, 524 F.3d 938, 953 (9th Cir. 2008) (EA requires "sufficient environmental information…to permit members of the public to weigh in with their views and thus inform the agency decision-making process.") *See also*, *Ohio Valley Envtl. Coal. v. United States Army Corps of Eng'rs*, 674 F. Supp. 2d 783, 809 (S.D. W. Va. 2009) ("These guidelines: (1) instruct that environmental information be made available to the public *before* decisions are made and *before* action is taken, and (2) direct that this information be of 'high quality' . . ."') (citing 40 C.F.R. § 1500.1(b)). *WildEarth Guardians v. Mont. Snowmobile Ass'n*, 790 F.3d 920, 926 (9th Cir. 2015) (quoting *Native Ecosystems Council v. U.S. Forest Serv*., 418 F.3d 953, 964 (9th Cir. 2005) (citing 40 C.F.R. § 1500.1(b)("To take the required 'hard look' at a proposed project's effects, an agency may not rely on incorrect assumptions or data in an EIS. It surely follows that the data the Forest Service provides to the public to substantiate its analysis and conclusions must also be accurate. If the wolverine habitat prediction map does not accurately depict the big game winter range, and the Forest Service ultimately worked from a different, accurate map, then it is the accurate map that must be disclosed to the public.")(internal quotations omitted).

It is the agency's duty to provide clear, consistent and accurate information so that the public is fully informed of the scope of the agency action. BLM did not provide accurate GIS mapping data that delineated the final lease parcels at the time the final leasing notice was published. Two emails from the BLM Montana State Office confirm that BLM did not provide the accurate information on the final leasing notice website.[4] Therefore, BLM should re-issue the final notice with the accurate data, and provide for an extended protest period.

B. The EA fails to take a "hard look" at direct, indirect and cumulative environmental and climate change impacts that would result from new leasing in the Montana HiLine region.

BLM's Environmental Assessment ("EA") for analyzing the impacts of the Montana HiLine leasing parcels is riddled with flaws. The EA fails to clearly analyze the direct, indirect and cumulative impacts stemming from new oil and gas development on the HiLine parcels, arbitrarily fails to analyze lifecycle greenhouse gas emissions and climate change impacts from foreseeable development of these leased parcels, and provides no site-specific analysis for impacted wildlife.

[44] Email from Tessa Wallace, Natural Resource Specialist, BLM Hiline Region, re: October 18th 2016 final HiLine lease sale (August 17th, 2016 03:32 MT) and Email from Lane Carano, Land Law Examiner, BLM State Office, re: October 18th, 2016 HiLine lease sale mapping (August 18th, 2016 08:09am MT).

The National Environmental Policy Act (NEPA) establishes action-forcing procedures that require agencies to take a "hard look" at environmental consequences of the proposed action. *Pennaco Energy, Inc. v. U.S. Dep't of Interior*, 377 F.3d 1147, 1150 (10th Cir. 2004); *see also N.M. ex rel. Richardson v. BLM*, 565 F.3d 683, 714 (10th Cir. 2009). In the matter at hand, BLM has not taken any look, let alone the requisite "hard look," at the potential impacts of oil and gas development on the parcels. Instead, the agencies' decision to proceed with the October 2016 lease sale is based solely on the analysis contained in the Leasing EA, which refers to and incorporates by reference the Montana HiLine Resource Management Plan (RMP) Federal Environmental Impact Statement (FEIS) finalized in 2015.

The Leasing EA performs only broad and generalized analysis of the RMP's effects on resources throughout the planning area. The EA provides only a highly general overview of the range of possible impacts on a very broad scale – the analysis area in the RMP FEIS covers approximately 2,437,000 acres of public land and 4,240,000 acres of federal minerals within the planning area, which is too general to meaningfully address the foreseeable site-specific impacts to the parcels at issue.

The Leasing EA therefore does not contain any of the required analysis of environmental impacts likely to occur from oil and gas development *in the areas to be leased*. Any and all significant environmental consequences of site-specific projects such as this one must be reviewed and disclosed. The analysis of site-specific impacts must occur at the leasing stage, because leasing is highly likely to result in development of the parcels at issue and production of fluid mineral resources. A multitude of effects are readily foreseeable as discussed in detail in the subsequent sections.

The argument that BLM cannot precisely determine the type and amount of development that could occur on these lease parcels is a red herring. 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). "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*. Further, while specific development plans have not yet been proposed, such plans are not necessary to predict that development in these areas would entail significant impacts. The problem of degradation of air quality, water pollution, greenhouse gas emissions, and wildlife impacts from new oil and gas leasing are "readily apparent," and there are "enough specifics to permit productive analysis of [oil and gas development], including proposals for alternative ways of dealing with the problem." *Kern v. BLM*, 284 F.3d 1062, 1073 (9th Cir. 2002).

Indeed, all impacts of induced oil and gas production are indirect effects of any BLM lease sale. *See* 40 C.F.R. § 1508.8(a). Indirect impacts may include "growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." *Id*. BLM has an obligation to consider all reasonably foreseeable indirect effects of leasing including the fact that this lease sale will induce additional oil and natural gas production, transmission and

end-user impacts that contribute to environmental degradation, climate change, and destruction of critical wildlife habitat.

The EA is deficient because it fails to consider critical indirect effects associated with this lease sale, including the environmental and climate change consequences of increasing oil and natural gas production. New downstream fossil fuel development is fairly understood as indirectly caused by project development or more specifically, leasing, and thus the environmental and climate effects of leasing must be considered in the EA. *Native Village of Point Hope v. Salazar*, 730 F. Supp. 2d 1009, 1017 (D. Alaska 2010) (requiring consideration of induced development of natural gas drilling in EIS for offshore oil and gas lease sale that caused the gas development); *see also Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992) (a future impact is reasonably foreseeable if it is "sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision"); *Natural Res. Def. Council, Inc. v. Fed. Aviation Admin.*, 564 F.3d 549, 559-60 (2d Cir. 2009) (agency properly considered indirect and cumulative impacts of induced growth caused by construction of new airport); *City of Davis v. Coleman*, 521 F.2d 661, 674-77 (9th Cir. 1975) (environmental review for highway project needed to analyze impact of induced development despite uncertainty about pace and direction of development); *Border Power Plant Working Group v. Dept. of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (requiring consideration of environmental impacts, such as increased carbon dioxide and ammonia emissions, from additional electricity generation spurred by construction of energy transmission lines subject to federal approval).

1. **The EA Fails to analyze air quality impacts that would result from new leasing in the Montana HiLine region.**

Oil and gas operations emit numerous air pollutants, including volatile organic compounds (VOCs), NO_X, particulate matter, hydrogen sulfide, and 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 HiLine 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 makes a blanket statement that "regional air quality surrounding the HiLine District is in compliance with all NAAQS and MAAQS. The data shows that concentrations of measured air pollutants are well below health based standards." EA at 12. Upon closer review, the Malta SLAMS monitoring station's data for 24-hour health-based standards for particulate matter (PM)10 and PM 2.5 displayed a dramatically increasing trend over the past three years, and were exceeded for both PM10 and PM2.5 in 2015 (177 g/m^3 and 38.6 g/m^3 respectively).[5] The PM NAAQS are applied based on a three-year annual average. 40

[5] Final EA at 11-12 Table 2.

CFR §50.6, §50.7. If either the current trend continues or particulate concentrations simply remain at 2015 levels, on day one of 2017, the region will be in noncompliance with the 24-hour NAAQS for PM10 and PM2.5.

The dramatic trend of increasing criteria pollutants within the HiLine planning area have significant environmental and public health impacts, but are neither acknowledged, explained, or analyzed in either the EA or the HiLine RMP FEIS.[6] There is no analysis of this potential pollutant exceedance or what is causing sharp increases in particulate concentrations and exceedances of the 24-hour PM standards in this region. Nor does BLM offer any explanation for why observed pollutant concentrations are increasing and exceeding the models in the 2015 Hi-Line RMP FEIS, Table 4.14. BLM must review both (a) the foreseeable site-specific emission sources for PM from the proposed lease parcels and (b) the sources of PM 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. BLM's failure to address this one example of a trend towards a foreseeable future violation of health-based air quality standards in their environmental review of this lease sale violates the mandates of NEPA.

Additionally, BLM must go a step further and analyze the impacts of all foreseeable future air emissions from induced oil and gas development and operations on these lease parcels, and cumulatively with future lease parcel sales in the HiLine region. Forecasting cumulative 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,* 104 F. Supp. 3d 1208, 1227-1228 (D.Colo. 2015).[7]

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.[8] For the Montana HiLine lease sale, this simple calculation yields an estimated oil volume of 122,865 MMbbl and an estimated gas volume of 8.743288 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.[9] The type, quantity and future impact of additional air emissions from this new

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[6] *See* Hi-Line RMP FEIS at 463-64 & Table 4.14 (predicting that near-field PM_{10} and $PM_{2.5}$ concentrations will remain below NAAQS).

[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] 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

[9] James Russell, Alison Pollack and Greg Yarwood, *An Emission Inventory of Non-point Oil and Gas Emissions Sources in the Western Region*, ENVIRON International Corporation, available at https://www3.epa.gov/ttnchie1/conference/ei15/session12/russell.pdf. *See also*, Amnon Bar-Ilan, et al., *A*

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's air quality analysis must include the following information for public review:

a. Types of Air Emissions

Unconventional oil and gas operations emit large amounts of toxic air pollutants,[10] 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.[11] 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.[12] Through the implementation of these new reporting requirements, it is now known that operators have been using several types of air toxics in California, 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.[13] EPA has also identified six "criteria" air pollutants that must be regulated under the National Ambient Air Quality Standards (NAAQS) due to their potential to cause primary and secondary health effects. Concentrations of these pollutants—ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead—will likely 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.[14] The VOCs emitted include the BTEX compounds – benzene, toluene, ethyl benzene, and xylene – which are listed as Hazardous Air Pollutants. 42 U.S.C. § 7412(b). There is substantial evidence showing the grave harm from these pollutants.[15] Recent studies and reports confirm the pervasive and extensive amount of VOCs emitted by unconventional oil and gas extraction.[16] In particular,

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Comprehensive Emissions Inventory of Upstream Oil and Gas Activities in the Rocky Mountain States: available at https://www3.epa.gov/ttnchie1/conference/ei19/session8/barilan.pdf.

[10] 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.

[11] U.S. EPA, Hazardous Air Pollutants, *available at* http://www.epa.gov/haps (accessed Jan. 10, 2016).

[12] Center for Biological Diversity, Air Toxics One Year Report, p. 1 (June 2014).

[13] U.S. Environmental Protection Agency, The Clean Air Act Amendments of 1990 List of Hazardous Air Pollutants, Technology Transfer Network Air Toxics Web Site, http://www.epa.gov/ttnatw01/orig189.html (accessed July 29, 2015).

[14] 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.

[15] Colborn, Theo et al., Natural Gas Operations from a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039 (2011) (Colborn 2011); McKenzie, L. et al., Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources, 424 Science of the Total Environment 79 (2012); Food and Water Watch, The Case for a Ban on gas Fracking (June 2011). Food & Water Watch 2012.

[16] McCawley, M., 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

a study covering sites near oil and gas wells in five different states found that concentrations of eight volatile chemicals, including benzene, formaldehyde and hydrogen sulfide, exceeded risk-based comparison values under several operational circumstances.[17] Another study determined that vehicle traffic and engine exhaust were likely the sources of intermittently high dust and benzene concentrations observed near well pads.[18] 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.[19] Another study found that oil and gas operations in this area emit approximately 55% of the VOCs in northeastern Colorado. [20]

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,[21] and sunlight. This reaction can diminish visibility and air quality and harm vegetation. Tropospheric 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.[22] In addition to its role as a greenhouse gas, methane contributes to increased concentrations of ground-level ozone, the primary component of smog, because it is an ozone precursor.[23] 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 . . . ."[24]

Like methane, VOCs and NO_X are also ozone precursors; therefore, 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.[25] Ozone can result in serious health conditions, including heart and lung disease and mortality.[26] A recent study of ozone pollution in the Uintah

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Unconventional Oil Development in the Los Angeles Basin (Sept. 2013).

[17] Macey, G.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.

[18] McCawley 2013.

[19] 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").

[20] Gilman, J.B. et al., *Source Signature of Volatile Organic Compounds from Oil and Natural Gas Operations in Northeastern Colorado*, 47 Envtl. Sci & Tech. 1297, 1303 (2013).

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

[22] Fiore, Arlene et al., Linking Ozone Pollution and Climate Change: The Case for Controlling Methane, 29 Geophys. Res Letters 19 (2002).

[23] 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).

[24] Fiore, Arlene et al., Linking ozone pollution and climate change: The case for controlling methane, 29 Geophys. Res Letters 19 (2002); *see also* Martin, Randal et al., Final Report: Uinta Basin Winter Ozone and Air Quality Study Dec 2010 - March 2011 (2011) at 7.

[25] Armendariz at 1, 3, 25-26; Wendy Koch, *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.

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

Basin of northeastern Utah, a rural area that experiences hazardous tropospheric ozone concentrations, found that oil and gas operations were responsible for 98 to 99 percent of VOCs and 57 to 61 percent of NO_X emitted from sources within the Basin considered in the study's inventory.[27]

Oil and gas operations can also emit hydrogen sulfide. The hydrogen sulfide is contained in the natural gas and makes that gas "sour."[28] 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.[29]

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[30] that is especially harmful.[31] Vehicles traveling on unpaved roads also kick up fugitive dust, which is particulate matter.[32] Further, both NO_X and VOCs, which as discussed above are heavily emitted by the oil and gas industry, are also particulate matter precursors.[33] Some of the health effects associated with particulate matter exposure are "premature mortality, increased hospital admissions and development of chronic respiratory disease."[34]

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.[35] Also, 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.[36] 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

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[27] Lyman, Seth and Howard Shorthill, Final Report: 2012 Uintah Basin Winter Ozone & Air Quality Study, Utah Department of Environmental Quality (2013); *see also* Gilman, Jessica et al., Source signature of colatile organic compounds from oil and natural gas operations in northeastern Colorado, Environ Sci and Technology (Jan 14, 2013), DOI: 10.1021/es304119a.
[28] Sierra Club Comments.
[29] USEPA, 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").
[30] Earthworks, Sources of Oil and Gas Pollution (2011).
[31] Bay Area Air Quality Management District, Particulate Matter Overview, Particulate Matter and Human Health (2012).
[32] 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").
[33] EPA RIA at 2-2.
[34] 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).
[35] Colborn 2011 at 8.
[36] South Coast Air Quality Management District, Draft Staff Report on Proposed Rule 1148.2 - Notification and Reporting Requirements for Oil and Gas Wells and Chemical Suppliers (January 2013).at 15 ("SCAQMD Revised Draft Staff Report PR1148-2").

particulate matter emissions.[37] Further, these proppants often include silica sand, which increases the risk of lung disease and silicosis when inhaled.[38] 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.[39]

BLM's environmental review of the Montana Hiline lease parcel sale should study the potential for oil and gas operation sites in the leasing 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 have relied on the most up-to-date information regarding the contribution of oil and gas operations to VOC and air toxics levels.

b. Sources of Air Emissions

Harmful air pollutants are emitted during every stage of unconventional oil and gas recovery, including drilling, completion, well stimulation, production, and disposal. 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 result 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. 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 is as much as 270 percent greater than previously estimated by calculation.[40] 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.[41]

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. Even where waste fluid is stored in so-called "closed loop" storage tanks, fugitive emissions can escape from tanks.

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[37] *Id.*
[38] 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.
[39] SCAQMD Revised Draft Staff Report PR1148-2 at 15.
[40] Miller 2013.
[41] Allen, David et al., Measurements of methane emissions at natural gas production sites in the United States, PNAS Early Edition, doi:10.1073/pnas.1304880110 (2013).; Harriss, Robert et al., Using Multi-Scale Measurements to Improve Methane Emission Estimates from Oil and Gas Operations in the Barnett Shale Region, Texas, Environ. Sci. Technol., 2015, 49 (13), pp 7524–7526.

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.

c. Impact of Increased Air Pollution

The potential harms resulting from increased exposure to the dangerous air pollutants described above are serious and wide ranging. 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.
>
> *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.[42]
>
> *Sulfur Dioxide* (SO_2) has been shown to cause an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms.[43] 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.[44]
>
> *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.[45] 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 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

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[42] U.S. Environmental Protection Agency, Particulate Matter, (PM) http://www.epa.gov/airquality/particlepollution/health.html (accessed July 30, 2015); 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).

[43] U.S. Environmental Protection Agency, Sulfur Dioxide http://www.epa.gov/airquality/sulfurdioxide/health.html, *available at* (accessed July 29, 2015).

[44] *Id.*

[45] U.S. Environmental Protection Agency, Carbon Monoxide, *available at* http://www.epa.gov/airquality/carbonmonoxide/health.html (accessed July 29, 2015).

> or under increased stress.[46] 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.[47]
>
> *Ozone* (O_3) can trigger or worsen asthma and other respiratory ailments.[48] 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.

Air toxics and hazardous air pollutants, by definition, can result in harm to human health and safety. 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 range of illnesses that can result are summarized in a study by Dr. Theo Colburn, which charts which chemicals have been shown to be linked to certain illnesses.[49]

Natural gas drilling operations result in the emissions of numerous non-methane hydrocarbons (NMHCs) that have been linked to numerous adverse health effects. A recent study that analyzed air samples taken during drilling operations near natural gas wells and residential areas in Garfield County, detected 57 chemicals between July 2010 and October 2011, including 44 with reported health effects.[50] 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.[51]

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.[52] While none of the detected chemicals exceeded governmental safety thresholds of exposure, the study noted

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[46] *Id.*
[47] *Id.*
[48] U.S. Environmental Protection Agency, Ground Level Ozone, *available at* http://www.epa.gov/airquality/ozonepollution/health.html (accessed July 29, 2015).
[49] Colborn, Theo et al., Natural Gas Operations from a Public Health Perspective, 17 Human and Ecological Risk Assessment 1039 (2011) ("Colborn 2011"); Colborn, Theo, et al., An Exploratory Study of Air Quality near Natural Gas Operations, Human and Ecological Risk Assessment: An International Journal doi:10.1080/10807039.2012.749447 (2012); *see* note 120 & accompanying text below.
[50] Colborn et al., An Exploratory Study of Air Quality Near Natural Gas Operations, Human and Ecological Risk Assessment: An International Journal, Vol. 20, Iss. 1, 2014, pp. 21-22 (pages refer to page numbers in attached manuscript and not journal pages) ("Colborn 2014), *available at* http://www.tandfonline.com/doi/full/10.1080/10807039.2012.749447.
[51] Colborn 2014, p. 11.
[52] *Id.*, p. 10.

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."[53] 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.[54] 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.[55] In addition, 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.[56]

Another study reviewed exposures to emissions from unconventional natural gas development and noted that trimethylbenzenes are among the largest contributors to non-cancer threats for people living within a half mile of a well, while benzene is the largest contributor to cumulative cancer risk for people, regardless of the distance from the wells.[57]

d. Air Modeling

BLM should have used air modeling to understand what areas and communities will most likely be affected by air pollution in any environmental review of this lease parcel sale. It is crucial to gather independent data rather than relying on industry estimates, which may be inaccurate or biased. Wind and weather patterns, and atmospheric chemistry, determine the fate and transport of air pollution over a region, over time. Any BLM environmental review document should be informed by air modeling to show where the air pollution will flow.

2. <u>The EA fails to analyze water quality impacts that would result from new leasing in the Montana HiLine region.</u>

The EA's deficient analysis of site-specific impacts of this lease sale to waterbodies and groundwater in the Upper Missouri, Marias and Milk watersheds is a clear violation of NEPA. In fact, there is little to no discussion of potential impacts to water quality from this lease sale in the EA. BLM acknowledges that:

> [T]he lease parcels are located in the Missouri-Marias (HUC 1003) and Milk (HUC 1005) subregions (WBD, 3/18/16), which contain unique and complex hydrologic systems of stream, prairie wetland, and lake features that vary in hydrologic permanence. Water resources in the area are essential to the residents for agriculture, public water supplies, industry, and recreation. Additionally, water resources and the corresponding riparian-wetland areas are crucial to the survival of fish and wildlife, including many BLM-sensitive fish, reptiles, birds, and amphibians. According to the National Hydrography Dataset (NHD V.210), the parcels contain ~0.3 miles of perennial stream,

[53] *Id*., pp. 11-12.
[54] *Id*. p. 12.
[55] *Id*., p. 10-11.
[56] *Id*., p. 12.

66 miles of ephemeral & intermittent stream, 3 springs, and 327 acres of waterbodies (Table 3)." EA at 20.

But, BLM fails to provide the public with any meaningful analysis or discussion of potential impacts from use and development of these lease parcels on highly sensitive watersheds and groundwater.

Across the U.S., in states where unconventional oil and gas recovery has occurred, surface water and groundwater have been contaminated. Recent studies have concluded that water contamination attributed to unconventional oil and gas activity has occurred in several states, including Colorado,[58] Wyoming,[59] Texas,[60] Pennsylvania,[61] Ohio,[62] and West Virginia.[63]

The likelihood that the sale will result in new and unconventional oil and gas recovery methods raises several issues that BLM must address:

- Where will the water come from and what are the impacts of extracting it?
- What chemicals will be used in the drilling and fracking process?
- How will BLM ensure the collection and disclosure of that information?
- What limitations will BLM place on the chemicals used in order to protect public health and the environment?
- What measures will BLM require to ensure adequate monitoring of water impacts, both during and after drilling?
- What baseline data is available to ensure that monitoring of impacts can be carried out effectively? How will BLM collect baseline data that is not currently available?
- Much of the fracking fluid return to the surface as toxic waste. Where will the discharge go?

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[58] Trowbridge, A., *Colorado Floods Spur Fracking Concerns*, CBS News, Sept. 17, 2013, *available at* http://www.cbsnews.com/8301-201_162-57603336/colorado-floods-spur-fracking-concerns/ ("Trowbridge 2013") (accessed July 30, 2015).

[59] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination near Pavillion, Wyoming (2011) ("USEPA Draft Pavillion Investigation"); DiGiulio, Dominic C. et al. Impact to Underground Sources of Drinking Water and Domestic Wells from Production Well Stimulation and Completion Practices in the Pavillion, Wyoming, Field, Environ. Sci. Technol., 2016, 50 (8), pp. 4524–4536, abstract available at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b04970.

[60] Fontenot, Brian et al., *An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation*, Environ. Sci. Technol., 47 (17), 10032–10040 DOI: 10.1021/es4011724, *available at* http://pubs.acs.org/doi/abs/10.1021/es4011724 ("Fontenot 2013").

[61] Jackson, Robert et al., *Increased Stray Gas Abundance in a Subset of Drinking Water Wells near Marcellus Shale Gas Extraction*, Proc. Natl. Acad. of Sciences Early Edition, doi: 10.1073/pnas.1221635110/-/DCSupplemental (2013) ("Jackson 2013").

[62] Ohio Department of Natural Resources, Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio (Sep. 2008) ("ODNR 2008").

[63] Begos, K., *Four States Confirm Water Pollution*, Associated Press, January 5, 2014, *available at* http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/ (accessed July 29, 2015); *see also* U.S. EPA, Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, External Review Draft (June 2015) ("EPA 2015"), *available at* http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=523539 (accessed July 30, 2015).

- Is there the potential for subsurface migration of fracking fluids, or the potential for those fluids to escape into the groundwater by way of a faulty casing?
- What kinds of treatment will be required?
- What is the potential footprint and impact of the necessary treatment facilities?

BLM's analysis of potential impacts to water must take account of all significant and "foreseeable" impacts to water that may arise from the sale, including the following issues:

a. Surface water impacts.

Surface waters can be contaminated in many ways from unconventional well stimulation. In addition to storm water runoff, surface water contamination may also occur from chemical and waste transport, chemical storage leaks, and breaches in pit liners.[64] The spilling or leaking of fracking fluids, flowback, or produced water is a serious problem. Harmful chemicals present in these fluids can include volatile organic compounds ("VOCs"), such as benzene, toluene, xylenes, and acetone.[65] As much as 25 percent of fracking chemicals are carcinogens,[66] and flowback can even be radioactive.[67] As described below, contaminated surface water can result in many adverse effects to wildlife, agriculture, and human health and safety. It may make waters unsafe for drinking, fishing, swimming and other activities, and may be infeasible to restore the original water quality once surface water is contaminated. BLM should have considered this analysis in the Montana HiLine EA.

b. Chemical and waste transport impacts to local watersheds.

Massive volumes of chemicals and wastewater used or produced in oil and gas operations have the potential to contaminate local watersheds. Between 2,600 to 18,000 gallons of chemicals are injected per hydraulically fracked well depending on the number of chemicals injected.[68] This waste can reach fresh water aquifers and drinking water.

Produced waters that fracking operations force to the surface from deep underground can contain high levels of total dissolved solids, salts, metals, and naturally occurring radioactive materials.[69] If spilled, the effects of produced water or brine can be more severe and longer-

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[64] Vengosh, Avner et al., *A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing in the United States*, Environ. Sci. Technol., DOI: 10.1021/es405118y (2014) ("Vengosh 2014").
[65] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (Nov. 2011) ("EPA Plan to Study Fracking Impacts").
[66] Colborn 2011.
[67] EPA Plan to Study Fracking Impacts; White, Ivan E., Consideration of radiation in hazardous waste produced from horizontal hydrofracking, National Council on Radiation Protection (2012).
[68] EPA 2015 at ES-12.
[69] Brittingham, Margaret C. et al., *Ecological Risks of Shale Oil and Gas Development to Wildlife, Aquatic Resources and their Habitats*, Environ. Sci. Technol. 2014, 48, 11034-11047, p. 11039; Lauer, Nancy E. Brine Spills Associated with Unconventional Oil Development in North Dakota. Environmental Science & Technology Article ASAP, DOI: 10.1021/acs.est.5b06349 (April 27, 2016), available at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b06349 (finding contaminants such as ammonium, selenium, and lead at produced-water spill sites in North Dakota, and contamination in violation of national water quality regulations).

lasting than oil spills, because salts do not biodegrade or break down over time.[70] The only way to deal with them is to remove them.[71] The accumulation of long-lived isotopes of radium has been observed in the sediments and soils of produced-water spill sites.[72] Due to its relatively long half-life, radium contamination could remain in the soil for thousands of years.[73] Flowback waters (i.e., fracturing fluids that return to the surface) may also contain similar constituents along with fracturing fluid additives such as surfactants and hydrocarbons.[74] Given the massive volumes of chemicals and wastewater produced, their potentially harmful constituents, and their persistence in the environment, the potential for environmental disaster is real.

Fluids must be transported to and/or from the well, which presents opportunities for spills.[75] Unconventional well stimulation relies on numerous trucks to transport chemicals to the site as well as collect and carry disposal fluid from the site to processing facilities. A U.S. Government Accountability Office (GAO) study found that up to 1,365 truckloads can be required just for the drilling and fracturing of a single well pad[76] while the New York Department of Conservation estimated the number of "heavy truck" trips to be about 3,950 per horizontal well (including unloaded and loaded trucks).[77] Accidents during transit may cause leaks and spills that result in the transported chemicals and fluids reaching surface waters. Chemicals and waste transported by pipeline can also leak or spill. There are also multiple reports of truckers dumping waste uncontained into the environment.[78]

BLM's EA should have evaluated how often accidents can be expected to occur, and the effect of chemical and fluid spills. Such analysis should also include identification of the particular harms faced by communities near oil and gas fields. The EA must include specific mitigation measures and alternatives based on a cumulative impacts assessment, and the particular vulnerabilities of environmental justice communities in both urban and rural settings.

Thousands of gallons of chemicals can be potentially stored on-site and used during hydraulic fracturing and other unconventional well stimulation activities.[79] These chemicals can be susceptible to accidental spills and leaks. Natural occurrences such as storms and earthquakes may cause accidents, as can negligent operator practices.

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[70] *Id*. at G (observing contamination from produced water "is remarkably persistent in the environment" and "elevated levels of salts and trace elements…can be preserved in spill sites for at least months to years"); King, Pamela, *Limited study supports findings on bigger brine spill risks*, E&E News (Nov. 4, 2015).
[71] *Id*.
[72] Lauer 2016 at G.
[73] *Id*.
[74] King 2015.
[75] Warco, Kathy, *Fracking truck runs off road; contents spill*, Observer Reporter (Oct 21, 2010).
[76] U.S. Government Accountability Office, Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks, GAO 12-732 (2012) at 33.
[77] New York Department of Environmental Conservation, *Final Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, Ch. 6 Potential Environmental Impacts (2015) at 6-306 –*available at* http://www.dec.ny.gov/docs/materials_minerals_pdf/fsgeis2015.pdf.
[78] Kusnetz, Nicholas, *North Dakota's Oil Boom Brings Damage Along with Prosperity* at 4, ProPublica (June 7, 2012) ("Kusnetz North Dakota"); E&E News, *Ohio man pleads not guilty to brine dumping* (Feb. 15, 2013).
[79] EPA 2015 at ES-10.

Some sites may also use on-site wastewater treatment facilities. Improper use or maintenance of the processing equipment used for these facilities may result in discharges of contaminants. Other spill causes include equipment failure (most commonly, blowout preventer failure, corrosion and failed valves) and failure of container integrity.[80] Spills can result from accidents, negligence, or intentional dumping.

The EA should have examined and quantified the risks to human health and the environment associated with on-site chemical and wastewater storage, including risks from natural events and negligent operator practices. Again, such analysis must also include an analysis of potential impacts faced by environmental justice communities in both rural and urban settings.

c. Groundwater impacts.

Studies have reported many instances around the country of groundwater contamination due to surface spills of oil and gas wastewater, including fracking flowback.[81] Fracking and other unconventional techniques likewise pose inherent risks to groundwater due to releases below the surface, and these risks must be properly evaluated.[82] Once groundwater is contaminated, it is very difficult, if not impossible, to restore the original quality of the water. As a result, in communities that rely on groundwater drinking water supplies, groundwater contamination can deprive communities of usable drinking water. Such long-term contamination necessitates the costly importation of drinking water supplies.

Groundwater contamination can occur in a number of ways, and the contamination may persist for many years.[83] Improper well construction and surface spills are cited as a confirmed or potential cause of groundwater contamination in numerous incidents at locations across the U.S. including but not limited to Colorado,[84] Wyoming,[85] Pennsylvania,[86] Ohio,[87] West Virginia,[88] and Texas.[89] These sorts of problems at the well are not uncommon. Dr. Ingraffea of Cornell has noted an 8.9 percent failure rate for wells in the Marcellus Shale.[90] Older wells that may not have

[80] EPA 2015 at ES-11.
[81] *See, e.g*., Fontenot 2013, Jackson 2013.
[82] Vengosh 2014.
[83] Myers, Tom, Potential Contamination Pathways from Hydraulically Fractured Shale to Aquifers, National Groundwater Association (2012) (Myers 2012).
[84] Gross, Sherilyn A. et al., *Abstract: Analysis of BTEX groundwater concentrations from surface spills associated with hydraulic fracturing operations*, 63 J. Air and Waste Mgmt. Assoc. 4, 424 doi: 10.1080/10962247.2012.759166 (2013).
[85] U.S. Environmental Protection Agency, Draft Investigation of Ground Water Contamination Near Pavillion, Wyoming (2011) ("EPA Draft Pavillion Investigation").
[86] Darrah, Thomas H. et al., *Noble Gases Identify the Mechanisms of Fugitive Gas Contamination in Drinking-Water Wells Overlying the Marcellus and Barnett Shales*, Proc. Natl. Acad. Of Sciences Early Edition, doi: 10.1073/pnas.1322107111 (2014) ("Darrah 2014").
[87] Begos, Kevin, *Some States Confirm Water Pollution from Oil, Gas Drilling*, Seattle Times, Jan. 6, 2014, http://www.seattletimes.com/business/some-states-confirm-water-pollution-from-oil-gas-drilling/ (accessed July 29, 2015) ("Begos, Seattle Times, Jan 6, 2014"). *See also,* ODNR 2008, *supra.*
[88] Begos, Seattle Times, Jan 6. 2014.
[89] Darrah 2014.
[90] Ingraffea, Anthony R., Some Scientific Failings within High Volume Hydraulic Fracturing Proposed Regulations 6 NYCRR Parts 550-556, 560, Comments and Recommendations Submitted to the NYS Dept. of Environmental Conservation (Jan 8, 2013); *see also* Davies, Richard J. et al. Oil and gas wells and their integrity: Implications for

been designed to withstand the stresses of hydraulic fracturing but which are reused for this purpose are especially vulnerable.[91]

Current federal rules do not ensure well integrity. The EA should have studied the rates of well casing failures over time and evaluate the likelihood that well casing failures can lead to groundwater contamination.

Also, fluids and hydrocarbons may contaminate groundwater by migrating through newly created or natural fractures.[92] Many unconventional techniques intentionally fracture the formation to increase the flow of gas or oil. New cracks and fissures can allow the additives or naturally occurring elements such as natural gas to migrate to groundwater. "[T]he increased deployment of hydraulic fracturing associated with oil and gas production activities, including techniques such as horizontal drilling and multi-well pads, may increase the likelihood that these pathways could develop," which, "in turn, could lead to increased opportunities for impacts on drinking water sources."[93] Fluids can also migrate through pre-existing and natural faults and fractures that may become pathways once the fracking or other method has been used.

A well in which stimulation operations are being conducted may also "communicate" with nearby wells, which may lead to groundwater and surface contamination, particularly if the nearby wells are improperly constructed or abandoned.[94] In the last 150 years, as many as 12 million "holes" have been drilled across the United States in search of oil and gas, many of which are old and decaying, or are in unknown locations.[95] Fracking can contaminate water resources by intersecting one of those wells. For instance, one study found at least nineteen instances of fluid communication in British Columbia and Western Alberta.[96] Wells as far away as 1.8 miles away have provided pathways for surface contamination.[97] The EA should have considered long-term studies on the potential for fluid migration through newly created subsurface pathways.

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shale and unconventional resource exploitation, Marine and Petroleum Geology 56 (2014) 239e254, available at http://ac.els-cdn.com/S0264817214000609/1-s2.0-S0264817214000609-main.pdf?_tid=7344676e-d5f1-11e5-9200-00000aab0f02&acdnat=1455767050_bdf90f64ecdb607187778614024039c4 (documenting 6.3% of wells in the Marcellus shale experienced well barrier or integrity failure between 2005 and 2013).

[91] EPA 2015 at 6-11.

[92] EPA Draft Pavillion Investigation; Warner, Nathaniel R., et al., Geochemical Evidence for Possible Natural Migration of Marcellus Formation Brine to Shallow Aquifers in Pennsylvania, PNAS Early Edition (2012).

[93] EPA 2015 at 6-55.

[94] *See* Detrow, Scott. (2012) *Perilous Pathways: How Drilling Near An Abandoned Well Produced a Methane Geyser,* StateImpact Pennsylvania, National Public Radio (October 9, 2012), *available at* https://stateimpact.npr.org/pennsylvania/2012/10/09/perilous-pathways-how-drilling-near-an-abandoned-well-produced-a-methane-geyser/ (accessed July 29, 2015); Alberta Energy Board, Directive 083: Hydraulic Fracturing – Subsurface Integrity, Alberta Energy Regulator (2013), *available at* http://www.aer.ca/documents/directives/Directive083.pdf.

[95] Kusnetz, Nicholas, *Deteriorating Oil and Gas Wells Threaten Drinking Water, Homes Across the Country*, ProPublica (April 4, 2011).

[96] BC Oil & Gas Commission, Safety Advisory 2010-03, Communication During Fracture Stimulation (2010).

[97] King, Pamela, *'Frack hits' provide pathways for methane migration study*, E&E News (Oct. 21, 2015).

According to the EPA, "evidence of any fracturing-related fluid migration affecting a drinking water resources…could take years to discover."[98] Another study based on modeling found that advective transport of fracking fluid from a fracked well to an aquifer could occur in less than 10 years.[99]

Contamination of groundwater of drinking water sources is a real risk The EPA's Draft Investigation of Groundwater Contamination near Pavillion, Wyoming, found that chemicals found in samples of groundwater were from fracked wells.[100] These results have been confirmed with follow-up analyses.[101] Groundwater contamination in the Barnett Shale region is likely a result of unconventional well development activities.[102] One study detected "multiple volatile organic carbon compounds throughout the region, including various alcohols, the BTEX family of compounds, and several chlorinated compounds" in private and public drinking water well samples drawn from aquifers overlying the Barnett shale formation."[103] Another study found that "arsenic, selenium, strontium and total dissolved solids (TDS) exceeded the Environmental Protection Agency's Drinking Water Maximum Contaminant Limit (MCL) in some samples from private water wells located within 3 km of active natural gas wells.[104] Many of the detected compounds were associated with unconventional oil and gas extraction.[105]

Fracking fluid can also spill at the surface during the fracking process. For instance, mechanical failure or operator error during the process has caused leaks from tanks, valves, and pipes.[106] At the surface, pits or tanks can leak fracking fluid or waste.[107] Surface pits, in which wastewater is often dumped, are a major source of pollution. In California, a farmer was awarded $8.5 million in damages after his almond trees died when he irrigated them with well water that had been contaminated by nearby oil and gas operations. The contamination was traced to

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[98] EPA 2015 at 6-56 – 6-57.
[99] Myers, Tom, Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers, Ground Water 50, no. 6, p. 1 (2012).
[100] EPA Draft Pavillion Investigation.
[101] Drajem, Mark, *Wyoming Water Tests in Line with EPA Finding on Fracking*, Bloomberg (Oct. 11, 2012); U.S. Environmental Protection Agency, Investigation of Ground Water Contamination near Pavillion, Wyoming Phase V Sampling Event - Summary of Methods and Results (September 2012); Myers, Tom, Review of DRAFT: Investigation of Ground Water Contamination near Pavillion Wyoming Prepared by the Environmental Protection Agency, Ada OK (Apr. 30, 2012).
[102] Hildenbrand, Zacariah, A Comprehensive Analysis of Groundwater Quality in The Barnett Shale Region, Environ. Sci. Technol. (June 16, 2015), available at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b01526.
[103] *Id*.
[104] Fontenot, Brian et al., An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation, Environ. Sci. Technol., 47 (17), 10032–10040 DOI: 10.1021/es4011724, available at http://pubs.acs.org/doi/abs/10.1021/es4011724 ("Fontenot 2013").
[105] *Id*.
[106] Natural Resources Defense Council, Water Facts: Hydraulic Fracturing Can Potentially Contaminate Drinking Water Sources (2012) at 2; Food & Water Watch 2012 at 7.
[107] *See, e.g.*, E&E Staff Writer, *Fracking Fluid leaks from wellhead in Colo.*, E&E News (Feb 14, 2013). ("At least 84,000 gallons of water contaminated from hydraulic fracturing seeped from a broken wellhead and into a field . . . ."); Michaels, Craig, et al., Fractured Communities: Case Studies of the Environmental Impacts of Industrial Gas Drilling, Riverkeeper (2010) at 12.

unlined pits where one of California's largest oil and gas producers for decades dumped billions of gallons of wastewater that slowly leached pollutants into nearby groundwater.[108]

Unfiltered drinking water supplies, such as drinking water wells, are especially at risk because they have no readily available means of removing contaminants from the water. Even water wells with filtration systems are not designed to handle the kind of contaminants that result from unconventional oil and gas extraction.[109] In some areas hydraulic fracturing may occur at shallower depths or within the same formation as drinking water resources, resulting in direct aquifer contamination. [110] The EA must disclose where the potential for such drilling exists.

Setbacks may not be adequate to protect groundwater from potential fracking fluid contamination. A recent study by the University of Colorado at Boulder suggests that setbacks of even up to 300-feet may not prevent contamination of drinking water resources.[111] The study found that 15 organic compounds found in hydraulic fracturing fluids may be of concern as groundwater contaminants based on their toxicity, mobility, persistence in the environment, and frequency of use. These chemicals could have 10 percent or more of their initial concentrations remaining at a transport distance of 300 feet, the average "setback" distance in the U.S. The effectiveness and feasibility of any proposed setbacks must be evaluated.

Finally, disposal of wastes from oil and gas operations can also lead to contamination of water resources. Potential sources of contamination include:

- leaching from landfills that receive drilling and fracking solid wastes;
- spreading of drilling and fracking wastes over large areas of land;
- wastewaters discharged from treatment facilities without advanced "total dissolved solids" removal processes, or inadequate capacity to remove radioactive material removal; and
- breaches in underground injection disposal wells.[112]

U.S. EPA has found that California's Class II underground injection well program to be insufficiently protective of groundwater resources.[113]

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[108] Renee Sharp & Bill Allayuad, California Regulator: See No Fracking, Speak No Fracking at 6 (2012); *see also* Miller, Jeremy, *Oil and Water Don't Mix with California Agriculture*, High Country News (2012).
[109] Howarth, Robert et al., Letter from Robert Howarth Ph.D. and 58 other scientists to Andrew M. Cuomo, Governor of New York State re: municipal drinking water filtration systems and hydraulic fracturing fluid (Sept 15, 2011), *available at* http://www.psehealthyenergy.org/data/Cuomo_ScientistsLetter_15Sep20112.pdf (accessed July 29, 2015).
[110] EPA 2015 at ES-15.
[111] University of Colorado News Center, New study identifies organic compounds of potential concern in fracking Fluids, University of Colorado--Boulder (July 1, 2015), http://www.colorado.edu/news/releases/2015/06/30/newstudyidentifiesorganiccompoundspotentialconcernfrackingfluids,(accessed July 29, 2015).
[112] EPA 2015, 8-20, 8-36, 8-48, 8-65, 8-70; USGS, Indication of Unconventional Oil and Gas Wastewaters Found in Local Surface Waters, available at http://toxics.usgs.gov/highlights/2016-05-09-uog_wastes_in_streams.html.
[113] Walker, James, California Class II UIC Program Review, Report submitted to Ground Water Office USEPA Region 9 at 119 (Jun. 2011); U.S. Environmental Protection Agency Region IX, Letter from David Albright, Manager Ground Water, to Elena Miller, State Oil and Gas Supervisor Dept of Conservation re California Class II Underground Injection Control (UIC) Program Review final report (July 18, 2011).

The EA should have evaluated the potential for contamination from each of these disposal methods.

d. Increased storm water runoff from oil and gas operations.

Oil and gas operations require land clearance for access roads, pipelines, well pads, drilling equipment, chemical storage, and waste disposal pits. As a result, new oil and gas development will cause short-term disturbance as well as long-term disturbance within the areas for lease. While undisturbed land can retain greater amounts of water through plants and pervious soil, land that has been disturbed or developed may be unable to retain as much water, thereby increasing the volume of runoff. The area of land that is able to retain water will be significantly decreased if unconventional oil and gas extraction methods are permitted to expand.

Water from precipitation and snowmelt can serve as an avenue through which contaminants travel from an operation site to sensitive areas, including population centers. Contaminated water runoff may seep into residential areas, polluting streets, sidewalks, soil, and vegetation in urban areas, adversely affecting human health. Thus, not only do these oil and gas activities create pollution, they create greater conduits for storm water runoff to carry those pollutants from the operation site, into areas in which significant harm can be caused.

Rapid runoff, even without contaminants, can harm the environment by changing water flow patterns and causing erosion, habitat loss, and flooding. Greater runoff volumes may also increase the amount of sediment that is carried to lakes and streams, affecting the turbidity and chemical content of surface waters. Because a National Pollutant Discharge Elimination System permit is not required for oil and gas operations, it is particularly important that the impact of runoff is considered as part of the NEPA process. *See* 33 U.S.C. § 1342(l)(2).

e. Water depletion.

Some unconventional extraction techniques, most notably fracking, require the use of tremendous amounts of freshwater. Typically between 2 and 5.6 million gallons of water are required to frack each well.[114] These volumes far exceed the amounts used in conventional natural gas development.[115]

Water used in large quantities may lead to several kinds of harmful environmental impacts. The extraction of water for fracking can, for example, lower the water table, affect biodiversity, harm local ecosystems, and reduce water available to communities.[116]

Withdrawal of large quantities of freshwater from streams and other surface waters will undoubtedly have an impact on the environment, particularly the Upper Missouri watershed.[117]

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[114] U.S. Government Accountability Office 2012 at 17.
[115] *See* Clark, Corrie E. et al., *Life Cycle Water Consumption for Shale Gas and Conventional Natural Gas*, Environ. Sci. Technol., 2013, 47 (20), pp 11829–11836, abstract *available at* http://pubs.acs.org/doi/abs/10.1021/es4013855.
[116] International Energy Agency, Golden Rules for the Golden Age of Gas at 31-32 (2012).

Withdrawing water from streams will decrease the supply for downstream users, such as farmers or municipalities. Rising demand from oil and gas operators has already led to increased competition for water between farmers and oil and gas operators. In some regions of Colorado, farmers have had to fallow fields due to astronomical water prices.[118] For example, in prior years, farmers in Colorado have paid at most $100 per acre-feet of water in auctions held by cities with excess supplies, but in 2013 energy companies paid $1200 to $2,900 per acre-feet.[119] Reductions in stream flows may also lead to downstream water quality problems by diminishing the water bodies' capacity for dilution and degradation.

Furthermore, withdrawing large quantities of water from subsurface waters to supply oil and gas production will likely deplete and harm aquifers. Removing water from surface water or directly from underground sources of water faster than the rate that aquifers can be replenished will lower the volume of water available for other uses. Depletion can also lead to compaction of the rock formation serving as an aquifer, after which the original level of water volume can never be restored.[120] Depleted aquifer water resources may also adversely affect agriculture, species habitat and ecosystems, and human health.

The freshwater in the planning areas therefore would be greatly affected by the increased demand for water if fracking and other unconventional oil and gas extraction are permitted. The EA should have analyzed where water will be sourced, how much, and the effects on water sources under different alternatives. All of these effects must be analyzed in the context of increasing water scarcity in Montana due to climate change, drought, and increasing population growth.

f. Harms to aquatic life and habitat.

When streams and other surface waters are depleted, the habitat for countless plants and animals will be harmed, and the depletion places tremendous pressure on species that depend on having a constant and ample stream of water. Oil and gas activities in the HiLine leasing area, for example, may harm the listed pallid sturgeon and sensitive Northern Redbelly Dace, due to an increased risk of toxic spills and massive water depletions required for hydraulic fracturing and horizontal drilling.

A pair of studies that compared water quality downstream from a wastewater injection site in West Virginia to that of upstream areas found (1) downstream sites had elevated levels of endocrine-disrupting chemicals at levels known to adversely affect aquatic organisms; and (2)

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[117] *See* Entrekin, Sally et al., *Rapid Expansion of Natural Gas Development Poses a Threat to Surface Waters*, 9 Front Ecol. Environ. 9, 503 (2011); EPA 2015 at 4-16.
[118] Healy, Jack. For Farmers in the West, Oil Wells are Thirsty Rivals, The New York Times (Sept. 5,2012), available at http://www.nytimes.com/2012/09/06/us/struggle-for-water-in-colorado-with-rise-in-fracking.html?_r=0 (accessed July 29, 2015); Burke, Garance. Fracking fuels water fights in nation's dry spots, Associated Press (June 17, 2013), available at http://news.yahoo.com/fracking-fuels-water-fights-nations-dry-spots-133742770.html.
[119] *Id*.
[120] Freyman, Monika and Ryan Salmon, Hydraulic Fracturing and Water Stress: Growing Competitive Pressures for Water, CERES, 9 (2013) ("Freyman 2013"), *available at* http://www.ceres.org/resources/reports/hydraulic-fracturing-water-stress-water-demand-by-the-numbers.

microbial communities in downstream sediments had lower diversity and shifts in community composition, altering microbial activity and potentially impacting nutrient cycling.[121]

Physical habitats such as banks, pools, runs, and glides (low gradient river sections) are important yet susceptible to disturbance with changing stream flows. Altering the volume of water can also change the water's temperature and oxygen content, harming some species that require a certain level of oxygenated water. Decreasing the volume of streamflow and stream channels by diverting water to fracking would have a negative impact on the environment.

The physical equipment itself that is designed to intake and divert water may also pose a threat to certain wildlife. If not properly designed, such equipment and intake points may be a risk to wildlife. A greater analysis of impacted species is discussed at length in Part 1, I.B of this protest.

g. Harms to wetlands.

Oil and gas development, and particularly the practice of fracking, pose an immense threat to water resources. High volume removal of surface or groundwater can result in damage to wetlands, which rely on ample water supplies to maintain the fragile dynamics of a wetland habitat. Damage can also occur from spills of chemicals or wastewater, filling operations, and sediment runoff.[122] BLM in its EA should have fully vetted the impacts from every potential aspect of the proposed HiLine lease sale.

Many plant and animal species depend on wetland habitats, and even small changes can lead to significant impacts. Wetlands provide a variety of "eco-service" functions, including water purification, protection from floods, and functioning as carbon sinks.[123] The ecological importance of wetlands is unquestionable, and their full protection is paramount. The EA and its reliance on the Montana HiLine RMP failed to analyze these potential impacts to wetlands, and the related, potential indirect impacts that may stem from such impacts. This omission renders the EA insufficient for purposes of NEPA review.

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[121] Akob, D.M., et al., 2016, Wastewater disposal from unconventional oil and gas development degrades stream quality at a West Virginia injection facility: Environmental Science and Technology, doi:10.1021/acs.est.6b00428 (Advanced Web release); Kassotis, C.D., et al., 2016, Endocrine disrupting activities of surface water associated with a West Virginia oil and gas Industry wastewater disposal site: Science of the Total Environment, v. 557–558, p. 901910, doi:10.1016/j.scitotenv.2016.03.113. The two studies are summarized at: http://toxics.usgs.gov/highlights/2016-05-09-uog_wastes_in_streams.html.

[122] U.S. Department of Justice, *Trans Energy Inc. to Restore Streams and Wetland Damaged by Natural Gas Extraction Activities in West Virginia* (Sep. 2, 2014), http://www.justice.gov/opa/pr/trans-energy-inc-restore-streams-and-wetland-damaged-natural-gas-extraction-activities-west (accessed July 29, 2015); *See also,* Pennsylvania Department of Environmental Protection, Commonwealth of Pennsylvania, DEP Fines Seneca Resources Corp. $40,000 for Violations at Marcellus Operation in Tioga County (Jul. 10, 2010), http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=14655&typeid=1 (accessed July 29, 2015).

[123] U.S. Environmental Protection Agency, *Wetlands and People*, http://water.epa.gov/type/wetlands/people.cfm (accessed July 29, 2015).

3. The EA fails to address greenhouse gas emissions and climate change impacts that would result from new leasing in the Montana HiLine region.

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*., 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 analyze the impacts of increased oil and gas development on greenhouse gas (GHG) emissions and climate change based on the HiLine lease parcel sale. It makes no attempt to even identify the various sources of greenhouse gas pollution that could result from new leasing, much less quantify potential emissions. It relies on BLM's *Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota* (Climate Change SIR, 2010) as well as the *Air Resource Technical Support Document for Emission Inventories and Near-Field Modeling* (March 8, 2013). These documents are incorporated by reference into the EA. EA at 14, 157. However, while the *Climate Change SIR* provides a useful broad-based analysis of climate impacts to Montana and the Dakotas and the *Air Resources Technical Support Document* provides a direct GHG emissions analysis for potential sources using representative parameters for typical development in the region, they do not provide the level of site-specific emissions analysis that is possible for the HiLine lease parcel sale at issue here. The EA incorrectly suggests that because "substantial uncertainty exists at the time the BLM offers a lease for sale regarding crucial factors that affect potential GHG emissions..," it need not make any effort to quantify these emissions. EA Appendix E, at 157. BLM also incorrectly asserts that if actual operations are proposed on the lease, only then can they quantify potential emissions and develop mitigation plans during the APD stage. EA Appendix E, at 157.

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). Full development of the areas for lease is entirely foreseeable in light of the Reasonably Foreseeable Development

Scenarios for each of the field offices and existing development patterns. 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[124]. *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:

> 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*.

Again, as described above in II.B.1, the number of future wells and volume of potential oil and gas from these lease parcels are knowable and calculating the direct emissions impact from these lease parcels are also quantifiable. Utilizing BLM's own potential volume data for the Montana HiLine lease sale, the estimated oil volume of 122,865 MMbbl represents lifecycle greenhouse gas emissions of up to 43,088.31 tons of CO2e and the estimated gas volume of 8.743288 Bcf represents lifecycle greenhouse gas emissions of up to 670,573.44 tons of CO2e.

[124] 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); U.S. Bureau of Land Management, Greenhouse Gases Estimate (West Desert District Nov 2015 Lease Sale), http://www.blm.gov/style/medialib/blm/ut/natural_resources/airQuality.Par.38

Potential lifecycle greenhouse gas emissions for resultant oil and gas volumes were generated using a peer-reviewed carbon calculator and lifecycle greenhouse gas emissions model developed by EcoShift consulting.[125] 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 .[126] Indeed, the Department of Energy has historically utilized these types of lifecycle emissions analyses in NEPA review of oil and gas infrastructure projects.[127] Other federal agencies have begun to employ upstream, downstream and lifecycle greenhouse gas emissions analyses for NEPA review of energy-related projects.[128] Courts have upheld the viability and usefulness of lifecycle analyses, and adoption of

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[125] *See* 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.

[126] *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.

[127] 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,* 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; U.S. Department of Energy National Energy Technology Laboratory Role of Alternative Energy Sources: Natural Gas Technology Assessment, Pub No. DOE/NETL- 2012/1539 (NETL, 2012) *available at* https://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Life%20Cycle%20Analysis/LCA-2012-1539.pdf; 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 (NETL, 2011) *available at* http://www.fossil.energy.gov/programs/gasregulation/authorizations/2013_applications/sierra_club_13-69_venture/exhibits_44_45.pdf; U.S. Department of Energy National Energy Technology Laboratory, 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.

[128] U.S. Bureau of Land Management, Final Supplemental Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Leas 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*, 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*., 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.) 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.) 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

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").[129]

BLM has acknowledged in the EA that "[P]otential impacts of development could include… potential releases of GHGs and VOCs during drilling and production activities." EA at 45. Thus, 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 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 implicitly 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

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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.)

[129] *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).

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.")[130]

Even if it were true that potential emissions cannot reasonably be estimated, 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 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 quantification of GHGs would occur when actual drilling is proposed. 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 Leasing EA's failure to quantify reasonably foreseeable GHG emissions that could result from new leasing within the Montana HiLine region—including emissions from construction, operating fossil-fuel powered equipment during production, reclamation,

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[130] *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.)

transportation, processing and refining, and combustion of the extracted product—is unlawful and unsupported by evidence or reasoned analysis.

4. The EA improperly tiers to the final Montana HiLine and Miles City Resource Management Plans Federal Environmental Impact Statements.

Case law and NEPA itself make clear that BLM is required to perform and disclose an analysis of environmental impacts before the issuance of an oil and gas lease. *N.M. ex rel. Richardson v. BLM*, 565 F.3d 683, 716 (10th Cir. 2009). In the Tenth Circuit, "assessment of all 'reasonably foreseeable' impacts must occur at the earliest practicable point, and must take place before an irretrievable commitment of resources' is made." *Id*. at 718 (citations omitted).

Rather than conduct any environmental review of the parcels before proceeding with the lease sale, BLM states in response to comments on the final EA, that it may postpone analysis until an Application for Permit to Drill ("APD") is submitted for a specific well. EA Appendix E, at 156-162. In *Richardson*, the Tenth Circuit rejected the contention that site-specific analysis may be deferred until the APD stage in all cases. Rather, the inquiry of whether site-specific analysis is required is "necessarily contextual" and "fact-specific." *Id*.

In the instant lease sale, BLM cannot seriously dispute that offering the parcels is likely to result in oil and gas development and the production of oil and gas. The parcels are offered for the sole purpose of promoting oil and gas development. As discussed previously in Part 1 I.A.1, BLM has made specific projections as to the number of wells and volume of gas that could be expected to be developed for this lease parcel sale. BLM can also project the type of development that would likely occur in the leased areas based on existing well types already within the area and the plays that are likely to be developed.

The issuance of a lease is an "irretrievable commitment of resources." *See id*.; *Sierra Club v. Peterson*, 717 F.2d 1409, 1414 (D.C. Cir. 1983); *Pennaco Energy, Inc. v. U.S. Dep't of Interior*, 377 F.3d 1147, 1160 (10th Cir. 2004). Under BLM's interpretation of its regulations, absent a no surface occupancy stipulation, a lessee cannot be prohibited entirely "from surface use of the leased parcel once its lease is final." *See Richardson*, 565 F.3d at 718 (citing 43 C.F.R. § 3101.1-2 ["A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold subject to: Stipulations attached to the lease . . . [and other] reasonable measures . . . ."]); see also BLM Handbook H-1624-1 ("By law, these impacts [from oil and gas development] must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance.").

Instead of disclosing reasonably foreseeable impacts, however, BLM improperly tiers the Leasing EA to the HiLine and Miles City RMP FEISs, in violation of NEPA. The EA and EISs lack any analysis of the impacts of oil and gas development in the specific local areas at issue, and BLM unlawfully postpones disclosure of site-specific impacts when such analysis is possible now. For example, the RMP FEIS for Miles City is currently the subject of litigation in the U.S. District Court for the District of Montana. *Western Organization of Resource Councils et al. v. U.S. Bureau of Land Management et al.,* no. 4:16-cv-00021-BMM (D. Mont.) (filed March 15,

2016). The complaint alleges significant deficiencies in the Miles City RMP's FEIS review of indirect and cumulative impacts from combustion emissions in violation of NEPA. *Id*. at 37-43.. Given that the Miles City lease parcels at issue here tier to the RMP FEIS, which is being challenged for failure to conduct proper NEPA review, demonstrates that there is a clear lack of site-specific analysis by improperly tiering to a likewise deficient NEPA document. The fact-specific holding in *Kern v. U.S. Bureau of Land Mgmt.* provides a clear precedent for improper NEPA tiering cases. 284 F.3d 1062, 1067 (9th Cir. 2002). In *Kern*, the 9th circuit invalidated an EA that tiered to a broader EIS and BLM Guideline document that was deficient under NEPA or where NEPA review was not conducted. *Id*. at 1074. The court held that while tiering to a broader NEPA document is permitted generally, site-specific impacts of the broader environmental impacts must be analyzed in an EA "as soon as it can reasonably be done." *Id*. at 1072.

For the proposed parcels within the HiLine field office, tiering to the RMP FEIS is also improper due to significant new information regarding air quality that was not addressed in the RMP FEIS. Air quality modeling for the HiLine RMP FEIS predicted that criteria air pollutants, including PM10 and PM2.5, would remain well below National and Montana Ambient Air Quality Standards. The more recent monitoring data disclosed in the EA, however, indicates that 24-hour concentrations of both PM10 and PM2.5 at the Malta SLAMS monitoring station in Phillips County have been rapidly increasing from 2013 to 2015, and that 2015 24-hour concentrations were in excess of NAAQS. This significant new information not addressed in the HiLine RMP FEIS also precludes BLM's tiering to that FEIS for purposes of air quality analyses.

5. <u>BLM should have conducted an EIS instead of an EA and FONSI for the Montana HiLine lease sale.</u>

NEPA requires that federal agencies take a hard look at the environmental consequences of a major federal action before taking that action. *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.,* 462 U.S. 87, 97 (1983). To that end, NEPA requires every federal agency to:

> [I]nclude in every recommendation … on … major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on (i) the environmental impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. 42 U.S.C. § 4332(2)(C).

NEPA demands that a federal agency prepare an EIS before taking a "'major [f]ederal action significantly affecting the quality' of the environment." *Kern v. U.S. Bureau of Land Mgmt.*, 284 F.3d 1062, 1067 (9th Cir. 2002). In order to determine whether a project's impacts may be "significant," an agency may first prepare an Environmental Assessment ("EA"). 40 C.F.R. §§ 1501.4, 1508.9. If the EA reveals that "the agency's action may have a significant effect upon the . . . environment, an EIS must be prepared." *Nat'l Parks & Conservation Ass'n v.*

Babbitt, 241 F.3d 722, 730 (9th Cir. 2001) (internal quotations omitted). If the agency determines that no significant impacts are possible, it must still adequately explain its decision by supplying a "convincing statement of reasons" why the action's effects are insignificant. *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1212 (9th Cir. 1998). Further, an agency must prepare all environmental analyses required by NEPA at "the earliest possible time." 40 C.F.R. § 1501.2. "NEPA is not designed to postpone analysis of an environmental consequence to the last possible moment," but is "designed to require such analysis as soon as it can reasonably be done." *Kern*, 284 F.3d at 1072.

To determine whether the impacts of an action are significant, Council on Environmental Quality (CEQ) regulations identify two factors: context and intensity. 40 C.F.R. § 1508.27(a)-(b). Context refers to an action's significance in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality, considering short- and long-term effects. *Id*. § 1508.27(a). Intensity refers to the severity of impact, based on a number of possible factors, including effects on public health or safety, cumulatively significant environmental impacts that are reasonable to anticipate, and the degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. *Id*. § 1508.27(b)(2), (6), (7).

BLM is therefore required under NEPA to prepare an EIS to support this proposed project. This is especially true in light of the likelihood that fracking would occur on the leases. *CBD*, 937 F. Supp. 2d at 1155-59 (holding that oil and gas leases were issued in violation of NEPA where BLM failed to prepare an EIS and failed to properly address the significance factors for context and intensity in 40 C.F.R. § 1508.27.

In considering whether the lease sale would have significant effects on the environment, NEPA's regulations require BLM to evaluate ten factors regarding the "intensity" of the impacts. 40 C.F.R. § 1508.27(b). The Ninth Circuit has held that the existence of any "one of these factors may be sufficient to require preparation of an EIS." *Ocean Advocates*, 402 F.3d at 865; *Nat'l Parks & Conservation Ass'n*, 241 F.3d at 731. Several of these "significance factors" are implicated in the lease sale and clearly warrant the preparation of an EIS:

> The degree to which the effects on the quality of the human environment are likely to be highly controversial.
>
> The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
>
> The degree to which the proposed action affects public health or safety.
>
> The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

40 C.F.R. § 1508.27(b)(4), (5), (2) & (9). *See CBD*, 937 F. Supp. 2d at 1158-59 (holding that BLM failed to properly address the significance factors regarding controversy and uncertainty

that may have been resolved by further data collection (citing *Native Ecosystems Council v. U.S. Forest Serv*., 428 F.3d 1233, 1240 (9th Cir. 2005)). Here, individually and considered as a whole, there is no doubt that significant effects may result from the lease sale; thus, NEPA requires that BLM should have prepared an EIS for the action.

a. The effects on the human environment will be highly controversial.

A proposal is highly controversial when "substantial questions are raised as to whether a project . . . may cause significant degradation" of a resource, *Nw. Envtl. Def. Ctr. v. Bonneville Power Admin.*, 117 F.3d 1520, 1536 (9th Cir. 1997), or when there is a "substantial dispute [about] the size, nature, or effect of the" action. *Blue Mtns. Biodiversity*, 161 F.3d at 1212. A "substantial dispute exists when evidence, raised prior to the preparation of [a] . . . FONSI, casts serious doubt upon the reasonableness of an agency's conclusions." *Nat'l Parks & Conserv. Ass'n*, 241 F.3d at 736. When such a doubt is raised, "NEPA then places the burden on the agency to come forward with a 'well-reasoned explanation' demonstrating why those responses disputing the EA's conclusions 'do not . . . create a public controversy.'" *Id. See also CBD*, 937 F. Supp. 2d at 1158 .

Here, the controversy regarding the lease sale is fully evident. This protest provides abundant evidence that oil and gas operations can cause significant impacts to human health, water resources, air quality, imperiled species, and seismicity. The potential for these significant impacts to occur is particularly clear in light of the potential for fracking to result from the lease sale.

Fracking is among the top, if not the most controversial energy issue facing America today. The controversy spans the public arena, scientific discourse, local governments, and the halls of Congress. At the request of Congress, EPA is conducting a study into the effects of fracking on drinking and ground water.[131] Similarly, the New York DEC concluded that the health and environmental risks from fracking supports its ban in New York State. However, in addition to the presence of controversy, it is already evident, as discussed above, that fracking is harmful. Clearly, the level of controversy associated with fracking and its expansion in Montana in association with the lease sale is sufficient to trigger the need for an EIS. 40 C.F.R. § 1508.27(b)(4).

b. The lease sale presents highly uncertain or unknown risks.

An EIS must also be prepared when an action's effects are "highly uncertain or involve unique or unknown risks." 40 C.F.R. § 1508.27(b)(5). As the Ninth Circuit has held, "[p]reparation of an EIS is mandated where uncertainty may be resolved by further collection of data, or where the collection of such data may prevent speculation on potential . . . effects." *Native Ecosystems Council v. U.S. Forest Serv.*, 428 F.3d 1233, 1240 (9th Cir. 2005) (internal citations omitted); *Blue Mtns. Biodiversity*, 161 F.3d at 1213-1214 (finding "EA's cursory and

[131] U.S. Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (November 2011).

inconsistent treatment of sedimentation issues . . . raises substantial questions about . . . the unknown risks to" fish populations). As one court recently explained regarding oil and gas leasing that may facilitate fracking, "BLM erroneously discounted the uncertainty from fracking that may be resolved by further data collection. 'Preparation [of an EIS] is mandated where uncertainty may be resolved by further collection of data, or where collection of such data may prevent speculation on potential effects.'" *CBD*, 937 F. Supp. 2d at 1159 (quoting *Native Ecosystems Council v. U.S. Forest Serv*., 428 F.3d 1233, 1240 (9th Cir. 2005)).

While it is clear that oil and gas activities can cause great harm, there remains much to be learned about the specific pathways through which harm may occur and the potential degree of harm that may result. Additional information is needed, for example, about possible rates of natural gas leakage, the potential for fluids to migrate through the ground in and around the parcels, the safety of various fracking chemicals, and the potential for drilling to affect local faults. NEPA clearly dictates that the way to address such uncertainties is through the preparation of an EIS.

c. The lease sale poses threats to public health and safety.

As discussed in great detail above, the oil and gas activities that may occur as a result of the lease sale could cause significant impacts to public health and safety. 40 C.F.R. § 1508.27(b)(2). Fracking would pose a grave threat to the region's water resources, harm air quality, pose seismic risks, negatively affect wildlife, and fuel climate change.

As a congressional report noted, oil and gas companies have used fracking products containing at least 29 products that are known as possible carcinogens, regulated for their human health risk, or listed as hazardous air pollutants.[132] The public's exposure to these harmful pollutants alone would plainly constitute a significant impact. So do the many other public health risks associated with unconventional drilling as described in Part II of this protest. Furthermore and as previously discussed, information continues to emerge on the risk of earthquakes induced by wastewater injected into areas near faults. It is undeniable that these earthquakes pose risks to the residents of the area and points beyond

The use of fracking fluid, which is likely to occur as a result of the lease sale, and other risks associated with unconventional drilling, pose a major threat to public health and safety and therefore constitute a significant impact. BLM therefore must evaluate such impacts in an EIS.

d. The lease sale action will adversely affect candidate and agency sensitive species and their habitat.

An EIS may also be required when an action "may adversely affect an endangered or threatened species or its habitat." 40 C.F.R. § 1508.27(b)(9). Although a finding that a project has "some negative effects does not mandate a finding of significant impact," an agency must nonetheless fully and closely evaluate the effects on listed species and issue an EIS if those

[132] Waxman, Henry et al., United States House of Representatives, Committee on Energy and Commerce, Minority Staff, Chemicals Used in Hydraulic Fracturing (Apr. 2011) ("Waxman 2011")

impacts are significant. *Klamath-Siskiyou Wildlands Ctr. v. U.S. Forest Serv.*, 373 F. Supp. 2d 1069, 1081 (E.D. Cal. 2004) (finding agency's conclusion that action "may affect, is likely to adversely affect" species due to "disturbance and disruption of breeding" and "degradation" of habitat is "[a]t a minimum, . . . an important factor supporting the need for an EIS").

B. BLM Has Violated the Endangered Species Act by Failed to Consult with the Fish and Wildlife Service Regarding Effects to Listed Species

Further, BLM's failure to consult with the Fish and Wildlife Service regarding impacts to listed species including the pallid sturgeon, least tern, and whooping crane is unsupported and violates Section 7 of the Endangered Species Act. Specifically, the BLM's failure to conduct site-specific consultation with the Fish and Wildlife Service regarding the proposed parcels violates both ESA § 7 and the terms of the Fish and Wildlife Service's May 2015 concurrence with the Biological Assessment for the HiLine District Resource Management Plan.

The EA reveals the presence of numerous threatened, endangered, and sensitive species and their critical habitat within the areas proposed for leasing, but fails to provide any meaningful information regarding potential effects. BLM must not only evaluate the indirect and cumulative effects on special status species under NEPA, it must also (a) consult (and/or confer in the case of black-footed ferrets) with the Fish and Wildlife Service under Section 7 regarding the effects of oil and gas development and water use on listed species and critical habitat, and (b) evaluate the effects on sensitive species under its own sensitive species policy.

Congress enacted the Endangered Species Act (ESA) in 1973 to provide for the conservation of endangered and threatened fish, wildlife, plants and their natural habitats. 16 U.S.C § 1531, 1532. The ESA imposes substantive and procedural obligations on all federal agencies with regard to listed and proposed species and their critical habitats. *See id*. §§ 1536(a)(1), (a)(2) and (a)(4) and § 1538(a); 50 C.F.R. § 402. Under section 7 of the ESA, federal agencies must "insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined ... to be critical."16 U.S.C. § 1536(a)(2).

The definition of agency "action" is broad and includes "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies," including programmatic actions. 50 C.F.R. § 402.02. Likewise, the "action area" includes "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." *Id*.

The duties in ESA section 7 are only fulfilled by an agency's satisfaction of the consultation requirements that are set forth in the implementing regulations for section 7 of the ESA, and only after the agency lawfully complies with these requirements may an action that "may affect" a protected species go forward. *Pac. Rivers Council v. Thomas*, 30 F.3d 1050, 1055-57 (9th Cir. 1994). The action agency must initially prepare a biological assessment (BA) to "evaluate the potential effects of the proposed action" on listed species. 50 C.F.R. § 402.12. If the action agency concludes that the proposed action is "not likely to adversely affect" a listed

species that occurs in the action area, the Service must concur in writing with this determination. *Id*. §§ 402.13(a) and 402.14(b). If the Service concurs in this determination, then formal consultation is not required. *Id*. § 402.13(a). If the Service's concurrence in a "not likely to adversely affect" finding is inconsistent with the best available data, however, any such concurrence must be set aside. *See id*. § 402.14(g)(8); 5 U.S.C. § 706(2). If the action agency concludes that an action is "likely to adversely affect" listed species or critical habitat, it must enter into "formal consultation" with the Service. 50 C.F.R. §§ 402.12(k), 402.14(a). The threshold for triggering the formal consultation requirement is "very low"; indeed, "any possible effect ... triggers formal consultation requirements."[133]

Formal consultation commences with the action agency's written request for consultation and concludes with the Service's issuance of a "biological opinion." 50 C.F.R. § 402.02. The biological opinion states the Service's opinion as to whether the effects of the action are "likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat." *Id*. § 402.14(g)(4). [134] When conducting formal consultation, the Service and the action agency must evaluate the "effects of the action," including all direct and indirect effects of the proposed action, plus the effects of actions that are interrelated or interdependent, added to all existing environmental conditions – that is, the "environmental baseline." *Id*. §§ 402.14 and 402.02. The environmental baseline includes the past and present impacts of all Federal, state, and private actions and other human activities in the action area…."*Id*. The effects of the action must be considered together with "cumulative effects," which are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." *Id*.

If the Service concludes in a biological opinion that jeopardy is likely to occur, it must prescribe "reasonable and prudent alternatives" to avoid jeopardy. *Id*. § 402.14(h)(3). If the Service concludes that a project is not likely to jeopardize listed species, it must nevertheless provide an incidental take statement (ITS) with the biological opinion, specifying the amount or extent of take that is incidental to the action (but which would otherwise be prohibited under Section 9 of the ESA), "reasonable and prudent measures" (RPMs) necessary or appropriate to minimize such take, and the "terms and conditions" that must be complied with by the action agency to implement any reasonable and prudent measures. 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14(i).

The ESA requires federal agencies to use the best scientific and commercial data available when consulting about whether federal actions will jeopardize listed species. *See* 16 U.S.C. § 1536(a)(2).Accordingly, an action agency must "provide the Service with the best scientific and commercial data available or which can be obtained during the consultation for an adequate review of the effects that an action may have upon listed species of critical habitat." 50 C.F.R. § 402.14(d). Likewise, "[i]n formulating its biological opinion…the Service will use the best scientific and commercial data available." *Id*. § 402.14(g)(8). However, if the action agency

[133] *See* Interagency Cooperation Under the Endangered Species Act, 51 Fed. Reg. 19,926 (June 3 1996).
[134] To "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." *Id*. § 402.02.

failed "to discuss information that would undercut the opinion's conclusions," the biological opinion is legally flawed, and the ITS will not insulate the agency from ESA Section 9 liability. S*ee Ctr. for Biological Diversity v. BLM*, 698 F.3d 1101, 1127-28 (9th Cir. 2012).

Section 7(d) of the ESA provides that once a federal agency initiates consultation on an action under the ESA, the agency, as well as any applicant for a federal permit, "shall not make any irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would not violate subsection (a)(2) of this section." 16 U.S.C. § 1536(d). The purpose of section 7(d) is to maintain the environmental status quo pending the completion of consultation. Section 7(d) prohibitions remain in effect throughout the consultation period and until the federal agency has satisfied its obligations under section 7(a)(2) that the action will not result in jeopardy to listed species or adverse modification of critical habitat.

BLM must use the existing readily available data to identify which sensitive species that are of critical concern with regards to the lands included in, or in immediate proximity to, the proposed sale parcels. BLM's EIS must disclose any potential direct, indirect or cumulative impacts to such species, including the Pallid Sturgeon (*Scaphirhynchus albus*); Least Tern (*Sterna antillarum*); Piping Plover (*Charadrius melodus*); Whooping Crane (*Grus americana*); Red Knot (*Calidris canutus rufa*) and Black-footed Ferret (*Mustela nigripes*).

In addition, BLM must consult with the Service regarding the impacts of the lease sale on affected listed species, in compliance with its section 7 obligations under the ESA. To the extent that BLM relies on its section 7 programmatic consultations for the several management plans governing the lease sale, that reliance is not proper for any of the listed species affected by BLM's action. The potential for fracking and horizontal drilling and its associated impacts within the planning area constitutes "new information reveal[ing] effects of the [RMPs] that may affect listed species or critical habitat in a manner or to an extent not previously considered [in the prior section 7 programmatic consultations]." 50 CFR § 402.16(b). BLM must therefore reinitiate consultation on all of the planning documents for these areas. In any case, it must formally consult over the lease sale's potential adverse effects on listed species and consider the full scope of fracking and other drilling activities that could affect these species.

In May 2015, the U.S. Fish and Wildlife Service concurred with the BLM's Biological Assessment for the amended HiLine District Resource Management Plan.[135] The Service concurred with BLM's determination that RMP-level planning decisions "may affect" but are "not likely to adversely affect" the black-footed ferret, whooping crane, least tern, pallid sturgeon, grizzly bear, red knot, piping plover, and piping plover critical habitat.[136] This concurrence, however, is premised on the explicit assumption that further Section 7 consultation would take place for particular activities authorized under the RMP:

[135] USFWS Concurrence, HiLine ARMP App. K (May 27, 2015).
[136] USFWS Concurrence, HiLine ARMP at K-2.

> This concurrence is based upon the action scope and location, implementation of proposed conservation measures listed and/or referenced in the BA, the fact that site-specific evaluations will be conducted for individual activities authorized under the HiLine RMP at the time they are proposed, and consultation or conference would occur with the Service for such activities that may affect listed or proposed threatened and endangered species.[137]

Based on the EA, it appears that, in violation of both the terms of the 2015 concurrence and Section 7 of the ESA, the BLM has declined to conduct the required consultation or to determine whether the proposed leases and resulting exploration and development may affect listed species and/or their critical habitat:

> At the time of this review it is unknown whether or not a particular parcel will be sold and a lease issued and what potential impacts to those resources may occur. A detailed site-specific analysis and mitigation of activities associated with any particular lease would occur when a lease holder submits an application for permit to drill (APD). This could include re-evaluating the area for protected species and habitat under a Section 7 consultation process and/or additional stipulations and involvement with external entities (e.g. USFWS, MFWP), as necessary, based on the purposed action.[138]

The law is clear that, in the context of oil and gas leasing, "agency action" under the ESA includes not just the legal transaction of lease issuance, but also all resulting post-leasing activities from exploration, through production, to abandonment:

> we hold that agency action in this case entails not only leasing but leasing and all post-leasing activities through production and abandonment. Thus, section 7 of the ESA on its face requires the FWS in this case to consider all phases of the agency action, which includes postleasing activities, in its biological opinion. Therefore the FWS was required to prepare, at the leasing stage, a comprehensive biological opinion assessing whether or not the agency action was likely to jeopardize the continued existence of protected species, based on "the best scientific and commercial data available." *16 U.S.C. § 1536(a)(2)*.[139]

The Ninth Circuit's decision in *Conner v. Burford* is similarly clear that the consultation requirement is not obviated by uncertainty about the precise location and extent of future drilling: "Although we recognize that the precise location and extent of future oil and gas activities were unknown at the time, extensive information about the behavior and habitat of the species in the areas covered by the leases was available."[140] Similarly, the inclusion of a general Threatened and Endangered Species stipulation in the standard lease terms cannot substitute for the ESA Section 7 obligation to prepare a comprehensive biological opinion at the initial leasing stage:

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[137] USFWS Concurrence, HiLine ARMP at K-2 (emphasis added)
[138] Final EA at 51.
[139] *Conner*, 848 F.2d at 1453.
[140] *Id.* at 1453.

> Appellants ask us, in essence, to carve out a judicial exception to ESA's clear mandate that a comprehensive biological opinion -- in this case one addressing the effects of leasing and all post-leasing activities -- be completed before initiation of the agency action. They would have us read into the ESA language to the effect that a federal agency may be excused from this requirement if, in its judgment, there is insufficient information available to complete a comprehensive opinion and it take upon itself incremental step consultation such as that embodied in the T & E stipulations. We reject this invitation to amend the ESA. That it is the role of Congress, not the courts.[141]

The BLM's refusal to consult at the lease stage, and proposal to defer consultation to the APD stage, is precisely the sort of incremental step consultation decisively rejected as inconsistent with the ESA in *Conner v. Burford*. The refusal to consult at the lease stage further precludes reliance on the 2015 HiLine RMP Biological Opinion and concurrence, because that concurrence is explicitly founded on the assumption that "site-specific evaluations will be consulted" (emphasis added) for individual activities. Under *Conner*, the individual activity in question is clearly the issuance of a (non-NSO) lease, and consultation must occur prior to lease issuance if the resulting activities may affect listed species or critical habitat. Based on the information in the EA and the maps we have provided based on BLM GIS data, there is substantial basis to conclude that leasing and post-leasing activities may affect, at a minimum, the piping plover, piping plover critical habitat, pallid sturgeon, least tern, whooping crane, and red knot. Therefore, under ESA § 7 and the 2015 BA/Concurrence, BLM must consult with FWS prior to leasing.

1. Pallid Sturgeon – Parcels MTM 102757-QL and102757-QM

The pallid sturgeon is listed as endangered under the Endangered Species Act.[142] The pallid sturgeon is primarily the Missouri River (and its tributaries such as the Milk River), as well as the Mississippi downstream of its confluence with the Missouri. The Fish and Wildlife Service summarized the threats to the species in its most recent recovery plan:

> The Pallid Sturgeon is native to the Missouri and Mississippi rivers and adapted to the pre-development habitat conditions that historically existed in these rivers. These conditions generally can be described as large, freeflowing, warm-water, and turbid rivers with a diverse assemblage of dynamic physical habitats.Limiting factors include: 1) activities which affect in-river connectivity and the natural form, function, and hydrologic processes of rivers; 2) illegal harvest; 3) impaired water quality and quantity; 4) entrainment; and 5) life history attributes of the species (i.e., delayed sexual maturity, females not spawning every year, and larval drift requirements).[143]

[141] *Id.* at 1455.
[142] Fish and Wildlife Service, Determination of Endangered Status for the Pallid Sturgeon, 55 Fed. Reg. 36,641 (Sept. 6, 1990).
[143] Fish and Wildlife Service, Revised Recovery Plan for the Pallid Sturgeon 6 (Jan. 2014).

Importantly, the effect of oil and gas development, and resulting oil and gas pipelines, on pallid sturgeon has recently been identified as a "potential new threat," but not yet adequately studied:

> Potential new threats identified subsequent to the 5-year review (USFWS 2007) or new information has resulted in additional evaluation of: 1) energy development, 2), hybridization, and 3) invasive species/aquatic nuisance species.
>
> **ENERGY DEVELOPMENT**
>
> Gas and Oil Exploration: Exploration of natural gas and oil deposits occurs in portions of the Pallid Sturgeon's range. Preliminary assessment of the impacts of seismic air guns, a tool used for exploration, suggests that they may have negative effects on larval Pallid Sturgeon (Krentz in litt. 2010). Additional research is necessary to fully evaluate the extent and magnitude of these effects.
>
> Gas and Oil Pipelines: The federal authority for pipeline safety is the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration. This agency reports that there were 2.3 million miles of pipelines in the United States carrying natural gas and hazardous liquids (primarily petroleum, refined petroleum products, and other chemicals). Many pipelines cross rivers within the range of Pallid Sturgeon; some of which are buried under the river bed.
>
> While not directly within the historical range of Pallid Sturgeon, the 2011 rupture of the Silvertip Pipeline crossing under the Yellowstone River serves as a reminder that accidental releases of hazardous materials can occur. Depending on the timing, magnitude, and the material leaked, a ruptured pipeline could pose a threat to Pallid Sturgeon.
>
> Summary of Impacts from Energy Development
>
> Increased demand for energy resources has led to an increased interest in new technology for development and exploration. Oil and gas exploration techniques have the potential to take Pallid Sturgeon yet the ability to evaluate these takings will be nearly non-existent given the nature of the river systems these fish live in.[144]

Despite acknowledgment in the Recovery Plan, HiLine ARMPA FEIS, and HiLine ARMPA Biological Assessment that energy development (and resulting pipeline infrastructure) may cause take of pallid sturgeon and/or adversely affect pallid sturgeon habitat, the BLM has failed to either (a) evaluate in the EA the site-specific consequences to sturgeon habitat from the proposed leases, or (b) consult with FWS as required by ESA § 7, the HiLine RMP concurrence, and the HiLine RMP FEIS.

[144] Recovery Plan at 40.

Montana's Department of Fish, Wildlife, and Parks has identified two parcels proposed for leasing as containing habitat for the endangered pallid sturgeon – parcels MTM 102757-QL and 102757-QM.[145] Parcel 102757-QL in particular has additionally been assessed as having impaired or threatened water quality.[146] Although parcel 79010-ZT is recommended for deferral, parcels 102757-QL and –QM remain in the lease sale notice, and are immediately adjacent to the pallid sturgeon-occupied Milk River.[147]

Oil and gas activities resulting from leasing within the parcels for sale may affect endangered pallid sturgeon and its critical habitat, including habitat downstream of those areas for lease. The EIS must discuss the impacts of new leasing on the pallid sturgeon, including greater water depletions and the increased risk of spills and water contamination that could result from horizontal drilling and hydraulic fracturing. As the lease sale is reasonably certain to result in new oil and gas development, BLM must also consult with the Service regarding these potential harms to the endangered fish, and to water quality within their habitat, under section 7 of the ESA.

Significantly, the HiLine RMP FEIS specifically calls for site-specific ESA consultation for oil and gas leasing actions adjacent to pallid sturgeon habitat such as the Milk River:

> ***Pallid Sturgeon:*** The distribution of pallid sturgeon in the planning area is limited to the larger main stem rivers with turbid water and swift currents. Management decisions on the dispersed BLM parcels would likely have limited influence on these habitat areas, and recovery of a self-sustaining population would require restoration of the river flows, temperatures, turbidity and habitats in these main stem areas. Therefore, the implementation of the RMP and typical BLM management decisions are not expected to substantially affect or benefit pallid sturgeon. However, pallid sturgeon would also receive protection as an endangered species under the ESA and continuing efforts resulting from the pallid sturgeon recovery plan (USFWS 1993). <u>This will require the BLM to complete ESA consultation with the USFWS for specific land management actions within the planning area which could affect this species. The most likely action would be the leasing of federal minerals in split estate in lots adjacent to the Milk River.</u>[148]

Despite the fact that the 2015 ARMPA FWS concurrence and the HiLine RMP FEIS <u>specifically anticipate and call for site-specific consultation</u>, and that MT FWP has identified sturgeon habitat within the proposed lease sale, the BLM neither accounts for impacts to sturgeon habitat in the EA, nor has undertaken ESA-required consultation with FWS.

It is plain from the proposed action, pallid sturgeon recovery plan, and HiLine ARMP Biological Assessment that drilling, production, and infrastructure resulting from oil and gas

[145] *See* Comments of Montana Department of Fish, Wildlife, and Parks on the BLM HiLine District's October 2016 Oil and Gas Lease Sale (June 14, 2016), Attachment 1 at 13-14, 18.
[146] Final EA at 19.
[147] S*ee* Center for Biological Diversity, Map of Parcels MTM 102757-QL and –QM (Aug. 18, 2016).
[148] BLM, HiLine Proposed RMP/Final EIS at 522 (2015).

leasing adjacent to sturgeon habitat "may affect" the species, mandating site-specific ESA consultation.

Spills and leaks will inevitably increase with the addition of new wells, and resulting pipeline infrastructure in the proposed areas for lease.[149] The EA, contrary to the data provided by Montana FWP, contends that the lease parcels themselves do not contain habitat for the pallid sturgeon, EA at 23, but contains no analysis whatsoever of whether the lease parcels contain or adjoin waters that drain into pallid sturgeon habitat.

BLM's and the Service's analysis of the lease sale's effects on endangered fish must also account for the unprecedented sheer volume of chemicals and wastewaters that will be generated by hydraulic fracturing, horizontal drilling, and/or other foreseeable well stimulation and enhancement techniques. Thousands of pounds of fracking chemicals are likely to be transported to these area, injected into the ground, and either reinjected underground or transported offsite for disposal.[150] The amount of produced water also is likely to increase with increasing rates of hydraulic fracturing.[151] Such wastewaters are highly corrosive, increasing the risk of pipelines and tanks releasing their contents.[152] Corrosion of pipelines and tanks is a common cause of leaks and spills.[153]

The cumulative effects of this increased risk of spills on endangered fish in the region, including the Missouri and/or Milk Rivers and their tributaries, must also be accounted for in the Service's analysis of the lease sale's effects on the endangered fish. This includes the spill effects of the lease sale in connection with non-federal well development projects in the entire watershed. With increasing oil and gas development expected to occur throughout the entire watershed (and not just the areas for lease), it is entirely foreseeable that the risk of spills in this region will only increase.

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[149] *See* Mike Soraghan and Pamela King, Drilling Mishaps Damage Water in Hundreds of Cases, EnergyWire (Aug. 8, 2016) (inventorying more than 640 oil and gas spills affecting ground or surface water in 2015, including a spill of more than 3 million gallons of salty, toxic drilling wastewater into a tributary of the Missouri); Nancy E. Lauer et al., Brine Spills Associated With Unconventional Oil Development in North Dakota (documenting impairment of surface and ground water resources in Northd Dakota due to brine spills from Bakken oil development).

[150] *See* EPA, "Analysis of Hydraulic Fracturing Fluid Data from the FracFocus Chemical Disclosure Registry 1.0 ," Webinar Presentation, March 2015, p. 14, available at http://www2.epa.gov/sites/production/files/2015-04/documents/fracfocus_public_webinars_508_0.pdf (noting that hundreds or thousands of pounds may be brought to, stored, and mixed on the well pad).

[151] Souther 2014 at 332 (noting 570% increase in wastewater production since 2004 from development of the Marcellus Shale).

[152] Petrowiki, "Corrosion Problems in Production," Oct. 29, 2014, available at http://petrowiki.org/Corrosion_problems_in_production ("The fact that most oil and gas production includes co-produced water makes corrosion a pervasive issue across the industry.")

[153]Schardine, Daniel T., Detecting Corrosion in Production Tanks, Inspection Trends, p. 19-21, Summer 2008, available at http://testex-ndt.com/technical-papers/detecting-corrosion-in-production-tanks/; U.S. DOT, Pipeline & Hazardous Materials Safety Administration (PHMSA), Fact Sheet: Internal Corrosion, 2011, available at https://primis.phmsa.dot.gov/comm/FactSheets/FSInternalCorrosion.htm?nocache=6923 ("Corrosion of all types is one of the leading causes of pipeline leaks and ruptures."); *see also* PHMSA, Fact Sheet: External Corrosion, 2011, available at http://primis.phmsa.dot.gov/comm/FactSheets/FSExternalCorrosion.htm?nocache=7104.

An increased risk of spills due to the lease sale would adversely affect the endangered fish. Fracking chemicals and fracking wastewaters can be highly toxic to fish. Produced waters that fracking operations force to the surface from deep underground can contain high levels of total dissolved solids, salts, metals, and naturally occurring radioactive materials.[154] Flowback waters (i.e., fracturing fluids that return to the surface) may also contain similar constituents along with fracturing fluid additives such as surfactants and hydrocarbons.[155] The identity and effects of many of these additives is unknown, due to operators' claims of confidential business information. Compounds in mixtures can have synergistic or antagonistic effects, but it is impossible to know these effects without full disclosure.[156]

Nonetheless, accidental spills and intentional dumping of fracking fluids and wastewaters can cause large-scale harm to aquatic life. Numerous incidents of fracking wastewater contamination from pipelines, equipment blowouts, and truck accidents have been reported, and have resulted in kills of fish.[157] In 2013, a company admitted to dumping wastewater from fracking operations into the Acorn Fork Creek in Kentucky, causing a massive fish kill.[158] Among the species harmed was the blackside dace, a threatened minnow species.[159] The lead author (a scientist at USGS) noted that the "study is a precautionary tale of how entire populations could be put at risk even with small-scale fluid spills," "especially…if the species is threatened or is only found in limited areas, like the Blackside dace is in the Cumberland."[160]

Wastewaters can have high levels of salinity, which aquatic organisms are sensitive to (including plants and invertebrate species that fish may depend on); thus, accidental releases of

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[154] Brittingham, Margaret C., et al. Ecological Risks of Shale Oil and Gas Development to Wildlife, Aquatic Resources and their Habitats. *Environ. Sci. Technol.* 2014, 48, 11034-11047, p. 11039.
[155] *Id*.
[156] Souther 2014, p. 334.
[157] *See, e.g.*, Department of Environmental Protection, Commonwealth of Pennsylvania, Inspection Report, May 27, 2009, www.marcellus-shale.us/pdf/CC-Spill_DEP-Insp-Rpt.pdf *(pipeline accidentally discharged an estimated 4,200 gallons of wastewater, as well as sediments and state investigation report concluded, "The creek was impacted by sediments all the way down to the lake and there was evidence of a fish kill as invertebrates and fish were observed lying dead in the creek.");* Warco, Kathie, "Fracking truck runs off road; contents spill", The Observer-Reporter, October 21, 2010, available at http://www.uppermon.org/news/Other/OR-Frac_Truck_Spill-21Oct10.html (tanker truck hauling fracking liquid ran off a road and spilled almost 5,000 gallons of liquid spill, resulting in the contamination of a stream and several dead minnows); Michaels, C., J.L. Simpson, and W. Wegner. 2010. "Fractured Communities, Case studies of the Environmental Impacts of Industrial Gas Drilling," Riverkeeper, p. 6, available at www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf (blowout released nearly 1 million gallons of wastewater into nearby creeks, resulting in uncontrolled discharge of wastewater into a tributary of Little Laurel Run, a high-quality coldwater fishery); Department of Environmental Protection, Commonwealth of Pennsylvania, DEP Fines Talisman Energy USA for Bradford County Drilling Wastewater Spill, Polluting Nearby Water Resource," August 2, 2010, available at http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=13249&typeid=1 (spill of used natural gas drilling fluids in Bradford County, PA, sent 4,200-6,300 gallons of fluids into a wetland and a tributary of Webier Creek, which drains into a coldwater fishery).
[158] Vaidyanathan, Gayathri, *Fracking Spills Cause Massive Ky. Fish Kill*, E&E News, Aug. 29. 2013.
[159] *Id*.
[160] *See* US Geological Survey, "Hydraulic Fracturing Fluids Likely Harmed Threatened Kentucky Fish Species, Aug. 28, 2013, available at http://www.usgs.gov/newsroom/article.asp?ID=3677#.VTf3oCFVhBd.

produced and flowback waters may have harmful effects on fish and their habitat.[161] Increased levels of total dissolved solids in surface waters are associated with higher rates of fish mortality.[162] Further, produced waters can contain copper, iron, lead, manganese, arsenic, cadmium, nickel, zinc, chromium, selenium, and sodium bicarbonate at levels above thresholds that are harmful to aquatic organisms, including fish.[163] Fracking fluids may also contain hydrocarbons,[164] which can cause deterioration of body tissues of aquatic organisms and reduced growth.[165] Drilling fluids may also cause impaired immune function in fish.[166] Other contaminant effects may include "changes in heart and respiratory rates; gill hyperplasia; enlarged liver; reduced growth; fin erosion; impaired endocrine system; a variety of biochemical, blood, and cellular changes; and behavioral responses."[167] As the Fish and Wildlife Service has previously noted, "[d]isruption of behavioral functions can result in population declines or changes in year-class strength if enough individuals are affected."[168] Thus, chronic and persistent pollution from spills and leaks could result in harm to endangered fish at the population-scale.

C. BLM Has Failed to Evaluate and/or Mitigate Effects on Sensitive Species and Their Habitat

The EA completely fails to analyze site-specific impacts of oil and gas development on important wildlife areas, including documented grassland habitat for the Sprague's Pipit and other BLM-sensitive grassland birds, and State-designated connectivity areas for the Greater Sage-Grouse. BLM Manual 6840 requires the agency "[t]o initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA."[169] Manual 6840 further states that it is the BLM's Policy to promote the "conservation and to minimize the likelihood and need for listing" Bureau sensitive species.[170] Piecemeal analyses of individual lease sales does not provide the appropriate perspective for examining and developing the proactive conservation measures necessary to reduce or eliminate threats to Sprague's pipit from oil and gas leases.

Furthermore, pursuant to Manual 6840 it is the responsibility of State Directors to not only inventory BLM lands to determine the occurrence of BLM special status species, but also to

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[161] Brittingham 2014, p. 11039; Souther, p. 332 (noting small increases in salinity can harm or kill aquatic plants and invertebrates).
[162] Tuckwiller, Ross, Annotated Bibliography: Potential Impacts of Energy Development on Fisheries in the Rocky Mountain West Prepared for Theodore Roosevelt Conservation Partnership Fish, Wildlife, & Energy Working Group, p. 17.
[163] *Id*. pp. 21-22 (extremely elevated chromium concentrations in fish exposed to produced waters), p. 23 (fish showing lesions and kidney damage after exposure to sodium bicarbonate).
[164] EPA, State-level Summaries of FracFocus 1.0 Hydraulic Fracturing Data, p. 38 (Colorado fracking chemical disclosures showing high incidence of naphthalene and "solvent naphtha, petroleum, and heavy arom.").
[165] Gasco BO, p. 27; In the Matter of Changes to the Rules and Regulations of the Oil and Gas Conservation Commission of the State of Colorado, Cause No. 1R, Dkt No. 0803-RM-02, Testimony of Colorado Division of Wildlife Staff Regarding Surface Occupancy Restrictions, p. 39 (describing effects of toluene, naphthalene, and crude oil on various fish).
[166] Tuckwiller, p. 22.
[167] Gasco BO, p. 27.
[168] *Id*.
[169] *Id*. at § .02 (emphasis added).
[170] *Id.* at § .06.

determine "the condition of the populations and their habitats, and how discretionary BLM actions affect those species and their habitats."[171] The leasing of federal lands for oil and gas extraction is a discretionary BLM action that has the potential to adversely affect sensitive species including the Greater Sage-Grouse and Sprague's pipit.

1. Sage Grouse Habitat – Parcels 102757-G4, 102757-G6, 102757-GW, 102757-J7, 102757-J9, 102757-KA, 102757-KB, 102757-KE, 102757-QJ, 102757-QK, 102757-QL, 102757-QM, 102757-QN, 105431-Q3

We commend the BLM's stated decision to defer leasing of lands identified as Priority or General Habitat for the Greater Sage-Grouse. Consistent with the decision in the 2015 HiLine Sage-Grouse RMP Amendments, BLM should continue to prioritize oil and gas development outside of identified Priority and General Habitat. However, based on comparison of BLM's final Montana October 2016 lease sale parcel data with the sage-grouse habitat mapping data from BLM's 2015 HiLine Approved Resource Management Plan Amendment, it appears that BLM has erroneously failed to defer parcel MTM 102757-GW, substantial portions of which overlap designated Sage-Grouse Priority Habitat Management Area.[172] Although other parcels containing Sage-Grouse Priority and/or General Habitat are proposed for deferral pursuant to "the State Director's discretion to not carry forward parcels within sage-grouse habitat pending implementation guidance on the 2015 approved Hiline District Resource Management Plan,"[173] parcel MTM 102757-GW remains included in the final lease sale notice, despite what appears to be, based on BLM data, the presence of substantial designated Priority Habitat within the parcel. If Parcel 102757-GW is not deferred, BLM must revise its EA and FONSI to consider effects to sage-grouse priority habitat and consistency with the 2015 HiLine ARMPA.

The BLM has also included in the lease sale twelve parcels within the Glasgow Field Office - **102757-G4, 102757-G6, 102757-GW, 102757-J7, 102757-J9, 102757-KA, 102757-KB, 102757-KE, 102757-QJ, 102757-QK, 102757-QL, 102757-QM, 102757-QN, 105431-Q3** – that affect State of Montana-designated "Connectivity Habitat" under Montana Executive Order 12-2015.[174] It appears, however, that the BLM's HiLine ARMPA, and proposed lease stipulations, fail to take into account the State's connectivity designation, or include stipulations or other mitigation measures to preserve habitat connectivity within the connectivity area:

> Twelve of the parcels are located within the Montana-Saskatchewan Connectivity Area designated by the State of Montana. The State of Montana Executive Order No. 12-2015 for Sage-Grouse provides for the use of stipulations to be applied by the State. The HiLine Resource Management Plan does not include designation of the Valley County Connectivity Area.[175]

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[171] *Id.* at § .04.
[172] *See* Center for Biological Diversity, Map of Glasgow Field Office Parcels and Designated Sage-Grouse Habitat (Aug. 18, 2016), attached as Exh. B.
[173] Final EA at Appendix A.
[174] Final EA at 25, 49.
[175] Final EA at 49.

The 2015 Montana Executive Order, which constitutes part of the regulatory mechanisms relied on by FWS in its decision not to list the Greater Sage-Grouse under the Endangered Species Act, identifies connectivity areas, including the Valley County Connectivity Area, as "areas that provide important linkages among populations of sage-grouse, particularly between Core Areas or priority populations in adjacent states and across international borders."[176] The Montana Executive Order identifies the need for further research both to define additional Connectivity Areas, and that "MSGOT shall study and recommend the stipulations that are necessary in Connectivity areas to prevent a decline in sage grouse populations."[177] For the Valley Connectivity Area impacted by the proposed lease sale, however, the Executive Order provides that "[i]n the interim, the Valley County Connectivity area shall be subject to the stipulations for General Habitat."[178]

In summary: the State of Montana has identified the Valley Connectivity Area as a priority for sage-grouse conservation, called for additional study to identify appropriate stipulations, and declared that pending that study, the area shall be subject to the stipulations for General Habitat. However, the HiLine ARMPA does not include this interim provision for treating the Valley Connectivity Area, and the proposed lease sale and EA not only fail to defer Connectivity Area parcels as they do (most) General Habitat Management Areas, but they fail even to include analysis of the effects of additional oil and gas development resulting from the twelve leases on the Valley Connectivity Area.[179] BLM further appears to have failed to address Montana FWP's request to consult with the Montana Sage-Grouse program regarding impacts to the Connectivity Area. In their comments on the lease sale, FWP noted, for parcels 102757-G4, -G6, -GW, -J7, -J9, -KB, -KE, -QJ, -QK, -QL, -QM, -QN, and –Q3, that:

> Project is located in Executive Order Sage-grouse Connectivity Layer. In accordance with Executive Orders 10-2014 and 12-2015, Montana's Sage Grouse Habitat Conservation Program is responsible for reviewing all development projects in sage-grouse habitat for impacts to Sage-grouse. Please consult with the Program at www.sagegrouse.mt.gov.[180]

The EA contends that "BLM has coordinated with MFWP and USFWS in the completion of this EA in order to prepare analysis, identify protective measures, and apply stipulations associated with these parcels being analyzed." EA at 7. However, the EA contains no analysis of the effects of leasing the twelve Valley Connectivity Area parcels on the habitat effectiveness of the Connectivity Area, nor any indication that BLM complied with FWP's requests to consult with the Sage Grouse Habitat Conservation Program to review development projects and identify appropriate stipulations.

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[176] State of Montana, Office of the Governor, Exec. Order No. 12-2015 at 21 (Sept. 8, 2015).
[177] *Id.*
[178] *Id.*
[179] *See* Final EA at 49.
[180] MT FWP Comment Letter, Attachment 1 at 9.

Failure to address effects of proposed leases not only violates NEPA's requirement to take a hard look at environmental impacts of the proposed action and BLM's obligation to consult and cooperate with relevant State agencies such as MT FWP and the Sage Grouse Habitat Conservation Program, it also undermines the assumptions underlying the Montana Sage Grouse Conservation Strategy, the HiLine ARMPA FEIS, and FWS's "Not Warranted" decision for the species that state strategies such as the Montana Executive Order will be effective in stemming sage-grouse habitat and population decline and maintaining habitat connectivity. The twelve parcels within the Valley Connectivity Area must, at a minimum, be deferred from the proposed sale pending analysis of the effects of leasing, coordination with Montana state agencies, and development of appropriate stipulations.

2. **Sprague's Pipit and Grassland Birds –** 79010-FB, 105431-H3, 105431-FG, 105431-LA, 105431-K9, 105431-LC, 105431-LB, 105431-K6, 105431-LL, 105431-LF, 105431-LE, 105431-LD, 97300-BO, 97300-CC, 105431-KA, 105431-KB, 105431-KC, 105431-KD, 105431-LH, 105431-LJ, 102757-WC, 105431-HU, 105431-HV, 102757-QH, 102757-J7, 102757-J8, 102757-KC, 102757-KE, 105431-Q3, 102757-GW, 102757-G4, 102757-G6, 791010-ZT, 102757-QU, 79010-ZR, 79010-ZS, 79010-7J, 102757-RM, 102757-6K, 79010-A9, 79010-B2, 105431-FK, 105431-FL, 105431-FM, 105431-FN, 105431-FP, 79010-A2, 105431-K4, 79010-B9, 79010-C1, 105431-FQ, 105431-FT, 105431-FU, 105431-FV, 105431-FW, 105431-FR

BLM acknowledges that habitat for the BLM Montana sensitive species Sprague's Pipit is present within the following proposed lease parcels:

79010-FB, 105431-H3, 105431-FG, 105431-LA, 105431-K9, 105431-LC, 105431-LB, 105431-K6, 105431-LL, 105431-LF, 105431-LE, 105431-LD, 97300-BO, 97300-CC, 105431-KA, 105431-KB, 105431-KC, 105431-KD, 105431-LH, 105431-LJ, 102757-WC, 105431-HU, 105431-HV, 102757-QH, 102757-J7, 102757-J8, 102757-KC, 102757-KE, 105431-Q3, 102757-GW, 102757-G4, 102757-G6, 791010-ZT, 102757-QU, 79010-ZR, 79010-ZS, 79010-7J, 102757-RM, 102757-6K, 79010-A9, 79010-B2, 105431-FK, 105431-FL, 105431-FM, 105431-FN, 105431-FP, 79010-A2, 105431-K4, 79010-B9, 79010-C1, 105431-FQ, 105431-FT, 105431-FU, 105431-FV, 105431-FW, 105431-FR [181]

BLM's failure to consider site-specific impacts to the Sprague's Pipit violates its own regulations regarding conservation of sensitive species.

The Sprague's pipit (*Anthus spragueii*) is a native grassland specialist and is one of only 12 birds endemic to the Great Plains grasslands. The bird breeds in the northern prairie regions of the United States and Canada and winters in parts of the U.S. southwest east to Louisiana and south through northern Mexico.

The Sprague's pipit depends on large patches of open, native grassland. The Northern Plains have lost up to 99% of native grasslands in the Sprague's pipit's breeding grounds. Drainage of wetlands has further resulted in a 50% loss of wetland and wet meadow habitat used by the pipit. In the bird's wintering range, habitat degradation by tree, shrub, and weed encroachment is a particular problem, along with permanent habitat loss to human uses of the

[181] Final EA at 24 & Table 5.

land. Climate change is and will continue to exacerbate all of these threats to pipit habitat and will also change natural fire cycles to the detriment of the bird.

Due to this loss of habitat, the Sprague's pipit has experienced a 79% population drop across its range. The population has been declining at an average rate of 4.1% since 1966, when the Breeding Bird Survey (BBS) began monitoring bird population trends.[182]

The Sprague's pipit is particularly sensitive to anthropogenic disturbance. The birds avoid roads, for example. Sprague's pipits have a strong preference for native grasses over exotic species such as smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*).[183] Increased oil and gas exploration and extraction have likely already increased disturbances and habitat loss throughout the pipit's range.

Many grassland birds are experiencing catastrophic declines. Knopf described the magnitude of avian losses:

> During the last 25 years, grassland species have shown steeper, more consistent, and more geographically widespread declines than any other behavioral or ecological guild of North American birds, including Neotropical migrants.[184]

Similarly, Peterjohn and Sauer proclaimed, "…the potential for species extinctions in grasslands is relatively high; for example, populations of grassland birds are declining more precipitously than other groups of North American bird species."[185] The Sprague's pipit is one of these birds at risk. Wells described the Sprague's pipit as, "one of the fastest declining songbirds of North America."[186]

The Sprague's pipit is particularly vulnerable during the spring and summer months. Nest building generally begins in mid-May, and clutching can start from the second week of May

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[182] Sauer, J. R., J. E. Hines, and J. Fallon. 2005. *The North American Breeding Bird Survey, Results and Analysis* 1966 - 2005. Version 6.2.2006. Laurel, MD: USGS Patuxent Wildlife Research Center.

[183] Madden, E. M. 1996. *Passerine communities and bird-habitat relationships on prescribe-burned, mixed-grass prairie in North Dakota*. M.S. thesis, Montana State Univ., Bozeman; Prescott, D. R. C. and G. M. Wagner. 1996. Avian responses to implementation of a complimentary/rotational grazing system by the North American Waterfowl Management Plan in southern Alberta: the Medicine Wheel project. Alberta NAWMP Centre. NAWMP-018. Edmonton, Alberta; Prescott, D. R. C., R. Arbuckle, B. Goddard and A. Murphy. 1993. Methods for monitoring and assessment of avian communities on NAWMP landscapes in Alberta, and 1993 results. Alberta NWMP Centre. NAWMP-007. Edmonton, Alberta;

[184] Knopf, F.L. 1994. *Avian assemblages on altered grasslands*. Studies in Avian Biology. 15: 247-257.

[185] Peterjohn, B.G., and J.R. Sauer. 1999. *Population status of North American grassland birds from the North American Breeding Bird Survey,* 1966 -1996. Studies in Avian Biology. 19:27-44.

[186] Wells, J.V. 2007. Birder's Conservation Handbook: *100 North American Birds at Risk*. Princeton University Press.

through July.[187] Fledging occurs from around June 13 through the end of August.[188] Sprague's pipits have a low frequency of re-nesting and high rates of nest abandonment.[189]

Oil and gas exploration and extraction is likely a severe threat to Sprague's pipit's habitat. The imposition of infrastructure for oil and gas extraction facilitates the spread of weeds and establishes structures and roads that pipits avoid. Specifically, mineral extraction development causes habitat fragmentation that perpetuates and exacerbates degradation. According to a U.S. Forest Service technical report:

> The potential effects of petroleum development on wildlife in wildland environments are numerous and varied…The major wildlife groups affected… are ungulates, carnivores, water birds, upland birds and raptors.[190]

Possible environmental disruption that would adversely affect Sprague's pipit includes, but is not limited to: noise pollution, human intrusion, alteration of vegetation and land and introduction of harmful substances. Habitat alteration from oil and gas development, one of the greater threats to Sprague's pipit, is caused by seismic trail clearing, clearing and grading of right of ways, site development, excavation of storage and mud pits, borrow pit excavation, construction of process, treatment and storage facilities, installation of flow lines, erection of power lines, communication systems development, trenching and pipe installation, pipe burial and backfill, effluent accidents and development of ancillary industry (i.e., boomtowns associated with labor forces).[191]

Effects from secondary activities may be greater in the long term than those from development itself. It is possible that disrupted ecosystems may never be totally rehabilitated, as human settlement occurring during development and production may persist, and invasive grass species may diminish viable habitat. Moreover, impacts will have been cumulative over many years during the life of an oil field.

Oil and gas facilities can cause direct mortality as well. There are reports from several state governments of avian deaths in extraction pits. These were caused when birds 1) were coated with oil from the pit and their flight was thereby impeded; 2) ingested toxic substances when drinking in the pits; and 3) drowned in the pits.[192] Avian species are also susceptible to moderate mortality rates from collisions with overhead power lines associated with increased oil and gas and other human activities.[193] Linnen (2008) examined the effects of oil and gas disturbances, including road establishment, and suggested that Sprague's Pipits tended to occur

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[187] Maher, W. J. 1973. *Birds: I. Population dynamics*. Canadian Committee for the International Biological Programmme (Matador Project) Technical Report no. 34. Univ. of Saskatchewan, Saskatoon.
[188] *Id.*
[189] Sutter, G.C., D.J. Sawatzky, D. M. Cooper and R. M. Brigham. 1996. *Renesting intervals in Sprague's Pipit, Anthus spragueii*. Can. Field-Nat. 110: 1–4.
[190] Bromley, M. 1985. *Wildlife management implications of petroleum exploration and development in wildland environments*. U.S. Forest Service Technical Report INT-191.
[191] *Id.*
[192] *Id*.
[193] *Id*.

in lower numbers and at fewer sites near natural gas wells and trails than in interior habitat patches. According to the Service's Sprague's pipit conservation plan,

> Energy exploration and extraction are expected to continue to be a threat to Sprague's Pipits habitat and populations into the future as demands for resources increase globally (Environment Canada 2008). Sprague's Pipits abundance decreases within 300 m of oil wells (Linnen 2008).
>
> Currently, no regulatory mechanisms exist for many of these activities to ensure that drilling and associated activities avoid nesting habitat. In the United States, much of the Sprague's Pipit's breeding range overlaps major areas of oil production in eastern Montana, western North Dakota and northwestern South Dakota. Areas with a high density of oil production may also decrease migration and wintering habitats available. [194]

The Service further found that "[e]xpanding energy development (wind energy and oil and gas) in grassland regions may result in increased noise levels and subsequently interfere with male song in Sprague's Pipits. The effect of anthropogenic noise on Sprague's Pipit breeding success is unmeasured."[195]

Sprague's pipit are found within the HiLine planning area, with viable habitat within several of the proposed lease parcels.[196] The EA acknowledges that "All of the nominations in Phillips County provide medium to high value habitat for grassland birds such as Sprague's Pipit, Long-billed Curlew and Baird's Sparrow."[197] No analysis has been provided as to the actual amount of habitat that would be impacted by the proposed leasing.

Significant new research since the Service's 2010 warranted but precluded finding shows that the unconventional (i.e., fracking) techniques now at play in the Bakken shale and elsewhere cause even greater levels of disruption to Sprague's pipit habitat use and breeding than previously understood.[198]

U.S. Geological Survey and other researchers examined oil infrastructure ("Single-bore well pads, developed with hydraulic fracturing and horizontal drilling, were the most common oil-related infrastructure on the landscape at the time of the study") and conducted bird surveys in the Williston Basin and Bakken formations of North Dakota and eastern Montana.[199] Their analysis of grassland bird densities showed avoidance of infrastructure to various degrees by

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[194] U.S. Fish and Wildlife Service, *Sprague's Pipit (Anthus spragueii) Conservation Plan* at 20 (2010) (citing Linnen, C.G. 2008. Effects of oil and gas development on grassland birds. Unpublished report, prepared for Petroleum Technology Alliance Canada. Saskatoon, Saskatchewan, Canada.)
[195] *Id.*
[196] U.S. Fish and Wildlife Service, *12-Month Finding on a Petition to List Sprague's Pipit as Endangered or Threatened Throughout Its Range*, 75 Fed. Reg. 56,028 (Sept. 15, 2015).
[197] EA at 25
[198] *See* Sarah J. Thompson *et al.*, *Avoidance of unconventional oil wells and roads exacerbates habitat loss for grassland birds in the North American great plains*, 192 Biological Conservation 82-90 (2015).
[199] *Id.* at 83-85.

different grassland bird species, but confirmed that Sprague's pipit in particular avoided infrastructure by 350 meters.[200]

As a result of this extensive avoidance distance, researchers found that "[b]ecause negative effects extend into surrounding habitat, variation in well and road configurations can dramatically alter the amount of habitat that will remain suitable for grassland birds as oil development continues in the region."[201] Their research concluded that "of endemic grassland birds, Sprague's pipit is one of the most sensitive to disturbances associated with oil development, raising further concern about the impact of ongoing oil development in the region."[202] Further, they recommended potential strategies and avenues of research for determining whether alternative patterns of development (scattered single-bore wells versus corridors and multi-bore pads) might mitigate this sensitivity.

The updated EA acknowledges none of this. It then proceeds to defer all analysis and consultation to the drilling permit stage:

> Effects to migratory birds from oil and gas development at the APD stage could include direct loss of habitat from roads, well pads and other infrastructure, disturbance, power line strikes and accidental direct mortality, fragmentation of habitat, change in use of habitats, and potential threats and competition from edge species. Mitigation measures would be assigned at the APD stage to ensure there would be no measurable negative effect on migratory bird populations, in compliance with Executive Order 13186 and MBTA. These mitigation measures would be required as Conditions of Approval.[203]

This piecemeal approach to analysis and consultation is squarely foreclosed by the Ninth Circuit's decision in *Conner v. Burford*, 848 F.2d 1441, 1454-57 (9th Cir. 1988), where the court found that it was improper to exclude the potential effects of future lessee activity when reviewing the leasing phase for oil and gas permits on public lands.

Moreover, BLM's attempt to defer analysis of the potential impacts to Sprague's pipit to the APD stage is in direct violation of BLM's regulations regarding Bureau sensitive species as set forth in BLM Manual 6840 - Special Status Species Management.

Pursuant to Manual 6840, "[a]ll Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species."[204] The Objective of Manual 6840 is "[t]o initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA."[205] Manual 6840 further states that it is the BLM's Policy to promote the "conservation and to minimize the likelihood and need for listing" Bureau sensitive

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[200] *Id.* at 86.

[201] *Id.* at 86.
[202] *Id.* at 89.
[203] EA at 49.
[204] Manual 6840 at § .01.
[205] *Id*. at § .02 (emphasis added).

species.[206] Piecemeal analyses of individual lease sales does not provide the appropriate perspective for examining and developing the proactive conservation measures necessary to reduce or eliminate threats to Sprague's pipit from oil and gas leases.

Furthermore, pursuant to Manual 6840 it is the responsibility of State Directors to not only inventory BLM lands to determine the occurrence of BLM special status species, but also to determine "the condition of the populations and their habitats, and how discretionary BLM actions affect those species and their habitats."[207] The leasing of federal lands for oil and gas extraction is a discretionary BLM action that has the potential to adversely affect Sprague's pipit. Deferring an analysis of the potential effects of selling oil and gas leases to the APD stage is entirely inconsistent with the requirements of Manual 6840. If a lease is sold, the lessee acquires certain contractual rights constraining BLM authority. For example, according to 43 C.F.R. § 3101.1-2, once a lease is issued to its owner, that owner has the "right to use as much of the lease lands as is necessary to explore for, drill for, mine, extract, remove and dispose of the leased resource in the leasehold" subject to specific nondiscretionary statutes and lease stipulations. Unless an NSO stipulation is included now, such a condition may face obstacles to post-lease imposition, and any future alternative proposing such an NSO at the APD-stage could be rejected as infeasible under the terms of the lease. *See Biodiversity Conservation Alliance v. BLM*, 608 F.3d 709, 716 (10th Cir. 2010).

Furthermore, pursuant to Manual 6840 Bureau sensitive species are considered BLM special status species, and Section 2 of the Manual provides specific measures that BLM is required to undertake in order to "conserve these species and their habitats."[208] To implement this section, BLM "shall... minimize or eliminate threats" affecting Bureau sensitive species, by determining their current threats and habitat needs, and ensuring that BLM activities "are carried out in a way that is consistent with its objectives for managing those species and their habitats at the appropriate spatial scale."[209] Due to the potential harms from habitat loss and fragmentation, the appropriate spatial scale for determining threats to Sprague's pipit from oil and gas development is the entire area subject to lease sales, rather than the piecemeal, limited APD-specific review that BLM is attempting to employ.

The need for a broader analysis to assess the threats to this species from the lease sale itself is further supported by Manual 6840's requirement that BLM work with partners and stakeholders to "develop species-specific or ecosystem-based conservation strategies," and in the absence of such strategies, to incorporate standard operating procedures and other conservation measures "to mitigate specific threats to Bureau sensitive species during the planning of activities and projects."[210] Postponing any analysis of impacts to Sprague's pipit until the later APD stage may foreclose the implementation of standard procedures and conservation measures necessary to mitigate threats to the species during exploration or other actions that might take place prior to an APD being filed, since as noted above once a lease is issued, the owner has the

[206] *Id.* at § .06.

[207] *Id.* at § .04.

[208] *Id.* at § .2 ("All federally designated candidate species, proposed species, and delisted species in the 5 years following their delisting shall be conserved as Bureau sensitive species.").

[209] *Id*. at § .2(C) (emphasis added).

[210] *Id.* (emphasis added).

"right to use as much of the lease lands as is necessary to explore for, drill for, mine, extract, remove and dispose of the leased resource in the leasehold." 43 C.F.R. § 3101.1-2.

Moreover, the development of species-specific and ecosystem-based conservation strategies implicitly necessitates a more holistic review of the cumulative impacts of the proposed lease sale, which cannot be accomplished through site-specific APD-stage analysis alone. And, piecemeal analyses of individual lease sales do not provide the appropriate perspective for examining the cumulative effects of hydraulic fracturing and climate change impacts at the regional and landscape scale and for making land management decisions.

Where activities have the potential to adversely impact species of concern, the general practice is to consider those impacts and address them "at the earliest possible time," in order to avoid delay, ensure that impacts are avoided and opportunities for mitigation are not overlooked. *See i.e.* 50 C.F.R. §§ 402.14(a), (g)(8). This is likewise true in the context of even more general environmental review, such as under NEPA. *See* 40 C.F.R. § 1501.2.[211] Furthermore, it is general practice to evaluate the impacts of several related projects with cumulative impacts proposed or reasonably foreseeable in the same geographic region in a single, comprehensive, analysis. *See Kleppe v. Sierra Club*, 427 U.S. 390, 410 (1976).[212] Likewise, under the ESA an analysis of the effects of an action must consider actions that are interrelated or interdependent. 50 C.F.R. §§ 402.14 and 402.02. This suggests that BLM should consider the effects of oil and gas extraction activities at the lease sale stage, since those actions are inherent in leasing land for such purposes. It is therefore evident that in order to effectuate the policy of protecting Bureau sensitive species set forth in Manual 6840,[213] and consistent with the established practice of early, comprehensive review of potential impacts to sensitive species, BLM must consider impacts to Sprague's pipit at the lease sale, rather than waiting until the APD stage for project specific review.

In sum, BLM has issued regulations in Manual 6840 that require the agency to undertake actions to protect candidate species, much like they protect proposed and listed species. Delaying an analysis of impacts to Sprague's pipit until the APD stage risks harm to an at-risk species that could otherwise be avoided. A failure to address the impacts to Sprague's pipit at the lease sale stage violates BLM's own regulations set forth in Manual 6840, is entirely inconsistent with established practice and policies regarding species protection, and is therefore arbitrary and capricious agency action under the Administrative Procedures Act.

III. BLM must end all new fossil fuel leasing and hydraulic fracturing.

[211] "Agencies shall integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values, to avoid delays later in the process, and to head off potential conflicts."
[212] "when several proposals for . . . actions that will have cumulative or synergistic environmental impact upon a region are pending concurrently before an agency, their environmental consequences must be considered together."
[213] *See* BLM Manual 6840 at .06 ("Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA.").

Climate change is a problem of global proportions resulting from the cumulative greenhouse gas emissions of countless individual sources. A comprehensive look at the impacts of fossil fuel extraction, and especially fracking, across all of the planning areas affected by the leases in updated RMPs is absolutely necessary. BLM has *never* thoroughly considered the cumulative climate change impacts of *all* potential fossil fuel extraction and fracking (1) within each of the planning areas, (2) across the state, and (3) across all public lands. Proceeding with new leasing proposals *ad hoc* in the absence of a comprehensive plan that addresses climate change and fracking is premature and risks irreversible damage before the agency and public have had the opportunity to weigh the full costs of oil and gas and other fossil fuel extraction and consider necessary limits on such activities. Therefore BLM must cease all new leasing at least until the issue is adequately analyzed in a programmatic review of all U.S. fossil fuel leasing, or at least within amended RMPs.

A. BLM must limit greenhouse gas emissions by keeping federal fossil fuels in the ground.

Expansion of fossil fuel production will substantially increase the volume of greenhouse gases emitted into the atmosphere and jeopardize the environment and the health and well-being of future generations. BLM's mandate to ensure "harmonious and coordinated management of the various resources *without permanent impairment of the productivity of the land and the quality of the environment*" requires BLM to limit the climate change effects of its actions. *See* 43 U.S.C. §§ 1701(a)(7), 1702(c), 1712(c)(1), 1732(a) (emphasis added); *see also id*. § 1732(b).[214] Keeping all unleased fossil fuels in the ground and banning fracking and other unconventional well stimulation methods would lock away millions of tons of greenhouse gas pollution and limit the destructive effects of these practices.

A ban on new fossil fuel leasing and fracking is necessary to meet the U.S.'s greenhouse gas reduction commitments. On December 12, 2015, 197 nation-state and supra-national organization parties meeting in Paris at the 2015 United Nations Framework Convention on Climate Change Conference of the Parties consented to an agreement (Paris Agreement) committing its parties to take action so as to avoid dangerous climate change.[215] As the United States signed the treaty on April 22, 2016[216] as a legally binding instrument through executive agreement,[217] the Paris Agreement commits the United States to critical goals—both binding and aspirational—that mandate bold action on the United States' domestic policy to rapidly reduce greenhouse gas emissions.[218]

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[214] Directing Secretary to take any action to "prevent unnecessary or undue degradation" of the public lands.
[215] Paris Agreement, Art. 2.
[216] For purposes of this Petition, the term "treaty" refers to its international law definition, whereby a treaty is "an international law agreement concluded between states in written form and governed by international law" pursuant to article 2(a) of the Vienna Convention on the Law of Treaties, 1155 U.N.T.S. 331, 8 I.L.M. 679 (Jan. 27, 1980).
[217] *See* United Nations Treaty Collection, Chapter XXVII, 7.d Paris Agreement, List of Signatories; U.S. Department of State, Background Briefing on the Paris Climate Agreement, (Dec. 12, 2015), http://www. state.gov/ r/pa/prs/ps/2015/12/250592.htm.
[218] Although not every provision in the Paris Agreement is legally binding or enforceable, the U.S. and all parties are committed to perform the treaty commitments in good faith under the international legal principle of *pacta sunt servanda* ("agreements must be kept"). Vienna Convention on the Law of Treaties, Art. 26.

The United States and other parties to the Paris Agreement recognized "the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge."[219] The Paris Agreement articulates the practical steps necessary to obtain its goals: parties including the United States have to "reach global peaking of greenhouse gas emissions *as soon as possible* . . . and to *undertake rapid reductions* thereafter in accordance *with best available science*,"[220] imperatively commanding that developed countries specifically "should continue taking the lead by undertaking economy-wide absolute emission reduction targets"[221] and that such actions reflect the "highest possible ambition."[222]

The Paris Agreement codifies the international consensus that climate change is an "urgent threat" of global concern,[223] and commits all signatories to achieving a set of global goals. Importantly, the Paris Agreement commits all signatories to an articulated target to hold the long-term global average temperature "to *well below 2°C* above pre-industrial levels and to *pursue efforts to limit the temperature increase to 1.5°C* above pre-industrial levels"[224] (emphasis added).

In light of the severe threats posed by even limited global warming, the Paris Agreement established the international goal of limiting global warming to 1.5°C above pre-industrial levels in order to "prevent dangerous anthropogenic interference with the climate system," as set forth in the UNFCCC, a treaty which the United States has ratified and to which it is bound.[225] The Paris consensus on a 1.5°C warming goal reflects the findings of the IPCC and numerous scientific studies that indicate that 2°C warming would exceed thresholds for severe, extremely dangerous, and potentially irreversible impacts.[226] Those impacts include increased global food and water insecurity, the inundation of coastal regions and small island nations by sea level rise and increasing storm surge, complete loss of Arctic summer sea ice, irreversible melting of the Greenland ice sheet, increased extinction risk for at least 20-30% of species on Earth, dieback of the Amazon rainforest, and "rapid and terminal" declines of coral reefs worldwide.[227] As

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[219] *Id.*, Recitals.
[220] *Id.*, Art. 4(1).
[221] *Id.*, Art. 4(4).
[222] *Id.*, Art. 4(3).
[223] *Id.*, Recitals.
[224] *Id.*, Art. 2.
[225] *See* U.N. Framework Convention on Climate Change, Cancun Agreement. Available at http://cancun.unfccc.int/ (last visited Jan 7, 2015); United Nations Framework Convention on Climate Change, Copenhagen Accord. Available at http://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php (last accessed Jan 7, 2015). The United States Senate ratified the UNFCC on October 7, 1992. *See* https://www.congress.gov/treaty-document/102nd-congress/38.
[226] *See* Paris Agreement, Art. 2(1)(a); U); U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technical Advice, Report on the structured expert dialogue on the 2013-15 review, No. FCCC/SB/2015/INF.1 at 15-16 (June 2015);IPCC AR5 Synthesis Report at 65 & Box 2.4.
[227] *See* Jones, C. et al, Committed Terrestrial Ecosystem Changes due to Climate Change, 2 Nature Geoscience 484, 484–487 (2009); Smith, J. B. *et al.*, Assessing Dangerous Climate Change Through an Update of the Intergovernmental Panel on Climate Change (IPCC) 'Reasons for Concern', 106 Proceedings of the National Academy of Sciences of the United States of America 4133, 4133–37 (2009); Veron, J. E. N. *et al.*, The Coral Reef Crisis: The Critical Importance of <350 ppm CO2, 58 Marine Pollution Bulletin 1428, 1428–36, (2009); Warren, R. J. *et al.*, Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141–77 (2011); Hare, W. W. *et al.*, Climate Hotspots: Key Vulnerable Regions, Climate Change and Limits to Warming, 11 Regional Environmental Change 1, 1–13 (2011); Frieler, K. M. *et al.*, Limiting

scientists noted, the impacts associated with 2°C temperature rise have been "revised upwards, sufficiently so that 2°C now more appropriately represents the threshold between 'dangerous' and 'extremely dangerous' climate change."[228] Consequently, a target of 1.5 ºC or less temperature rise is now seen as essential to avoid dangerous climate change and has largely supplanted the 2°C target that had been the focus of most climate literature until recently.

Immediate and aggressive greenhouse gas emissions reductions are necessary to keep warming below a 1.5º or 2°C rise above pre-industrial levels. Put simply, there is only a finite amount of CO_2 that can be released into the atmosphere without rendering the goal of meeting the 1.5°C target virtually impossible. A slightly larger amount could be burned before meeting a 2°C became an impossibility. Globally, fossil fuel reserves, if all were extracted and burned, would release enough CO_2 to exceed this limit several times over.[229]

The question of what amount of fossil fuels can be extracted and burned without negating a realistic chance of meeting a 1.5 or 2°C target is relatively easy to answer, even if the answer is framed in probabilities and ranges. The IPCC Fifth Assessment Report and other expert assessments have established global carbon budgets, or the total amount of remaining carbon that can be burned while maintaining some probability of staying below a given temperature target. According to the IPCC, total cumulative anthropogenic emissions of CO_2 must remain below about 1,000 gigatonnes ($GtCO_2$) from 2011 onward for a 66% probability of limiting warming to 2°C above pre-industrial levels.[230] Given more than 100 $GtCO_2$ have been emitted since 2011,[231] the remaining portion of the budget under this scenario is well below 900 $GtCO_2$. To have an 80% probability of staying below the 2°C target, the budget from 2000 is 890 $GtCO_2$, with less than 430 $GtCO_2$ remaining.[232]

To have even a 50% probability of achieving the Paris Agreement goal of limiting warming to 1.5°C above pre-industrial levels equates to a carbon budget of 550-600 $GtCO_2$ from 2011 onward,[233] of which more than 100 $GtCO_2$ has already been emitted. To achieve a 66% probability of limiting warming to 1.5°C requires adherence to a more stringent carbon budget of

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Global Warming to 2ºC is Unlikely to Save Most Coral Reefs, Nature Climate Change, Published Online (2013) doi: 10.1038/NCLIMATE1674; M. Schaeffer *et al.*, Adequacy and Feasibility of the 1.5°C Long-Term Global Limit, Climate Analytics (2013).

[228] Anderson, K. and A. Bows, Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World, 369 Philosophical Transactions, Series A, Mathematical, Physical, and Engineering Sciences 20, 20–44 (2011).

[229] Marlene Cimons, Keep It In the Ground 6 (Sierra Club *et al.*, Jan. 25, 2016).

[230] IPCC, 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Summary for Policymakers at 27; IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change at 64 & Table 2.2 [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)] at 63-64 & Table 2.2 ("IPCC AR5 Synthesis Report").

[231] From 2012-2014, 107 GtCO2 was emitted (*see* Annual Global Carbon Emissions at http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions.html).

[232] Carbon Tracker Initiative, Unburnable Carbon – Are the world's financial markets carrying a carbon bubble? available at http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf; Meinshausen, M. *et al.*, Greenhouse gas emission targets for limiting global warming to 2 degrees Celsius, 458 Nature 1158, 1159 (2009)

[233] IPCC AR5 Synthesis Report at 64 & Table 2.2.

only 400 $GtCO_2$ from 2011 onward,[234] of which less than 300 $GtCO_2$ remained at the start of 2015. An 80% probability budget for 1.5°C would have far less that 300 $GtCO_2$ remaining. Given that global CO_2 emissions in 2014 alone totaled 36 $GtCO_2$,[235] humanity is rapidly consuming the remaining burnable carbon budget needed to have even a 50/50 chance of meeting the 1.5°C temperature goal.[236]

According to a recent report by EcoShift Consulting commissioned by the Center and Friends of the Earth, unleased (and thus unburnable) federal fossil fuels represent a significant source of potential greenhouse gas emissions:

- Potential GHG emissions of federal fossil fuels (leased and unleased) if developed would release up to 492 gigatons (Gt) (one gigaton equals 1 billion tons) of carbon dioxide equivalent pollution (CO2e); representing 46 percent to 50 percent of potential emissions from all remaining U.S. fossil fuels.
- Of that amount, up to 450 Gt CO2e have not yet been leased to private industry for extraction;
- Releasing those 450 Gt CO2e (the equivalent annual pollution of more than 118,000 coal-fired power plants) would be greater than any proposed U.S. share of global carbon limits that would keep emissions below scientifically advised levels.

Fracking has also opened up vast reserves that otherwise would not be available, increasing the potential greenhouse gas emissions that can be released into the atmosphere. BLM must consider a ban on this dangerous practice and a ban on new leasing to prevent the worst effects of climate change.

B. <u>BLM must consider a ban on new oil and gas leasing and fracking in a programmatic review and halt all new leasing and fracking in the meantime.</u>

Development of unleased oil and gas resources will fuel climate disruption and undercut the needed transition to a clean energy economy. As BLM has not yet had a chance to consider no-leasing and no-fracking alternatives as part of any of its RMP planning processes or a comprehensive review of its federal oil and gas leasing program, BLM should suspend new leasing until it properly considers this alternative in updated RMPs or a programmatic EIS for the entire leasing program. BLM demonstrably has tools available to consider the climate consequences of its leasing programs, and alternatives available to mitigate those consequences,

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[234] *Id*.
[235] *See* Global Carbon Emissions, http://co2now.org/Current-CO2/CO2-Now/global-carbon-emissions.html
[236] In addition to limits on the *amount* of fossil fuels that can be utilized, emissions pathways compatible with a 1.5 or 2°C target also have a significant temporal element. Leading studies make clear that to reach a reasonable likelihood of stopping warming at 1.5° or even 2°C, global CO2 emissions must be phased out by mid-century and likely as early as 2040-2045. *See, e.g*. Joeri Rogelj *et al.*, Energy system transformations for limiting end-of-century warming to below 1.5°C, 5 Nature Climate Change 519, 522 (2015). United States focused studies indicate that we must phase out fossil fuel CO2 emissions even earlier—between 2025 and 2040—for a reasonable chance of staying below 2ºC. *See, e.g*. Climate Action Tracker, http://climateactiontracker.org/countries/usa. Issuing new legal entitlements to explore for and extract federal fossil fuels for decades to come is wholly incompatible with such a transition.

at either a regional or national scale.[237] Indeed, in its 2010 Supplementary Implementation Report, BLM inventoried greenhouse gas emissions from its Montana/Dakotas leasing activities and listed alternatives to mitigate emissions, but has never considered reasonable alternatives that would limit and/or condition leasing to mitigate greenhouse gas emissions.

BLM would be remiss to continue leasing when it has never stepped back and taken a hard look at this problem at the programmatic scale. Before allowing more oil and gas extraction in the planning area, BLM must: (1) comprehensively analyze the total greenhouse gas emissions which result from past, present, and potential future fossil fuel leasing and all other activities across all BLM lands and within the various planning areas at issue here, (2) consider their cumulative significance in the context of global climate change, carbon budgets, and other greenhouse gas pollution sources outside BLM lands and the planning area, and (3) formulate measures that avoid or limit their climate change effects. By continuing leasing and allowing new fracking in the absence of any overall plan addressing climate change BLM is effectively burying its head in the sand.

A programmatic review and moratorium on new leasing would be consistent with the Secretary of Interior's recent order to conduct a comprehensive, programmatic EIS (PEIS) on its coal leasing program, in light of the need to take into account the program's impacts on climate change, among other issues, and "the lack of any recent analysis of the Federal coal program as a whole."[238] Specifically, the Secretary directed that the PEIS "should examine how best to assess the climate impacts of continued Federal coal production and combustion and how to address those impacts in the management of the program to meet both the Nation's energy needs and its climate goals, as well as how best to protect the public lands from climate change impacts."[239]

The Secretary also ordered a moratorium on new coal leasing while such a review is being conducted. The Secretary reasoned:

> Lease sales and lease modifications result in lease terms of 20 years and for so long thereafter as coal is produced in commercial quantities. Continuing to conduct lease sales or approve lease modifications during this programmatic review risks locking in for decades the future development of large quantities of coal under current rates and terms that the PEIS may ultimately determine to be less than optimal. This risk is why, during the previous two programmatic reviews, the Department halted most lease sales with limited exceptions…. Considering these factors and given the extensive recoverable reserves of Federal coal currently under lease, I have decided that a similar policy is warranted here. A pause on leasing, with limited exceptions, will allow future leasing decisions to

[237] *See, e.g.*, BLM Montana, North Dakota and South Dakota, Climate Change Supplementary Information Report (updated Oct. 2010) (conducting GHG inventory for BLM leasing in Montana, North Dakota and South Dakota); BLM, Proposed Rule: Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 6615 (Feb. 8, 2016) (proposing BLM-wide rule for prevention of methane waste).
[238] *See* The Secretary of the Interior, Order No. 3338 re: Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program, U.S. Department of the Interior (Jan 15, 2016).
[239] *Id*. § 4(c).

benefit from the recommendations that result from the PEIS while minimizing any economic hardship during that review.[240]

The Secretary's reasoning is also apt here. A programmatic review assessing the climate change effects of public fossil fuels is long overdue. And there is no shortage of oil and gas that would preclude a moratorium while such a review is conducted, as evidenced by very low natural oil and gas prices. More importantly, BLM should not "risk[] locking in for decades the future development of large quantities of [fossil fuels] under current…terms that a [programmatic review] may ultimately determine to be less than optimal."[241] BLM should cancel the sale and halt all new leasing and fracking until a programmatic review is completed.

1. The dangers of hydraulic fracking and horizontal drilling.

New information, not adequately addressed in the HiLine RMPs, makes clear that the use of hydraulic fracturing within the area is both readily foreseeable and already occurring with significant environment environmental consequences. NEPA regulations and case law require that BLM evaluate all "reasonably foreseeable" direct and indirect effects of its leasing.[242]

The proposed leasing action is part of a dramatic recent increase in oil and gas leasing in the areas at issue, and reflects increased industry interest in developing Montana's fossil fuel resources. The entire basis for this surge of interest is the possibility that hydraulic fracturing and other advanced recovery techniques will allow the profitable exploitation of geologic formations previously perceived as insufficiently valuable for development. Elements of these technologies have been used individually for decades. However, the combination of practices employed by industry recently is new: "Modern formation stimulation practices have become more complex and the process has developed into a sophisticated, engineered process in which production companies strive to design a hydraulic fracturing treatment to emplace fracture networks in specific areas."[243]

Hydraulic fracturing brings with it all of the harms to water quality, air quality, the climate, species, and communities associated with traditional oil and gas development, but also brings increased risks in many areas. Analysis of the consequences of this practice, prior to irrevocable consequences, is therefore required at the leasing stage. Oil and gas leasing is an irrevocable commitment to convey rights to use of federal land – a commitment with readily predictable environmental consequences that BLM is required to address. These include the specific geological formations, surface and ground water resources, seismic potential, or human, animal, and plant health and safety concerns present in the area to be leased.

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[240] *Id*. § 5.
[241] *Id*.
[242] . 40 C.F.R. § 1508.8; *Davis v. Coleman*, 521 F.2d 661, 676 (9th Cir. 1975)*; Center for Biological Diversity v. Bureau of Land Management* ("*CBD*"), 937 F. Supp. 2d 1140 (N.D. Cal. 2013) (holding that oil and gas leases were issued in violation of NEPA where BLM failed to prepare an EIS and unreasonably concluded that the leases would have no significant environmental impact because the agency failed to take into account all reasonably foreseeable development under the leases).
[243] Arthur, J. Daniel et al., Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale at 2 (Sep. 2008) ("Arthur") at 9.

Hydraulic fracturing, a dangerous practice in which operators inject toxic fluid underground under extreme pressure to release oil and gas, has greatly increased industry interest in developing tightly held oil and gas deposits such as those in the proposed lease area. The first aspect of this technique is the hydraulic fracturing of the rock. When the rock is fractured, the resulting cracks in the rock serve as passages through which gas and liquids can flow, increasing the permeability of the fractured area. To fracture the rock, the well operator injects hydraulic fracturing fluid at tremendous pressure. The composition of fracturing fluid has changed over time. Halliburton developed the practice of injecting fluids into wells under high pressure in the late 1940s;[244] however, companies now use permutations of "slick-water" fracturing fluid developed in the mid-1990s.[245] The main ingredient in modern fracturing fluid (or "frack fluid") is generally water, although liquefied petroleum has also been used as a base fluid for modern fracking.[246] The second ingredient is a "proppant," typically sand, that becomes wedged in the fractures and holds them open so that passages remain after pressure is relieved.[247] In addition to the base fluid and proppant, a mixture of chemicals are used, for purposes such as increasing the viscosity of the fluid, keeping proppants suspended, impeding bacterial growth or mineral deposition.[248]

Frack fluid is hazardous to human health, although industry's resistance to disclosing the full list of ingredients formulation of frack fluid makes it difficult for the public to know exactly how dangerous.[249] A congressional report sampling incomplete industry self-reports found that "[t]he oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act."[250] Recently published scientific papers also describe the harmfulness of the chemicals often in fracking fluid. One study reviewed a list of 944 fracking fluid products containing 632 chemicals, 353 of which could be identified with Chemical Abstract Service numbers.[251] The study concluded that more than 75 percent of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems; approximately 40 to 50 percent could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37 percent could affect the endocrine system; and 25 percent could cause cancer and mutations.[252]

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[244] Tompkins, How will High-Volume (Slick-water) Hydraulic Fracturing of the Marcellus (or Utica) Shale Differ from Traditional Hydraulic Fracturing? Marcellus Accountability Project at 1 (Feb. 2011).
[245] New York State Department of Environmental Conservation, *Final Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs* (2015) ("NYDEC SGEIS") at 5-5.
[246] *Id.*; Arthur at 10; Waxman, Henry et al., United States House of Representatives, Committee on Energy and Commerce, Minority Staff, Chemicals Used in Hydraulic Fracturing (Apr. 2011) ("Waxman 2011b").
[247] Arthur at 10.
[248] Arthur at 10.
[249] Waxman 2011b; *see also* Colborn, Theo et al., *Natural Gas Operations for a Public Health Perspective*, 17 Human and Ecological Risk Assessment 1039 (2011) ("Colborn 2011"); McKenzie, Lisa et al., *Human Health Risk Assessment of Air Emissions form Development of Unconventional Natural Gas Resources*, Sci Total Environ (2012), doi:10.1016/j.scitotenv.2012.02.018 ("McKenzie 2012").
[250] Waxman 2011b at 8.
[251] Colborn 2011 at 1.
[252] Colborn 2011 at 1.

The impacts associated with the fracking-induced oil and gas development boom has caused some jurisdictions to place a moratorium or ban on fracking. For instance, in 2011 France became the first country to ban the practice.[253] In May, Vermont became the first state to ban fracking. Vermont's governor called the ban "a big deal" and stated that the bill "will ensure that we do not inject chemicals into groundwater in a desperate pursuit for energy."[254] New York State halted fracking within its borders in 2008, continued the moratorium in 2014 and banned the practice in 2015.The state's seven-year review concluded that fracking posed risks to land, water, natural resources and public health.[255] [256] Also, New Jersey's legislature recently passed a bill that would prevent fracking waste, like toxic wastewater and drill cuttings, from entering its borders,[257] and Pennsylvania, ground zero for the fracking debate, has banned "natural-gas exploration across a swath of suburban Philadelphia . . . ."[258] Numerous cities and communities, like Buffalo, Pittsburgh, Raleigh, Woodstock, and Morgantown have banned fracking.[259]

Separate from hydraulic fracturing, the second technological development underlying the recent shale boom is the use of horizontal drilling. Shale oil and shale gas formations are typically located far below the surface, and as such, the cost of drilling a vertical well to access the layer is high.[260] The shale formation itself is typically a thin layer; however, such that a vertical well only provides access to a small volume of shale—the cylinder of permeability surrounding the well bore.[261] Although hydraulic fracturing increases the radius of this cylinder of shale, this effect is often itself insufficient to allow profitable extraction of shale resources.[262] Horizontal drilling solves this economic problem: by drilling sideways along the shale formation once it is reached, a company can extract resources from a much higher volume of shale for the same amount of drilling through the overburden, drastically increasing the fraction of total well length that passes through producing zones.[263] The practice of combining horizontal drilling with hydraulic fracturing was developed in the early 1990s.[264]

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[253] Castelvecchi, Davide, *France becomes first country to ban extraction of natural gas by fracking*, Scientific American (Jun. 30, 2011).
[254] CNN Staff Writer, *Vermont first state to ban fracking*, CNN U.S. (May 17, 2012).
[255] Public News Service - NY, *Cuomo Declares: No Fracking for Now in NY.* See: http://www.publicnewsservice.org/2014-12-18/health-issues/cuomo-declares-no-fracking-for-now-in-ny/a43579-1 .
[256] RT Network. June 30, 2015. *It's official: New York bans fracking.* https://www.rt.com/usa/270562-new-york-fracking-ban/ .
[257] Tittel, Jeff, *Opinion: Stop fracking waste from entering New Jersey's borders* (Jul 14, 2012) *available at* http://www.nj.com/times-opinion/index.ssf/2012/07/opinion_stop_fracking_waste_fr.html .
[258] Philly.com, *Fracking ban is about our water*, The Inquirer (Jul. 11, 2012).
[259] *CBS, Pittsburgh Bans Natural Gas Drilling,* CBS/AP (Dec 8, 2010)*;* Wooten, Michael *City of Buffalo Bans Fracking* (Feb. 9, 2011); The Raleigh Telegram, *Raleigh City Council Bans Fracking Within City Limits* (Jul. 11, 2012); Kemble, William, *Woodstock bans activities tied to fracking*, Daily Freeman (Jul. 19, 2012); MetroNews.com, *Morgantown Bans Fracking* (June 22, 2011), *available at* http://www.wvmetronews.com/news.cfm?func=displayfullstory&storyid=46214.
[260] CITI, Resurging North American Oil Production and the Death of the Peak Oil Hypothesis at 9 (Feb.15, 2012) ("CITI"); United States Energy Information Administration, Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays at 4 (Jul. 2011) ("USEIA 2011"); Orszag, Peter, Fracking Boom Could Finally Cap Myth of Peak Oil (Jan. 31, 2011) ("Orszag").
[261] *Id.*
[262] *Id.*; Arthur at 8 (Figure 4).
[263] Venoco, Inc., Monterey Shale Focused Analyst Day Slide Show at 23 (May 26, 2010) ("Venoco Slide Show"), USEIA 2012a at 63.
[264] *Id.*

A third technological development is the use of "multi-stage" fracking. In the 1990s industry began drilling longer and longer horizontal well segments. The difficulty of hydraulic fracturing increases with the length of the well bore to be fractured, however, both because longer well segments are more likely to pass through varied conditions in the rock and because it becomes difficult to create the high pressures required in a larger volume.[265] In 2002 industry began to address these problems by employing multi-stage fracking. In multi-stage fracking, the operator treats only part of the wellbore at a time, typically 300 to 500 feet.[266] Each stage "may require 300,000 to 600,000 gallons of water," and consequently, a frack job that is two or more stages can contaminate and pump into the ground over a million gallons of water.[267]

Notwithstanding the grave impacts that these practices have on the environment, this new combination of multi-stage slickwater hydraulic fracturing and horizontal drilling has made it possible to profitably extract oil and gas from formations that only a few years ago were generally viewed as uneconomical to develop.[268] The effect of hydraulic fracturing on the oil and gas markets has been tremendous, with many reports documenting the boom in domestic energy production. A recent congressional report notes that "[a]s a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades."[269] A 2011 U.S. EIA report notes how recently these changes have occurred, stating that "only in the past 5 years has shale gas been recognized as a 'game changer' for the U.S. natural gas market."[270] With respect to oil, the EIA notes that oil production has been increasing, with the production of shale oil resources pushing levels even higher over the next decade:

> Domestic crude oil production has increased over the past few years, reversing a decline that began in 1986. U.S. crude oil production increased from 5.0 million barrels per day in 2008 to 5.5 million barrels per day in 2010. Over the next 10 years, continued development of tight oil, in combination with the ongoing development of offshore resources in the Gulf of Mexico, pushes domestic crude oil production higher.[271]

Thus, it is evident that fracking, including fracking with the most recent techniques that have been associated with serious adverse impacts in other areas of the country, is poised to expand; it is further evident that the oil and gas industry is still exploring new locations to develop, and the nation has not yet seen the full extent of fracking's impact on oil and gas development and production.

In large part through the use of fracking, the oil and gas sector is now producing huge amounts of oil and gas throughout the United States, rapidly transforming the domestic energy

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[265] NYDEC SGEIS at 5-93.
[266] *Id.*
[267] *Id.*
[268] *See* CITI at 9 ; USEIA 2011 at 4; Orszag, Peter, *Fracking Boom Could Finally Cap Myth of Peak Oil* (Jan. 31, 2011) ("Orszag").
[269] Waxman 2011b at 1.
[270] USEIA 2011 at 4.
[271] USEIA 2012a at 2

outlook. Fracking is occurring in the absence of any adequate federal or state oversight. The current informational and regulatory void on the state level makes it even more critical that the BLM perform its legal obligations to review, analyze, disclose, and avoid and mitigate the impacts of its oil and gas leasing decisions. Further, given the failure of the existing Green River, Rawlins, Kemmerer, and Pinedale RMPs to adequately address the impacts of fracking, it would be inappropriate for BLM to simply refer to the environmental analysis for these documents.

2. Fossil fuel development will exacerbate climate change.

a. BLM must fully analyze greenhouse gas emissions of oil and gas operations.

BLM cannot ignore the mounting evidence proving that oil and gas operations are a major cause of climate change. This is due to emissions from the operations themselves, and emissions from the combustion of the oil and gas produced. Every step of the lifecycle process for development of these resources results in significant carbon emissions, including but not limited to:

End-user oil and gas combustion emissions. The combustion of extracted oil and gas will add vast amounts of carbon dioxide to the atmosphere, further heating the climate and moving the Earth closer to catastrophic and irreversible climate change. Though much of the oil is used as gasoline to fuel the transportation sector, the produced oil may also be used in other types of products. The EIS should study all end-uses as contributors to climate change.

Combustion in the distribution of product. To the extent that distribution of raw and end-use products will rely on rail or trucks, the combustion of gasoline or diesel to transport these products will emit significant greenhouse gas emissions.

Emissions from Refineries and Production. Oil and gas must undergo intensive refinery and production processes before the product is ready for consumption. Refineries and their auxiliary activities constitute a significant source of emissions.

Vented emissions. Oil and gas wells may vent gas that flows to the surface at times where the gas cannot otherwise be captured and sold. Vented gas is a significant source of greenhouse gas emissions and can also pose a safety hazard.

Combustion during construction and extraction operations. Operators rely on both mobile and stationary sources of power to construct and run their sites. The engines of drilling or excavation equipment, pumps, trucks, conveyors, and other types of equipment burn large amounts of fuel to operate. Carbon dioxide, methane, and nitrous oxide (another potent greenhouse gas) are emitted from oxidized fuel during the combustion process. Engines emit greenhouse gases during all stages of oil and gas recovery, including drilling rig mobilization, site preparation and demobilization, completion rig mobilization and demobilization, well drilling, well completion (including fracking and other unconventional extraction techniques), and well production. Transportation of equipment and chemicals to and from the site is an integral part of the production process and contributes to greenhouse gas emissions. Gas flaring is another important source of

carbon dioxide emissions. Significant sources of emissions in oil production include pneumatic devices, dehydrators and pumps, and compressors, and system upsets.[272]

Fugitive emissions. Potent greenhouse gases can leak as fugitive emissions at many different points in the production process, especially in the production of gas wells. Recent studies suggest that previous estimates significantly underestimate leakage rates.[273] New research shows methane leakage from some gas wells may be as high at 17.3 percent.[274] Moreover, new research has shown that unconventional gas wells are up to 2.7 times more likely than a conventional well to have a cement or casing impairment, which can lead to methane leaks.[275] The intersection of new fractures with nearby abandoned wells can also result in methane migration to the surface.[276] Leakage can also occur during storage, processing, and distribution to customers.[277]

Natural gas emissions are generally about 84 percent methane.[278] Methane is a potent greenhouse gas that contributes substantially to global climate change. Its global warming potential is approximately 34 times that of carbon dioxide over a 100 year time frame and at least 86 times that of carbon dioxide over a 20 year time frame.[279] Oil and gas operations release large amounts of methane. While the exact amount is not clear, EPA has estimated that "oil and gas systems are the largest human-made source of methane emissions and account for 37 percent of methane emissions in the United States and is expected to be one of the most rapidly growing sources of anthropogenic methane emissions in the coming decades."[280] That proportion is based

[272] U.S. Environmental Protection Agency, National Gas STAR Program, Basic Information, Major Methane Emission Sources and Opportunities to Reduce Methane Emissions ("USEPA, Basic Information").
[273] Brandt, A. R. *et al., Methane leaks from North American natural gas systems, 343* Science 733 *(2014);* Miller, S. M. et al. Anthropogenic Emissions of Methane in the United States, Proc. Natl. Acad. Sci. Early Edition, DOI: 10.1073/pnas.1314392110 (2013) ("Miller 2013").
[274] Caulton, Dana R. et al., Toward a Better Understanding and Quantification of Methane Emissions from Shale Gas Development, 111 Proc. Natl. Acad. Sciences 17 (2014); Schneising, Oliver, et al., Remote Sensing of Fugitive Methane Emissions from Oil and Gas Production in North American Tight Geologic Formations, Earth's Future 2, doi:10.1002/2014EF000265 (2014); Allen, D. T. et al., (2013), *Measurements of Methane Emissions at Natural Gas Production Sites in the United States*, 110 Proc. Natl. Acad. Sci. 44 (2013) ("Allen 2013"); Zavala-Araizaa, Daniel et al., Reconciling divergent estimates of oil and gas methane emissions, 112 Proc. Natl. Acad. Sciences 51 (2015), *available at* www.pnas.org/cgi/doi/10.1073/pnas.1522126112 *(*leakage rate 1.5% of production in Barnett shale or twice EPA's estimate); Vaidyanathan, G, *Bad news for the climate as methane leaks far surpass previous estimates*, E&E News (Dec. 8, 2015) (leakage rate in Barnett shale equal to annual emissions of 8,000 cars).
[275] Ingraffea, Anthony R, et al., Assessment and Risk Analysis of Casing and Cement Impairment in Oil and Gas Wells in Pennsylvania, 2000 – 2012, 111 Proc. Natl. Acad. Sciences 30 (2014).
[276] King, Pamela. *'Frack hits' provide pathways for methane migration study* , E&E News (Oct. 21, 2015).
[277] Howarth, R. W. A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas, Energy Science and Engineering 2014; 2(2): 47–60, 49 ("Howarth 2014").
[278] Brown Memo to EPA at 3; Power, Thomas, The Local Impacts of Natural Gas Development in Valle Vidal, New Mexico, University of Montana (2005) ("Power").
[279] Intergovernmental Panel on Climate Change, Chapter 8: Anthropogenic and Natural Radiative Forcing in Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table 8.7 (2013); Howarth, Robert, et al., Methane and the greenhouse-gas footprint of natural gas from shale formations, Climactic Change (Mar. 31, 2011) ("Howarth 2011"); Shindell, Drew, *Improved Attribution of Climate Forcing to Emissions*, 326 Science 716 (2009).
[280] USEPA, Basic Information; *see also* Petron, Gabrielle, et al., Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study, 117 Journal of Geophysical Research (2012).

on an estimated calculation of methane emissions, rather than measured actual emissions, which indicate that methane emissions may be much greater in volume than calculated.[281]

Fracked wells leak an especially large amount of methane, with some evidence indicating that the leakage rate is so high that shale gas is worse for the climate than coal.[282] In fact, a research team associated with the National Oceanic and Atmospheric Administration recently reported that preliminary results from a field study in the Uinta Basin of Utah suggest that the field leaked methane at an eye-popping rate of nine percent of total production.[283]

The EIS must weigh the no-leasing and no-fracking alternatives' climate-change benefits against the impacts of allowing new leasing and fracking, and address the following:

1. Sources of greenhouse gases.

In performing a full analysis of climate impacts, BLM must consider all potential sources of greenhouse gas emissions (e.g. greenhouse gas emissions generated by transporting large amounts of water for fracking). BLM should also perform a full analysis of all gas emissions that contribute to climate change, including methane and carbon dioxide. The EIS should calculate the amount of greenhouse gas that will result on an annual basis from (1) each of the fossil fuels that can be developed within the planning area, (2) each of the well stimulation or other extraction methods that can be used, including, but not limited to, fracking, acidization, acid fracking, and gravel packing, and (3) cumulative greenhouse gas emissions expected over the long term (expressed in global warming potential of each greenhouse pollutant as well as CO_2 equivalent), including emissions throughout the entire fossil fuel lifecycle discussed above.

2. Effects of Climate Change

In addition to quantifying the total emissions that would result from the lease sale, an EIS should consider the environmental effects of these emissions, resulting from climate disruption's ecological and social effects.[284] Release of greenhouse gases (from extraction, leakage, and downstream combustion) is not merely a reasonably foreseeable consequence of fracking extraction, it is the necessary and intended consequence. CEQ and the courts have repeatedly cautioned federal agencies that they cannot ignore either climate change generally, or the combustion impacts of fossil fuel extraction in particular. *See* 40 C.F.R. §§ 1508.7, 1508.8; *Center for Biological Diversity v. Nat'l Highway Transp. Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008); *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1176 (10th

[281] Miller, S. M. et al., Anthropogenic Emissions of Methane in the United States, Proc. Natl. Acad. Sci. Early Edition, DOI: 10.1073/pnas.1314392110 (2013).
[282] Howarth 2011; Brune, Michael, Statement of Sierra Club Executive Director Michael Brune Before the Committee on Oversight & Government Reform (May 31, 2012); Wang, Jinsheng, et al., Reducing the Greenhouse Gas Footprint of Shale (2011); Alvarez, Ramon et al., Greater focus needed on methane leakage from natural gas infrastructure, Proc. Nat'l. Acad. Sci. Early Edition (Feb 13, 2012) at 3; *see also* Howarth, Robert, et al., Venting and Leaking of Methane from Shale Gas Development: Response to Cathles et al., (2012); Hou, Deyi, et al., Shale gas can be a double-edged sword for climate change, Nature Climate Change at 386 (2012)
[283] Tollefson, Jeff, *Methane leaks erode green credentials of natural gas*, Nature News (Jan 2, 2013).
[284] *See* Council on Environmental Quality 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 10 (August 5, 2016).

Cir. 2002); *Dine Citizens Against Ruining Our Env't v. U.S. Office of Surface Mining*, 82 F.Supp.3d 1201, 1212-14 (D. Colo. 2015).

On December 12, 2015, nearly 200 governments, including the United States, agreed to the commitments enumerated in the Paris Agreement to "strengthen the global response to the threat of climate change."[285] The Paris Agreement codified the international consensus that the climate crisis is an urgent threat to human societies and the planet, with the parties recognizing that:

> Climate change represents an *urgent and potentially irreversible threat to human societies and the planet* and thus requires the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions (emphasis added).[286]

Numerous authoritative scientific assessments have established that climate change is causing grave harms to human society and natural systems, and these threats are becoming increasingly dangerous. The Intergovernmental Panel on Climate Change (IPCC), in its 2014 Fifth Assessment Report, stated that: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" and that "[r]ecent climate changes have had widespread impacts on human and natural systems."[287]

The 2014 Third National Climate Assessment, prepared by a panel of non-governmental experts and reviewed by the National Academy of Sciences and multiple federal agencies similarly stated that "That the planet has warmed is 'unequivocal,' and is corroborated though multiple lines of evidence, as is the conclusion that the causes are very likely human in origin"[288] and "[i]impacts related to climate change are already evident in many regions and are expected to become increasingly disruptive across the nation throughout this century and beyond."[289] The United States National Research Council similarly concluded that: "[c]limate change is occurring, is caused largely by human activities, and poses significant risks for—and in many cases is already affecting—a broad range of human and natural systems."[290]

The IPCC and National Climate Assessment further decisively recognize the dominant

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[285] Paris Agreement, Art. 2(1).
[286] Paris Agreement, Decision, Recitals.
[287] IPCC AR5 Synthesis Report at 2.
[288] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment(U.S. Global Change Research Program). doi:10.7930/J0Z31WJ2 ("Third National Climate Assessment") at 61 (quoting IPCC, 2007:. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, Eds., Cambridge University Press, 1-18.).
[289] Third National Climate Assessment at 10.
[290] National Research Council, Advancing the Science of Climate Change (2010), available at www.nap.edu. ("Advancing the Science of Climate Change") at 2.

role of fossil fuels in driving climate change:

> While scientists continue to refine projections of the future, observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases. These emissions come mainly from burning coal, oil, and gas, with additional contributions from forest clearing and some agricultural practices.[291]
> ***
>
> CO_2 emissions from fossil fuel combustion and industrial processes contributed about 78% to the total GHG emission increase between 1970 and 2010, with a contribution of similar percentage over the 2000–2010 period (*high confidence*).[292]

These impacts ultimately emanating from the extraction and combustion of fossil fuels are harming the United States in myriad ways, with the impacts certain to worsen over the coming decades absent deep reductions in domestic and global GHG emissions. EPA recognized these threats in its 2009 Final Endangerment Finding under Clean Air Act Section 202(a), concluding that greenhouse gases from fossil fuel combustion endanger public health and welfare: "the body of scientific evidence compellingly supports [the] finding" that "greenhouse gases in the atmosphere may reasonably be anticipated both to endanger public health and to endanger public welfare."[293] In finding that climate change endangers public health and welfare, EPA has acknowledged the overwhelming evidence of the documented and projected effects of climate change upon the nation:

*Effects on air quality: "*The evidence concerning adverse air quality impacts provides strong and clear support for an endangerment finding. Increases in ambient ozone are expected to occur over broad areas of the country, and they are expected to increase serious adverse health effects in large population areas that are and may continue to be in nonattainment. The evaluation of the potential risks associated with increases in ozone in attainment areas also supports such a finding**."**[294]

*Effects on health from increased temperatures: "*The impact on mortality and morbidity associated with increases in average temperatures, which increase the likelihood of heat waves, also provides support for a public health endangerment finding.**"**[295]

Increased chance of extreme weather events: "The evidence concerning how human induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. Additionally, public health is expected to be adversely affected by an increase in the

[291] Third National Climate Assessment at 2.
[292] IPCC AR5 Synthesis Report at 46.
[293] Final Endangerment Finding, 74 Fed. Reg. at 66,497.
[294] *Id.*
[295] *Id.*

severity of coastal storm events due to rising sea levels."[296]

Impacts to water resources: "Water resources across large areas of the country are at serious risk from climate change, with effects on water supplies, water quality, and adverse effects from extreme events such as floods and droughts. Even areas of the country where an increase in water flow is projected could face water resource problems from the supply and water quality problems associated with temperature increases and precipitation variability, as well as the increased risk of serious adverse effects from extreme events, such as floods and drought. The severity of risks and impacts is likely to increase over time with accumulating greenhouse gas concentrations and associated temperature increases."[297]

Impacts from sea level rise: "The most serious potential adverse effects are the increased risk of storm surge and flooding in coastal areas from sea level rise and more intense storms. Observed sea level rise is already increasing the risk of storm surge and flooding in some coastal areas. The conclusion in the assessment literature that there is the potential for hurricanes to become more intense (and even some evidence that Atlantic hurricanes have already become more intense) reinforces the judgment that coastal communities are now endangered by human-induced climate change, and may face substantially greater risk in the future. Even if there is a low probability of raising the destructive power of hurricanes, this threat is enough to support a finding that coastal communities are endangered by greenhouse gas air pollution. In addition, coastal areas face other adverse impacts from sea level rise such as land loss due to inundation, erosion, wetland submergence, and habitat loss. The increased risk associated with these adverse impacts also endangers public welfare, with an increasing risk of greater adverse impacts in the future."[298]

Impacts to energy, infrastructure, and settlements: "Changes in extreme weather events threaten energy, transportation, and water resource infrastructure. Vulnerabilities of industry, infrastructure, and settlements to climate change are generally greater in high-risk locations, particularly coastal and riverine areas, and areas whose economies are closely linked with climate-sensitive resources. Climate change will likely interact with and possibly exacerbate ongoing environmental change and environmental pressures in settlements, particularly in Alaska where indigenous communities are facing major environmental and cultural impacts on their historic lifestyles."[299]

Impacts to wildlife: "Over the 21st century, changes in climate will cause some species to shift north and to higher elevations and fundamentally rearrange U.S. ecosystems. Differential capacities for range shifts and constraints from development, habitat fragmentation, invasive species, and broken ecological connections will likely alter ecosystem structure, function, and services, leading to predominantly negative consequences for biodiversity and the provision of ecosystem goods and services."[300]

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[296] *Id.* at 66,497-98.
[297] *Id.* at 66,498.
[298] *Id.*
[299] *Id.*
[300] *Id.*; *see also* Third National Climate Assessment at 195-219.

In addition to these acknowledged impacts on public health and welfare more generally, climate change is causing and will continue to cause serious impacts on natural resources that the Department of Interior is specifically charged with safeguarding.[301]

Impacts to Public Lands: Climate change is causing and will continue to cause specific impacts to public lands ecosystem services. Although public lands provide a variety of difficult-to-quantify public benefits, one recent Forest Service attempt at quantification estimates the public land ecosystem services at risk from climate change at between $14.5 and $36.1 billion annually.[302] In addition to the general loss of ecosystem services, irreplaceable species and aesthetic and recreational treasures are at risk of permanent destruction. High temperatures are causing loss of glaciers in Glacier National Park; the Park's glaciers are expected to disappear entirely by 2030, with ensuing warming of stream temperatures and adverse effects to aquatic ecosystems.[303] With effects of warming more pronounced at higher latitudes, tundra ecosystems on Alaska public lands face serious declines, with potentially serious additional climate feedbacks from melting permafrost.[304] In Florida, the Everglades face severe ecosystem disruption from already-occurring saltwater incursion.[305] Sea level rise will further damage freshwater ecosystems and the endangered species that rely on them.

Impacts to Biodiversity and Ecosystems: Across the United States ecosystems and biodiversity, including those on public lands, are directly under siege from climate change—leading to the loss of iconic species and landscapes, negative effects on food chains, disrupted migrations, and the degradation of whole ecosystems.[306] Specifically, scientific evidence shows that climate change is already causing changes in distribution, phenology, physiology, genetics, species interactions, ecosystem services, demographic rates, and population viability: many animals and plants are moving poleward and upward in elevation, shifting their timing of breeding and migration, and experiencing population declines and extirpations.[307] Because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to result in catastrophic species losses during this century. For example, the IPCC concluded that 20% to 30% of plant and animal species will face an increased risk of extinction if global average temperature rise exceeds 1.5°C to 2.5°C relative to 1980-1999, with an increased risk of extinction for up to 70% of species worldwide if global average temperature

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[301] *See* Federal Land Policy and Management Act of 1976, 43 U.S.C. §§ 1701(a)(8), 1712(c)(1); Multiple-Use Sustained Yield Act of 1960, 16 U.S.C. § 528; National Environmental Policy Act of 1969, 42 U.S.C. §§ 4331-4332.

[302] Esposito, Valerie et al., Climate Change and Ecosystem Services: The Contribution and Impacts on Federal Public Lands in the United States, USDA Forest Service Proceedings RMRS-P-64 at 155-164 (2011).

[303] U.S. Environmental Protection Agency, Climate Change and Public Lands (1999).

[304] *See* National Climate Assessment at 48; MacDougall, A. H., et al., Significant contribution to climate warming from the permafrost carbon feedback, 5 Nature Geoscience 719-721 (2012), doi:10.1038/ngeo1573.

[305] *See* National Climate Assessment at 592; Foti, R., Met al., Signs of critical transition in the Everglades wetlands in response to climate and anthropogenic changes, 110 Proceedings of the National Academy of Sciences6296-6300, (2013), doi:10.1073/pnas.1302558110.

[306] National Climate Assessment at 13.

[307] *See* Parmesan, C. and G. Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37–42 (2003); Root, T. et al., Fingerprints of global warming on wild animals and plants, 421 Nature 57–60 (2003); Chen, I. et al., Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024–1026 (2011).

exceeds 3.5°C relative to 1980-1999.[308]

In sum, climate change, driven primarily by the combustion of fossil fuels, poses a severe and immediate threat to the health, welfare, ecosystems and economy of the United States. These impacts are felt across the nation, including upon the public lands the Secretary of the Interior is charged with safeguarding. A rapid and deep reduction of emissions generated from fossil fuels is essential if such threats are to be minimized and their impacts mitigated.

Although cost-benefit analysis is not necessarily the ideal or exclusive method for assessing contributions to an adverse effect as enormous, uncertain, and potentially catastrophic as climate change, BLM does have tools available to provide one approximation of external costs and has previously performed a "social cost of carbon" analysis in prior environmental reviews.[309] *See High Country Conserv'n Advocates v. United States Forest Serv.*, 2014 U.S. Dist. Lexis 87820 (D. Colo. 2014) (invalidating environmental assessment ["EA"] for improperly omitting social cost of carbon analysis, where BLM had included it in preliminary analysis). Its own internal memo identifies one available analytical tool: "For federal agencies the authoritative estimates of [social cost of carbon] are provided by the 2013 technical report of the Interagency Working Group on Social Cost of Carbon, which was convened by the Council of Economic Advisers and the Office of Management and Budget."[310] As explained in that report:

> The purpose of the "social cost of carbon" (SCC) estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO_2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions. The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.[311]

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[308] IPCC, 2007:. Synthesis Report: An Assessment of the Intergovernmental Panel on Climate Change. Other studies have predicted similarly severe losses: 15%-37% of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario, s*ee* Thomas et al., Extinction risk from climate change, 427 Nature 145–8 (2004)); the potential extinction of 10% to 14% of species by 2100 if climate change continues unabated, *see* Maclean, I. M. D. and R. J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 Proceedings of the National Academy of Sciences of the United States of America 12337-12342 (2011); and the loss of more than half of the present climatic range for 58% of plants and 35% of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species, *see* Warren, R. J. et al., Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141–77 (2011)..

[309] *See also* Taylor, P. *BLM crafting guidance on social cost of carbon -- internal memo*, Greenwire, April 15, 2015, available at http://www.eenews.net/greenwire/stories/1060016810/; U.S. Bureau of Land Management, Internal Memo from Assistant Director of Resources and Planning Ed Roberson titled Addressing Climate Change Under NEPA (2015) ("Roberson Internal Memo"),, *available at* http://www.eenews.net/assets/2015/04/15/document_gw_01.pdf (noting "some BLM field offices have included estimates of the [social cost of carbon] in project-level NEPA documents") (accessed July 29, 2015).

[310] BLM, Roberson Internal Memo.

[311] *See* Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, May 2013, available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

Further, other analytical tools exist to evaluate the cost of methane emissions.[312] EPA has peer reviewed and employed such a tool in its "Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector."[313]

Leasing and development of unconventional wells could exact extraordinary financial costs to communities and future generations, setting aside the immeasurable loss of irreplaceable, natural values that can never be recovered. The EA fails to provide an accounting of these potential costs.

3. Oil and gas development harms sensitive species and wildlife.

The expansion of oil and gas development activities will harm wildlife through habitat destruction and fragmentation, stress and displacement caused by development-related activities (e.g., construction and operation activities, truck traffic, noise and light pollution), surface water depletion leading to low stream flows, water and air contamination, introduction of invasive species, and climate change. These harms can result in negative health effects and population declines. Studies and reports of observed impacts to wildlife from unconventional oil and gas extraction activities are summarized in the Center's "Review of Impacts of Oil and Gas Exploration and Development on Wildlife," submitted herewith.[314] Because the allowance of destructive oil and gas extraction runs contrary to BLM's policy of managing resources in a manner that will "protect the quality of…ecological…values" and "provide…habitat for wildlife,"[315] a no-fracking alternative minimizing industrial development and its harmful effects on wildlife must be considered.

a. Habitat Loss

Oil and gas development creates a network of well pads, roads, pipelines, and other infrastructure that lead to direct habitat loss and fragmentation, as well as displacement of wildlife from these areas due to increased human disturbance. Habitat loss occurs as a result of a reduction in the total area of the habitat, the decrease of the interior-to-edge ratio, isolation of one habitat fragment from another, breaking up of one habitat into several smaller patches of habitat, and decreasing the average size of a habitat patch. New research has revealed the extent

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(accessed July 29, 2015); *see also* Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Feb. 2010, available at http://www.epa.gov/otaq/climate/regulations/scc-tsd.pdf (accessed July 29, 2015).

[312] *See* Marten A.L., et al., Incremental CH4 and N2O mitigation benefits consistent with the US Government's SC-CO2 estimates, 15 Climate Policy (2):272-298 (2015)

[313] *See* USEPA, Social Cost of Carbon, *available at* http://www3.epa.gov/climatechange/EPAactivities/economics/scc.html (noting application of social cost of methane supported by peer review); USEPA, Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector, Ch. 4, available at http://www3.epa.gov/airquality/oilandgas/pdfs/og_prop_ria_081815.pdf.

[314] *See* Center for Biological Diversity, Review of the Impacts of Fracking and Other Oil and Gas Exploration and Development Activity on Wildlife (2015)This review presents the findings of numerous studies and reports on the impacts of hydraulic fracturing on wildlife.

[315] 43 U.S. Code § 1701(a)(8).

of this habitat loss. For example, in the western United States, the amount of high-quality habitat for the pronghorn has shrunk drastically due to oil and gas development.[316]

The indirect effects from unconventional oil and gas development can often be far greater than the direct disturbances to habitat. The impacts from the well site—including noise, light, and pollution—extend beyond the borders of the operation site and will consequently render even greater areas uninhabitable for some wildlife. Species dependent on having an "interior" habitat will lose their habitat as operation sites or other infrastructure fragment previously buffered and secluded areas. These and other indirect effects can be far greater than the direct disturbances to land. In the Marcellus shale of Pennsylvania, for instance, research shows that 8.8 acres of forest on average are cleared for each drilling pad along with associated infrastructure, but after accounting for ecological edge effects, each drilling station actually affected 30 acres of forest.[317]

While individual well sites may cause some disturbance and destruction, the cumulative impacts of oil and gas production using unconventional methods must receive attention as well. While the actual well pads may only occupy a small proportion of a particular habitat, their impact can be much greater when their aggregate impact is considered. As discussed above, interior habitats will be destroyed by removing the buffer between the interior habitat and the operation site. For example, one study found that grassland bird species' habitat have been degraded by oil development in the Bakken shale region, as evidenced by their avoidance of these areas. Grassland birds avoided areas within 150 meters of roads, 267 meters of single-bore well pads, and 150 meters of multi-bore well pads.[318] In areas of dense development, these habitat effects are greatly multiplied for sensitive species, such as the Sprague's pipit (*Anthus spragueii*), which avoided areas within 350 meters of single-bore well pads. The EIS must quantify the potential cumulative loss of habitat for sensitive species.[319]

b. Water Depletion

Water depletion also affects species whose habitats are far removed from the actual well site. Because of the high volume of water required for even a single well that uses unconventional extraction methods, the cumulative water depletion has a significant impact on species that rely on water sources that serve to supply oil and gas operations. In addition, water depletion adversely impacts water temperature and chemistry, as well as amplifies the effects of harmful pollutants on wildlife that would otherwise be diluted without the depletion.

c. Water Contamination

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[316] Beckmann, J.P. et al. Human-mediated shifts in animal habitat use: Sequential changes in pronghorn use of a natural gas field in Greater Yellowstone, 147 Biological Conservation 1:222 (2012).
[317] Johnson, N., Pennsylvania energy impacts assessment: Report 1: Marcellus shale natural gas and wind, Nature Conservancy – Pennsylvania Chapter (2010) at 10.
[318] Thompson, Sarah J. et al. Avoidance of unconventional oil wells and roads exacerbates habitat loss for grassland birds in the North American great plains, Biological Conservation 192 (2015) 82–90, *available at* https://www.researchgate.net/publication/282292567_Avoidance_of_unconventional_oil_wells_and_roads_exacerbates_habitat_loss_for_grassland_birds_in_the_North_American_great_plains.
[319] *Id.*

Accidental spills or intentional dumping of wastewater contaminate surface water and cause large-scale harm to wildlife. Numerous incidents of wastewater contamination from pipelines, equipment blowouts, and truck accidents have been reported, and have resulted in kills of fish, aquatic invertebrates, and trees and shrubs, as well as negative health effects for wildlife and domestic animals. In 2013, a company admitted to dumping wastewater from fracking operations into the Acorn Fork Creek in Kentucky, causing a massive fish kill.[320] Among the species harmed was the blackside dace, a threatened minnow species.[321] An analysis of water quality of Acorn Creek and fish tissues taken shortly after the incident was exposed showed the fish displayed general signs of stress and had a higher rate of gill lesions, than fish in areas not affected by the dumping.[322] The discharge of fracking wastewater into the Susquehanna River in Pennsylvania is suspected to be the cause of fish abnormalities, including high rates of spots, lesions, and intersex.[323] In West Virginia, the permitted application of hydrofracturing fluid to an area of mixed hardwood forest caused extensive tree mortality and a 50-fold increase in surface soil concentrations of sodium and chloride.[324]

In addition, open air pits that store waste fluid pose risks for wildlife that may come into contact with the chemicals stored in the pits. Already, there have been several documented cases of animal mortality resulting from contact with pits. A field inspection of open pits in Wyoming found 269 bird carcasses, the likely cause of death being exposure to toxic chemicals stored in the open pits.[325] Open pits can also serve as breeding grounds for mosquitoes, which serve as a vector for West Nile virus, a threat to humans and animals alike. In Wyoming, an increase of ponds led to an increase of West Nile virus among greater sage-grouse populations.[326] Recently, new information has come to light that operators in California have been dumping wastewater into hundreds of unpermitted open pits.[327] The EIS must take into account the impact of both unpermitted, illegal waste pits as well as those that are regulated.

Contaminants from spills not only directly harm species exposed to these contaminants but can enter the food chain and harm predators. A recent study found that in watersheds where hydraulic fracturing occurs, a top predator , riparian songbird in headwater systems, the Louisiana Waterthrush (*Parkesia motacilla*), accumulated metals associated with the fracking process. “In both the Marcellus and Fayetteville shale regions, barium and strontium were found

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[320] Vaidyanathan, Gayathri, *Fracking Spills Cause Massive Ky. Fish Kill*, E&E News, Aug. 29. 2013, http://www.eenews.net/greenwire/2013/08/29/stories/1059986559 (accessed July 30, 2015).
[321] *Id.*
[322] Papoulias, D.M. and A.L. Velasco. Histopathological analysis of fish from Acorn Fork Creek, Kentucky, exposed to hydraulic fracturing fluid releases, 12 Southwestern Naturalist (Special Issue 4):92 (2013).
[323] Piette, Betsy, BP Oil Spill, Fracking Cause Wildlife Abnormalities, Workers World (April 27, 2012) available at http://www.workers.org/2012/us/bp_oil_spill_fracking_0503/; Pennsylvania Fish & Boat Commission, Ongoing Problems with the Susquehanna River smallmouth bass, a Case for Impairment (May 23, 2012), www.fish.state.pa.us/newsreleases/2012press/senate_susq/SMB_ConservationIssuesForum_Lycoming.pdf
[324] Adams, Mary Beth, Land Application of Hydrofracturing Fluids Damages a Deciduous Forest Stand in West Virginia, 40 Journal of Environmental Quality 1340 (2011).
[325] *See, e.g.,* Ramirez, P. Jr., Bird Mortality in Oil Field Wastewater Disposal Facilities, 46 Environ Mgmt 5: 820 (2010).
[326] Zou, Li et al., Mosquito Larval Habitat Mapping Using Remote Sensing and GIS: Implications of Coalbed Methane Development and West Nile Virus, 43 J. Med. Entomol. 5:1034 (2006) (“Zou 2006”).
[327] Cart, Julie. *Hundreds of Illicit Oil Wastewater Pits Found in Kern County*, (Feb. 26, 2015), *available at* http://www.latimes.com/local/lanow/la-me-ln-pits-oil-wastewater-20150226-story.html.

at significantly higher levels in feathers of birds in sites with fracking activity than at sites without fracking."[328] While the study did not resolve the pathway for these metals entering the food chain, their findings suggested that "hydraulic fracturing may be contaminating surface waters and underscores the need for additional monitoring and study to further assess ecological and human health risks posed by the increasingly widespread development of unconventional sources of natural gas around the world."[329]

d. Invasive Species

Invasive species may be introduced through a variety of pathways that would be increasingly common if oil and gas activity is allowed to expand. Machinery, equipment, and trucks moved from site to site can carry invasive plant species to new areas. In addition, materials such as crushed stone or gravel transported to the site from other locations may serve as a conduit for invasive species to migrate to the well site or other areas en route.

Aquatic invasive species may also spread more easily given the large amounts of freshwater that must be transported to accommodate new drilling and extraction techniques. These species may be inadvertently introduced to new habitats when water is discharged at the surface. Alternatively, hoses, trucks, tanks, and other water use equipment may function as conduits for aquatic invasive species to access new habitats.

e. Climate Change

Anthropogenic climate change poses a significant threat to biodiversity.[330] Climate disruption is already causing changes in distribution, phenology, physiology, genetics, species interactions, ecosystem services, demographic rates, and population viability: many animals and plants are moving poleward and upward in elevation, shifting their timing of breeding and migration, and experiencing population declines and extinctions.[331] Because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to significantly increase extinction risk for many species. The IPCC concludes that it is extremely likely that climate change at or above 4°C will result in substantial special extinction.[332] Other studies have predicted similarly severe losses: 15-37 percent of the world's

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[328] Latta, Steven C., et al., Evidence from two shale regions that a riparian songbird accumulates metals associated with hydraulic fracturing," *Ecosphere* vol. 6(9), Article 144 (September 2015), *available at* http://www.esajournals.org/doi/pdf/10.1890/ES14-00406.1.

[329] *Id*.

[330] Warren, R. et al.,Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss, 3 Nature Climate Change 678 (2013) ("Warren 2013").

[331] Cahill, A.E. et al., How Does Climate Change Cause Extinction? Proceedings of the Royal Society B, doi:10.1098/rspb.2012.1890 (2012); Chen, I. et al., Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024 (2011); Maclean, I.M.D., and R.J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 Proc. Natl. Acad. Sci. Early Edition 12337 (2011) ("Maclean and Wilson 2011"); Parmesan, C., Ecological and Evolutionary Responses to Recent Climate Change, 37 Annual Review of Ecology Evolution & Systematics 637 (2006); Parmesan, C., and G. Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37 (2003); Root, T.L. et al., Fingerprints of Global Warming on Wild Animals and Plants, 421 Nature 57 (2003); Warren, Rachel et al., Increasing Impacts of Climate Change Upon Ecosystems with Increasing Global Mean Temperature Rise, 106 Climatic Change 141 (2011). ("Warren 2011").

[332]Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report, Summary for Policy Makers IPCC Fifth Assessment Synthesis Report*, 18 (2014).

plants and animals committed to extinction by 2050 under a mid-level emissions scenario[333]; the extinction of 10 to 14 percent of species by 2100 if climate change continues unabated.[334] Another recent study predicts the loss of more than half of the present climatic range for 58 percent of plants and 35 percent of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species.[335] Because expansion of oil and gas production in the planning area will substantially increase the emissions of greenhouse gases, this activity will further contribute to the harms from climate change to wildlife and ecosystems.

f. Population-level Impacts

Oil and gas development has been linked to population-level impacts on wildlife, including lower reproductive success of sage grouse and declines in the abundance of songbirds and aquatic species. For example, young greater-sage grouse avoided mating near infrastructure of natural-gas fields, and those that were reared near infrastructure had lower annual survival rates and were less successful at establishing breeding territories compared to those reared away from infrastructure.[336] In Wyoming, an increasing density of wells was associated with decreased numbers of Brewer's sparrows, sage sparrows, and vesper sparrows.[337] In the Fayetteville Shale of central Arkansas, the proportional abundance of sensitive aquatic taxa, including darters, was negatively correlated with gas well density.[338] The EIS must consider the population-level impacts that oil and gas development may have on wildlife in the planning areas.

IV. Unconventional extraction techniques and underground wastewater disposal pose seismic risks and other geological hazards.

If oil and gas development is allowed to proliferate in the areas for lease, increased unconventional oil and gas extraction and underground waste injection will increase the risk of induced seismicity. Induced seismic events could damage or destroy property and cause injuries or even death, especially in a state where earthquakes are rare and communities are typically not prepared for them. A no-fracking alternative would minimize these risks, while continued leasing and unconventional well development would increase them.

Research has shown that in regions of the central and eastern United States where unconventional oil and gas development has proliferated in recent years, earthquake activity has increased dramatically.[339] More than 300 earthquakes with magnitude (M) ≥ 3 occurred between

[333] Thomas, C.D. et al., Extinction Risk from Climate Change, 427 Nature 8:145 (2004).
[334] Maclean and Wilson 2011.
[335] Warren 2013.
[336] Holloran, M.J. et al., Yearling Greater Sage-Grouse Response to Energy Development in Wyoming, 74 Journal of Wildlife Management 1:65 (2010).
[337] Gilbert, Michelle M. & Anna D. Chalfoun, Energy Development Affects Populations of Sagebrush Songbirds in Wyoming, 75 The Journal of Wildlife Management 4:816 (2011).
[338] Green, Jessie J. et al., Abstract: Examining Community Level Variables of Fishes in Relation to Natural Gas Development, Southeastern Fishes Council, Annual Meeting Program, November 8 - 9, 2012, New Orleans, Louisiana (2012).
[339] Ellsworth, W.L. Injection-Induced Earthquakes, 341 Science 1225942 (2013) ("Ellsworth 2013"); Keranen, Katie et al., Potentially Induced Earthquakes in Oklahoma, USA: Links Between Wastewater Injection and the 2011 Mw5.7 Earthquake Sequence, Geology doi:10.1130/G34045.1 (March 26, 2013) ("Keranen 2013").

2010 through 2012, compared with an average of 21 per year between 1967 and 2000.[340] Moreover, although earthquakes with magnitude (M) ≥ 5.0 are very uncommon east of the Rocky Mountains, the number per year recorded in the midcontinent increased 11-fold between 2008 and 2011, compared to 1976 to 2007.[341] Mid-continent states experiencing elevated levels of seismic activity include Arkansas, Colorado, New Mexico, Ohio, Oklahoma, Texas, and Virginia.[342]

Research has linked much of the increased earthquake activity and several of the largest earthquakes in the U.S. midcontinent in recent years to the disposal of wastewater into deep injection wells, which is well-established to pose a significant seismic risk.[343] Much of the fracking wastewater is a byproduct of oil and gas production and is routinely disposed of by injection into wells specifically designed and approved for this purpose. The injected fluids push stable faults past their tipping points, and thereby induce earthquakes.[344] In 2015, a study published in *Science* found that, the unprecedented increase in earthquakes in the U.S. mid-continent began in 2009 has been caused solely by the instability caused by fluid injection wells associated with fracking waste disposal.[345] To put an exclamation point on this finding, a 4.7 magnitude earthquake struck northern Oklahoma that was felt in 7 additional states, leading the Oklahoma Geological Survey to reiterate the connection between disposal wells and earthquakes and to shut down the most high risk wells.[346] Earthquakes at magnitudes (M) that are felt (M3 and M4) or destructive (M4 and M5) have been attributed to wastewater injection wells in at least five states - Arkansas, Colorado, Ohio, Oklahoma, and Texas. The largest of these was a M5.7 earthquake in Prague, Oklahoma, which was the biggest in the state's history, destroying 14 homes and injuring two people.[347] Other large earthquakes attributed to wastewater injection include an M5.3 in Colorado,[348] M4.9 in Texas,[349] M4.7 in Arkansas,[350] and M3.9 in Ohio.[351]

The proliferation of unconventional oil and gas development, including increases in extraction and injection, may increase earthquake risk in Montana. Accordingly, an EIS must

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[340] Ellsworth 2013.
[341] Keranen 2013.
[342] Ellsworth 2013.
[343] *Id*.
[344] Lamont-Doherty Earth Observatory, Columbia University. Distant Quakes Trigger Tremors at U.S. Waste-Injection Sites, Says Study. July 11, 2013. *Available at*: https://www.ldeo.columbia.edu/news-events/distant-quakes-trigger-tremors-us-waste-injection-sites-says-study .
[345] M. Weingarten, S. Ge, J. W. Godt, B. A. Bekins, and J. L. Rubinstein. June 19, 2015. High-rate injection is associated with the increase in U.S. mid-continent seismicity. Science, VOL 348 ISSUE 6241, pages 1336-1340.
[346] Chow, Lorraine. November 19, 2015. Strong Earthquake Rattles Oklahoma, Felt in 7 Other States. https://ecowatch.com/2015/11/19/oklahoma-earthquake-fracking/
[347] Ellsworth 2013, Keranen 2013.
[348] Rubinstein, J.L. et al., The 2001–present triggered seismicity sequence in the Raton Basin of southern Colorado/northern New Mexico, 104 Bull. Seismol. Soc'y of America 5 (2014).
[349] Brown, W.A. et al. Abstract: Investigating the cause of the 17 May 2012 M4.8 earthquake near Timpson, East Texas, Abstract 84 Seismol. Res. Lett 374 (2013).
[350] Horton, S., Disposal of Hydrofracking Waste Fluid by Injection into Subsurface Aquifers Triggers Earthquake Swarm in Central Arkansas with Potential for Damaging Earthquake, 83 Seismol. Res. Lett. 2 (2012).
[351] Kim, Won-Young, Induced Seismicity Associated with Fluid Injection into a Deep Well in Youngstown, Ohio, 118 J. of Geophys. Res.: Solid Earth 3506 (February 1, 2013).

fully assess the risk of induced seismicity cause by all unconventional oil and gas extraction and injection activities, including wastewater injection wells.

The analysis should assess the following issues based on guidance from the scientific literature, the National Research Council,[352] and the Department of Energy[353]:

(1) whether existing oil and gas wells and wastewater injection wells in the areas for lease have induced seismic activity, using earthquake catalogs (which provide an inventory of earthquakes of differing magnitudes) and fluid extraction and injection data collected by industry;

(2) the region's fault environment by identifying and characterizing all faults in these areas based on sources including but not limited to the USGS Quaternary Fault and Fold database. In its analysis, BLM should assess its ability to identify all faults in these areas, including strike-slip faults and deep faults that can be difficult to detect;

(3) the background seismicity of oil- and gas-bearing lands including the history of earthquake size and frequency, fault structure (including orientation of faults), seismicity rates, failure mechanisms, and state of stress of faults;

(4) the geology of oil- and gas-bearing lands including pore pressure, formation permeability, and hydrological connectivity to deeper faults;

(5) the hazards to human communities and infrastructure from induced seismic activity; and

(6) the current state of knowledge on important questions related to the risk and hazards of induced seismicity from oil and gas development activities, including:

  (a) how the distance from a well to a fault affects seismic risk (i.e., locating wells in close proximity to faults can increase the risk of inducing earthquakes);

  (b) how fluid injection and extraction volumes, rates, and pressures affect seismic risk;

  (c) how the density of wells affects seismic risk (i.e., a greater density of wells affects a greater volume of the subsurface and potentially contacts more areas of a single fault or a greater number of faults);

  (d) the time period following the initiation of injection or extraction activities over which earthquakes can be induced (i.e., studies indicate that induced seismicity often occurs within months of initiation of extraction or injection although there are cases demonstrating multi-year delays);

[352]National Research Council, *Induced Seismicity Potential in Energy Technologies*. National Academies Press (2012).
[353]U.S. Department of Energy, *Protocol for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems*, DOE/EE-0662 (2012); U.S. Department of Energy, *Best Practices for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems - Draft* (2013).

(e) how stopping extraction or injection activities affects induced seismicity (i.e., can induced seismicity be turned off by stopping extraction and injection and over what period, since studies indicate that there are often delays—sometimes more than a year—between the termination of extraction and injection activities and the cessation of induced earthquake activity);

(f) the largest earthquake that could be induced by unconventional oil and gas development activities in areas for lease, including earthquakes caused by wastewater injection; and

(g) whether active and abandoned wells are safe from damage from earthquake activity over the short and long-term.

V. Oil and gas development poses significant human health and safety risks.

In addition to climate change effects, oil and gas leasing and fracking entail significant public health risks that should compel BLM to consider a ban on these practices in a programmatic review and in the current leasing proposal. The EA fails to study these public health risks, precluding meaningful review of the proposed action.

Ample scientific evidence indicates that well development and well stimulation activities have been linked to an array of adverse human health effects, including carcinogenic, developmental, reproductive, and endocrine disruption effects. This is all the more alarming when considering how close wells may be developed to schools, residences, and businesses under BLM's proposed leasing decision. Just as troubling, is how much is *unknown* about the chemicals used in well stimulation activities.[354] The potential human health dangers and the precautionary principle should further compel BLM to consider not allowing further development of oil and gas minerals in the areas for lease. In comparing the no-leasing and no-fracking alternatives to leasing and continued unconventional well development scenarios, BLM should include a health impact assessment, or equivalent, of the aggregate impact that unconventional extraction techniques, including fracking, will have on human health and nearby communities.

Due to the heavy and frequent use of chemicals, proximity to fracked wells is associated with higher rates of cancer, birth defects, poor infant health, and acute health effects for nearby residents who must endure long-term exposure:

- In one study, residents living within one-half mile of a fracked well were significantly more likely to develop cancer than those who live more than one-half mile away, with exposure to benzene being the most significant risk.[355]

[354] *See, e.g.* EPA 2015 at 5-73, 10-7.
[355] McKenzie, L. 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").

- Another study found that pregnant women living within 10 miles of a fracked well were more likely to bear children with congenital heart defects and possibly neural tube defects.[356] A separate study independently found the same pattern; infants born near fracked gas wells had more health problems than infants born near sites that had not yet conducted fracking.[357, 358]

- A study analyzed Pennsylvania birth records from 2004 to 2011 to assess the health of infants born within a 2.5-kilometer radius of natural-gas fracking sites. They found that proximity to fracking increased the likelihood of low birth weight by more than half, from about 5.6 percent to more than 9 percent.[359] The chances of a low Apgar score, a summary measure of the health of newborn children, roughly doubled, to more than 5 percent.[360] Another recent Pennsylvania study found a correlation between proximity to unconventional gas drilling and higher incidence of lower birth weight and small-for-gestational-age babies.[361]

- A recent study found increased rates of cardiology-patient hospitalizations in zip codes with greater number of unconventional oil and gas wells and higher well density in Pennsylvania.[362] The results suggested that if a zip code went from having zero wells to well density greater than 0.79 wells/km^2, the number of cardiology-patient hospitalizations per 100 people (or "cardiology inpatient prevalence rate") in that zip code would increase by 27%. If a zip code went from having zero wells to a well density of 0.17 to 0.79 wells/km^2, a 14% increase in cardiology inpatient prevalence rates would be expected. Further, higher rates of neurology-patient hospitalizations were correlated with zip codes with higher well density.

- Recently published reports indicate that people living in proximity to fracked gas wells commonly report skin rashes and irritation, nausea or vomiting, headache, dizziness, eye irritation and throat irritation.[363]

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[356] McKenzie, L. et al., Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado, Advance Publication Environmental Health Perspectives (Jan. 28, 2014), http://dx.doi.org/10.1289/ehp.1306722 ("McKenzie 2014").
[357] Hill, Elaine L., Unconventional Natural Gas Development and Infant Health: Evidence from Pennsylvania, Cornell University (2012).
[358] Whitehouse, Mark, *Study Shows Fracking is Bad for Babies*, Bloomberg View, Jan. 4, 2014, *available at* http://www.bloombergview.com/articles/2014-01-04/study-shows-fracking-is-bad-for-babies.
[359] *Id*., citing Janet Currie of Princeton University, Katherine Meckel of Columbia University, and John Deutch and Michael Greenstone of the Massachusetts Institute of Technology.
[360] *Id.*
[361] Stacy, Shaina L. et al. (2015) Perinatal Outcomes and Unconventional Natural Gas Operations in Southwest Pennsylvania. PLoS ONE 10(6): e0126425. doi:10.1371/journal.pone.0126425, *available at* http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0126425.
[362] Jemielital, T. et al. Unconventional Gas and Oil Drilling Is Associated with Increased Hospital Utilization Rates. PLoS ONE 10(7): e0131093, *available at* http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0131093.
[363] Rabinowitz, P.M. et al., Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania. Environmental Health Perspectives Advance Publication (2014); Bamberger, Michelle and R.E. Oswald, Impacts of Gas Drilling on Human and Animal Health, 22 New Solutions 51 (2012); Steinzor, N. et al., Gas Patch Roulette: How Shale Development Risks Public Health in Pennsylvania, Earthworks Gas & Oil Accountability Project (2012).

- A survey found agreement among experts that a minimum setback of a quarter mile from oil and gas development is necessary to protect public health. [364] Half of the experts recommended a 1 to 1 ¼ mile setback. The panel also agreed that additional protections are necessary for vulnerable populations such as children and the elderly.[365]

- In Texas, a jury awarded nearly $3 million to a family who lived near a well that was hydraulically fractured.[366] The family complained that they experienced migraines, rashes, dizziness, nausea and chronic nosebleeds. Medical tests showed one of the plaintiffs had more than 20 toxic chemicals in her bloodstream.[367] Air samples around their home also showed the presence of BTEX — benzene, toluene, ethylbenzene and xylene —colorless but toxic chemicals typically found in petroleum products.[368]

Chemicals used for fracking also put nearby residents at risk of endocrine disruption effects. A study that sampled water near active wells and known spill sites in Garfield County Colorado found alarming levels of estrogenic, antiestrogenic, androgenic, and antiandrogenic activities, indicating that endocrine system disrupting chemicals (EDC) threaten to contaminate surface and groundwater sources for nearby residents.[369] The study concluded:

- [M]ost water samples from sites with known drilling-related incidents in a drilling-dense region of Colorado exhibited more estrogenic, antiestrogenic, and/or antiandrogenic activities than the water samples collected from reference sites[,] and 12 chemicals used in drilling operations exhibited similar activities. Taken together, the following support an association between natural gas drilling operations and EDC activity in surface and ground water: [1] hormonal activities in Garfield County spill sites and the Colorado River are higher than those in reference sites in Garfield County and in Missouri, [2] selected drilling chemicals displayed activities similar to those measured in water samples collected from a drilling-dense region, [3] several of these chemicals and similar compounds were detected by other researchers at our sample collection sites, and [4] known spills of natural gas fluids occurred at these spill sites.

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[364] Brown, David et al. The Problem of Setback Distance for Unconventional Oil & Gas Development: An analysis of expert opinions. Southwest Pennsylvania Environmental Health Project Technical Reports, Issue 2 (May 9, 2016).
[365] *Id.*; *see also* 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, Review Envtl. Health 2016, available at http://ecowatch.com/wp-content/uploads/2016/05/fracking_study.pdf (suggesting greater protection from unconventional oil and gas development necessary for children and infants).
[366] *Parr v. Aruba Petroleum, Inc.*, Case No. 11-01650-E (Dallas Cty., filed Sept.13, 2013).
[367] Deam, Jenny, *Jury Awards Texas family Nearly $3 million in Fracking Case*, Los Angeles Times (Apr. 3, 2014) http://www.latimes.com/nation/la-na-fracking-lawsuit-20140424-story.html.
[368] *Id.*
[369] Kassotis, Christopher D. et al., Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region. Endocrinology, March 2014, 155(3):897–907, pp. 905-906, *available at* http://press.endocrine.org/doi/full/10.1210/en.2013-1697.

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  he study also noted a linkage between EDCs and "negative health outcomes in laboratory animals, wildlife, and humans":

- Despite an understanding of adverse health outcomes associated with exposure to EDCs, research on the potential health implications of exposure to chemicals used in hydraulic fracturing is lacking. Bamberger and Oswald (26) analyzed the health consequences associated with exposure to chemicals used in natural gas operations and found respiratory, gastrointestinal, dermatologic, neurologic, immunologic, endocrine, reproductive, and other negative health outcomes in humans, pets, livestock, and wildlife species.

- Of note, site 4 in the current study was used as a small-scale ranch before the produced water spill in 2004. This use had to be discontinued because the animals no longer produced live offspring, perhaps because of the high antiestrogenic activity observed at this site. There is evidence that hydraulic fracturing fluids are associated with negative health outcomes, and there is a critical need to quickly and thoroughly evaluate the overall human and environmental health impact of this process. It should be noted that although this study focused on only estrogen and androgen receptors, there is a need for evaluation of other hormone receptor activities to provide a more complete endocrine-disrupting profile associated with natural gas drilling.[370]

Operational accidents also pose a significant threat to public health. For example in August 2008, Newsweek reported that an employee of an energy-services company got caught in a fracking fluid spill and was taken to the emergency room, complaining of nausea and headaches.[371] The fracking fluid was so toxic that it ended up harming not only the worker, but also the emergency room nurse who treated him. Several days later, after she began vomiting and retaining fluid, her skin turned yellow and she was diagnosed with chemical poisoning.[372]

Harmful chemicals are also found in the flowback fluid after well stimulation events. Flowback fluid is a key component of oil-industry wastewater from stimulated wells. A survey of chemical analyses of flowback fluid dating back to April 2014 in California revealed that concentrations of benzene, a known carcinogen, were detected at levels over 1,500 times the federal limits for drinking water.[373] Of the 329 available tests that measured for benzene, the chemical was detected at levels in excess of federal limits in 320 tests (97 percent).[374] On

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[370] *Id*., p. 905.
[371] Wiseman, Hannah, Untested Waters: the Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation, Fordham Envtl. Law Rev. 115 (2009),138-39.
[372] *Id.*
[373] California Department of Conservation Division of Oil, Gas, & Geothermal Resources, California Well Stimulation Public Disclosure Report, *available at* http://www.conservation.ca.gov/dog/Pages/WellStimulationTreatmentDisclosure.aspx. The highest concentration was 7,700 parts per billion (ppb) for a well with API number 03052587. The US EPA's maximum contaminant level for benzene is 5 ppb.
[374] *Id*.

average, benzene levels were around 700 times the federal limit for drinking water.[375]Among other carcinogenic or otherwise dangerous chemicals found in flowback fluid from fracked wells are toluene and chromium-6.[376] These hazardous substances were detected in excess of federal limits for drinking water in over one hundred tests. This dangerous fluid is commonly disposed of in injection wells, which often feed into aquifers, including some that could be used for drinking water and irrigation.

Acidizing presents similarly alarming risks to public health and safety. In acidizing operations, large volumes of hydrochloric and hydrofluoric acid are transported to the site and injected underground. These chemicals are highly dangerous due to their corrosive properties and ability to trigger tissue corrosion and damage to sensory organs through contact.

While many risks are known, much more is unknown about the hundreds of chemicals used in fracking. The identity and effects of many of these additives is unknown, due to operators' claims of confidential business information. But, as the EPA recognizes, chemical identities are "necessary to understand their chemical, physical, and toxicological properties, which determine how they might move through the environment to drinking water resources and any resulting effects."[377] Compounds in mixtures can have synergistic or antagonistic effects, but again, it is impossible to know these effects without full disclosure.[378] The lack of this information also precludes effective remediation: "Knowing their identities would also help inform what chemicals to test for in the event of suspected drinking water impacts and, in the case of wastewater, may help predict whether current treatment systems are effective at removing them."[379]

Even where chemical identities are known, chemical safety data may be limited. In EPA's study of the hazards of fracking chemicals to drinking water, EPA found that "[o]ral reference values and oral slope factors meeting the criteria used in this assessment were not available for the majority of chemicals used in hydraulic fracturing fluids [87%], representing a significant data gap for hazard identification."[380] Without this data, EPA could not adequately assess potential impacts on drinking water resources and human health.[381] Further, of 1,076 hydraulic fracturing fluid chemicals identified by the EPA, 623 did not have estimated physiochemical properties reported in EPA's toxics database, although this information is "essential to predicting how and where it will travel in the environment."[382] The data gaps are

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[375] *Id*., *see also* Cart, J., High Levels of Benzene Found in Fracking Wastewater, Los Angeles Times, Feb. 11, 2015, http://www.latimes.com/local/california/la-me-fracking-20150211-story.html#page=1.
[376] *Id*.; *see also* Center for Biological Diversity, Cancer-causing Chemicals Found in Fracking Flowback from California Oil Wells (2015) Feb. 11, 2015, *available at* http://www.biologicaldiversity.org/news/press_releases/2015/fracking-02-11-2015.html.
[377] EPA 2015 at 10-18.
[378] Souther, Sara et al. Biotic Impacts of Energy Development from Shale: Research Priorities and Knowledge Gaps, Front Ecol Environ 2014; 12(6): p. 334.
[379] EPA 2015 at 10-18.
[380] *Id*. at 10-7, 9-7.
[381] *Id*. at 9-37-38.
[382] *Id*. at 5-73.

actually much larger, because EPA excluded 35% of fracking chemicals reported to FracFocus from its analysis because it could not assign them standardized chemical names.[383]

The EA fails to incorporate a literature review of the harmful effects of each of the 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.

The EA also fails to study the human health and safety impacts of noise pollution, light pollution, and traffic accidents resulting from oil and gas development. A recent study found that automobile and truck accident rates in counties in Pennsylvania with heavy unconventional oil and gas extraction activity were between 15 and 65 percent higher than accident rates in counties without unconventional oil and gas extraction activities.[384] Rates of traffic fatalities and major injuries may be higher in areas with heavy drilling activity than areas without.[385]

VI. Fossil fuel development will impact land use.

Increased oil and gas extraction and production have the potential to dramatically and permanently change the landscape of the areas for lease and their surroundings. Countless acres of land will likely be leveled to allow for the construction and operation of well pads and related facilities such as wastewater pits. Roads may have to be constructed or expanded to accommodate trucks transporting chemicals and the large quantities of water needed for some recovery methods. Transmission lines and other utilities may also be required. The need for new distribution, refining, or waste treatment facilities will expand industrial land use. With new roads and other industrial infrastructure, certain areas could open up to new industrial or extractive activities, permanently changing the character and use of the land.

Such changes would result in a significant cumulative losses of agricultural and conservation lands. Vegetation removal by oil and gas development across central North America between 2000 and 2012 is estimated to be 4.5 tetragrams of carbon or 10 tetragrams of dry biomass.[386] This is equivalent to more than half of annual available grazing on public lands managed by BLM or 6% of the wheat produced in 2013 within the region (120.2 million bushels of wheat).[387] This loss of "net primary production" (amount of carbon fixed by plants and accumulated as biomass) is "likely long-lasting and potentially permanent, as recovery or reclamation of previously drilled land has not kept pace with accelerated drilling."[388] The total surface disturbance by oil and gas development within this time period is 3 million hectares, the equivalent of three Yellowstone National Parks.[389] As noted above, the fragmented nature of this

[383] *Id*. at 9-38.
[384] Graham, J., Irving et al., Increased Traffic Accident Rates Associated with Shale Gas Drilling in Pennsylvania. 74 Accident Analysis and Prevention 203 (2015).
[385] *Id.*
[386] Allred, Brady et al. Ecosystem services lost to oil and gas in North America: Net primary production reduced in crop and rangelands. Science, vol. 384, issue 6233 (April 24, 2015) at 401.
[387] *Id*.
[388] *Id*.
[389] *Id* at 402.

surface disturbance negatively impacts wildlife by severing migratory pathways, altering wildlife behavior and mortality, and increasing susceptibility to ecologically disruptive species.[390]

The conversion of substantial acreages from rural or natural landscapes to industrial sites will also mar scenic views throughout the planning area. Given BLM's failure to ensure full reclamation of idle wells and the difficulty of restoring sites to their original condition, scenic resources may be permanently impaired.

VII. BLM must ensure that the Federal Land Policy and Management Act and the Mineral Leasing Act are not violated.

The Mineral Leasing Act ("MLA") requires BLM to demand lessees take all reasonable measures to prevent the waste of natural gas. The MLA states:

> All leases of lands containing oil or gas, made or issued under the provisions of this chapter, shall be subject to the condition that the lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits.

30 U.S.C. § 225; *see also id.* § 187 (stating that for the assignment or subletting of leases that "[e]ach lease shall contain . . . a provision . . . for the prevention of undue waste"). This statutory mandate is unambiguous and must be enforced. *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 184 n.29 (1978) (stating that "[w]hen confronted with a statute which is plain and unambiguous on its face," "it is not necessary to look beyond the words of the statute."). As already discussed in previous sections, oil and gas operations emit significant amounts of natural gases, including methane and carbon dioxide, which can be easily prevented. [391]

Pursuant to the Federal Land Policy and Management Act ("FLPMA"), BLM must "take any action necessary to prevent unnecessary or undue degradation of the [public] lands." 43 U.S.C. § 1732(b). Written in the disjunctive, BLM must prevent degradation that is "unnecessary" and degradation that is "undue." *Mineral Policy Ctr. v. Norton*, 292 F.Supp.2d 30, 41-43 (D. D.C. 2003). The protective mandate applies to BLM's leasing decisions. *See Utah Shared Access Alliance v. Carpenter*, 463 F.3d 1125, 1136 (10th Cir. 2006) (finding that BLM's authority to prevent degradation is not limited to the RMP planning process). Greenhouse gas pollution for example causes "undue" degradation. Even if the activity causing the degradation may be "necessary," where greenhouse gas pollution is avoidable, it is still "unnecessary" degradation. 43 U.S.C. § 1732(b).

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[390] *Id.*

[391] *See* U.S. Government Accountability Office, Federal Oil and Gas Leases, Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases 20 (2010)

In addition to being harmful to human health and the environment, the emissions from oil and gas operations are also an undue and unnecessary waste and degradation of public lands. Consequently, BLM's proposed gas and oil lease sale violates FLPMA. *See* 43 U.S.C. § 1732(b).

VIII. Conclusion

Oil and gas leasing is an irrevocable commitment to convey rights to use of federal land – a commitment with readily predictable environmental consequences that BLM is required to address. These include the specific geological formations, surface and ground water resources, seismic potential, or human, animal, and plant health and safety concerns present in the area to be leased. Unconventional oil and gas development not only fuel the climate crisis but entail significant public health risks and harms to the environment. Accordingly, BLM should end all new leasing of federal minerals. Should BLM proceed with the proposed oil and gas leasing, it must thoroughly analyze the alternatives of no new leasing (or no action), and no fracking or other unconventional well stimulation methods in an EIS.

Thank you for your consideration of this protest. The proposed leasing's significant environmental impacts should compel BLM to withdraw the leasing proposal.

Sincerely,

Diana Dascalu-Joffe
Senior Attorney
Center for Biological Diversity

Shelley Silbert
Executive Director
Great Old Broads for Wilderness

Amanda Jahshan
Wildlife Energy Conservation Fellow
Natural Resources Defense Council

Jonathan Matthews, PhD
Chapter Chair
Energy Committee Chair
Montana Sierra Club

EXHIBIT A

Center for Biological Diversity, Map of Parcels MTM 102757-QL and –QM (Aug. 18, 2016).

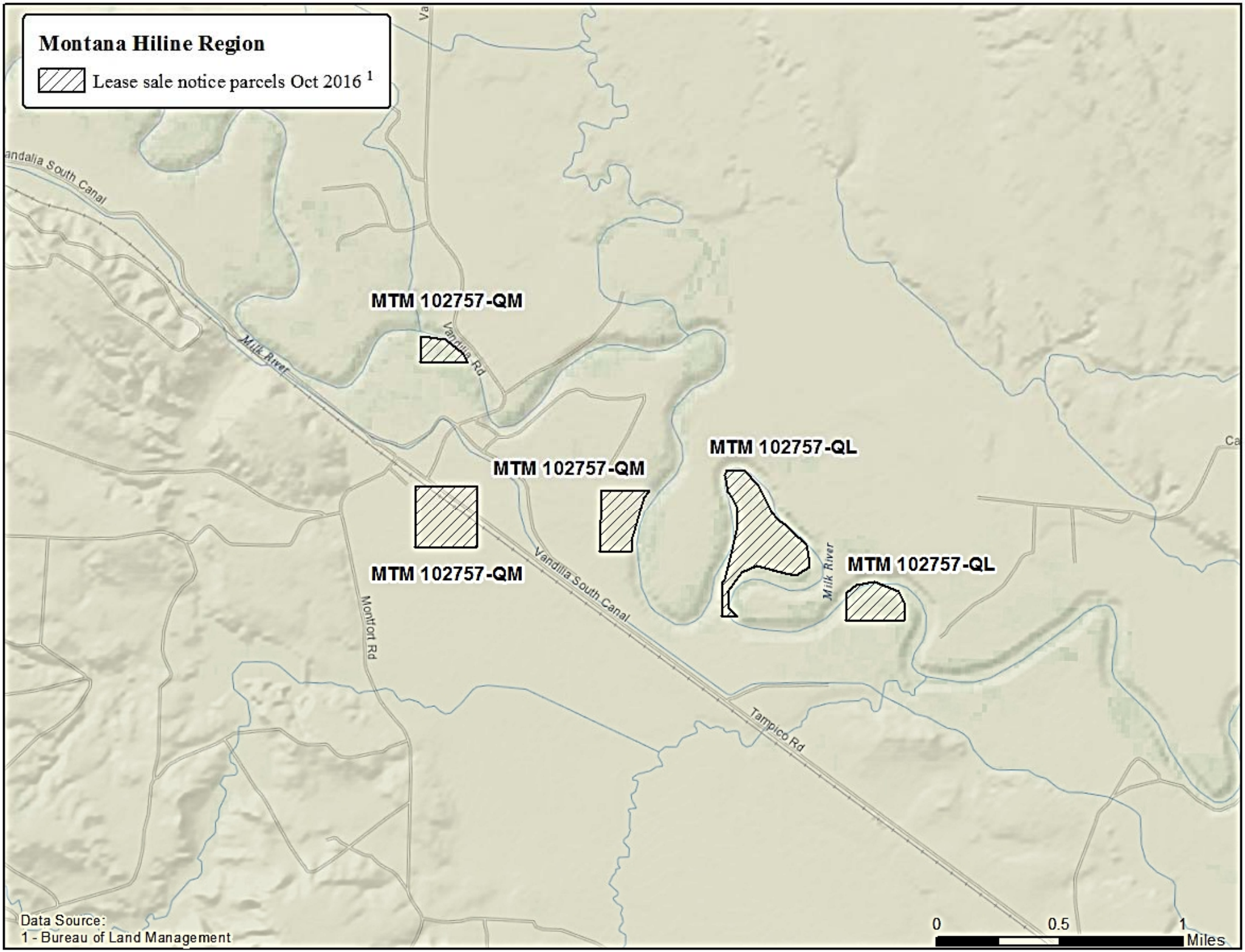
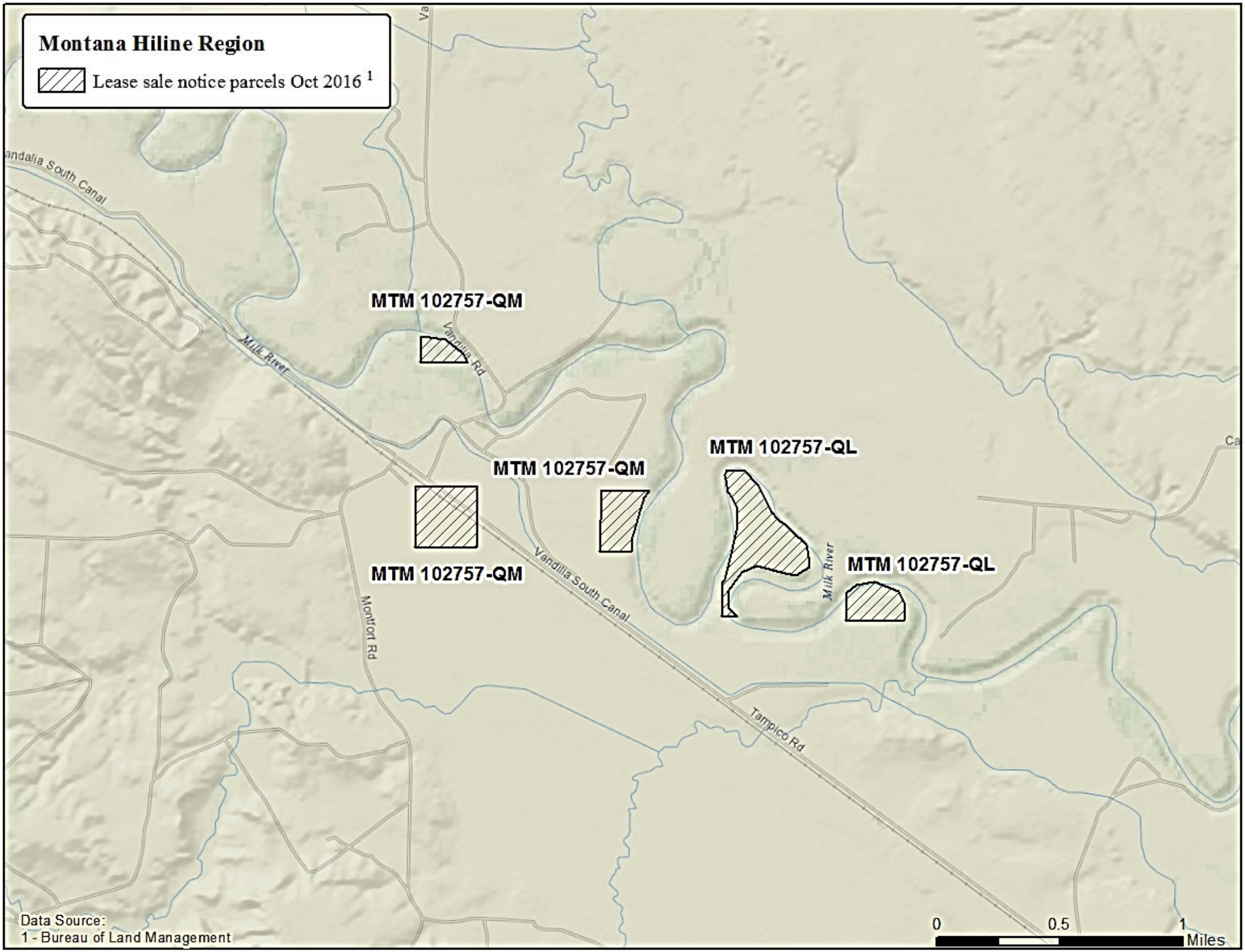

Montana Hiline Region
Lease sale notice parcels Oct 2016 [1]
MTM 102757-QM
MTM 102757-QM
MTM 102757-QM
MTM 102757-QL
MTM 102757-QL
Vandalia South Canal
Milk River
Vandalia Rd
Montfort Rd
Tampico Rd
Data Source:
1 - Bureau of Land Management
0
0.5
1
Miles

EXHIBIT B

Center for Biological Diversity, Map of Glasgow Field Office Parcels and Designated Sage-Grouse Habitat (Aug. 18, 2016)


Montana Hiline Region
Lease sale notice parcels Oct 2016 [1]
MTM 102757-QM
MTM 102757-QM
MTM 102757-QM
MTM 102757-QL
MTM 102757-QL
Vandalia South Canal
Milk River
Vandalia Rd
Montfort Rd
Tampico Rd
Data Source:
1 - Bureau of Land Management
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Miles

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Alberta Energy Board, Directive 083: Hydraulic Fracturing – Subsurface Integrity, Alberta Energy Regulator (May 21, 2013)

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