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COMMENTS OF UTAH PHYSICIANS FOR A HEALTHY ENVIRONMENT ON THE FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE MONUMENT BUTTE AREA OIL AND GAS DEVELOPMENT PROJECT

Utah Physicians for a Healthy Environment (UPHE) is an association of more than 400 physicians and other health care professionals, but it also includes industrial and environmental engineers. All of its members share a concern that the health of the residents of Utah, and the viability of its environment, are suffering ever greater adverse impacts from pollution and climate disruption that are largely the result of relying on fossil fuels as our main source of energy. Many of the illnesses that our health professionals treat are caused by, or exacerbated by, environmental pollution. For this reason, we offer our expertise to inform the debate about how society should deal with the threat that pollution presents to human health.

Background

The Green River drainage is thought to contain half of the world's oil shale reserves. In addition, it is one of the most active conventional oil and gas regions in the United States. Newfield Exploration Company--the proponent of the project that is the subject of this Environmental Impact Statement—speculates that there are still probably 5,400 million barrels of oil and 21.4 trillion cubic feet to be extracted from the Uinta-Piceance Basin (USGS DDS-69-B 2002). This has led to 25,000 additional proposed

wells in various stages of planning to exploit this resource. There are currently 9,036 producing wells in the Uinta side of this basin alone (5,565 of them gas, 3,471 of them oil). EIS at 3-13. All of this drilling and hydrocarbon product handling has produced the unexpected and somewhat alarming climatic phenomenon of extreme concentrations of Volatile Organic Carbons (VOCs) and ozone appearing in winter, far from population and industrial centers where such levels of pollution had typically been found.

This frenzy of oil and gas development activity has produced VOCs more concentrated than in Mexico City, at levels that violate applicable health standards for Hazardous Air Pollutants (HAPS), and turned the Uinta Basin into an ozone nonattainment area where winters see more concentrated ozone than Los Angeles.[1] This dramatic deterioration in air quality in the Uinta Basin has produced a public health emergency.

Newmont Exploration Company proposes to add up to 5,750 new oil and gas wells to those already operating in the Uinta Basin. Additionally, approximately 226 miles of new roads and pipelines would be constructed, 21 new compressor stations would be constructed, three existing compressors would be expanded, one gas processing plant would be constructed, 13 new water treatment and injection facilities would be built or expanded, 12 gas and oil separation plants would be constructed, one fresh water collector well would be drilled, and six water pump stations would be built. Total new surface disturbance under the Agency Preferred Alternative would be approximately 10,122 acres, which would be reduced to 4,978 acres after successful application of interim reclamation. This would expand current oil and gas development activity in the Uinta Basin by approximately two-thirds, and add to the air quality crisis that the oil and gas industry has already brought to this region. The primary pollutants

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[1] D. Helmig,* C. R. Thompson, J. Evans, P. Boylan, J. Hueber, and J.-H. Park, Highly Elevated Atmospheric Levels of Volatile Organic Compounds in the Uintah Basin, Utah, Environ. Sci. Technol. 2014, 48, 4707−4715. This study was conducted during the winters of 2012 and 2013 and directly measures concentrations of VOCs and its many NMHC constituents at very high temporal an spatial resolutions. It would, therefore, seem to be more reliable than model-dependent estimates of VOCs on which the BLM's EIS prefers to rely.

that this project would unacceptably exacerbate are Volatile Organic Compounds and ozone.

Volatile Organic Compounds

VOCs include non-methane hydrocarbons (NMHCs), of which Benzene is representative in its toxic effects. Benzene is, among other things, a carcinogen, a neurotoxin, a developmental toxicant, a reproductive toxicant, a respiratory and a cardiovascular toxicant. Many VOCs are hazardous to human health in concentrations that are commonplace in the Uinta Basin in winter.[2] The source of these VOCs is revealed by the astonishing levels of fugitive VOC loss. In its EIS, the BLM consistently avoids using 2013 data on the ground that it has not been sufficient error-checked. But there is a wealth of directly-measured 2013 data on VOC and ozone emissions available from a special study by the Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder. That study's field measurements of various constituent VOCs were found to range between two-to-three hundred times regional and seasonal background levels. The study reasoned that the difference between measured concentrations of non-methane hydrocarbons (NMHC) and background levels of those compounds represented fugitive emissions. Based on that assumption, it estimated fugitive NMHS emissions equivalent to 1.4 million barrels of oil, or the equivalent of the annual average NMHC emissions of 100 million cars.[3] Combining fugitive methane with fugitive NMHC, the study estimated a total hydrocarbon/natural gas production loss rate of 8.4−15.9%.[4]

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[2] Id.

[3] Id. at 4713.

[4] This implied loss rate for the Uinta Basin oil and gas industry is scandalous. It suggests not just indifference to the air quality degradation that the industry causes, but indifference to the norms of economic inefficiency. Since Newmont's Monument Butte lease produces 97% of the oil and 72% of the gas produced in the Uinta Basin, this indifference and inefficiency must be attributed primarily to Newmont. This being the case, one wonders why it has earned the right to expand the scale of its operation by nearly two-thirds (5,750 wells).

Despite exhibiting VOC pollution that in winter are comparable to VOC concentrations suffered by Mexico City, the BLM proposes to approve a two-thirds expansion of drilling and production. It proposes to justify this by establishing a process that it calls an "Annual Emissions Balance Sheet." In EIS section 2.2.12.1.7, it describes the process this way:

> Newfield will ensure that new stationary sources authorized by the ROD will not result in net increases of volatile organic compounds (VOC) emissions. This will be accomplished by achieving reductions of VOC emissions from existing stationary sources prior to operating new sources, balanced on a calendar year annual basis.
>
> VOC emissions reductions including, but not limited to, actions taken in response to voluntary actions, the implementation of applicant committed environmental protection measures, natural production decline (defined in the Technical Support Document), existing or new regulations, and/or ozone attainment and maintenance plans can be used to create headroom for project activities that result in new sources of VOC emissions.

In other words, it proposes what amounts to a "cap and trade" program internal to Newmont whose objective is to preserve the status quo with respect to VOC concentrations.

VOC concentrations that seasonally approach the notorious levels suffered by Mexico City are not a worthy objective for an Environmental Impact Statement to set, particularly where the approval of the project is offered ahead of time, and compliance is sought when the leverage of project approval has already been given away. This is not an effective regulatory approach, particularly if the goal is bring VOC levels down to levels that protect human health, rather than to merely avoid further deterioration. It is especially important that the BLM not approve the project (Alternative A or D) ***before*** it identifies the concrete steps that Newmont must take to reduce VOCs, because VOCs are the likely source of the ozone that the BLM should be ***reducing*** to levels that the science says do not harm public health.[5] The VOC reduction plan should come first,

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[5] Although additional study of the local causes of ozone is needed, both the BLM, and the Institute of Arctic and Alpine Research have tentatively concluded that that the process of ozone formation in the Uinta Basin is limited by the availability of VOC.

and the commitment to adhere to it. A credible, basin-wide VOC reduction plan should be drawn up, and Newmont should agree to follow it, before approval of the project is granted. Otherwise, Newmont will invest money, and then push back if it thinks the VOC controls will cause it to lose money on those investments.

Ozone

Exposure to VOCs at levels that commonly prevail in the Uinta Basin in winter directly harm human health, but they cause further harm to human health when they are converted ozone by sunlight in the presence of NOx. Research demonstrates, and the BLM acknowledges in this EIS, that in the Uinta Basin, the source of these precursors of ozone are almost entirely local oil and gas development activity. In this EIS, the BLM analyzes the impact on human health of approving Newmont's project by focusing almost exclusively on whether, and how often, and by how much, ozone concentrations in the Uinta Basin violate the NAAQS ambient air standard. The BLM proposes to deal with the reality that the Uinta Basin is already in violation of that standard by approving of Newmont's proposed massive expansion of current drilling in the basin, but promising to require Newmont to adapt its processes, or even slow its project build out, just enough to get the basin's ozone pollution barely back under the limit. See EIS, page 2-7.

This focus on the NAAQS standard is misplaced if genuinely protecting human health is the objective because the standard is a political compromise that doesn't reflect the current scientific consensus. Substantial harm to human health has been consistently demonstrated by epidemiological studies and animal models to be caused by ozone exposure to concentrations well below the current NAAQS standard, as can be seen from the research summarized below.

Ground-level ozone significantly harms human health not just at concentrations above the EPA's recently-adopted NAAQS standard of 70 ppb, but at average concentrations that currently prevail in summer along the Wasatch Front and in the Class I air sheds of Utah's iconic national parks. Ozone impairs human health by reacting with molecules in the lining of our airways. Inhaled ozone breaks chemical

bonds in lung tissue and transforms that tissue by adding oxygen atoms. Such oxidation inflames the lining of our airways (the endothelium) and makes it less able to protect the rest of our bodies from microbes, toxic chemicals, and allergens. Our airways respond to ozone by covering the affected areas with fluid and by contracting muscles, making breathing more difficult.

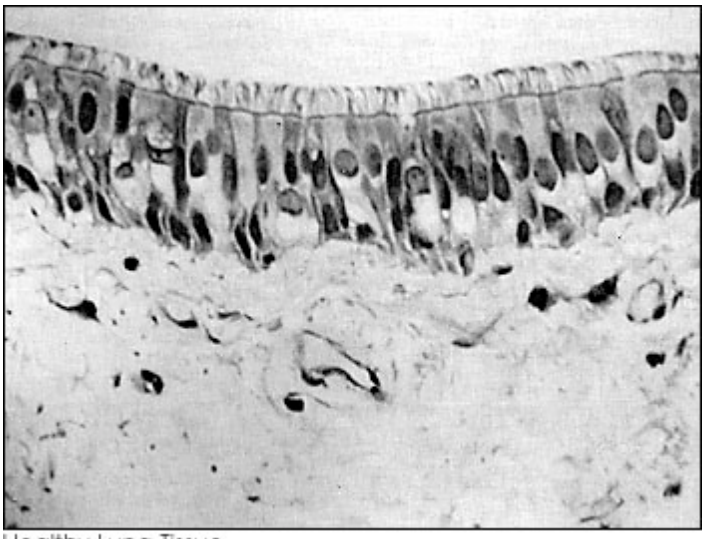
Asthma is a growing threat to children and adults. Children make up 25 percent of the population but comprise 40 percent of asthma cases. For asthmatics having an attack, the pathways of the lungs become so narrow that breathing becomes akin to sucking a thick milk shake through a straw. Ozone triggers asthma, causing more asthma attacks, increased use of medication, more medical treatment, and more visits to hospital emergency clinics.

Long-term exposure to ozone raises rates of respiratory, cardiovascular, metabolic, and neurodegenerative diseases. When exposure to moderately elevated ozone levels 6 to 8 hours at a time is repeated over the long term, it impairs lung defense mechanisms, and can cause permanent changes in lung structure. This leads to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis. Ozone has these effects on the general population —not just the young and the old--at concentrations well below the EPA's newly adopted 8-hour ambient air standard of 70 parts per billion.

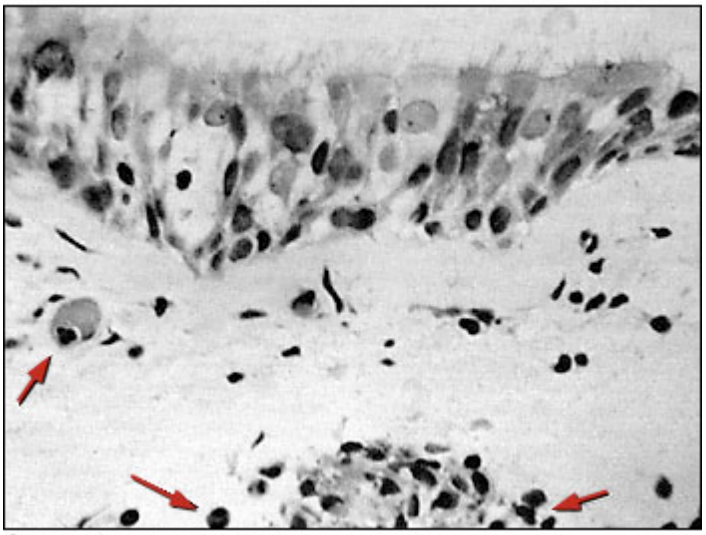
Healthy adults who exercise moderately outdoors can suffer reductions in lung function of 15 to 20% from exposure to low levels of ozone over just several hours. Repeated exposure to high or moderate levels of ozone can cause permanent damage to lung tissue in the same way that repeated sunburns age and damage skin. This reduces the quality of life as people age. Animal studies indicate that exposure to high levels of ozone over a period of several months can produce permanent structural damage in the lungs. Healthy adults who are most at risk for such damage are people who spend substantial time outdoors over the spring and summer months exercising moderately. This includes construction and other outdoor workers.

Short-term increases in the concentration of ozone of just 20 ppb are sufficient to make physiological changes to the lungs of otherwise healthy adults. The figure below shows two slides of endothelium—the tissue that lines the lung. The top slide is tissue taken from a person exposed to pristine air without man-caused pollutants. Note that the tiny cilia that clear the lung of pollutants appear on the top in a neat and regular row. The bottom slide is tissue taken from the same person after four hours of moderate exercise when just 20 ppb are added to natural background levels of ozone. Note that many of the cilia are now missing or misshapen. The small black dots indicated by the arrows are neutrophils. Their proliferation is a response to inflammation of the lung.

Healthy Lung Tissue and Lung Tissue Exposed to Low Levels of Ozone



Healthy Lung Tissue



Ozone-damaged Lung Tissue

Source: The American Thoracic Society, from American Review of Respiratory Diseases, Vol. 148, 1993, Robert Aris et al., pp. 1368-1369.

The damage to the lungs displayed in these photos resulted from temporary exposure to ozone concentrations that were only 20 ppb above unpolluted background

baseline levels of 15 ppb.[6] In other words, the exposure that was sufficient to visibly damage this normal healthy adult's lungs was half the concentration of the new 8-hour ambient air health standard and for half as long, i.e., about one fourth of the exposure allowed under the new 8-hour standard of 70 ppb. Daytime ozone concentrations exceed 35 ppb for entire seasons throughout the state of Utah, including the Uinta Basin.[7]

Exposure to concentrations of ozone well below the EPA's 70 ppb 8-hour standard can be deadly. A study of 48 largest cities in the U.S. examined the association between ozone and all-cause mortality during the summer months. Average ozone concentrations by city over the summer ranged from 16 percent to 80 percent lower than the 70 ppb 8-hour standard that the EPA currently considers safe. Researchers found that ozone at those below-the-standard levels was associated with significant additional deaths from cardiovascular disease, strokes, and respiratory illness.[8]

The impact of relatively short-term (eight-hour) increases in ozone concentrations on health and well-being can be profound. For example, increases in ozone concentrations of 20 ppb have been shown to increase elementary school absences by 63%, and to increase the incidence of respiratory disease by 83%.[9]

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[6] Ozone concentrations in air without anthropogenic pollution averages between 10 and 15 ppb in calm conditions without significant foreign-origin contributions. See "The Ozone We Breath," By Jeannie Allen, April 19, 2002, NASA Earth Observatory, available at http://earthobservatory.nasa.gov/Features/OzoneWeBreathe/.

[7] See Nationa Park Service table of 3-month ozone exposures at the areas that it administers at http://nature.nps.gov/air/maps/airatlas/docs/Air_Atlas_Values_Tables/Ozone/NPS_AQC_Ozone_0913_web.pdf. These exposures are expressed in terms of parts-per-million/hours. The National Park Service notes that when this measure is expressed as parts per million, they generally exceed 0.06 ppm. http://nature.nps.gov/air/maps/airatlas/ozone.cfm. 0.06 parts per million equates to 60 ppb.

[8] Zanobetti A, Schwartz J. Mortality displacement in the association of ozone with mortality: an analysis of 48 cities in the United States. Am J Respir Crit Care Med. 2008.

[9] Gilliland, Frank D., et al. 2001: The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illnesses. Epidemiology, January 2001, Vol 12, 43-54.

The EPA as well as its Clean Air Scientific Advisory Committee (CASAC) have compiled a large body of research that shows dramatic reductions in respiratory symptoms and disease when the 8-hour concentration of ozone is reduced by just 10 ppb (from 75 ppb to 65 ppb). The study notes that there is no reason to assume that further reductions of 10 ppb increments would elicit an attenuation of the response.[10] The European Union's 8-hour ozone health standard is 60 ppb. If the current guidelines of the World Health Organization were followed in the United States, our 8-hour exposure to ozone would be kept below 51 ppb. Daytime ozone concentrations commonly exceed this level for entire seasons (late spring and summer along the Wasatch Front, and winter in the Uinta Basin).

Existing levels of oil and gas development have already brought an air quality crisis to the Uinta Basin with its massive leakages of VOCs contributing to regular violations of NAAQS ozone standards. The BLM acknowledges that it has yet to identify either the causes of the cures of those ozone exceedences. In Appendix B of the EIS, at section 6.2 "Adaptive Management Strategy for Potential Ozone Impacts," it says

> Ozone concentrations in the Uinta Basin have been found to be exceeding National Ambient Air Quality Standards (NAAQS) during periodic winter inversion events. A comprehensive understanding of the chemical pathways, analytical methodologies, and demonstrable control technologies and methods has been lacking to allow for a scientifically based examination of this issue in recent NEPA documents relating to oil and gas production in the Uinta Basin
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> Over the past 3 years significant research had been conducted in the Uinta Basin to further the understanding of winter ozone formation (Martin et. al. 2011). These studies to date are indicating that volatile organic compound (VOC) controls and seasonal response plans are the most promising avenues to address winter ozone formation. BLM, in consultation with the Utah Division of Air Quality (UDAQ) and the U.S Environmental Protection Agency (EPA), has developed a list of enhanced seasonal pollution control measures and work practices specifically aimed at reducing the emissions of VOCs which form winter ozone. These

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[10] See table summarizing this research in Environ Health Perspectives, 2008 Jul; 116(7): A302–A305. PMCID: PMC2453178.

> control measures and work practices will be required for all operations approved under this NEPA action, and will be retroactively applied to other recent oil and gas NEPA in the Uinta Basin that have adaptive management requirements.

The causes of ozone levels in the Uinta Basin that regularly surpass those suffered by Los Angeles are still not well understood, and the Uinta Basin is (or is on its way to being) designated an ozone non-attainment area by the EPA. In the midst of this uncertainty, one can only wonder why the BLM deems it appropriate to authorize Newmont to expand the scale of oil and gas development in the Uinta Basin by 5,750 wells first, and then see if it can figure out what the specific causes of its ozone crisis are, and what cures might be effective. Without knowing what those causes are, it seems unreasonable for the BLM to think that it can keep ozone levels from increasing while it expands the basin's oil and gas production by two-thirds (5,750 new wells), and even less reasonable to think that it can ***reduce*** those levels below 70 ppb (the current NAAQS standard).

A credible plan for reducing current ozone levels should be drawn up first, and Newmont to should commit itself to such a plan, before approval of its project is granted. Any credible plan to reduce ozone would seem to first require confidence that science has identified the particular causes of winter ozone formation well enough to devise solutions that will work. The BLM, by its own admission, is recommending the project first be approved, then causes of the problem be understood, then cures be identified. As discussed in connection with VOC mitigation proposals, if approval of the project comes first, the leverage that approval normally brings is lost. With its project already approved, Newmont will make investments, and push back if it thinks the ozone mitigation procedures will cause it to lose money on those investments.

The BLM appears to justify its leap of faith that everything will turn out all right in the end, by describing its "Applicant-Committed Environmental Protection Measures" (ACEPMs) These include capturing high-pressure gas well flowback emissions (EIS 2.2.12.1.2 Drilling / Completion Operations), stock tank emission

controls (EIS 2.2.12.1.4 Central Facilities), tying wells to Gas Oil Separation Plants (EIS .2.12.1.5), and institution of fugitive vapor monitoring programs (EIS 2.2.12.1.6).

There are two problems with these ACEPMs. The first is that they are often hedged requirements, there implementation being conditioned on successful pilot programs, or required except where a process is "crucial", or required only "where practicable" (as in Gas Oil Separation Plants) and required without any implementation timetable (again, as in Gas Oil Separation Plants). The second problem is that even if all of these ACEPMs are implemented (the pilot programs all pan out, the measures all turns out to be "practicable" and not "crucial," and they are implemented early rather than late), they will still allow substantial annual ***increases*** in ozone precursors (2,100 tons or 40% for NOx; 3,965 tons or 33% for VOC).

The EIS has no air dispersion model of the impact of the implementing the project (Alternatives A and D) on the concentration of VOCs or ozone. It does, however, have a model of another project in Colorado that makes reference to the Newmont project. It purports to show that the Newmont project would only add 2% to the background level of ozone (even though the background level of ozone would still be well in excess of the NAAQs of 70 ppb.) This, however, lacks credibility when compared to 40% increase in NOx that is projected and the 33% increase in VOC that is projected. As to why such substantial increases in these ozone precursors would have virtually no effect on ozone concentrations, the EIS says only that the effect of ozone precursors on ozone is "non-linear." This is another of way of saying that the BLM has no estimate of the relationship of ozone precursors to ozone formation in the Uinta Basin. Once again, if this relationship is so poorly understood, the logical next step is to study it until it is understood, rather to than to plunge full steam ahead with a 66% expansion of current oil and gas development, and hoping that miracles will appear along the way to solve the air quality crisis in the Uinta Basin that the BLM has allowed to develop.

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