Attachment 2
Human Health Impacts of Oil and Gas

Emissions from oil and gas development occur throughout the chain of production—with some of the greatest emissions occurring at the point of extraction. These impacts are a consequence of various stages of oil and gas development—from the drilling and fracking of oil and gas wells, to air quality impacts and the release of hazardous emissions. The USFS must sufficiently address and analyze these impacts in its NEPA analysis.

Aside from the direct health impacts of NOX and VOCs,[1] these emissions can also result in significant increases in ground-level ozone (i.e., ozone precursors), and, consequently, can have a dramatic impact on human health.[2] For example, ozone has been shown to decrease lung function – particularly in adolescents and young adults—as well as increase the risk of death from respiratory causes.[3]

According to the EPA, the oil and gas industry is "the largest industrial source of emissions of volatile organic compounds (VOCs), a group of chemicals that contribute to the formation of ground-level ozone (smog)."[4] Moreover, "[e]xposure to ozone is linked to a wide range of health effects, including aggravated asthma, increased emergency room visits and hospital admissions, and premature death."[5] The oil and natural gas industry is also "a significant source of emission of methane," as well as an emitter of

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[1] *See, e.g.*, Colorado Department of Public Health and Environment, *2010 Air Quality Data Report* (2010) (attached as Exhibit 93).

[2] *See, e.g.*, GAO Report, *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks* (Sept. 2012) (attached as Exhibit 94); GAO Report, *Unconventional Oil and Gas Development: Key Environmental and Public Health Requirements* (Sept. 2012) (attached as Exhibit 95); Earthworks, *Natural Gas Flowback: How the Texas Natural Gas Boom Affects Health and Safety* (April 2012) (attached as Exhibit 96); Green River Alliance, *Healthy Air Questionnaire Final Report: Clean Air and Healthy Communities* (2011) (attached as Exhibit 209); Lisa McKenzie, Ph.D., et. al., *Human health and risk assessment of air emissions from development of unconventional natural gas resources* (Feb. 2012) (attached as Exhibit 98); Lisa McKenzie, Ph.D., Testimony on: *Federal Regulation: Economic, job, and energy security implications of federal hydraulic fracturing regulation*, May 2, 2012 (attached as Exhibit 99); Earthworks, *Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania,* October 2012 (attached as Exhibit 100).

[3] *See* Ira B. Tager, et. al., *Chronic Exposure to Ambient Ozone and Lung Function in Young Adults,* EPIDEMIOLOGY, Vol. 16, No. 6 (Nov. 2005) (attached as Exhibit 101); Michael Jarrett, Ph.D., et. al., *Long-Term Ozone Exposure and Mortality*, THE NEW ENGLAND JOURNAL OF MEDICINE, 360: 1085-95 (2009) (attached as Exhibit 102).

[4] EPA, *Oil and Natural Gas Pollution Standards: Basic Information, Emissions from the Oil & Natural Gas Industry* (2011), available at: http://www.epa.gov/airquality/oilandgas/basic.html; *see also* Cally Carswell, *Cracking the ozone code – Utah's gas fields,* HIGH COUNTRY NEWS, Sept. 4, 2012 (attached as Exhibit 103).

[5] *See id.*, EPA, *Pollution Standards*.

"air toxics such as benzene, ethylbenzene, and n-hexane," which are "pollutants known, or suspected of causing cancer and other serious health effects."[6] The EPA reports that the oil and gas industry:

> emits 2.2 million tons of VOCs, 130,000 tons of air toxics, and 16 million tons of greenhouse gases (methane) each year (40% of all methane emission in the U.S.). The industry is one of the largest sources of VOCs and sulfur dioxide emissions in the United States.[7]

The rapid development of high volume/horizontal drilling in conjunction with hydraulic fracturing has driven expansion of new sources resulting in increased emissions—a change that requires consideration by the USFS.

Many of the impacts to human health have already been documented in communities subject to industrial scale oil and gas development. For example, in Garfield County, Colorado, residents have experienced health effects they believe to be caused from oil and gas development. "Community concerns range from mild complaints such as dizziness, nausea, respiratory problems, and eye and skin irritation to more severe concerns including cancer."[8]

Additionally, the community has "environmental concerns related to noise, odors, dust, and 'toxic' chemicals in water and air."[9] After a thorough review of ambient air data across Garfield County, ATSDR determined that, "considering both theoretical cancer risks as well as non-cancer health effects and the uncertainties associated with the available data, it is concluded that the exposures to air pollution in Garfield County pose an indeterminate public health hazard for current exposures."[10] ATSDR further provided that "estimated theoretical cancer risks and non-cancer hazards for benzene [in the community], which is within the oil and gas development area, appear significantly higher than those in typical urban and rural area, causing some potential concern," and

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[6] *Id.*

[7] Letter from American Lung Association, American Public Health Association, American Thoracic Society, Asthma and Allergy Foundation of America, and Trust for America's Health to Lisa Jackson, Administrator, U.S. Environmental Protection Agency (Nov. 30, 2011), at 4 (attached as Exhibit 104).

[8] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry ("ATSDR"), *Health Consultation: Garfield County, Public Health Implications of Ambient Air Exposures to Volatile Organic Compounds as Measured in Rural, Urban, and Oil & Gas Development Areas* (2008), at 1 (attached as Exhibit 105).

[9] *Id.*

[10] *Id.*

later concluded that "[t]hese elevated levels are an indicator of the increased potential for health effects related to benzene exposure . . . in the oil and gas development area.[11]

Unfortunately, impacts to human health are not limited only to gas emissions, but can result from exposure to chemicals necessary for gas extraction—namely, the hundreds of chemicals used in hydraulic fracturing.[12] Indeed, "[b]etween 2005 and 2009, the 14 oil and gas service companies [analyzed by Congress] used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products – not including water added at the well site – between 2005 and 2009."[13] Chemical components include BTEX compounds—benzene, toluene, xylene, and ethylbenzene—which are hazardous air pollutants and known human carcinogens. As the USFS undergoes Forest Planning, it must consider the human health impacts associated with these extractive practices.

Leading doctors and scientists studying these issues recognize the unknown risks inherent to fracking. "We don't know the chemicals that are involved, really; we sort of generally know," Vikas Kapil, chief medical officer at National Center for Environmental Health, part of the U.S. Centers for Disease Control and Prevention, said at a conference on hydraulic fracturing.[14] "We don't have a great handle on the toxicology of fracking chemicals."[15] Christopher Portier, director of the CDC's National Center for Environmental Health and Agency for Toxic Substances and Disease Registry further provided that "additional studies should examine whether wastewater from wells can harm people or the animals and vegetables they eat."[16] "We do not have enough information to say with certainty whether shale gas drilling poses a threat to public

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11 *Id.*

12 *See* Theo Colborn, et. al., *Comments to the Bureau of Land Management, Uncompahgre Field Office*, THE ENDOCRINE DISRUPTION EXCHANGE, April 20, 2012 (attached as Exhibit 106); Theo Colborn, et. al., *Natural Gas Operations from a Public Health Perspective*, HUMAN AND ECOLOGICAL RISK ASSESSMENT, 17: 1039-1056 (2011) (attached as Exhibit 107).

13 UNITED STATES HOUSE OF REPRESENTATIVES, COMMITTEE ON ENERGY AND COMMERCE, *Chemicals Used in Hydraulic Fracturing* (April 2011) (attached as Exhibit 171).

14 Alex Wayne, *Fracking Moratorium Urged by U.S. Doctors Until Health Studies Conducted*, BLOOMBERG NEWS, January 9, 2012, available at: http://www.bloomberg.com/news/2012-01-09/fracking-moratorium-urged-by-u-s-doctors-until-health-studies-conducted.html.

15 *Id.*

16 Alex Wayne and Katarzyna Klimasinska, *Health Effects of Fracking for Natural Gas Need Study, Says CDC Scientist*, BLOOMBERG NEWS, January 4, 2012, available at: http://www.bloomberg.com/news/2012-01-04/health-effects-of-fracking-for-natural-gas-need- study-says-cdc-scientist.html.

health."[17]

Indeed, a new study demonstrates that animals, especially livestock, are sensitive to the contaminants released into the environment by drilling and by its cumulative impacts.[18] Because animals often are exposed continually to air, soil, and groundwater and have more frequent reproductive cycles, animals can be used to monitor potential impacts to human health—they are fracking's "canary in the coalmine." The study evaluated all available fracking- related reports on sick or dying animals. Although secrecy surrounds the fracking industry, "a few 'natural experiments' have provided powerful evidence that fracking can harm animals."[19] For example:

> Two cases involving beef cattle farms inadvertently provided control and experimental groups. In one case, a creek into which wastewater was allegedly dumped was the source of water for 60 head, with the remaining 36 head in the herd kept in other pastures without access to the creek. Of the 60 head that were exposed to the creek water, 21 died and 16 failed to produce calves the following spring. Of the 36 that were not exposed, no health problems were observed, and only one cow failed to breed. At another farm, 140 head were exposed when the liner of a wastewater impoundment was allegedly slit, as reported by the farmer, and the fluid drained into the pasture and the pond used as a source of water for the cows. Of those 140 head exposed to the wastewater, approximately 70 died and there was a high incidence of stillborn and stunted calves. The remainder of the herd (60 head) was held in another pasture and did not have access to the wastewater; they showed no health or growth problems. These cases approach the design of a controlled experiment, and strongly implicate wastewater exposure in the death, failure to breed, and reduced growth rate of cattle.[20]

Most recently the 5th edition of the Physicians for Social Responsibility's Compendium on the Impacts of Fracking on Health, 266 page review of the scientific and medical studies on fracking and health, concludes that "There is no evidence that fracking can

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[17] *Id.*

[18] Michelle Bamberger and Robert E. Oswald, *Impacts of Gas Drilling on Human and Animal Health*, NEW SOLUTIONS, VOL. 22(1) 51-77 (2012) (attached as Exhibit 109).

[19] *See* Peter Montague, *Why Fracking and Other Disasters Are So Hard to Stop*, HUFFINGTON POST, Jan. 20, 2012, available at: http://www.huffingtonpost.com/peter-montague/why-fracking- and-other-di_b_1218889.html (last visited Jan. 23, 2012).

[20] *See* Bamberger at 60 (attached above as Exhibit 109).

operate without threatening public health directly or without imperiling climate stability upon which public health depends."[21]

The health problems and uncertainties that proliferate in communities where oil and gas development takes place warrants the further collection of data and research, as contemplated under NEPA. NEPA requires a hard look at these impacts.

[21] Concerned Health Professionals of New York & Physicians for Social Responsibility. (2018, March). Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction) (5th ed.) p. 266. http://concernedhealthny.org/compendium/