

January 4, 2016

Dear Mr. Snow, DEQ:

These comments are from Ban Michigan Fracking, a Michigan non profit organization. We write regarding an application for drilling and operating an oil well by Jordan Development (Word of Faith 16-27) within the City of Southfield.

1. Given the City of Southfield's moratorium on drilling, you must deny the permit. In addition, the site is zoned residential and this industrial activity is not allowed in that zoning.

The application asks "Has applicant obtained all contractual rights needed to locate the well where it is proposed? And the box is checked "Yes." We think that is not accurate given the City of Southfield's moratorium.

2. We demand public hearings be held in Southfield, surrounding communities, and all impacted communities for the public to bring to light their concerns about health and environmental impacts of both the drill site and the toxic waste sites. A major medical facility, Providence Hospital in Southfield, is 2 miles due east of the site.

3. The application indicates this is an exploratory well. "Exploratory" is a misnomer that deceives the public because exploratory wells do produce oil and gas. This well is intended for production and presumably would have continued industrial activities of tanker trucks hauling both wastes (drill cuttings, muds, and "brines") and produced oil along public streets and highways. Exploratory drilling also leads to more drilling, perhaps horizontal legs and multiple wellheads. At least one horizontal well has been producing in the Niagaran formation (Hubbell 2-22 HD1). The public has

no knowledge of Jordan Development's plans for increased drilling activity at this site.

4. Every well becomes its own toxic injection disposal well, with some of the acidizing/fracking mixture remaining onsite forever. Well-casing failure rates are well documented by industry itself, and by groups such as Physicians, Engineers and Scientists for Healthy Energy. See: Ingraffea, Anthony R., *Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play*, February 2013, <http://www.psehealthyenergy.org/site/view/1057>. Well casing and cement failures lead to contaminated water and methane leaks. We are providing that report by reference and placing it into the DEQ record.

5. Drill cuttings and muds are radioactive and are brought to the surface, then hauled by tanker truck along public roadways, creating hazards to the public. There is no indication on the application as to where the toxic drill cuttings or the toxic flowback, "brine" and other toxic wastes will be brought.

6. Methane flaring: Methane flaring into the atmosphere will be harmful to area residents and everyone downwind, and may lead to the evacuation of residents, should the methane releases be uncontrolled and at great amounts. Any methane flaring brings health damage.

7. Air pollution: We are submitting, with this comment letter, the entire Compendium of Scientific, Medical and Media Findings Demonstrating Risks and Harms of Fracking (unconventional oil and gas extraction) (3<sup>rd</sup> edition) into the MDEQ record. (Attached).

**For the health impacts alone, this permit should be denied.**

Below is the citation:

Concerned Health Professionals of New York & Physicians for Social Responsibility. (2015, October 14). Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction) (3rd ed.). <http://concernedhealthny.org/compendium/>

Εξτραχτεδ βελω αρε τηε Χομπενδιυμεσ λιστινγ οφ στυδιεσ φρομ 2015 ανδ 2014, ον τηε ηεαλτη ιμπαχτσ δυε το αιρ πολλυτιον (παγεσ 14 τηρουγη 22):

## Air pollution

### Compilation of Studies & Findings

Studies increasingly show that air pollution associated with drilling and fracking operations is a grave concern with a range of impacts. Researchers have documented dozens of air pollutants from drilling and fracking operations that pose serious health hazards. Areas with substantial drilling and fracking build-out show high levels of ozone, striking declines in air quality, and, in several cases, increased rates of health problems with known links to air pollution. Air sampling surveys find exceedingly high concentrations of volatile organic compounds, especially carcinogenic benzene and formaldehyde, both at the wellhead and at distances that exceed legal setback distances from wellhead to residence. In some cases, concentrations exceeded federal safety standards by several orders of magnitude.

- € July 9, 2015 – The California Council on Science and Technology, in collaboration with the Lawrence Berkeley National Laboratory, released the second and third volumes of an extensive, peer-reviewed assessment of fracking in California. Air quality impacts are the focus of volume 2,

chapter 3. It finds that current inventory methods underestimate methane and volatile organic chemical emissions from oil and gas operations and that fracking occurs in areas of California—most notably in the San Joaquin and South Coast air basins—that already suffer from serious air quality problems. Further, no experimental studies of air emissions from drilling and fracking operations have ever been conducted in California. Although California has well-developed air quality inventory methods, they are “not designed to estimate well stimulation emissions directly, and it is not possible to determine well stimulation emissions from current inventory methods.”<sup>1</sup>

• € July 1, 2015 – In accordance with California Senate Bill No. 4, the California Division of Oil, Gas, and Geothermal Resources released a three-volume environmental impact report on oil and gas well stimulation treatments in the state (which, in California, include fracking along with acidizing and other unconventional extraction technologies that break up oil- or gas-containing rock). The Division determined that fracking and related operations can have “significant and unavoidable” impacts on air quality, including increasing ozone and other federally regulated pollutants to levels that violate air quality standards or that would make those

violations worse.<sup>2, 3</sup> <sup>1</sup> Brandt, A., Millstein, D., Jin, L., & Englander, J. (2015, July 9). Air quality impacts from well stimulation. In: California Council on Science and Technology, An Independent Scientific Assessment of Well Stimulation in California, volume 2, chapter 3. Retrieved from <http://ccst.us/publications/2015/vol-II-chapter-3.pdf> <sup>2</sup> California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (2015, July 1). Analysis of Oil and Gas Well Stimulation Treatments in California, Volume II. Retrieved from

[http://www.conservation.ca.gov/dog/SB4DEIR/Pages/SB4\\_DEIR\\_TOC.aspx](http://www.conservation.ca.gov/dog/SB4DEIR/Pages/SB4_DEIR_TOC.aspx) <sup>3</sup> Cart. J. (2015, July 1). State issues toughest-in-the-nation fracking rules. Los Angeles Times. Retrieved from <http://www.latimes.com/local/lanow/la-me-ln-state-issues-fracking-rules-20150701-story.html>

- € April 21, 2015 – In a study funded by the electric power industry, a research team found that fracking had diminished air quality in rural areas downwind of gas sites in two heavily drilled Pennsylvania counties but that concentrations of volatile organic compounds were not as high as expected based on results in other states. Methane levels were higher than previous research had found.<sup>4</sup> The extent to which the results can be generalized to the Marcellus basin as a whole, the authors emphasized, remains uncertain.<sup>5</sup>

- € April 15, 2015 – In a review of the literature, Colorado researchers demonstrated that four common chemical air pollutants from drilling and fracking operations—benzene, toluene, ethylbenzene, and xylene (BTEX)—are endocrine disruptors commonly found in ambient air that have the ability to interfere with human hormones at low exposure levels, including at concentrations well below EPA recommended exposure limits. Among the health conditions linked to ambient level exposures to the BTEX family of air pollutants: sperm abnormalities, reduced fetal growth, cardiovascular disease, respiratory dysfunction, and asthma.<sup>6</sup> “This review suggests that BTEX may...have endocrine disrupting properties at low concentrations, presenting an important line of inquiry for future research. BTEX are used globally in consumer products, and are released from motor vehicles and oil and natural gas operations that are increasingly in close proximity to homes, schools, and other places of human activity.”<sup>7</sup>

- € March 26, 2015 – Working with citizen volunteers, a team led by Oregon State University researchers installed passive air samplers in the backyard properties of residents living within three miles of fracking wells in rural Ohio. They found levels of polycyclic aromatic hydrocarbons that surpassed those measured in downtown Chicago, were ten times higher than those found in other rural areas without fracking

operations, and exceeded the EPA's maximum acceptable risk level for cancer. Using standard EPA methodologies, researchers determined that the excess lifetime cancer risk for residents living nearest the wells was about 45 percent higher than for residents living farthest from them and three times higher than the EPA's acceptable risk level of 1 in 10,000.<sup>8,9</sup>

Public health researcher David O. Carpenter, MD, at University of Albany, who was not part of <sup>4</sup>Phillips, S. (2015, May 19). Study: lower than expected air pollutants detected at Marcellus drilling sites. State Impact Pennsylvania. Retrieved from <https://stateimpact.npr.org/pennsylvania/2015/05/19/study-lower-than-expected-air-pollutants-from-gas-drilling-sites/> <sup>5</sup>Goetz, J. D., Floerchinger, C., Fortner E. C., Wormhoudt, J., Massoli, P., Knighton, W. B., . . . DeCarlo, P.F. (2015). Atmospheric emission characterization of Marcellus Shale natural gas development sites. *Environmental Science & Technology*, 49, 7012-20. doi 10.1021/acs.est.5b00452 <sup>6</sup>Bienkowski, B. (2015, April 15). Scientists warn of hormone impacts from benzene, xylene, other common solvents. *Environmental Health News*. Retrieved from <http://www.environmentalhealthnews.org/ehs/news/2015/apr/endocrine-disruption-hormones-benzene-solvents> <sup>7</sup>Bolden, A. L., Kwiatkowski, C. F., & Colborn, T. (2015). New look at BTEX: are ambient levels a problem? *Environmental Science & Technology*, 49, 5261-76. doi: 10.1021/es505316f <sup>8</sup>Paulik, L. B., Donald C. E., Smith, B. W., Tidwell, L. G., Hobbie, K. A., Kind, L., Haynes, E. N., & Anderson, K. A. (2015, March 26). Impact of natural gas extraction on PAH levels in ambient air. *Environmental Science & Technology*, 49, 5203-10. <sup>9</sup>Hasemyer, D. (2015, May 20). New study finds fracking releases cancer-causing chemicals into air many times higher than the EPA considers safe. *Inside Climate News*. Retrieved from <http://insideclimatenews.org/news/19052015/heavily-fracked-ohio-county-unsafe-levels-toxic-air-pollutants- fracking-natural-gas-drilling>

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the research team, said the study supports growing evidence that fracking poses health risks to those living near well pads.<sup>10</sup>

- €March 26, 2015 – Fracking can pollute air hundreds of miles downwind from the well pad, according to the results of a study from University of Maryland. Researchers took hourly measurements of ethane in the air over Maryland and the greater Washington, DC area, where fracking does not occur,

and compared them to ethane data from areas of West Virginia, Pennsylvania, and Ohio where it does. They found month-to-month correlations, indicating that the ethane pollution in the air over Maryland appears to be coming from drilling and fracking operations in these other states. Ethane, a minor component of natural gas, rose 30 percent in the air over the Baltimore and Washington DC area since 2010, even as other air pollutants declined in concentration. By contrast, no increase in ethane levels were found in Atlanta, Georgia, which is not downwind of fracking operations.<sup>11, 12</sup> Given this evidence for widespread ethane leakage, the paper's lead author asked how much methane and other, more reactive emissions might be escaping from wells, noting that "a substantial amount of hydrocarbons" are emitted as a result of flowback procedures following the fracturing process.<sup>13</sup>

- € March 3, 2015 – Working in Washington County, Pennsylvania, researchers with the Southwest Pennsylvania Environmental Health Project developed an air exposure screening model to determine ambient levels of volatile chemicals and fine particulate air pollutants and to calculate expected human exposures for a 14-month period. The study found fluctuating periods of extreme exposures, especially at night when air was still. "The periodicity of occurrence of extreme exposures is similar to the episodic nature of the health complaints reported in Washington County and in the literature. This study demonstrates the need to determine the aggregate quantitative impact on health when multiple facilities are placed near residences, schools, daycare centers and other locations where people are present. It shows that understanding the influence of air stability and wind direction is essential to exposure assessment at the residential level."<sup>14</sup>

- € February 27, 2015 – A team of researchers from University of Texas, funded in part by the gas industry, examined ozone (smog) production resulting from natural gas

extraction and use in Texas. Previous research by this team had found that the increased use of <sup>10</sup>Lockwood, D. (2015, April 8). Fracking activities pollute nearby air with carcinogenic hydrocarbons. Chemical & Engineering News. Retrieved from <http://cen.acs.org/articles/93/web/2015/04/Fracking-Activities-Pollute-Nearby-Air.html> <sup>11</sup>Vinciguerra, T. Yao, S., Dadzie, J., Chittmans, A., Deskins, T., Ehrman, S., & Dickerson, R. R. (2015). Regional air quality impacts of hydraulic fracturing and shale natural gas activities: evidence from ambient VOC observations. Atmospheric Environment, 110, 144-50. doi: 10.1016/j.atmosenv.2015.03.056 <sup>12</sup>Valentine, K. (2015, April 30). Fracking wells could pollute the air hundreds of miles away. ClimateProgress. Retrieved from <http://thinkprogress.org/climate/2015/04/30/3653252/fracking-air-pollution-downwind/> <sup>13</sup>Levine, F. & Tune, L. (2015, April 30). Emissions from natural gas wells may travel far downwind. University of Maryland: UMD Right Now. Retrieved from <http://www.umdrightnow.umd.edu/news/emissions-natural-gas-wells-may-travel-far-downwind> <sup>14</sup>Brown, D. R., Lewis, C., & Weinberger, B. I. (2015). Human exposure to unconventional natural gas development: a public health demonstration of periodic high exposure to chemical mixtures in ambient air. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering, 50, 460-72. doi: 10.1080/10934529.2015.992663

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natural gas for generating electricity, as a replacement for coal, contributed to overall reductions in daily maximum ozone concentrations in northeastern Texas. By contrast, the results of this study found an increase in ozone in the Eagle Ford Shale area of south Texas. The Eagle Ford Shale is upwind from both Austin and San Antonio.<sup>15</sup> A potent greenhouse gas, methane is also a precursor for ground-level ozone and hence a contributor to smog formation.

- € January 16, 2015 – Researchers from a number of universities, including the University of New Hampshire and Appalachian State University, used a source apportionment model to estimate the contribution of natural gas extraction activities to overall air pollution, including ozone, in heavily drilled southwest Pennsylvania. This regional air sampling



effort demonstrated significant changes in atmospheric chemistry from drilling and fracking operations there. The researchers found that drilling and fracking operations may affect compliance with ozone standards.<sup>16</sup>

- € November 20, 2014 – The Texas Commission on Environmental Quality confirmed high levels of benzene emissions and other volatile organic compounds around an oil and gas facility in the Eagle Ford Shale. Symptoms reported by local residents were consistent with those known to be associated with exposure to such chemicals.<sup>17</sup>

- € November 14, 2014 – A University of Colorado at Boulder research team found that residential areas in intensely drilled northeastern Colorado have high levels of fracking-related air pollutants, including benzene. In some cases, concentrations exceed those found in large urban centers and are within the range of exposures known to be linked to chronic health effects. According to the study, “High ozone levels are a significant health concern, as are potential health impacts from chronic exposure to primary emissions of non-methane hydrocarbons (NMHC) for residents living near wells.” The study also noted that tighter regulations have not resulted in lower air pollution levels, “Even though the volume of emissions per well may be decreasing, the rapid and continuing increase in the number of wells may potentially negate any real improvements to the air quality situation.”<sup>18</sup>

- € October 30, 2014 – A research team assembled by University at Albany Institute for Health and the Environment identified eight highly toxic chemicals in air samples collected near fracking and associated infrastructure sites across five states: Arkansas, <sup>15</sup> Pacsi, A. P., Kimura, Y., McGaughey, G., McDonald-Buller, E. C., & Allen, D. T., Regional ozone impacts of increased natural gas use in the Texas power sector and development in the Eagle Ford Shale. *Environmental Science & Technology*, 49, 3966-73. doi: 10.1021/es5055012 <sup>16</sup> Swarthout, R. F., Russo, R.S., Zhou, Y., Miller, B.M.,

Mitchell, B., Horsman, E., . . . Sive, B.C. (2015). Impact of Marcellus Shale natural gas development in southwest Pennsylvania on volatile organic compound emissions and regional air quality. *Environmental Science & Technology*, 49, 3175-84. doi: 10.1021/es504315f <sup>17</sup> Davis, B.. (2014, November 20). TCEQ memo proves toxic chemicals are being released in the Eagle Ford Shale. KENS 5 Eyewitness News. Retrieved Nov. 25, 2014 from <http://www.kens5.com/story/news/investigations/i-team/2014/11/20/benzene-oil-toxic-fumes/70020596/> <sup>18</sup> Thompson C. R., Hueber J., & Helmig D. (2014). Influence of oil and gas emissions on ambient atmospheric non- methane hydrocarbons in residential areas of Northeastern Colorado. *Elementa: Science of the Anthropocene*, 2. doi: 10.12952/journal.elementa.000035

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Colorado, Pennsylvania, Ohio, and Wyoming. The most common airborne chemicals detected included two proven human carcinogens (benzene and formaldehyde) and two potent neurotoxicants (hexane and hydrogen sulfide). In 29 out of 76 samples, concentrations far exceeded federal health and safety standards, sometimes by several orders of magnitude. Further, high levels of pollutants were detected at distances exceeding legal setback distances from wellheads to homes. Highly elevated levels of formaldehyde, for example, were found up to a half-mile from a wellhead. In Arkansas, seven air samples contained formaldehyde at levels up to 60 times the level known to raise the risk for cancer.<sup>19</sup> said lead author David O. Carpenter, MD, in an accompanying interview: “

- € October 21, 2014 – Responding to health concerns by local residents, a research team from University of Cincinnati and Oregon State University found high levels of air pollution in heavily drilled areas of rural Carroll County, Ohio. Air monitors showed 32 different hydrocarbon-based air pollutants, including the carcinogens naphthalene and benzo[a]pyrene.<sup>21</sup> The researchers plan additional monitoring and analysis.
- € October 21, 2014 – Using a mobile laboratory designed by the National Oceanic and Atmospheric Administration (NOAA), a research team from the University of Colorado at

Boulder, the NOAA Earth System Research Laboratory, and the Karlsruhe Institute of Technology looked at air pollution from drilling and fracking operations in Utah's Uintah Basin. The researchers found that drilling and fracking emit prodigious amounts of volatile organic air pollutants, including benzene, toluene, and methane, all of which are precursors for ground-level ozone (smog). Multiple pieces of equipment on and off the well pad, including condensate tanks, compressors, dehydrators, and pumps, served as the sources of these emissions. This research shows that drilling and fracking activities are the cause of the extraordinarily high levels of winter smog in the remote Uintah basin—which regularly exceed air quality standards and rival that of downtown Los Angeles.<sup>22</sup>

• € October 2, 2014 – A joint investigation by InsideClimate News and the Center for Public Integrity found that toxic air emissions wafting from fracking waste pits in Texas are <sup>19</sup> Macey, G. P., Breech, R., Chernaik, M., Cox, C., Larson, D., Thomas, D., & Carpenter, D. O. (2014). Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. *Environmental Health*, 13(82). doi: 10.1186/1476-069X-13-82 <sup>20</sup> Neuhauser, A. (2014, October 30). Toxic chemicals, carcinogens skyrocket near fracking sites. *U.S. News and World Report*. Retrieved from <http://www.usnews.com/news/articles/2014/10/30/toxic-chemicals-and-carcinogens-skyrocket-near-fracking-sites-study-says> <sup>21</sup> Environmental Health Sciences Center, Oregon State University. (2014). List of 62 PAH analyzed in Carroll County, OH. Retrieved from <http://ehsc.oregonstate.edu/air/62PAH> <sup>22</sup> Warneke, C., Geiger, F., Edwards, P. M., Dube, W., Pétron, G., Kofler, J., . . . Roberts, J. M. (2014). Volatile organic compound emissions from the oil and natural gas industry in the Uintah Basin, Utah: oil and gas well pad emissions compared to ambient air composition. *Atmospheric Chemistry and Physics*, 14, 10977-10988. doi: 10.5194/acp-14-10977-2014

“This is a significant public health risk,”

Cancer has a long latency, so

you're not seeing an elevation in cancer in these communities. But five, 10, 15 years from

now, elevation in cancer is almost certain to happen.”<sup>20</sup>

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unmonitored and unregulated due to federal exemptions that classify oil and gas field waste as non-hazardous.<sup>23</sup>

- € October 1, 2014 – In a major paper published in Nature, an international team led by the National Oceanic and Atmospheric Administration demonstrated that exceptionally high emissions of volatile organic compounds (VOCs) explain how drilling and fracking operations in Utah’s Uintah Basin create extreme wintertime ozone events even in the absence of abundant ultraviolet light and water vapor, which are typically required to produce ground-level ozone (smog). Current air pollution trends in the United States are toward lower nitrogen oxides from urban sources and power generation, but increasing methane and VOCs from oil and gas extraction activities threaten to reverse decades of progress in attaining cleaner air. According to the study, the consequences for public health are “as yet unrecognized.”<sup>24</sup>

- € September 6, 2014 – As part of a comparative lifecycle analysis, a British team from the University of Manchester found that shale gas extracted via fracking in the United Kingdom would generate more smog than any other energy source evaluated (coal, conventional and liquefied gas, nuclear, wind, and solar). Leakage of vaporous organic compounds during the necessary removal of hydrogen sulfide gas, along with the venting of gas both during drilling and during the process of making the well ready for production, were major contributors. “In comparison to other technologies, shale gas has high [photochemical smog]. In the central case, it is worse than solar PV, offshore wind and nuclear power by factors of 3, 26 and 45, respectively. Even in the best case, wind and nuclear power are still preferable (by factors of 3.3 and 5.6 respectively).”<sup>25</sup>

- € September 2014 – ShaleTest Environmental Testing

conducted ambient air quality tests and gas-finder infrared video for several children’s play areas in North Texas that are located in close proximity to shale gas development. The results showed a large number of compounds detected above the Method Reporting Limit (the minimum quantity of the compound that can be confidently determined by the laboratory). Air sampling found three known/suspected carcinogens, and a number of other compounds associated with significant health effects. Benzene results from Denton, Dish, and Fort Worth are particularly alarming since they exceeded the long-term ambient air limits set by the Texas Commission on Environmental Quality, and benzene is a known carcinogen. “Benzene was found at all but one sampling location .... This is particularly noteworthy as benzene is a known carcinogen (based on evidence from studies in both people and lab”<sup>23</sup> Hasemyer, D. & Hirji, Z. (2014, October 2). Open piles offer cheap disposal for fracking sludge, but health worries mount. InsideClimate News and the Center for Public Integrity. Retrieved from <http://www.publicintegrity.org/2014/10/02/15826/open-pits-offer-cheap-disposal-fracking-sludge-health-worries-mount><sup>24</sup> Edwards, P. M., Brown, S. S., Roberts, J. M., Ahmadov, R., Banta, R. M., deGouw, J.A., . . . Zamora, R. (2014). High winter ozone pollution from carbonyl photolysis in an oil and gas basin. *Nature*, 514(7522), 351-354. doi: 10.1038/nature13767<sup>25</sup> Stamford, L. & Azapagic, A. (2014). Life cycle environmental impacts of UK shale gas. *Applied Energy*, 134, 506-518. doi: 10.1016/j.apenergy.2014.08.063

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animals), AND because it exceeds [levels above which effects have the potential to occur.]”<sup>26</sup>

- € August 24, 2014 – A Salt Lake City Tribune investigation found that evaporation from 14 fracking waste pits in western Colorado has added tons of toxic chemicals to Utah’s air in the last six years. Further, the company responsible operated with no permit, underreported its emissions and provided faulty data to regulators.<sup>27</sup>
- € June 26, 2014 – Public health professionals at the

Southwest Pennsylvania Environmental Health Project reported significant recurrent spikes in the amount of particulate matter in the air inside of residential homes located near drilling and fracking operations. Captured by indoor air monitors, the spikes tend to occur at night when stable atmospheric conditions hold particulate matter low to the ground. Director Raina Ripple emphasized that spikes in airborne particulate matter are likely to cause acute health impacts in community members. She added, “What the long-term effects are going to be, we’re not certain.”<sup>29</sup> (See also footnote 281 for a related study on self-reported health effects by researchers from Yale and University of Washington.)

- € May 8, 2014 – Researchers at the National Oceanic and Atmospheric Administration (NOAA) found high levels of methane leaks as well as benzene and smog-forming volatile organic compounds in the air over oil and gas drilling areas in Colorado. Researchers found methane emissions three times higher than previously estimated and benzene and volatile organic compound levels seven times higher than estimated by government agencies. The Denver Post noted that Colorado’s Front Range has failed to meet federal ozone air quality standards for years.<sup>30</sup>

- € April 26, 2014 – A Texas jury awarded a family \$2.8 million because, according to the lawsuit, a fracking company operating on property nearby had “created a ‘private nuisance’ by producing harmful air pollution and exposing [members of the affected

<sup>26</sup> ShaleTest Environmental Testing. (2014, September). Project playground: Cleaner air for active kids. Retrieved from <http://www.shaletest.org/wp-content/uploads/2014/09/ProjectPlaygroundPatagoniaReport-5-1.pdf><sup>27</sup>

Maffly, B. (2014, August 24). Utah grapples with toxic water from oil and gas industry. Salt Lake City Tribune. Retrieved from <http://www.sltrib.com/sltrib/news/58298470-78/danish-flats-ponds-company.html>

<sup>28</sup> Hiller, J. & Tedesco, J. (2014, August). Up in flames: Flare in Eagle Ford Shale wasting natural gas. San Antonio Express News. Retrieved from: <http://www.expressnews.com/business/eagleford/item/Up->

[in-Flames-Day-1-Flares- in-Eagle-Ford-Shale-32626.php](#) <sup>29</sup> McMahon, J. (2014, June 26). Air pollution spikes in homes near fracking wells. Forbes. Retrieved from <http://www.forbes.com/sites/jeffmcmahon/2014/06/26/air-pollution-spikes-in-homes-near-fracking-wells/> <sup>30</sup> Finley, B. (2014, May 8). Scientists flying over Colorado oil boom find worse air pollution. The Denver Post. Retrieved from [http://www.denverpost.com/environment/ci\\_25719742/scientists-flying-over-colorado-oil-boom- find-worse](http://www.denverpost.com/environment/ci_25719742/scientists-flying-over-colorado-oil-boom- find-worse)

- August 2014 – A four-part investigation by the San Antonio Express-News found that flaring in the Eagle Ford Shale in 2012 contributed more than 15,000 tons of volatile organic compounds and other contaminants to the air of southern Texas—which is roughly equivalent to the amount of pollution that would be released annually by six oil refineries.

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No state or federal agency is tracking the emissions from individual flares.<sup>28</sup>  
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family] to harmful emissions of volatile organic compounds, toxic air pollutants and diesel exhaust.” The family’s 11-year-old daughter became ill, and family members suffered a range of symptoms, including “nosebleeds, vision problems, nausea, rashes, blood pressure issues.”<sup>31</sup> Because drilling did not occur on their property, the family had initially been unaware that their symptoms were caused by activities around them.

- April 16, 2014 – Reviewing the peer-review literature to date of “direct pertinence to the environmental public health and environmental exposure pathways,” a U.S. team of researchers concluded: “[a] number of studies suggest that shale gas development contributes to levels of ambient air concentrations known to be associated with increased risk of morbidity and mortality.”<sup>32</sup> April 11, 2014 – A modeling study commissioned by the state of Texas made striking projections about worsening air quality in the Eagle Ford Shale. Findings included the possibility of a 281 percent increase in emissions of volatile organic compounds (VOCs). Some VOCs cause respiratory and neurological problems; others, like benzene, are also carcinogens. Another finding was that nitrogen oxides—which react with VOCs in sunlight to create ground-level ozone, the main component of smog—

increased 69 percent during the peak ozone season.<sup>33</sup>

- € March 29, 2014 – Scientists warn that current methods of collecting and analyzing emissions data do not accurately assess health risks. Researchers with the Southwest Pennsylvania Environmental Health Project showed that methods do not adequately measure the intensity, frequency, or durations of community exposure to the toxic chemicals routinely released from drilling and fracking activities. They found that exposures may be underestimated by an order of magnitude, mixtures of chemicals are not taken into account, and local weather conditions and vulnerable populations are ignored.<sup>34</sup>

- € March 27, 2014 – University of Texas research pointed to “potentially false assurances” in response to community health concerns in shale gas development areas. Dramatic shortcomings in air pollution monitoring to date include no accounting for cumulative toxic emissions or children’s exposures during critical developmental stages, and the <sup>31</sup> Morris, J. (2014, April 26). Texas family plagued with ailments gets \$3M in 1st-of-its-kind fracking judgment. CNN. Retrieved from <http://www.cnn.com/2014/04/25/justice/texas-family-wins-fracking-lawsuit/> <sup>32</sup> Shonkoff, S. B., Hays, J., & Finkel, M. L. (2014). Environmental public health dimensions of shale and tight gas development. *Environmental Health Perspectives*, 122, 787–795. doi: 10.1289/ehp.1307866 <sup>33</sup> Morris, J., Song, L., & Hasemayer, D. (2014, April 11). Report: Air quality to worsen in Eagle Ford shale. *The Texas Tribune*. Retrieved from <http://www.texastribune.org/2014/04/11/report-air-quality-worsen-eagle-ford-shale/> <sup>34</sup> Brown, D., Weinberger, B., Lewis, C., & Bonaparte, H. (2014). Understanding exposure from natural gas drilling puts current air standards to the test. *Reviews on Environmental Health*, 29(4), 277-92. doi: 10.1515/reveh-2014- 0002

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potential interactive effects of mixtures of chemicals. Chemical mixtures of concern include benzene, toluene, ethylbenzene, and xylenes.<sup>35, 36</sup>

- € March 13, 2014 – Volatile organic compounds (VOCs)



emitted in Utah's heavily drilled Uintah Basin led to 39 winter days exceeding the EPA's eight-hour National Ambient Air Quality Standards level for ozone pollutants the previous winter. "Levels above this threshold are considered to be harmful to human health, and high levels of ozone are known to cause respiratory distress and be responsible for an estimated 5,000 premature deaths in the U.S. per year," according to researchers at the University of Colorado. Their observations "reveal a strong causal link between oil and gas emissions, accumulation of air toxics, and significant production of ozone in the atmospheric surface layer."<sup>37</sup> Researchers estimated that total annual VOC emissions at the fracking sites are equivalent to those of about 100 million cars.<sup>38</sup>

- € March 3, 2014 – In a report summarizing "the current understanding of local and regional air quality impacts of natural gas extraction, production, and use," a group of researchers from NOAA, Stanford, Duke, and other institutions described what is known and unknown with regard to air emissions including greenhouse gases, ozone precursors (volatile organic compounds and nitrogen oxides), air toxics, and particulates. Crystalline silica was also discussed, including as a concern for people living near well pads and production staging areas.<sup>39</sup>

- € February 18, 2014 – An eight-month investigation by the Weather Channel, the Center for Public Integrity, and InsideClimate News into fracking in the Eagle Ford Shale in Texas revealed that fracking is "releasing a toxic soup of chemicals into the air." They noted very poor monitoring by the state of Texas and reported on hundreds of air complaints filed relating to air pollution associated with fracking.<sup>40</sup>

The State of Michigan has a history of ignoring medical

opinion, delaying attention to, and taking proper responsibility for public health crises when poisons have entered our environment, food and water and the people of Michigan. The PBB contamination of Michigan's food supply in the late 1970s and the recent lead poisoning of Flint's residents are just two examples.

Fracking and acidizing oil and gas wells constitute the intentional poisoning of communities, with many known consequences, and with many more coming to light with every new study.

Deny the permit.

Sincerely,

LuAnne Kozma  
President, Ban Michigan Fracking  
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