



**Report 1 of the Forty-Third
Statewide Investigating Grand Jury**

Table of Contents

Introduction.....	1
The Realities of Shale Gas Operations.....	12
The Effects of Shale Gas Operations on Pennsylvania Families	22
The Pennsylvania Department of Environmental Protection.....	48
The Pennsylvania Department of Health.....	68
Recommendations of the Forty-Third Statewide Investigating Grand Jury	93
 RESPONSES TO REPORT NO. 1:	
Response of the Pennsylvania Department of Environmental Protection	103
Response of the Pennsylvania Department of Health	160
Response of Michael Krancer	224
Response of Scott Perry	228

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COMMON PLEAS**
INVESTIGATING GRAND JURY : **CP-02-MD-5947-2017**
:
: **NOTICE NO. 42**

**ORDER ACCEPTING AND FILING
INVESTIGATING GRAND JURY REPORT NO. 1**

On February 27, 2020, this Court accepted Investigating Grand Jury Report No. 1, finding that said report, within the scope of the Grand Jury’s authority, proposed recommendations for legislative, executive or administrative action in the public interest based upon stated findings, and further finding that said report was based upon facts received in the course of an investigation authorized by the Investigating Grand Jury Act, 42 Pa.C.S. § 4541 *et seq.* and was supported by the preponderance of the evidence. Prior to the report being made public, however, this Court exercised its discretion to permit responses to be submitted pursuant to 42 Pa.C.S. § 4552(e). The time period for submitting responses has now ended.

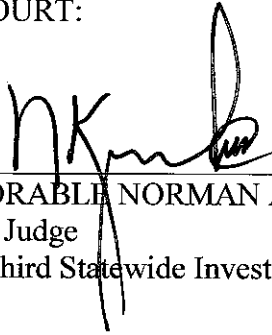
AND NOW, this 22 day of June, 2020, it is hereby **ORDERED** that:

1. Pursuant to 42 Pa.C.S. § 4552(e), the responses of the Pennsylvania Department of Environmental Protection, the Pennsylvania Department of Health, Michael Krancer and Scott Perry to Investigating Grand Jury Report No. 1 shall be attached to the report as part of the report, before the report is made part of the public record;
2. Investigating Grand Jury Report No. 1, having been accepted by the Court on February 27, 2020 pursuant to 42 Pa.C.S. § 4552(b), along with the responses of the Pennsylvania Department of Environmental Protection, the Pennsylvania Department

of Health, Michael Krancer and Scott Perry, shall be filed as a public record with the Washington County Court of Common Pleas and the Susquehanna County Court of Common Pleas pursuant to 42 Pa.C.S. § 4552(b),(e); and

3. The Attorney for the Commonwealth shall deliver copies of the Report to:
 - A. The Members of the Pennsylvania House of Representatives;
 - B. The Members of the Pennsylvania Senate; and
 - C. The Governor of the Commonwealth of Pennsylvania

BY THE COURT:



THE HONORABLE NORMAN A. KRUMENACKER, III
Supervising Judge
The Forty-Third Statewide Investigating Grand Jury

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COMMON PLEAS**
INVESTIGATING GRAND JURY : **CP-02-MD-5947-2017**
:
: **NOTICE NO. 42**

**ORDER ACCEPTING INVESTIGATING GRAND JURY REPORT NO. 1
AND DIRECTING FURTHER ACTION PRIOR TO THE REPORT BEING MADE
PART OF THE PUBLIC RECORD**

AND NOW, this 27 day of February, 2020, upon examination of Investigating Grand Jury Report No. 1, and finding that said report, within the scope of the Grand Jury's authority, proposes recommendations for legislative, executive or administrative action in the public interest based upon stated findings, and further finding that said report is based upon facts received in the course of an investigation authorized by the Investigating Grand Jury Act, 42 Pa.C.S. § 4541 *et seq.*, and is supported by the preponderance of the evidence, it is hereby **ORDERED** that:

1. Investigating Grand Jury Report No. 1 is accepted by the Court;
2. Investigating Grand Jury Report No. 1 shall be made part of the public record with the court of common pleas of Washington County and the court of common pleas of Susquehanna County, as these counties are the subject of Investigating Grand Jury Report No. 1. *See* 42 Pa.C.S. § 4552(b).
3. Pursuant to 42 Pa.C.S. § 4552(e), the Court finding that the report may be construed as offering constructive or critical guidance on matters implicating the operation of the Pennsylvania Department of Environmental Protection and the Pennsylvania Department of Health, and neither the Departments nor its employees being

charged with any criminal offenses, the Court hereby exercises its discretion to allow **THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF HEALTH, OR THEIR DESIGNEES,** to submit a response to the allegations in the report that may be construed as offering constructive or critical guidance on matters implicating the operation of their respective Departments;

4. The Attorney General, or his designee, is directed to disclose the entirety of the report to **THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF HEALTH, OR THEIR DESIGNEES,** who may share the entirety of the report with counsel for their respective Departments;
5. The limited disclosure of the report for purposes of submitting a response shall be accompanied by an Order of this Court advising that the content shall not be publicly disclosed until further Order of Court;
6. Upon receipt of the report, **THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND THE SECRETARY OF THE PENNSYLVANIA DEPARTMENT OF HEALTH, OR THEIR DESIGNEES,** may file a response within 21 days should they elect to do so. By Order of this Court, the response shall be submitted under seal to the Honorable Norman A. Krumenacker, III at the Cambria County Courthouse, 200 South Center Street, Ebensburg, Pennsylvania 15931; and

7. Upon receipt of any response, the Court shall then consider whether the responses shall be attached to the report before it is made part of the public record. *See* 42 Pa.C.S. § 4552(e).

BY THE COURT:




THE HONORABLE NORMAN A. KRUMENACKER, III
Supervising Judge
The Forty-Third Statewide Investigating Grand Jury

**IN THE COURT OF COMMON PLEAS
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INVESTIGATING GRAND JURY REPORT NO. 1

We, the members of the Forty-Third Statewide Investigating Grand Jury, duly charged to inquire into offenses against the laws of the Commonwealth of Pennsylvania, have received facts and evidence during the course of an investigation pursuant to Notice of Submission of Investigation No. 42 and have proposed recommendations for legislative, executive or administrative action in the public interest. So finding, by preponderance of the evidence, with no fewer than twelve concurring, we do hereby adopt this Report for submission to the Supervising Judge.


Foreperson
The Forty-Third Statewide Investigating Grand Jury

DATED: February 27, 2020

Introduction

The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

Pennsylvania Constitution, Article 1, Section 27: the Environmental Rights Amendment

This Grand Jury Report assesses impacts on Pennsylvania of a new, lucrative but often destructive enterprise – the unconventional oil and gas industry, commonly known as “fracking.” Unconventional oil and gas drilling began its explosive growth in this state more than a decade ago. We, the 43rd Pennsylvania Statewide Investigating Grand Jury, find by a preponderance of the evidence and in many instances by clear and convincing evidence, and that after comprehensive study in the course of our investigative duties, conclude that government oversight of this activity was for many years poor, and has only more recently shown signs of improvement. As a result, officials often did not do enough to properly protect the health, safety and welfare of the thousands of Pennsylvania citizens who were affected by this industry.

The Grand Jury began this investigation based on evidence that private companies engaged in unconventional oil and gas activities have committed criminal violations of Pennsylvania's environmental laws. We found such violations and we are issuing several presentments recommending the filing of criminal charges. And we believe investigation of additional crimes should, and will, continue beyond the term of this Grand Jury. In the course of our work, we found something else as well. We saw evidence that government institutions often failed in their constitutional duty to act as trustee and guardian “of all the people,” as Article 1,

Section 27 provides. We issue this Grand Jury Report to document our findings, and to make recommendations for improvements going forward.

We are not “anti”-fracking. The purpose of this Report is to present an account of the impacts of an industry that will affect Pennsylvanians for decades to come. We are aware that unconventional drilling brings significant economic benefits. But if the activity is to be permitted, it still must be regulated appropriately, in ways that prevent reckless harms. Instead, we believe that our government often ignored the costs to the environment and to the health and safety of the citizens of the Commonwealth, in a rush to reap the benefits of this industry.

At the same time, we recognize that some progress has been made in recent years. Our investigation engaged extensively with the Pennsylvania Department of Environmental Protection (DEP) and the Pennsylvania Department of Health (DOH), the two agencies whose responsibilities encompass oversight of unconventional oil and gas activity. We heard testimony from dozens of current and former employees of these departments, and learned that at least some of their failings are being somewhat addressed. But we strongly believe we have to examine and expose those failings, past and present, in order to illustrate the need for further improvement and to ensure that the mistakes of the past do not continue into the future.

We are also aware of continuing debate about the nature and degree of health impacts related to unconventional drilling. We do not believe, however, that such uncertainty could ever be an excuse for inaction. The risks of this new industry should fall on the industry and the regulatory agencies, not on the public. As we see it, the purpose of government agencies like DEP and DOH is to proactively prevent harm, not to wait and see if the worst really happens. There has already been too much of that.

Human impact

We heard, from witness after witness, about what happens when you find yourself living next to a fracking site. To understand, we had to spend a great deal of time over the last two years hearing testimony from experts and learning about the process. Unconventional oil and gas activity is heavy industry, requiring heavy construction, heavy trucks, and heavy traffic. Wells are drilled thousands of feet down into the ground, through water tables, and then drilled laterally for thousands more feet. The drills are lubricated with hazardous chemical compounds. When the holes are drilled, gas doesn't just flow up on its own. In order to release the gas, shale rock has to be fractured – “fracked” – using explosives and even more chemicals. There are thousands of wells around the state, and each one produces thousands of gallons of “flowback” or “produced water” – chemical-filled water that comes back up out of the well along with the gas. The fluid, as well as the drill cuttings, present unique issues for storage and disposal.

What is most concerning about this industry is that it doesn't happen in out-of-the-way industrial parks. It happens wherever there is a deep seam of shale rock – under houses, and farms, and woodlands. It's a geological crapshoot. Landowners who sell their mineral rights often have no idea what it really involves, and people who buy property after rights have already been sold, or who live next to someone else who sold, have no choice in the matter.

Wells can be drilled as close as 500 feet from your front door. Once construction of a well pad begins, life changes. We heard about the clouds of dust, the grimy film, the booming and the blinding lights, day and night. The construction phase of the process is still just the beginning. Next comes the drilling and the hydraulic fracturing of the wells. These parts of the process bring their own nuisances, some of which are similar to what homeowners experienced during the construction phase. Oftentimes, the noise is far worse than it was during the

construction phase and can occur 24 hours a day. Some people had to sleep in a corner of the basement trying to get away from it. The vibrations from drilling and fracking were sometimes so intense that all the worms were forced up out of the ground.

Aside from the nuisances of the process, some people, as we learned from testimony, began to notice changes to their water. In many areas where unconventional oil and gas activity is common, there is no public water line. People rely entirely on water wells drilled on their own property. When the oil and gas operators spilled products used to fracture a well, or the storage facilities that held the waste water leaked, the chemicals made their way into the aquifers that fed those water wells. The water started smelling like sulfur, or tasting like formaldehyde. It burned the skin. There was a black sludge in the toilet. Some people hauled in “water buffaloes” – giant tanks of clean water – but the monthly cost could be more than a mortgage payment.

Then there was the air. The smell from putrefying waste water in open pits was nauseating. Airborne chemicals burned the throat and irritated exposed skin. One witness had a name for it: “frack rash.” It felt like having alligator skin. At night, children would get intense, sudden nosebleeds; the blood would just pour out. But you can’t buy a water buffalo to replace the air you breathe.

Many of those living in close proximity to a well pad began to become chronically, and inexplicably, sick. Pets died; farm animals that lived outside started miscarrying, or giving birth to deformed offspring. But the worst was the children, who were most susceptible to the effects. Families went to their doctors for answers, but the doctors didn’t know what to do. The unconventional oil and gas companies would not even identify the chemicals they were using, so that they could be studied; the companies said the compounds were “trade secrets” and “proprietary information.” The absence of information created roadblocks to effective medical

treatment. One family was told that doctors would discuss their hypotheses, but only if the information never left the room.

Regulatory reaction

Contamination of water and air is not supposed to happen, of course. Environmental laws and regulations are supposed to prevent these very things. The agency responsible to enforce those requirements is DEP. Our investigation, however, convinced us that DEP did not take sufficient action in response to the fracking boom, and even now, more than a decade after it began, must do more to fully address the special challenges posed by the industry.

Unconventional oil and gas activity uses completely different processes than classic oil drilling, or any other industry that DEP had previously regulated. New rules were required to cope with these issues. But it took the agency years to promulgate regulations specifically targeting this industry, and some crucial areas still haven't been covered. The Department says formal regs are subject by law to an inherently slow review process beyond DEP's control. But we've seen the agency issue and enforce informal rules, when it elected to do so; and on many occasions it hasn't availed itself of that option either. As a consequence, companies were free to continue environmentally hazardous activities that DEP had the power to stop.

DEP employees didn't just need new rules; they needed new knowledge. The Department was faced with novel extraction technologies that no one knew anything about. In the early days of the industry, DEP endeavored to better understand aspects of the process by performing its own study. And yet, the agency did not effectively share the information among its own staff once it was acquired. We learned that expert training is available that could assist DEP employees in their ability to effectively regulate this industry. In spite of its availability, the agency hasn't found a way to avail itself of many of these training opportunities.

More concerning, though, were the Department's failures to enforce its existing powers. DEP was charged with protecting water quality. One of the mechanisms to do so was to conduct water testing when a homeowner complained of contamination. However, we learned that DEP was relying on old, pre-fracking criteria – meaning DEP employees weren't even looking for the new compounds used in unconventional drilling, and therefore couldn't accurately say whether it was causing contamination. And the Department sometimes failed to take advantage of the law's most powerful feature: the "zone of presumption." If water sources near a gas well showed contamination in the period soon after drilling and hydraulic fracturing, the burden was on the operator to disprove responsibility. But that presumption was not consistently enforced.

We were also troubled by other practices. We learned, for example, that DEP employees often elected not to inspect reported violations; some employees would just call the well's operator, and rely on his version of events. And even in cases where investigation did show that a violation had occurred, and that ground water had been tainted, DEP employees typically chose not to notify neighboring landowners, who would have had no way to know there was a problem. Even today, there is apparently no policy that requires DEP to notify unsuspecting neighbors that a nearby resident's water was found to be contaminated, and therefore that their water could be contaminated as well.

The goal of regulatory oversight, moreover, is not only to discover past violations of environmental requirements, but to deter new ones. And the way to do that is to punish violators once they are identified. Administrative action begins with a Notice of Violation (NOV). But especially in the early years, there just weren't very many NOVs issued for fracking violations. In fact, in 2011, the Department issued a directive prohibiting oil and gas NOVs unless they were personally reviewed and approved by the Secretary himself, the top official in the Department.

The message to employees, intended or otherwise, was to leave fracking alone. That message was reinforced by the Department's failure to use another powerful tool at its disposal: referral of cases for possible criminal prosecution. Even in recent years, when things have gotten better in some other respects, the number of criminal referrals for fracking infractions has been close to zero.

We believe that some DEP employees saw the job more as serving the industry than the public. We heard too many stories of complaints unanswered, or cavalierly dismissed. Some employees refused to consider evidence of problems presented by citizens, while at the same time readily accepting and believing information supplied by operators. Even when homeowners went to the trouble and expense of hiring their own experts, some DEP employees did not listen. We appreciate that not every complaint is founded. But, in areas of this Commonwealth where fracking has taken a toll, many people do not believe that DEP is an honest broker. Work remains to win back that trust.

Public health response

In some ways, the Department of Health should have had an easier time dealing with the shale gas boom than DEP did. Unconventional oil and gas activity was a revolutionary development. Public health crises, on the other hand, were nothing new for DOH. The Department, like other public health agencies, had seen plenty of newly arising health conditions, such as HIV, that demanded concerted action from health care officials: reaching out to doctors and hospitals in the affected area to gather information, tracing pathways of transmission, educating the public to recognize warning signs and prevent their spread.

Yet somehow it was different with fracking. When reports started coming in from homeowners suffering the symptoms of exposure to frack-contaminated air and water, DOH was

suddenly hands off. There was no special training for public health center staff in affected communities; no public education alerting people to the potential problem; no centralized collection of data that might help pin down what was making people feel sick.

Instead, staff were directed, in effect, to leave fracking-related complaints alone. The agency actually constructed a list of approximately 20 words related to health complaints arising from unconventional drilling activity. Staff were instructed that if anyone called in, and used one of those words, the staff member should end the call and direct the caller to a central office at headquarters. After that, nothing happened. Callers who had been transferred to the central office never got anywhere. They would call back to their district office asking what happened. Meanwhile, DOH employees who could see that something was going on in their communities, and who were trying to educate themselves about it, were instructed that they could not attend meetings or events related to fracking without applying for and receiving special permission that was not required in other areas.

It didn't have to be that way. We know, because we heard from other entities about how they handled these health issues. We heard evidence about a non-profit health organization active in southwestern Pennsylvania, and a federal agency working on this issue throughout Pennsylvania. Professionals from these organizations actually investigated to try to find out what was happening. They used tools to collect air specimens and to detect patterns. They discovered that exposure levels varied considerably by various factors, such as distance from the well, time of day or night, elevation, and weather conditions. DOH could, and should, have been doing the same kind of work, but never did.

Now the agency tells us they are enhancing their response to fracking-related health complaints. They have a new centralized database, although few people call to report

information, because DOH has little to provide in return. The Department says it is changing that; it is embarking on a new, three-year study, at a cost of one million dollars per year, to examine possible links between health and unconventional oil and gas activity. We are pleased to hear that. But the study is retrospective, meaning it will attempt to gather and analyze already existing data from prior complaints. And because DOH effectively discouraged such complaints in the past, there may be little data to review.

We believe the Department is still in a state of denial about the potential effects of fracking-generated substances on human beings. We asked DOH to share with us its opinion on whether fracking posed a risk to public health. The answer was that definitive causation “has not been proven.” Well, yes; you can’t prove what you don’t examine, and DOH has gone out of its way in the past not to look at connections between fracking and health effects. The circumstantial evidence is compelling and we think it was the Department’s job to look at it. The new study is a start, but is still far from the proper response of a public health agency.

Recommendations

We urge the executive and legislative branches of Pennsylvania’s government to seriously consider the findings of this Report, and to act in favor of the common good of Pennsylvania and its citizens. We think there is more that can and must be done to minimize the hazards arising from unconventional drilling. Some of it is science; but it’s not rocket science. These are practical and available responses to the problem.

1. Expand the no-drill zones

Everything we’ve seen confirms that all the impacts of fracking activity are magnified by proximity. The closer you live to a gas well, compressor station or pipeline the more likely you are to suffer ill effects. Yet the state law minimum “set-back” for well construction is only 500 feet. That is dangerously close. An increase in the set-

back, to 2500 feet, is far from extreme, but would do a lot to protect residents from risk.

2. Stop the chemical cover-up

Oil and gas companies use huge quantities of complex, man-made chemical compounds, which then get released into the environment. Some of them are subject to disclosure requirements, but only after they've been used. Some have no reporting requirement at all. And some are kept hidden based on "trade secret" claims. Let's end this camouflage, provide transparency to the public, and mandate disclosure of all chemicals used in any aspect of unconventional drilling, so their possible hazards can be properly considered.

3. Regulate the pipelines

Fracking requires special pipelines that pose special environmental risks. When they travel through less-populated areas, though, the network of smaller pipes, called "gathering lines," is almost completely unregulated. This is yet another undeserved exemption for elements of the unconventional drilling system. Close that loophole.

4. Add up the air pollution sources

Fracking equipment regularly releases gasses into the atmosphere. One of the culprits is the so-called "pigging station," where pipeline valves are opened up for cleaning. DEP generally considers individual pigging stations as too small to require attention. But these stations are often located near each other, and so they have a cumulative effect that is significant. Start adding together all the emissions producing sources in a specific area and treat them as one pollution source, so that the true impact on local residents can be properly addressed.

5. Transport the toxic waste more safely

The industry uses hazardous chemicals in drilling and hydraulically fracturing unconventional wells. These chemicals return to the surface as waste. This waste is transported around the Commonwealth in trucks labeled as non-hazardous "residual waste." That means when the public and first responders encounter this waste, they do not know it could be highly dangerous. To mitigate this risk, Pennsylvania should require trucks carrying waste containing chemicals used in the drilling and fracturing process display signage specifically identifying the source of the waste they carry.

6. Deliver a real public health response

Let's release DOH from its self-imposed constraints and require it to treat fracking like any other public health crisis. Send out the nurses and doctors to interview health care professionals. Advertise in affected areas. Collect sophisticated data and conduct sophisticated analysis.

7. End the revolving door

DEP employees, once trained about fracking at government expense, are often poached away to much higher-paying jobs in the oil and gas industry. That creates a potential conflict of interest for government workers whose duty is to regulate the people who may well be their future employers. A revolving door rule would reduce that potential conflict by requiring a period of delay before taking a new job in the regulated industry.

8. Use the criminal laws

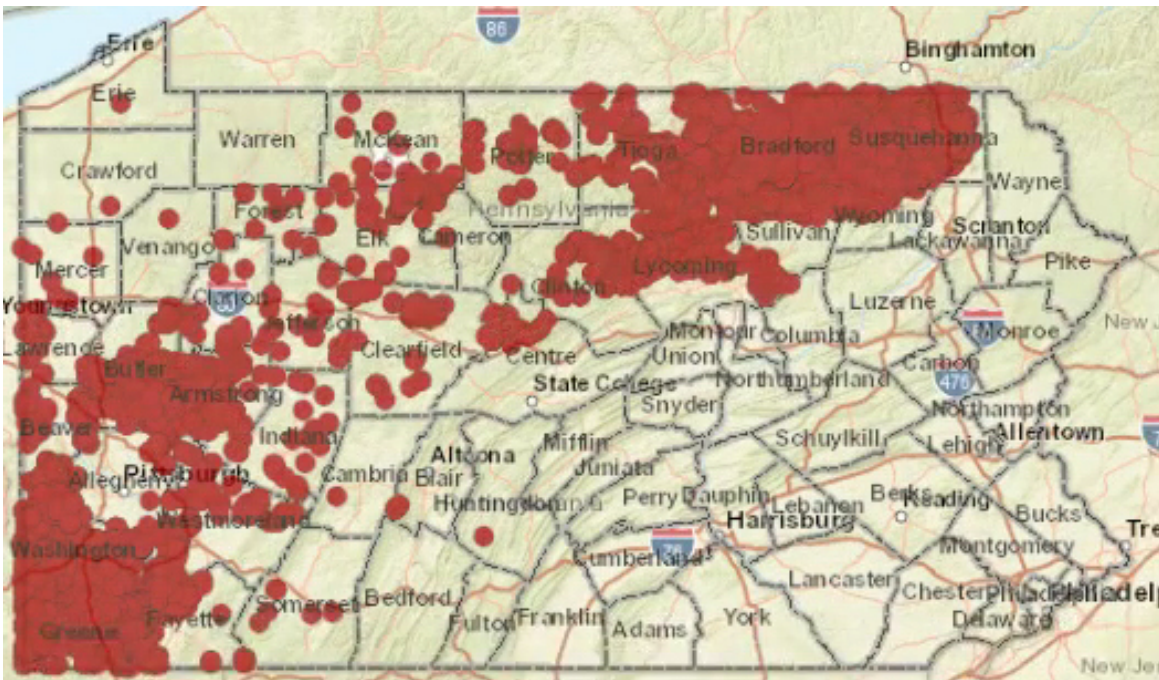
DEP won't use its most powerful weapon against frackers who break the rules: criminal prosecution. But there's no reason it should only be DEP's call to make. Extend jurisdiction to the Office of Attorney General, so that its environmental crimes section can follow the evidence and make appropriate decisions about criminal charges, without leaving it all up to DEP.

If we ignore history, we're bound to repeat our mistakes. That is why we are issuing this Report. We've been here before in Pennsylvania. First, we allowed the timber in our Commonwealth to be plundered. Then it was our coal. Now it's shale. Other industries will certainly come our way, for some new natural resource to exploit. This is the time to learn our lesson for the future: who will bear the inevitable risks? We say it should be those who exploit the resources, not those who live among them. That means let industry pay the price of harm reduction, and let government take the time to get it right before we hand over the keys. And for the present, let us at least do all we can to catch up.

The Realities of Shale Gas Operations

Pennsylvania has experienced an extraordinary oil and gas boom since the first unconventional well was drilled in Washington County in 2004. Today, approximately 12,500 unconventional oil and gas wells have been drilled in Pennsylvania, and around 10,500 are actively producing natural gas. Hydraulically fracturing a well is a heavy industrial operation. Even under ideal conditions, these operations significantly affect the environment and communities where they occur.

Fracking technology has enabled the extraction of once unobtainable oil and gas deposits in shale rock formations thousands of feet below the surface of Pennsylvania. In the Commonwealth, unconventional drilling has targeted the Marcellus shale formation, a 575-mile long deposit of flat lying shale rock running beneath West Virginia, Pennsylvania, Ohio, and New York. As shown in the depicted map, in Pennsylvania, the Marcellus runs from the southwest of the Commonwealth in an arc toward the northeastern region of the state, with drilling concentrated in the southwestern corner and northeast.



The ability to access gas deposits in shale formations through unconventional drilling has revolutionized energy production in the United States, and Pennsylvania is at the center of this revolution. While unconventional drilling and recovery involves impressive feats of engineering, it is an industrial enterprise. It has in many cases been undertaken within a few hundred feet of homes and water supplies. This close proximity between industry operations, homeowners, and communities results in unavoidable risks and problems.

The fracking industry is still in its infancy. Experts anticipate that there will be another 30,000 to 40,000 unconventional wells drilled in the Marcellus shale in the coming years. These estimates do not reflect the drilling potential of other shale formations lying beneath Pennsylvania, such as the Utica shale, which also contain substantial gas deposits. Understanding how fracking has developed in Pennsylvania up to the present day is important because we are concerned about Pennsylvania's future. We must act now, with a clear and honest understanding of the reality of this industry, to avoid potentially devastating consequences to our environment and the health and well-being of Pennsylvania residents.

The drilling process

The first stage requires clearing and leveling the drilling site and preparing the drilling infrastructure, including a well pad, an access road to the well pad, and any other required equipment. Once the necessary infrastructure and large machinery are in place, drilling begins. The industry utilizes fluids and chemicals throughout the drilling process to manage friction, allow drill cuttings to move vertically up and out of the well, and to cool and lubricate the drill bit. Drill cuttings can be contaminated with hazardous chemicals used in the drilling process, as well as naturally occurring metals previously trapped beneath the earth's surface, which can be harmful and even radioactive.

Drilling an unconventional well occurs in stages. As each section is drilled, a metal pipe called a "casing" is inserted into the ground to stabilize the hole. Cement is then pumped under pressure inside the casing and when it reaches the bottom of the drilled hole, is pushed up the outside of the casing to fill the area between the casing and surrounding rock and soil. Once the cement hardens, the intended result is a metal casing surrounded by cement that has completely filled and sealed any space between the well and its surroundings. The process is repeated with progressively narrower casings as the well is drilled.

The Marcellus formation lies from 7,000 to 9,000 feet underground and is around 100 to 350 feet thick. At around 1,000 feet of the targeted shale deposit, drilling goes from vertical to horizontal at a slight curve. Once lateral, the well is drilled out through the shale rock for upwards of 25,000 feet, or approximately five miles.

The hydraulic fracturing process

Once an unconventional well is drilled and casings are in place, "perforating guns" are lowered into the horizontal extension of the well. Perforating guns allow explosives to be placed and detonated in order to puncture hundreds of dime-size holes through the production casing and cement and out into the rock formation. This is followed by hydraulic fracturing, which uses a high-pressure injection of fluid (generally water), "proppant" (sand or silica), and chemicals to fracture the shale and stimulate production. The fracturing process requires the use of extraordinary amounts of fluid.

All of those fluids do not remain underground. A portion of the fluid used in the fracking process returns to the surface as "flowback." Flowback consists of the chemical composition of the fracking fluid plus naturally occurring substances it mixed with during the fracking process, such as chloride and strontium.

Once the flowback has exited, natural gas begins flowing upward and out of the well. At this point, the well is in production. In addition to gas, wells expel "produced water," which consists of fracking fluid that did not initially exit the well as flowback, but steadily exits a well during production. Because produced water has remained in the subsurface far longer than flowback, it is more contaminated, and will typically contain high levels of sodium chloride (salt), bromide, lithium, boron, iron, manganese, arsenic, and radioactive radium. An unconventional well can produce from half a million to over three and a half million gallons of flowback and produced water over the first five to ten years of production.

Pipelines

In Pennsylvania, natural gas is transported from well sites via a series of pipelines. From the wellhead, gas first travels through "gathering lines," which are around four-to-six inches in diameter and can be highly pressurized at around 1,000 psi. Gathering lines are not subject to safety regulations in less populated areas. Despite the proliferation of gathering lines throughout the Commonwealth and the fact that they commonly leak, in underpopulated areas (less than 10 residences within 1 linear mile of pipeline) they are not regulated or otherwise monitored by the federal government or the Commonwealth for safety.

Gas transfers from gathering lines to "transmission lines," which are 36-to-42 inches in diameter and travel for hundreds to thousands of miles. Transmission lines ultimately arrive at a "city gate," where gas is decompressed, odorized, and distributed to end use consumers through narrow, low-pressure "distribution lines."

"Compressor stations" are strategically placed along gathering and transmission lines to add and maintain pressure in the pipeline, as well as to clean, cool, and otherwise facilitate movement of natural gas through the pipeline network. It is necessary to release gas from

compressor stations through "blowdowns," which are required to ensure the pipeline can be depressurized in case of emergency. Transmission lines, as well as gathering lines, employ "pigging stations," where devices called "PIGs" (pipeline inspection gadgets) are inserted and removed from pipelines to clean out debris and gather data to ensure the pipeline is operating properly. Each time a pig is inserted or removed from a pigging station, the pipeline has to be depressurized and gas released through a blowdown. As with blowdowns at compressor stations, release of gas from a pigging station can have an impact on the environment and those in the vicinity of where the blowdown occurs.

Disclosure of chemicals used in drilling and hydraulic fracturing

Approximately 1,600 different chemicals have been detected in fracking wastewater. We have high quality toxicity data on only about 10% of these, however. Among the most common of these chemicals are petroleum distillates, which are like diesel fuel, and act as "friction reducers" to sustain pressure in a pipe. Hydrochloric acid is frequently used to keep the holes in a production casing clear and open to allow gas to flow into a well. Corrosion inhibitors protect the inside of the casing from corroding. We were particularly concerned to learn that petroleum distillates are commonly used in the fracking process because they contain "BTEX" chemicals like benzene, toluene, ethylbenzene, and xylene. BTEX chemicals are extremely toxic and can cause serious health effects in very small doses, including cancer, neurotoxicity, kidney damage, liver toxicity, changes to blood chemistry, and harm to the immune system.

A sophisticated nationwide system, referred to as "SARA Title III," governs the treatment of hazardous industrial chemicals in the workplace. This system requires businesses to directly report dangerous chemicals they store on site to "Local Area Emergency Planning Committees," local fire departments, and Hazmat teams. The information is also available to the

public. Notifying first responders of dangerous chemicals in their communities allows them to prepare for a fire or emergency at a facility where these chemicals are present. Businesses are required to maintain “Safety Data Sheets” to identify the chemicals on site and allow first responders to quickly determine the specific risks associated with them in emergencies. When dealing with dangerous chemicals such knowledge is essential – firefighters and Hazmat teams can only do their jobs if they know what they are dealing with.

Remarkably, the shale gas industry, despite using and transporting dangerous chemicals in their everyday operations, is largely excused from SARA Title III’s oversight regime. No other industry enjoys such comparable exemptions.

Because of these federal exemptions, the states almost exclusively govern the fracking industry’s obligations to publicly disclose the dangerous chemicals it uses. In Pennsylvania, the industry self-reports and publicly posts the chemicals used in hydraulically fracturing an unconventional well on a website called "FracFocus." Via FracFocus, anyone can look up any shale gas well in Pennsylvania and see what chemicals the operator reported using in fracturing the well. Operators are required to provide this information only after completing a fracturing job, however, with the DEP receiving notification 30 days after and a public posting occurring within 60 days.

There is a significant gap in reporting, however, because the industry is not obligated to identify or provide information about chemicals they classify as proprietary trade secrets. While the industry must disclose trade secret chemicals to the DEP, the public and first responders cannot access them. Keeping these proprietary chemicals secret leaves firefighters and Hazmat teams incapable of effectively or safely responding to emergencies at unconventional gas sites.

Communities, industry employees, and others who find themselves in close proximity are likewise kept in the dark. This risk is unacceptable. Only full public disclosure is sufficient.

In addition, the industry is only required to disclose chemicals used in the hydraulic fracturing process, but not the drilling process. This is a serious problem because chemicals used in the drilling stage can come into direct contact with the water table. We have learned that water contamination most frequently occurs when a well is drilled. Yet the drilling stage, when water supplies are most at risk, is largely unregulated.

The industry argues that maintaining the confidentiality of trade secret chemicals is necessary to protect their competitive advantages. We find any competitive interest of the industry outweighed by the need for Pennsylvanians to know all chemicals used in fracking operations. In addition, we have learned that full disclosure of trade secret chemicals can occur without harming oil and gas operators' economic interests.

In 2014, a United States Department of Energy task force unanimously recommended full disclosure of all constituents used in hydraulic fracturing, including those containing trade secret information. The task force concluded that complete disclosure can occur with nominal risk of revealing proprietary information if it is “organized by the chemicals rather than the additives of products to the fluid.” In the words of one witness, “it is like the back of the Kentucky Fried Chicken box Ingredients do not make a recipe.”

Pennsylvania should require full public disclosure of all chemicals, including trade secret chemicals, used in both drilling and hydraulically fracturing an unconventional well. These disclosures should occur before drilling commences, and an operator should update its disclosures if different chemicals are used during a fracking job. Anything other than complete disclosure poses an unacceptable risk to communities and first responders.

Hauling fracking waste

The dangerous chemicals used to drill and hydraulically fracture unconventional wells end up in drill cuttings and millions of gallons of wastewater produced by each individual well. Managing the millions of gallons of wastewater generated by unconventional oil and gas operations, in particular, presents an extremely challenging problem. The fracking industry has never had a good solution for this problem, and it persists today.

For years following the fracking boom, the DEP permitted the industry to dispose of flowback and production water at municipal wastewater facilities. However, these facilities could not process the various metals, chemicals, radioactive materials, and extreme salinity of these fluids. Therefore, in 2012, a voluntary ban on accepting fracking fluids at wastewater facilities was instituted, and Pennsylvania later formally banned the practice.

Fracking wastewater can be permanently disposed of by pumping it into decommissioned oil and gas wells called "deep injection wells," or "underground injection control wells." There are currently around a dozen permitted deep injection wells in Pennsylvania, and only a few of these operate commercially; meaning they can accept wastewater from any operator. Rigorous permitting requirements, local opposition and litigation, and the fact that Pennsylvania's geology is not conducive to these wells means they are not a viable local option to the fracking industry's wastewater problem.

There are over 200 deep injection wells in Ohio, however, so 90% to 95% of Pennsylvania's fracking wastewater disposed of in deep injection wells goes to Ohio. Given the cost and logistical burden of shipping wastewater to these out-of-state injection wells, this is not a viable solution to the industry's wastewater problem.

The industry primarily employs on-site tanks to store flowback and produced water, which is later "recycled" to frack other wells. In Pennsylvania, around 90% of flowback and produced water is recycled, and 20% to 30% of fracturing fluids are composed of recycled wastewater. This practice entails storing fluids in a series of interconnected "frac tanks," which hold around 20,000 gallons and are roughly the size of a shipping container. More recently, companies have begun using "modular aboveground storage structures," which are temporary holding tanks that store massive amounts of wastewater.

Before flowback and produced water can be recycled, it has to be treated. Operators use on-site mobile treatment units or ship their waste to the approximately 20 treatment plants around the Commonwealth. Treating fracking wastewater is its own distinct industry, with costs ranging from \$2.00 to \$10.00 a barrel (42 gallons) depending on the degree of treatment performed.

Both "recycling" wastewater and disposing of it in deep injection wells requires hauling it around the Commonwealth and neighboring states in tanker trucks. This wastewater may be composed mostly of brine and relatively harmless constituents, or it may be full of extremely dangerous chemicals or highly radioactive. There is no way to tell, however, because the industry is not required to identify or manage its wastewater for what it actually contains. Due to exemptions under federal law, trucks carrying fracking wastewater in Pennsylvania are not placarded as hauling hazardous waste, even though they may be carrying hazardous waste. Rather, they display signage indicating they are carrying "residual waste," which fails to account for the serious health and environmental risks posed by fracking wastewater.

Hauling fracking wastewater as "residual waste" poses a serious risk to the public and first responders because if there is an accident and the driver of a truck hauling fracking waste is

incapacitated, the public and first responders at the scene won't know that whatever may have spilled all over the roadway came from a fracking site. Pennsylvania should require that trucks hauling solid and liquid waste containing chemicals from shale gas operations display signage indicating the source of the waste in question. While this signage may not clearly state exactly what is in the waste in question, the public will know it came from a fracking site and can handle the matter appropriately given the risk that it may contain extremely dangerous chemicals.

Our government and the shale gas industry currently have no long-term sustainable solution to managing the toxic waste generated by fracking operations. At the very least, the industry should be required to more safely and responsibly transport this waste around the Commonwealth.

The Effects of Shale Gas Operations on Pennsylvania Families

We heard testimony of the experiences of over 70 households with the shale gas industry. This sampling represents the limited number of complaints we as a grand jury had jurisdiction to investigate. While the number of homeowners we heard from is far less than the total number of Pennsylvanians who have experienced harm from fracking operations, their stories provided us with a sound and detailed understanding of the realities of this industry and the problems associated with fracking in our Commonwealth.

We are deeply grateful to the homeowners who shared their stories with us. We were moved by the profoundly emotional experiences many have endured. Often, their pain was still raw, but they nevertheless testified and taught us about the sometimes harsh reality of shale gas operations. While we cannot truly capture what it was like to witness their testimony, all those reading this report should understand that we find the testimony of these homeowners credible and compelling.

While each homeowner's experience was unique, they were in many ways similar, regardless of whether they lived in the same township or hundreds of miles from one another. Indeed, many of their accounts were remarkably consistent. Dozens of people experienced the same medical symptoms in association with the same oil and gas activity. Parents invariably feared what exposure to fracking operations posed to their children's health and future, as any parent would. There are simply too many people who have suffered similar harms in communities throughout Pennsylvania where fracking occurs to disregard the damage caused by this industry's operations. This reality necessitates laws and regulations capable of protecting those put at risk by fracking, and a government willing to enforce them. For too long, Pennsylvania has failed to live up to its responsibility to its people in both respects.

Fracking is a heavy industrial operation. It requires hundreds or even thousands of trips by heavy trucks, coming and going from a well pad, 24 hours a day, for months. Drilling and fracturing requires the use of dangerous chemicals – some known and some unknown, because the industry refuses to disclose them. The use of these chemicals produces contaminated solid waste and hundreds of thousands of gallons of liquid waste. The industry is exempt from treating the dangerous byproducts of its operations as hazardous. Spills and accidents happen. Emissions are inevitable. We examined evidence and heard testimony showing that when all this industrial activity occurs within a few hundred feet of someone's home, as our laws have allowed, harm to public health and significant disruption to people's lives result.

We do not claim to have an easy solution that would allow fracking operations and residents to coexist in perfect harmony. However, the recommendations we do offer are necessary and obvious. Extensive testimony, hundreds of exhibits containing records, and technical data from leading experts and dozens of DEP and DOH employees support what we propose. Ultimately, the recommendations in this Report are rooted in and validated by the experiences of everyday Pennsylvanians who shared with us the real world effects unconventional oil and gas operations can have on people's lives. Confronting and fixing the legal, regulatory, and executive-level norms that enabled the harms experienced by the homeowners will go a long way toward restoring some balance between fracking operations, public health, and the constitutional right to "clean air, pure water, and the preservation of the natural, scenic, historic and esthetic values of the environment."

The vast majority of homeowners we heard from lived in rural, agricultural areas. Some deliberately sought an escape from the noise of urban or suburban life when they bought property and built their dream homes. They lived on small plots of land as well as on farms

spanning hundreds of acres. Some entered into oil and gas leases, often under false pretenses or lacking a full understanding of what fracking operations would entail. As one homeowner told us,

The land manager told us that when they were finished, all that would be in there were a few green tanks, but we had no idea that it was going to be a three-year ordeal of 24-hour lights, back-up beepers, digging, my wall vibrating in my house. Just had no idea.

Many did not sign leases, but that did not insulate them from the life-altering disruption of industry activities. Extraction may occur on a neighboring property, or an oil and gas company might have obtained the mineral rights to the land from a prior owner, allowing the company to access the property to extract the oil and gas lying below. So long as the operation was not within 500 feet of their home – the only limitation under Pennsylvania law – residents had no control.



Families that once lived in peaceful agrarian communities suddenly found themselves living in something resembling an oil refinery. As one witness described it,

It has made it an industrial zone. There is no country living out there anymore. Getting out of our driveway alone is dicey at best. We have a lot of fracking trucks. We have a lot of sand trucks. We have a lot of construction vehicles And there is – you know, when we first started building, there was one small compressor station. There is two very large compressor stations. There are two cryogenic plants. There are several wells, pigs, of course, and that is all within less than a mile from our house. Most is I would say less than three quarters of a mile. . . . So, yeah, it is – it is worrisome.

For homeowners who did not own the mineral rights beneath their property, the realization that an oil and gas operator had the right to come onto their land and set up operations could be traumatic:

A: I just got a chill. You kind of forget some of those things. But when it first happened, it was devastating to have somebody knock on your door and tell you we're going to come on your land, we have the right to do it, and we're going to use – I don't even know how many acres they said. I don't even know if they knew at the time. You know, beautiful wooded land, places I take trail horses with old tree lines with trees covered and old fence lines. It was a nightmare. I remember [my husband] and I both – I don't think I slept through the night for a month. It was like a nightmare. You just can't imagine somebody knocking on your door saying we have the right to come on your land and do such and such to the land. It was like a living nightmare really.

Q: Ultimately, did they come on the land to start constructing well pads?

A: Ultimately, they did, yeah.

Once an operator has secured leases for mineral rights in and around the area of the proposed well pad, their next step would be to acquire all necessary permits. Once the permits are in hand, the operator would begin the actual construction of the well pad. The heavy industrial nature of fracking becomes evident to property owners from the very outset of constructing the well pad. Many homeowners described the extreme disruption this process

caused to their lives. Heavy truck traffic caused clouds of dust to circulate around their properties, blanketing their homes inside and out. They kept their windows shut. They stopped spending time outdoors. Their children could not play in their yards. A grimy film would accumulate on glass surfaces as dust and particulate matter invaded the interior of their homes. These sort of problems were a direct result of our laws permitting shale gas sites in such close proximity to people's homes.

The industrial nature of fracking operations is apparent from just looking at a typical well pad.



Construction of the pad is only the beginning. Next comes the drilling of the gas wells. This part of the process can continue for weeks on end, day and night, with the drilling pad lit up with blinding lights, creating extraordinary noise and vibrating the Earth around it. The closer a homeowner lived to these operations, the more traumatic they were to their previously peaceful lives. Homeowners described sleeping in corners of their basements in an effort to escape the bright lights and noise. They could not sleep. Their children could not sleep. They could not escape the industrial activity happening so close to where they lived.

When they sought help from local authorities, their pleas often fell on deaf ears. For example, we heard testimony that when residents complained that industry operations were in violation of noise ordinances, local governments changed the ordinances to accommodate the industry rather than responding to the needs of their citizens. In addition to finding no help from the local authorities, we heard from homeowners who sought help elsewhere and were equally frustrated. One witness recounted calling DEP to register her complaints and being told to call 9-1-1 instead. When she called 9-1-1 as instructed, they did not understand why she was calling and were equally unhelpful. The lack of response from agency after agency led to feelings of hopelessness, despair, and distrust toward the government.

Many homeowners reported that they first experienced contamination of their drinking wells during the drilling process. Drilling through the water table would turn their well water brown and rust-colored and fill it with sediment. Sometimes after drilling was complete, their well water would eventually return to normal after constituents in the aquifer resettled or contaminants introduced during the drilling process dissipated or moved along in the aquifer. For others, contamination of their water supply was just beginning. In some cases, homeowners experienced a complete loss of their water supply.

Below is a photo of contaminated tap water from a homeowner's well:



For many Pennsylvanians living in rural areas, such as where shale gas drilling proliferates, clean drinking water is available only from wells. Most of us take for granted the safe, municipally supplied water we use every day. In rural parts of the Commonwealth, public water is the exception to the rule, and well water is the only option. Thus, if industry operations contaminate a family's water supply, they cannot simply hook up to a public system. When their water suddenly changes in taste, smell, or appearance, they can either continue drinking it and hope for the best or begin hauling clean water to their homes.

Many resort to using large water tanks called “water buffalos.” Sometimes an oil and gas operator alleged to have contaminated a family’s well will supply them with a water buffalo, at least temporarily, while other homeowners are left to cover the cost of an alternative water source themselves. One homeowner testified that paying for an alternative water supply cost her family \$650 per week, which can easily exceed a family's monthly mortgage payment. We heard testimony from some homeowners who felt that oil and gas operators would remove their water

buffalo in direct response to additional or continuing complaints that they made. We find this behavior, if true, unconscionable.

The next stage in the process of extracting natural gas is known as hydraulic fracturing. During this stage of the process, many homeowners described over 200 trucks coming and going from a well site in a single 24-hour cycle. This traffic goes on for weeks as a well is fracked. These numbers are not exaggerated. They reflect the millions of gallons of fluids, sand, and chemicals necessary to hydraulically fracture a well. We heard the following account of what fracking-related truck traffic is like:

It was horrific. It was constant. The amount of trucks going in and going out of there, I've never seen anything like it in my life. You couldn't pull out without being behind, between or trying to maneuver with the trucks. . . . [T]hey made the roads go like a washboard. It was rough.

Below is a screenshot from a video of fracking-related truck traffic that captures to some degree what such traffic looks like.



Hydraulic fracturing entails pumping millions of gallons of fluid into the earth under enormous pressure. This causes powerful vibrations to resonate through the earth. These vibrations shake homes and crack foundations. Several homeowners described how the earth around their homes would vibrate so intensely that worms would crawl out from the ground in their yards and basements. A fleet of heavy trucks coming and going, day and night, to provide millions of gallons of fluid to the well pad, accompanies all of this fracturing activity. The noise would be overwhelming.

Descriptions of the effects of fracking on peoples' well water were remarkably similar across the Commonwealth. Many described a "black film" or "black sheen" appearing in their water, particularly when it would sit idly in their toilets. Some would have "cloudy" water. "Black sludge" or "black slime" would clog and damage the pumps and filters used to treat their well water. They would find sandy, particulate matter in their water and filters. They described a "sulfur" or "rotten eggs" smell. Homeowners detailed a variety of chemical smells, as "sweet," "like a chemical lab," "plastic," or "like formaldehyde." Those who ventured to taste their water often described it as "foul" and "metallic." None of these conditions occurred prior to fracking operations near their homes.

Homeowners' water became unusable for not only drinking and cooking, but bathing, hand washing, and other basic household purposes. Some came to realize their water was contaminated not because of perceptible changes such as smell or color, but through illnesses and health effects. Accounts of red, itchy, burning rashes from exposure to contaminated water were widespread. When people were away from their residence, their skin problems subsided. They were unable to safely wash their hands or bathe in their own homes. Often these symptoms

would manifest without their water exhibiting noticeable problems such as intense smells or discoloration. As one homeowner described her family's experience,

We started getting sores all over us. And we were sick to our stomachs and having problems with breathing whenever we were in the shower. And it would burn our eyes, nose, and throat; and it just -- it was putrid. It was embarrassing. If we had anyone coming to our home, we would have to shower and air the house out and then try to spray air fresheners to get rid of the smell. It was bad.

We learned that part of what complicates well water testing and determinations of contamination is that subsurface waters are dynamic, and chemicals in an aquifer may not appear at detectable levels in a water supply at the same time. Nor do they necessarily remain indefinitely. This means that contaminants may be in someone's water and affecting their health, but they are initially unaware of it at the time, but when symptoms manifest those chemicals may have washed out or dissipated in the water table and been replaced by some other contaminants. Often a homeowner will take action to test their water only when it becomes highly salty, or when some other noticeable problem manifests, without realizing they have been exposed to contaminants over the prior months. When testing then occurs, it may not reflect the totality of their exposure, and the links between their health condition and possible causes are more difficult to determine.

Water analysis is an imperfect science that cannot always provide the answers homeowners need. This complexity of water testing is compounded by the fact that operators are not required to disclose all the chemicals used to fracture any particular well, or any chemicals used in the drilling process. That makes it impossible to analyze a homeowner's water for sources of contamination properly, because the tester does not know what to look for.

Homeowners frequently described a lingering fear that analysis of their water was not showing a full and accurate picture of what was happening. When they turned to DEP for answers, they were often left unsatisfied because DEP's standard water analysis was too narrow and would not account for the full range of potential contaminants in their water. When results were provided they were difficult for the layman to understand. Turning to the industry operator would bring equally unsatisfying answers. In the midst of this anxiety-inducing situation, homeowners often concluded that no one was taking their concerns seriously. They were ultimately left to decide whether to pay the hefty cost of an alternative water supply or complex treatment systems to clean their water of unknown chemicals and fracking byproducts or continue using their suspect well water.

Different homeowners described different ways in which the industry's operations affected their lives. We heard many accounts of impoundments; man made ponds, several acres in size, where oil and gas operators stored millions of gallons of fluids. In some instances the DEP permitted the use of an impoundment to hold fresh water for use in fracturing wells in the surrounding area. Over time, however, the industry sometimes would use these impoundments to store contaminated wastewater, even though they were not designed to store toxic fluids. Such impoundments lacked features like double liners and leak detection zones capable of detecting leaks. As a result some of these ponds of liquid waste failed, with devastating consequences. Dangerous chemicals and contaminants invaded the environment and affected public health.

Families came to realize that wastewater impoundments not only contaminated their water, but the air they breathed. As enormous open toxic pits, some of which were acres in size, impoundments would release harmful chemicals into the air. The smell of sulfur and intense

chemicals smells would inundate nearby homes. Property owners would sense a metallic taste in their mouths. Contamination in the air would overwhelm homeowners with nausea, dizziness, and a feeling that they would pass out. They would vomit. Their eyes, nose, skin, and throat would burn.

These were not fleeting episodes. The air in their homes would cause persistent sores, nosebleeds, mouth ulcers, unexplained bruises, and extreme fatigue. Visitors would grow ill. Children would become frighteningly lethargic. Homeowners stopped going outside from fear of exposure. Their children could no longer play in their yards or explore the previously bucolic farmland where they lived. Nor did the inside of their homes offer an escape. We learned that air quality testing inside residences confirmed the presence of dangerous chemicals that would not normally be in people's homes, like benzene, toluene, methylbenzene, chlorobenzene, xylenes, acrylonitrile, cyclohexane, and three different types of trimethylbenzene. One homeowner described what it was like to live near a wastewater impoundment:

My property had a fence around it and they put the frack pit in 200 feet behind my property which was the size of a football field. Then they started filling it with chemicals. It constantly smelled like gasoline and kerosene, constantly.

Homeowners processed their experiences in different ways. In telling their stories, some seemed haunted and freshly traumatized, while others were stoic. The common theme from every homeowner who testified before us was an all-encompassing, debilitating anxiety that comes from so many unknowns. This was especially the case in the early days of the fracking boom, when there were more questions than answers. While this was partially due to the newness of the activity, it was also a consequence of the industry having no obligation to provide information to families living within a stone's throw of a well pad. Homeowners were not informed that toxic chemicals were used during the drilling or fracturing of a well. They were

not told that toxic waste was stored in impoundments. They had no idea if these giant ponds of wastewater were leaking. They smelled foul odors, but did not know the cause, or if the mere act of inhaling could cause them to become ill. They did not know if their water was safe to drink or bathe in. Almost every normal daily activity suddenly posed unknown risks. There was little to no transparency.



When families would turn to the medical community their problems would often remain unresolved. We heard from several homeowners who attempted to find answers to their ongoing health concerns and received troubling responses from medical professionals. Too often, they recounted their doctors expressing reluctance to overtly link their symptoms to fracking operations, while also telling them it was not safe to stay in their homes. For instance, one parent described receiving test results confirming that chemicals used in an adjacent fracking site

were poisoning her family. When she visited a toxicologist with this information, the doctor told her his office could not confirm the gas industry was responsible because his practice may lose its government funding, but that if he were in her situation, he would leave the family home.

This type of account was not an anomaly. Another homeowner described a similar experience with the medical community:

. . . [W]e've kind of hit a brick wall there as well trying to relate it. We go to the doctor's with him and they're not allowed to talk about anything. You mention one word, drilling or fracking or any of the key words, then you're kind of shut down. At one point we met with the doctors at UPMC and they took us into an emergency room and brought a couple chairs in and shut the door and whatever happens in this room has to stay in this room. What they told us is they can't put a direct link to it. It's just that the only thing they can do is process of elimination, take one thing out of the mix at a time until they determine what's wrong. They sent us to a specialist. Then it just kind of went nowhere either.

Another homeowner recounted the struggle faced when trying to find answers to what was making her children so sick:

...our other doctors, like our family doctor and the pulmonologist and the gastroenterologist that my son saw, I mean basically, they were just trying to help us figure this out along with us. I mean, no one had any experience or expertise in this area. . . . And so it just – it was hard trying to put two and two together. And, you know, [the operator] wouldn't tell us what they were using up there. You know, they have their proprietary chemicals, which we fought hard to try to get those, and so we didn't even know what else to test for. I mean, it was – if they would have at least given us what they were using, then we could have – you know, I could have had my kids tested for other things. We were just trying to figure things out on our own, find out information from the people in Texas, who had already been through a lot of this. It was – it was just hard, and there was no cooperation whatsoever.

For many, determining what industry operation was causing them to get sick was elusive. The most obvious pathway of contamination seemed to be well water, so people initially focused on their water. Many would obtain alternative water sources once the quality of their well water

was ruined or they started getting sick. Even though they were no longer exposed to contaminated water, their health would not improve, and many found themselves and their children getting sicker.

Families would then turn to the next most likely pathway of contamination: air. Wastewater impoundments would release repugnant airborne smells and toxins so intense property owners would pass out, become sick or vomit, or so overwhelming that they would have to be rushed to the hospital. Many other components of this industry's operations release airborne contaminants as well, which can be particularly harmful to those living close to sources of these emissions. Emissions from well pads, pigging stations, compressor stations, and other industry operations can all contaminate the surrounding air. Sometimes the way homeowners experienced emissions from well sites would change over the course of a day, with the air smelling "sweet and sulfur-like" at night, and like "burning hair" during the day. We heard of smells like "hair dye at a salon" and "burnt electrical components."

We heard of the industry performing "blowdowns" or wellhead "flaring"; or the rapid release of gas due to maintenance, a malfunction, emergency, or as part of regularly mandated safety testing. Many homeowners described these events as sounding like a "jet engine," vibrating nearby homes and windows, and releasing plumes of gas that would, in some instances, settle like fog in the surrounding area. One homeowner described awakening at 4:00 in the morning, without notification, to the "jet engine" sound of a wellhead flaring natural gas. The industry employees overseeing these operations wore protective headgear, but she was not, and was left with a loud hissing sound in her ears.

Various homeowners all described emissions from compressor stations smelling like chlorine. Noxious gases generated from compressor stations would permeate the interior and

exterior of peoples' homes, causing burning eyes, headaches, and sores in their mouths, and the development of serious illnesses. Blood tests would confirm the presence of contaminants in people who had been exposed to these gaseous emissions.

Health symptoms related to exposure to routine emissions were numerous and deeply troubling. Respiratory problems, headaches, dizziness, and burning eyes were commonplace. Children in particular experienced nosebleeds and extreme stomach pain. People told us that after the industry came into their lives they experienced weight loss, neuropathy (nerve pain), tremors and shaking, nose and throat pain.

Linking the wide variety of health issues homeowners have associated with air contamination to specific industry operations can be difficult. The absence of testing and lack of access to industry data substantially impede understanding. What we do know is that upon installation of an industry operation close to a family's home, they would begin to detect smells associated with the gases and chemicals emitted from these operations. At the same time, they started experiencing various symptoms indicative of airborne contamination and getting sick. Environmental testing at their homes, when properly conducted, would confirm the presence of airborne contaminants. Medical testing would likewise reveal that chemicals associated with industry operations were inside of their bodies.

One homeowner eventually saw a specialist who told him his blood revealed "chronic benzene exposure." His wife also had benzene levels in her blood. But he was particularly concerned for his children. As he told us,

Q. How does it make you feel that your children were being exposed?

A. Well, the same thing. The worst thing about it is if you read the toxicologist's report, one of the last statements he makes is now you need to be concerned about cancer sometime in the future.

For many families, exposure to contaminated air results in health anxieties and requisite medical monitoring becoming a routine part of their children's lives:

A: So there was blood work, urinalysis; and it is hard to take kids to have their blood taken all the time. It is pretty terrifying. How much do you torture them through that; but yet, there were things found in their blood.

Q: Okay. And do you have any recollection sitting here today what those things were or would you have to look back at the actual medical records?

A: They said it had something to do with the ethyl benzene.

We heard the same account from witness after witness about the rashes their families would get from exposure to air contaminants. These rashes would appear on the frequently exposed parts of their bodies – their hands and arms, necks and faces – and would go away when they were away from home for a long enough period of time. While a rash may not seem like a particularly distressing ailment, one parent's description of a rash his son continually had captures the disturbing nature of this condition:

Yes. We all call it a frack rash. He gets like an alligator skin after that and becomes really sensitive after a while. He's moved out of the house a couple times, moved back in. As he moves away, he's gone for a month and it goes away. If he's back in, it acts up right away.

Another near constant account was of children frequently waking at night with sudden, severe nosebleeds. As one parent testified:

Both kids seemed to have [nosebleeds] a lot. My daughter seemed to get them more at night so she would kind of just wake up and panic, you know, something is on my face, screaming. She was, like, four or five years old. So by the time you turn on the light, you see – I know kids get bloody noses. We all do, but it was becoming a chronic thing. And it was getting to the point where I could trace them back to when they were doing maintenance at one of the compressor stations or opened the lines because there was

too much pressure. But it was getting really bad like she had this pretty little – her first princess bedspread and it was just ruined. It was getting to the point where I was using hydrogen peroxide to get the blood out of the carpet. That is not something normal. The doctors couldn't find any reason for it.

Another mother recalled a similar experience:

We had – my daughter had a lot of nosebleeds. It seems like the nosebleeds were worse with her. They would just be standing there and then all of the sudden blood would start pouring out of their noses. It wasn't anything like that they had done anything to prompt it.

A constant theme in the stories we heard was that children suffered health effects from nearby oil and gas operations more than adults. In addition to severe and chronic rashes, headaches, and nosebleeds, we heard accounts of children experiencing lethargy, bruising, intense cramping, difficulty sleeping, and painful stomach problems, including nausea and vomiting. They had eye problems ranging from frequent burning sensations and conjunctivitis to partial blindness. We heard of young people suffering symptoms associated with neurological problems, like twitching and tremors, erratic and uncontrollable eye movements, and neuropathy, which involves weakness, numbness, and stabbing or burning sensations throughout the body.

We heard clear and convincing evidence that leads us to conclude that industry operations in Pennsylvania have made our children sick. That is not a reality we are willing to accept, and the recommendations we propose will help to alleviate this problem.

We learned that kids get sick from airborne contamination not just because of some faulty industry operation, such as a malfunctioning compressor station, or practices that are no longer commonplace, like the use of wastewater impoundments. We know that air contamination is not limited to anomalous, outdated, or unintended industry activities. Indeed, the exact opposite is true. Standard operating procedure under Pennsylvania's current legal and regulatory regime

exposes those living in close proximity to fracking operations to possible exposure and health risks. Pennsylvania needs to resolve this problem by requiring industry sites be far more distant from where we live and work. The current 500 foot standard is woefully inadequate.

Pennsylvania's laws further aggravate the problem by not accounting for the aggregate effects of fracking operations. When numerous gas sites exist in a relatively small area, their collective effect is not measured or acknowledged in the governing regulatory scheme. Many homeowners described living near a combination of well pads, pigging stations, gas processing plants, compressor stations, and impoundments. The DEP regulates these sites only individually, however, and by each individual company associated with them. Therefore, two oil and gas companies may own and operate adjacent pigging stations, but so long as each is compliant with emissions limits, Pennsylvania law is met. Meanwhile, a nearby homeowner is exposed to the collective effect of the emissions from both pigging stations, in addition to other nearby well pads and industry operations, but there is no recognition of the heightened risk posed by the collective emissions from multiple sites.

When families would escape their homes, whether temporarily or permanently, many of their symptoms would go away. For some the damage was permanent, however, and they continue to struggle with long-term problems like reduced motor faculties and sensitivity to chemicals. Many parents and medical professionals fear for the long-term health of children who have suffered health problems related to industry activities, particularly their ability to have children of their own and the risk of developing cancer. Doctors have advised that children who have suffered persistent health problems related to nearby fracking sites participate in regular cancer screening for decades to come.

Additionally, we find that while families may implement measures to remediate the risks of living near an industry site inside their homes, such as with high-tech air filtration systems and alternative sources of water, they cannot remedy conditions outside the home. As a result, pets and livestock would continue to face exposure. Often, homeowners' animals first showed symptoms of contamination from industry activity. Even if their owners arranged a safe water supply for their animals, animals instinctively drink from seeps, streams, and ponds and their caretakers can do little to stop this. Family dogs got violently ill and died. Horses were poisoned and died. Many homeowners regularly bred livestock like goats, sheep, and cows. Some animals would become infertile, miscarry, and produce deformed offspring. Postmortem blood testing consistently showed the presence of fracking-related chemicals in animals' bodies. For many homeowners, the loss and harm to their animals was not strictly economic, but caused great emotional anguish.

Industry operations would ruin families' ability to enjoy other aspects of their country homesteads. For many, fishing and swimming in a pond is part of the joy of living in the countryside. Several homeowners described chemical spills, impoundment failure, or well bore breakdowns ruining their once thriving freshwater ponds. We heard about fish kills, ponds turning black, natural gas bubbling around the surface of the water, and plants and animals living around ponds dying off. Trees and massive patches of grass would die on people's land. While these effects of fracking may not seem as profound or life altering as other events we have learned about, such as someone's child becoming terribly ill, they nevertheless constitute a serious impact on homeowners' lives and are indicative of the variety of ways industry operations can harm the environment in which they occur.



Additionally, we heard testimony from individuals concerned about the possible effects of producing food on their property in close proximity to shale gas operations. Well pads in rural areas of Pennsylvania means there is a lot of industry activity near farming. We heard from a homeowner whose property was surrounded by multiple well pads who grew tomatoes, grapes, and apples. The owner watered the produce with potentially contaminated water and sold it to a local grocery chain. We heard from another farmer with a well pad on their property who raised and bred livestock that drank from suspected contaminated water. When the livestock failed to breed as anticipated, possibly because of the tainted water they were exposed to, the farmer sold them at auction to be butchered and sold to the public. We have learned that food, like water and

air, is a possible pathway of contamination, and are concerned that contaminants from fracking may be spreading into the broader community by entering our food supply.

Industry operations also had effects on interpersonal relationships and sense of community. Once close-knit communities unraveled over whether they supported or opposed fracking. The industry perpetuated this division by rallying public support for their work and opposing those who spoke out against their business interests. Formerly cordial neighbors would be openly hostile to one another. People told us they no longer felt comfortable shopping and socializing in their own communities because of the animosity they felt. Friendships and community bonds were broken. We heard testimony from a witness who spoke about how life in her community changed:

...I got some incidents where I would go to a grocery store and one time a guy came charging at me. The woman with him pulled him back. Other times I would be pushed pretty close to the edge of the road. I had a gas tanker beep loudly their air horn every time they go by my house. I went up to the [supermarket] one day and walked in and they had a table set up where you could get a subscription to the [local newspaper]. I thought about it. I said maybe I should. Then a guy came up behind me and said, you should, you're in it all the time. People felt free just to say things to me. Some of the neighbors that were talking to me just had to tell me how badly I was being spoken of. It was very hostile. I actually stopped shopping in my hometown. My family all lives a short distance away in [a nearby town] and I do all my shopping there or elsewhere. Once in a while, I have to run over to [the supermarket]. I have a beautiful home in a community that is not my home.

As these experiences compounded, some homeowners eventually reached a breaking point and were left with no choice but to leave the homes they loved. Medical professionals and others told them it was unsafe to stay; an obvious fact given what was happening to their family. They could not sell their home, however, because it was unsafe, but also could not afford the cost of maintaining their mortgage and paying to live somewhere else. Thus, they were stuck with

the option of financial ruin or trying to carry on living in a home where they feared for their health and the long-term wellbeing of themselves and their children. These were decisions born from desperation, and several homeowners shared with us the heartbreaking moment they realized they had no option but to leave:

One day I was unpacking the car from Costco, I realized I'm now buying the double pack of hydrogen peroxide at Costco because this is strictly just to clean the carpet. This is it for me. I am done. This is not how kids live. So we left.



Protecting one's children is fundamental to a parent, and the realization that your own kids cannot experience a healthy, happy childhood is too much for anyone to bear. A parent described learning from someone else that her own son would hide the fact that he was feeling the effects of airborne contamination from his parents just so he could play outside:

...And she was sitting in the sandbox with him and she came back down with tears in her eyes and literally said to me that he told her

that he doesn't always tell me when he is outside and gets headaches and dizzy and can smell it because mommy won't let him come out and play with his new trucks in the sand box.

Some homeowners were able to obtain financial relief by entering into settlement agreements with industry operators. This, however, brought additional issues in the form of non-disclosure agreements that prevented homeowners from discussing with their neighbors the fact that their community had been contaminated by industry activity. One homeowner described the way a non-disclosure agreement impacted her ability to answer her neighbors' questions:

And the people that just purchased the [] house down below. . . [S]he says tell me about your water situation and I said I'm not allowed. And she says we just bought this place. I need to know So I told them, I said you need to get in touch with the DEP and EPA as well and that is all I can tell them.

Some homeowners found themselves with no choice other than to stay where they were.

We heard from one homeowner who testified as follows:

I took my son [] to the doctor and he referred me to Children's Hospital for his rash. . . . I went in there and after several times of going to [the doctor's] office, she said that there was nothing she could do for me. Then she said her advice was to get an attorney or move.

And then that's when I thought, I can't live – why is this happening? And that's when I thought, I can't move. I'm going to sell this house to somebody else and let this happen to somebody else or somebody else's kid? I couldn't do it. So that's when we just decided we really have to, as a family, just watch out for one another and my two neighbors and just not go outside.

* * * * *

Knowing what we know, and having heard so many Pennsylvania families experiencing terrifying health problems in relation to unconventional oil and gas operations, we cannot accept the status quo in our Commonwealth that facilitates these harms. Every Pennsylvanian should ask themselves how they would feel if a fracking operation suddenly commenced near their

home. Imagine waking up in the morning and knowing that when you step into the shower, it fills the house with a smell of rotten eggs and burns your skin. You try to shower as quickly as possible with the windows open to mitigate the effects. You try to increase the number of days between bathing your children to minimize their exposure to this harmful water.

To protect friends and family and out of embarrassment, you never allow visitors to come over because of the way your water looks and smells when it comes out of the tap. You can't help but wash your clothes in your now contaminated water. You just hope you can air dry your clothes long enough that the odor diminishes before you have to wear them, all the while hoping that wearing clothes washed in unknown chemicals isn't going to exacerbate any symptoms you or your children have developed since your water changed.

And you do have symptoms that tell you that something is wrong: headaches and nose bleeds and rashes that don't go away. Your children are tired and nauseous all the time and frequently sick. You fear that something isn't right with your water, in spite of being told it is safe and so you begin to spend money to buy bottled water. You have animals to care for, but there is no way you can afford to give them bottled water to drink, so you continue to let them drink the potentially contaminated water. You watch as some of your livestock and pets become sick and die.

You become more and more concerned for your health and the health of your children. You cannot get straight answers from the gas company about what chemicals might be in your water because they're not required to tell you, so you're left to try to figure it out for yourself. DEP tests your water but only for a handful of compounds – and not the ones you really want to know about.

You worry that it's not just the water that is to blame, but the air that your family is breathing. You can't buy clean air at the grocery store. You make more frequent trips to the doctor. You scour the internet for information. You and your children do more blood tests. The symptoms persist.

You try to spend more time away from your house than you do in it. But you cannot leave permanently because your house is worthless without potable water, so you cannot sell it. You cannot afford to keep paying a mortgage on a house that has no value and so you just wait for the bank to foreclose or possibly declare bankruptcy. No matter what, your credit is ruined, which makes it almost impossible to find another place to live. You struggle to work because you're feeling sick and you're taking more time off to care for your sick children. And even if you do finally manage to get away from the house and you find a new place to live, even when you have the opportunity to breathe clean air and drink clean water again, you are left waiting for a diagnosis that you hope never comes. Because you know that the impact of drinking contaminated water or breathing contaminated air can show up slowly over time as a multitude of diseases.

This reality is not something that should be tolerated. We find it unacceptable that, for many living in close proximity to unconventional oil and gas operations, their health is jeopardized and their constitutional right to "clean air" and "pure water" has been rendered a fiction.

The Pennsylvania Department of Environmental Protection

DEP Mission Statement

The Department of Environmental Protection's mission is to protect Pennsylvania's air, land and water from pollution and to provide for the health and safety of its citizens through a cleaner environment. We will work as partners with individuals, organizations, governments and businesses to prevent pollution and restore our natural resources.

The Grand Jury heard extensive evidence about the response of the Pennsylvania Department of Environmental Protection (DEP) to the fracking boom. More than 30 witnesses from the department testified. They included retired and current employees, ranging from the ground-level inspectors up through various managers, to the people at the very top of the agency. We heard from water quality specialists, water quality specialist supervisors, oil and gas inspector supervisors, air quality specialists, air quality specialist supervisors, environmental program managers, environmental protection specialists, geologists, engineers, bureau directors, Deputy Secretaries and even former Secretaries – the top officials who ran the Department.

We conclude from this evidence that DEP was initially unprepared for and at times overwhelmed by the challenges resulting from the new technologies of unconventional drilling – or, as it is known in the general public, “fracking.” To some extent, this was not the fault of Department employees. They were not the people who opened the Commonwealth's shale resources to industrial exploitation, or who permitted aggressive expansion before an appropriate regulatory framework could be enacted. Nonetheless, we were disturbed by what we heard. We believe that many DEP employees were doing the best job possible with the limited resources they had. We also believe there were others who appeared to show undue deference to the fracking industry, and undue indifference to citizens with serious complaints about appalling effects they were suffering.

In more recent years, it appears progress has been made. The current administration has responded to our requests for information, and has documented improvements. We believe, however, that it remains important to highlight the past history of DEP's management of this new industry, both to explain the public distrust that has built up over time, and to ensure that the Department's actions going forward will fulfill its mission – to protect the environment, for all the citizens of Pennsylvania.

At the outset, we feel obligated to note concern about the role that industry influence may have played in DEP's delayed reaction to the arrival of unconventional drilling. We realize, of course, that government bureaucracy is inherently slow. But we heard enough testimony during the course of our investigation to believe that more may have been at work. Two former DEP Secretaries voiced similar opinions before the Grand Jury. Both felt an obligation under Article 1, Section 27 of the Constitution of the Commonwealth of Pennsylvania, known as the Environmental Rights Amendment. That provision, adopted by the voters in 1971, gives citizens the right to clean water and air, and makes the Commonwealth the trustee of the environment for present and future generations. Yet both Secretaries felt that the oil and gas industry had its own pipeline to elected officials, and both felt pressure to permit production of shale gas.

As our investigation progressed, we learned of a joke circulated in Harrisburg that there was an oil and gas industry lobbyist for every member of the General Assembly. We assume that is hyperbole. But the concern would explain a lot of what we saw, and what we heard from DEP employees at both high and low levels.

Failure to regulate

When the shale gas “boom” began in Pennsylvania, DEP was still working from administrative regulations that were geared to a different era. The only regulations in place were

those created to oversee conventional drilling – *e.g.*, old-fashioned oil wells. When the U.S. oil industry first began in the 1800s – ironically, in Pennsylvania – operators only had to dig down 100 feet or so in the right spot, and the oil spouted up by itself. Fracking requires an entirely different and more complex approach. As one witness described it to the Grand Jury, the comparison was like riding in a horse and buggy while the unconventional operators were flying to the moon and back.

- ***Impoundments***

A prime example of the outmoded regulatory approach was the use of “impoundments,” or pits for storing liquids at the well site. While pits certainly existed at old-fashioned conventional well sites, the impoundments that were springing up around fracking sites dwarfed anything DEP had seen previously. These impoundments were now being used to store tens of thousands of gallons of fracking fluid, which contained varieties of exotic, complex chemical compounds, many of which may have serious health consequences.

The Grand Jury heard testimony about consideration of new rules for such impoundments that would have required permits like those for landfills. In the end, DEP decided to let operators build impoundments as part of the well pad, making them exempt from permit requirements under the Solid Waste Management Act.

In the mid-2010s, DEP recognized that impoundments were not safe, and they were phased out in favor of more secure storage methods. But by that time, DEP had years of knowledge about impoundment failures. The Grand Jury heard extensive testimony about leaks from impoundments that contaminated springs and wells which had served as the only source of water for many Pennsylvania families. We also heard about the effects on neighbors’ living standards caused by the intense, rancid odors generated by the impoundments. The consequences

of these under-regulated impoundments ruined property values, family finances and water supplies in many areas, and impacts on physical health are still being assessed. DEP's new regulatory approach is welcome, but for many Pennsylvanians it came too late.

We heard from current DEP Deputy Secretary Scott Perry, who was also with the agency in those early fracking days. He testified that an initial decision made by DEP management to exempt impoundments from regulation under the Solid Waste Management Act was "wrong," but that his position was rejected. A former DEP employee testified that, based on his experience with the agency, the impoundment decision was likely made in deference to the oil and gas industry: "if they had to go through waste management, they were concerned that there were going to be delays in getting these permits issued.... [W]hat was consequential for [the industry] was time, not so much money.... They had a lot of resources. They could spend the money."

- ***Pigging stations***

We saw another example of failure to regulate in the case of pigging stations. At these junctions along a gas pipeline where the gas is treated and the lines are cleaned, methane and other pollutants are regularly released into the air. We know DEP knew about the issue, because it sent out a preliminary notice to the industry in 2011. Yet it did not follow up for five more years, until 2016, when it finally began to require emissions reporting for pigging stations. In the meantime, the lack of regulatory oversight in this area made it possible for operators to build multiple stations in close proximity, sometimes right next to a school or someone's backyard.

The net result, for some unlucky homeowners, has been high exposure to the kind of danger DEP is tasked to help protect us against. Health data presented to the Grand Jury have made clear that, although fracking has caused severe water contamination in certain parts of the

Commonwealth, we should be equally concerned about the contaminants the industry releases into our air. DEP regulation concerning pigging stations has been, in our view, insufficient and untimely.

Ask the family we heard from in Washington County. They built a home for their three children, and refused to grant an easement for oil and gas development. But the company came anyway, laid down a pipeline next to their property, and constructed a high pressure valve system for “blow-downs” that showered chemical waste into the yard. After a gas release that sounded “like a jet engine,” the family developed nosebleeds, dizziness, and a rash of eraser-sized dots on exposed areas of their skin. The family called DEP, but were told no action could be taken. “I assumed by the title of their name, department of environmental, I just thought they were protecting the environment,” the mother told us. “Now I really don’t know what they do.”

- ***Comprehensive regulations***

But the failure to regulate wasn’t just in one or two areas. Testimony showed that, early on, people in the agency knew they needed a whole new set of regulations specific to unconventional drilling, and there was much discussion of the issue. DEP helpfully prepared a timeline for us, showing that the Department began “developing concepts” for a comprehensive fracking regulation package as early as 2009-10. But the package wasn’t formally proposed until 2013, and it wasn’t until 2016 that full regulations were finally adopted. John Hanger, a former DEP secretary, testified that in his view the delay was partly political: “the business community has been very, very successful in making passing regulations or enacting regulations difficult because they don’t generally like regulations. So the rules about how you pass a regulation in Pennsylvania are very, very difficult.” But another former Secretary, Michael Krancer, testified that “the Department is able to move more nimbly by using policy documents and guidance

documents, which are not regulation,” but still provide a basis for enforcement. Unfortunately, DEP for a variety of reasons failed to create a comprehensive fracking policy, whether through formal regulations or internal guidance documents, in a timely fashion.

Failure to train

As fracking ramped up in Pennsylvania, DEP was attempting to perform its regulatory responsibilities with employees whose tenures largely predated unconventional drilling, and who knew little about the highly complex methods used to extract natural gas from shale. One employee, for example, told us he had never even seen an impoundment before. The testimony we heard established that agency personnel knew they were playing catch-up; yet many were unsatisfied by DEP’s efforts to train employees for the new challenges they would be facing.

Indeed, several employees testified that training opportunities that did arise seemed to be discouraged, both in earlier and in more recent years. One DEP employee testified that he traveled out of state for training on his own initiative, and met scientists (including one from Penn State, which has a Center for Marcellus Shale Research) who offered to provide training and assistance to DEP. The employee brought back the offer to supervisors, but nothing was ever done. Other DEP employees testified that they were told not to participate in training provided by outside entities because attendance would violate the administration’s “gift ban” policy. Another employee testified that he tried to institute bi-monthly training sessions within his district office, but that he was transferred after two or three sessions and the training stopped.

The result, once again, was the absence of any comprehensive response to the new circumstances. One employee told us that, when fracking began, he felt his colleagues were “thrown into the fire.” Another testified that agency staff received only “on-the-job training” and “an occasional staff meeting.” As he pointed out, “[w]hen you learn from someone who

learned from someone who learned from someone, you could have been doing it wrong the whole time.”

DEP did provide us with a list of training sessions conducted by the agency over the years. Many of these, however, do not appear to have focused on fracking, and in several years it appears there was little or no training at all. We recognize that most government agencies lack significant funding for training. Indeed, an official DEP representative acknowledged to the Grand Jury that this remained an item of need for the Department. For us the point is that fracking was the new challenge facing DEP, and that was the subject on which agency personnel most required information. As we heard from the employees who testified before us, they didn’t get it.

Failure to communicate

Testimony also established that, even when DEP employees did gain useful knowledge about the new industry, they failed to communicate it to others within the agency. Some of this was a structural problem; sections of the Department with overlapping responsibilities did not talk to each other. We learned of one case, for example, in which one DEP section – the Bureau of Waste Management – prepared a cease and desist order against a company that was illegally operating a waste storage unit without the required permit. When inspectors arrived at the scene to serve the order, however, the operator produced a document provided to him by a different DEP section – Oil and Gas – which authorized him to use the waste storage unit without getting a permit. The Oil and Gas employees had never bothered to check with Waste Management about its interpretation of the law it oversaw. Oil and Gas issued similarly improper authorizations throughout the Commonwealth.

In general, we learned, DEP showed little interest in cross-training employees with overlapping responsibilities. Instead, the culture was described to us as “stay in your lane.” We heard testimony about another very telling case, in which DEP actually did something responsible early on, and yet wound up wasting the effort. In the first days of unconventional drilling, starting in 2008, DEP undertook what should have been a crucial study to identify the precise chemicals the industry was using in frack fluid to open up shale deposits. The environmental engineer who led the investigation appeared before the Grand Jury. Several employees were assigned to the project, as well as interns. They took dozens of samples around the state, which were then analyzed by the Department’s Bureau of Labs.

But the results never really went anywhere. The engineer handed off the data, but the study was never published within the agency, and no one received any training on it. We asked other employees what they had learned from the study. It appeared that most had barely even heard of it. This was information that should have advanced DEP’s regulation efforts by years. But it didn’t.

DEP has assured us that its efforts from the beginning of the fracking boom included internal collaboration, and no doubt there was at least some in some form. But the testimony of the agency’s own employees persuaded us that, in the opening years of unconventional oil and gas activity, when the need was greatest, the Department’s efforts to coordinate its widespread staff were not sufficient.

Failure to test

We were also disturbed by testimony about how the Department failed to test, or ineffectively tested, water samples to find contamination caused by fracking. The law requires the Department to conduct water quality tests in response to citizen complaints. We learned that

DEP performed that obligation by relying on a set list of known parameters to test for, such as chloride and sediment levels. The list was called a “suite code”, and could be effective only to the extent that it accurately identified the appropriate factors for which to test in particular situations. One of these lists, suite code 942, had been developed by DEP before fracking, for old-fashioned conventional drilling. Since conventional drilling did not use the same chemicals or techniques as fracking, suite code 942 could not accurately indicate whether water was contaminated; yet many DEP employees relied upon it to the exclusion of any additional investigation. Eventually, a new list was developed, suite code 946, but many employees didn’t know about it, and kept on using suite code 942.

Even the new suite code, moreover, was often too narrow to catch contaminants. And once again, it was used without regard to individual circumstances. An operator might be using a particular compound on a specific occasion that is not universally present at fracking sites. If DEP did not check the operator’s records to see what he was using when a spill occurred (if the chemicals were fully disclosed), the Department would never know what to test for. Reliance on the standard suite code would actually be detrimental, because it would give a clean bill of health to water that might in fact be dangerously contaminated. And the problem was compounded, we learned, by the fact that DEP did not always fully report all the substances for which it did test. So even those homeowners whose water was tested, and who did receive results, might never know what they really meant.

We were also disturbed to learn about DEP practices concerning “pre-drill” sampling. Experts in the field explained to us that impact assessment relies heavily on comparing the water before and after a company starts drilling in a particular area. Some compounds occur naturally in water, and vary from location to location. Pre-drill samples establish a baseline for a

particular water supply; if the water changes significantly after fracking operations begin, the reasonable conclusion is that the fracking caused the change. DEP often lacked pre-drill data in the early years of fracking, but nevertheless purported to make determinations about whether a well site had caused contamination. We heard testimony from one water quality specialist supervisor who stated that without pre-drill testing a positive determination would not be possible and that any additional investigation would not be helpful. We shared that assertion with a higher ranking employee in the same section and the response was “that’s absurd.”

Moreover, even when proper samples did exist, we remained concerned about whether DEP knew how to properly analyze them. We reviewed a DEP policy document from 2015 setting forth guidelines for assessing water quality samples. But the document makes no reference to established federal standards for maximum safe concentrations of various contaminants, nor does it identify the criteria that are most likely to indicate whether water has been compromised by industrial activity. Surprisingly, this policy was adopted in 2015 – long after unconventional drilling began. By that time, DEP’s water-testing policies should have been far more advanced.

These concerns may sound technical; but they are not trivial. It is important to keep in mind that, in most of the areas where unconventional drilling became prevalent, there are no public water lines to supply water to landowners. These people rely entirely on wells that are dug on their property to supply their water. So when there is a noticeable change to their water, whether it is a smell or a change in appearance, it is devastating. We heard many accounts of landowners who literally begged and pleaded with operators to provide a temporary water supply so they wouldn’t have to drink, cook, clean, bathe or care for their animals using well water they believed was contaminated

We heard much testimony, however, indicating that DEP employees often approached these issues with less gravity than, in our view, they deserved. In many cases, DEP water quality specialists, relying on outmoded or overly restrictive testing parameters, would declare water to be clean and would “close” the investigation in the face of a homeowner’s knowledge that something was wrong. We remember one employee in particular who admitted in his testimony that, as he saw it, his duty prevented him from putting a “monetary hit” on an operator unless he could “prove that this water is being impacted by this activity.”

As we learned, however, that is not at all how the applicable law works. The Oil and Gas Act establishes a “*zone of presumption*.” Within the zone, contamination from oil and gas activity is presumed. DEP need not “prove” that the activity caused the contamination; rather, the operator must prove the opposite. Previously, the zone of presumption was 1,000 feet from an oil or gas well, and applied to any contamination manifesting within six months after completion of drilling or subsequent alterations. In 2012, the zone was enlarged – to 2,500 feet and 12 months after drilling or alteration.

This is an absolutely essential aspect of Pennsylvania’s environmental protection system. But testimony established that some DEP employees have simply disregarded this safeguard. One, for example, stated that “I would use probably the same, you know, level of proof regardless” of the zone of presumption. We find it troubling that any DEP employee was unaware of crucial legal guidelines that govern the Department’s testing program.

Failure to inspect

We were additionally troubled by testimony concerning the conduct of inspections, such as when a spill was reported. We learned that DEP regulations require well operators to report spills of more than five gallons. Several employees testified that, in order to make

determinations in such situations, they would simply take the operator's word for it about the existence or amount of a spill. These employees told us that they trusted the industry to follow the rules and self-report accurately.

We are mindful of concerns that DEP is understaffed and employees cannot spend all their time making inspections. At the same time, we are highly skeptical that operators can fairly or effectively police themselves, given the powerful incentives not to expose their own violations. Yet we learned that it was not uncommon for DEP employees to resolve some cases through an "administrative file review," meaning sitting at their desks, reviewing documentation submitted by the industry, without ever seeing the spill for themselves.

On other occasions, we learned, DEP employees would investigate citizen complaints simply by calling the operator and asking him what happened. "We had so many complaints," testified one employee. "It was impossible for us to respond to every one." So, instead, the first step was often to telephone the well site operator. If the operator sent in a photo purporting to show that no spill had occurred, the matter could be closed without ever leaving the office.

Revolving door

The credence given to oil and gas operators by some DEP employees proved less surprising to us after we learned this fact: that oil and gas operators often *were* DEP employees who had recently left the public sphere for private industry. As is typical with government work, they could make considerably more money by moving on. In fact we learned of an instance in which an operator scooped up seven employees from the same DEP office all at one time. This sort of hiring created an unfortunate talent drain for DEP – but more concerning to us was the potential effect on the integrity of the Department's investigations.

We heard testimony, for example, concerning the improper issuance of two “plugging” certificates that allowed a company to shut down wells without first doing the necessary work to make them safe. When we asked about the identity of the employee who had issued the certificates, we learned he was no longer at DEP; he was hired by the company to whom the certificates had been issued. Such career progression was not uncommon. Industry employees were often former employees of DEP. In our view, this is not a recipe for restoring public confidence in the DEP inspection process.

Failure to notify

We should emphasize that DEP did often perform proper testing and inspection, and in many cases has identified contamination caused by shale gas activity. Yet we were surprised to learn about what often happened, or more accurately didn’t happen, next. We would have expected that DEP would have a clear practice, if not a rule, of notifying neighbors in the area once a positive determination had been made that water sources had been tainted. That apparently is not the case.

DEP employees testified repeatedly that notification to neighbors was not the norm, nor required, as far as they were aware. As one put it, employees were reluctant to “poke a hornet’s nest.” Another explained that, in his view, surrounding homeowners might not *want* to know, “because they’re afraid of what it will do to their property value.” A third simply said, “[w]e generally do not do that. We address the complaint that’s given to us.” These employees were not against the idea that it made sense to notify neighbors if DEP determined someone’s water supply had been contaminated, they just understood that wasn’t the policy. As to why – that was “above [their] paygrade.”

We asked Deputy Secretary Perry about this issue. He stated DEP had an obligation to notify neighbors when a contaminating event occurred close to their homes, but that this obligation, and how it is carried out, depends on the circumstance of the particular event. For example, when serious instances of well failure cause stray gas to migrate out of a well bore and into the surrounding aquifer, according to Perry, DEP has a clear half-mile notification policy, which can expand beyond this radius. DEP has also required operators to notify neighbors about serious chemical spills in their area. Ultimately, however, DEP's approach to this issue depends on the "best judgment" of its employees in determining the need to notify nearby homeowners about a contaminating event.

What we know from the DEP employees we asked about this issue – including water quality supervisors and those supervisors' supervisor – is that to the extent there is some policy or practice about notifying homeowners in close proximity to a confirmed case of water contamination from shale gas activity – DEP employees are largely unaware of it. Indeed, their understanding was that the policy is *not* to notify those living nearby.

It is deeply troubling to us that this type of notification isn't routinely happening at DEP. The need is particularly great given that many homeowners enter into non-disclosure agreements (NDA) with operators in order to settle water supply complaints. If DEP doesn't tell neighbors there is a potential problem and their neighbors can't tell them because they entered into an NDA, there may be no way for people to find out. We think that, whether or not DEP believes adjacent landowners "want" to know, they have a *right* to know, so that they can make their own decisions about how to proceed. We recommend DEP take measures to ensure this is occurring—formalizing and standardizing policies and procedures to ensure consistent application by all regions and levels of employees.

Failure to issue violations

Our investigation also revealed evidence of another manner in which DEP was not vigorously enforcing Pennsylvania environmental laws. When the Department discovers that an operator is not in compliance with a regulation, the Department is supposed to issue a Notice of Violation, or “NOV.” DEP failed to do much of that in the formative years of fracking, which is when oil and gas violations were much more likely to occur.

We saw this in particular in relation to odor complaints. In the early days of the industry, when impoundments were commonly used to store noxious fluids in open air, neighbors lodged repeated air quality complaints. We think they should not have been that difficult to substantiate; the nose knows. The Department, however, imposed such stringent requirements that violations could rarely be found. A DEP air quality specialist explained, for example, that, in order to vindicate a complaint, the odor had to be smelled at the same time by three unrelated people in three different households, plus an inspector on site. And if the operations around the impoundment tended to produce the odor at a particular time of day that was outside of DEP work hours, no violation could be brought. The inspector testified that, in ten years in his position, he had never once been able to issue a “malodor” NOV.

We heard evidence indicating that in at least some cases DEP staff’s reluctance to issue oil and gas NOVs may have been a consequence of policy decisions made at the top of the Department. We reviewed an email from the then-Executive Deputy Secretary of DEP, dated March 23, 2011. The email directed that every single NOV had to be personally approved by the highest official in the agency, then-Secretary Michael Krancer. The email stated emphatically that “I need to repeat no final actions are to be taken unless ... with clearance from Mike. Any waiver from this directive will not be acceptable.”

From: Hines, John
Sent: Wednesday, March 23, 2011 9:03 AM
To: Aunkst, Dana; Taber, Nels; Jugovic, George; Bedrin, Michael; Burch, Kelly; Perry, Scott
Cc: Harris, Alisa; Raphael, David J.; Krancer, Michael
Subject: Marcellus Shale NOV and other Actions

Effective immediately, any actions, NOVs and such must get the approval of Dana and I with final clearance from Mike. Alisa and Dave are to be cc' on all correspondence related to these actions.

I need to repeat no final actions are to be taken unless approval comes from Dana and I with clearance from Mike. Any waiver from this directive will not be acceptable.

Call Dana or I if you want to discuss.

John T. Hines | Executive Deputy Secretary
Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street | Harrisburg, PA 17101
Phone: 717.787.2815 | Fax: 717.705.4980
www.depweb.state.pa.us

Mr. Krancer did come before this Grand Jury, and described the email as “a misunderstanding” based on a miscommunication between the Deputy Secretary and himself. Employees who learned of the email, understandably, did not take it that way. As one put it, he thought the message was clear: “To leave the Marcellus alone.... Don't interfere with their business.”

DEP has provided the Grand Jury with statistics showing that, in more recent years, the number of NOVs has dramatically increased. In 2015, for example, the Department issued over 400 unconventional well NOVs, and the numbers have gone up since. We're encouraged to see that. We do note, however, that the Department has begun, in effect, double-counting NOVs in some cases. If the violation is not corrected within the year, it is carried over to the following year but is registered as if it were a new violation. In addition, the Department can't tell us what we would most like to know: how many NOVs have risen to the level of enforcement action? DEP now publishes online the status of each NOV that occurred after 2017, and whether the violation has been corrected or noted on a subsequent report. DEP does *not* track all

enforcement actions and litigation that may result from an NOV. We also find it concerning that the Department says that while it tracks complaints generally, it is unable to parse out which complaints relate solely to oil and gas activities, so we cannot tell how many citizen complaints in this area have been investigated and acted upon. Still, the situation seems to be improving.

Failure to refer

In a related area, however, we think enforcement is still lagging, and has even been getting worse. The ultimate sanction for an environmental law violation is criminal prosecution. The Pennsylvania Legislature has created several criminal offenses in the environmental field. The Office of Attorney General has a special section dedicated to environmental crimes. But the office does not have the power to initiate such prosecutions on its own. The Attorney General can act only if an outside agency – primarily DEP – refers the case for investigation.

Evidence presented to the Grand Jury, however, established that, in contrast to NOVs, the number of criminal referrals by DEP in fracking-related cases has been *declining* in recent years, to the point where they rarely occur at all. A number of DEP employees testified that they didn't even know about the referral process. Others, who did know, justified the absence of criminal referrals mostly on the grounds that such referrals simply aren't necessary. They testified to their belief that the oil and gas industry wants to do the right thing, and that the threat of civil penalties is sufficient to achieve compliance with the law. As one supervisor put it, "[t]he industry is pretty scared of us."

We don't agree. We did not see anything in this investigation to convince us that oil and gas operators are running scared. The advantages of money and power are on their side. Given that reality, there will be cases on occasion in which appropriate enforcement includes prosecution. DEP witnesses themselves acknowledged that guns, badges, and subpoenas can get

the attention of people on a drilling site. Decisions about invoking these criminal sanctions should ultimately be made by experienced prosecutors, not oil and gas administrators.

DEP has recently given us new statistics, claiming that it actually has referred hundreds of cases for prosecution, with yearly levels in the double digits. We find those numbers to be irrelevant to the present inquiry. What we are talking about are *fracking*-related referrals, for violations related to unconventional drilling and pipelines. From 2008 to 2018 there were a total of only 17 such referrals. From 2015 to 2018, the grand total was *two*. If DEP is dedicated to effective use of the tools at its disposal, it should start referring appropriate cases for criminal prosecution. Given what we've seen, we feel confident there are more cases out there that deserve prosecutorial review.

Failure to listen

We end with one overriding concern. Our investigation persuaded us that DEP's actions in the past, during the years that defined its reaction to the fracking phenomenon, created significant distrust of the agency among many members of the public. We know that there are and have always been exemplary DEP employees. But we heard of too many times when Department representatives, all too willing to believe operators, dismissed the concerns of citizens who had turned to government for assistance. We hope that is changing, and that this Report, by exposing the behavior, may advance the change.

We heard, for example, from a homeowner who personally observed a spill occurring into the creek near his property. He saw the creek change color. He took video. He called DEP and described what was happening in real time. But nothing he said would convince the employee to come and look for himself. The employee said he had already talked to the operators of the well, that they had assured him there was no danger to the creek, and that he

therefore had no need of the homeowner's evidence. He threatened to have the homeowner prosecuted for filing a false report.

We heard testimony from other citizens who could get nowhere even when they went to the expense of hiring their own consultants to offer scientific analyses to DEP. The Department declined to review third party data from citizens, although we know that employees often accepted evidence from oil and gas operators. We heard from a DEP water quality specialist that he could not consider lab results provided by a homeowner, even when they came from the same lab regularly used by the industry. We heard from another homeowner that DEP not only refused to review her lab report, but also refused to do its own analysis to look for the compounds her report had revealed.

We also heard from a hydrologist at Penn State who had been called in to investigate well water that was milk-colored and frothing. The scientist performed extensive forensic lab testing to confirm that the foam had the same chemical signature as a drilling foam that was then being used at a nearby well site. But even this expert made no progress with DEP.

Ironically, forensic analysis is what one DEP employee expressly disavowed. “[T]hey expect my guys to be NCIS,” he testified, referring to a popular crime lab television series. “That’s not going to happen in reality.”

We don’t think the public really expects DEP to be NCIS. We think citizens just want to be listened to, to be taken seriously, and to be informed. We understand that complaints about fracking-related contamination are not always correct. Sometimes the operator is not to blame. But unconventional drilling is different from almost all other heavy duty industrial operations in that it can happen virtually in people’s backyards or the playgrounds where they take their children. Fracking can threaten the only water available to them to drink and the only air

available to them to breathe. DEP must respond to these concerns with neutrality and professionalism.

* * * * *

We recognize that certain actions taken by DEP as described in this report were based on legitimate policy decisions. A deliberate policy decision was made to support the fracking industry in Pennsylvania as an important economic driver. However, policy decisions also have consequences, and in this case, one consequence of the decisions made by multiple administrations and DEP was inadequate supervision of an industry which had – and continues to have – significant impacts on the Commonwealth’s citizens. While it may not have been intentional or malicious, ultimately, DEP failed to meet its mission “to protect Pennsylvania’s air, land and water from pollution and to provide for the health and safety of its citizens.”

The Pennsylvania Department of Health

DOH Mission Statement

The mission of the Pennsylvania Department of Health is to promote healthy behaviors, prevent injury and disease, and to assure the safe delivery of quality health care for all people in Pennsylvania.

For years following the outset of the fracking boom, Pennsylvania failed to sufficiently recognize or respond to the public health consequences of fracking. We failed to train or empower our public servants to educate and help those reaching out to their government when they believed their health was suffering because of industry operations. Our government devoted woefully insufficient resources toward gathering public health data associated with industry activities. It failed to implement executive-level policies that could have improved public health data collection. This absence of data crippled potential regulatory, legal, and enforcement actions aimed at addressing industry practices harmful to public health.

Things have improved under the current gubernatorial administration. Inheriting a legacy of inaction, the administration made a deliberate effort to gather health data associated with fracking operations more effectively, but the inadequate resources put toward this effort doomed it to failure. Just recently, the administration has directed greater effort and resources toward the problem, but in our view, more should be done. Most significantly, our government -- including its Department of Health (DOH) -- does not recognize that fracking operations harm public health, citing insufficient research on the issue. However, the absence of such research, at least in part, is due to DOH's own failure to inquire into the matter over the past decade. This "wait and see" approach facilitates placing the health risks of the shale gas industry's operations on everyday Pennsylvanians. We find this status quo unacceptable. The recommendations we

propose are in recognition of the public health risks posed by the fracking industry and seek to strike the right balance going forward.

DOH at the beginning of the fracking boom

We heard from a public health nurse who worked for the Pennsylvania Department of Health in Fayette County, in southwest Pennsylvania, for 36 years. In 2011 and 2012, State Health Centers in southwest Pennsylvania began receiving complaints from people in the community who believed they were experiencing health problems due to shale gas activity. Fracking was a new phenomenon, however, and DOH employees had not received training on how to respond to these complaints. As a result, they were unequipped to help members of the community reaching out to DOH for help.

This was not the first time the Department of Health was confronted with an emergent public health event. In such instances when communities were experiencing a broad public health phenomenon, such as the HIV crisis or hepatitis outbreaks, DOH responded by educating its staff through in-service and out-service programs. DOH staff would then implement a Department-directed public education, outreach, and treatment program. DOH would refer the public to resources and medical professionals for treatment and testing. As we were told, one of the “ten essential services of public health” is “informing and educating and empowering people regarding health issues.”

When DOH began receiving health complaints linked to fracking activity, however, no such collective public outreach and education response occurred. Rather, the Department of Health strictly limited its employees' activities in relation to fracking. For instance, the public health nurse we heard from explained that she and her colleagues received a list of 15 to 20 words related to the fracking industry they were to keep next to their telephones. If someone

called with a health complaint and referenced these terms, they could not answer any of the caller's questions. Rather, they were to take the caller's name and information and pass it on to a supervisor. While they were under the impression that someone higher up in DOH would respond, she and her colleagues frequently received calls from frustrated citizens who never received a follow-up response from DOH to their fracking-related health complaints. The witness we heard from testified that in her 36 years as a public health nurse, the Department had never handled any other public health complaints in this manner.

At the same time DOH employees received instructions on how to process fracking-related health complaints, the Department imposed other limitations on their freedom to engage with the public. DOH employees were instructed that in order to participate in conferences, boards, task forces, or public meetings, they first had to channel a request through their supervisor, which would ultimately require approval from the DOH Bureau of Community Health in Harrisburg. These requests entailed filling out a form specifying the date of the event, who would be attending, the agenda and what would be discussed, and if they would be taking an active or speaking role. Staff was obligated to sign a document confirming they understood the limitations DOH had placed on public engagements. Thus, although a public-facing office, DOH policies restrained public health employees from engaging with the public or from participating in events where they could learn about fracking, health concerns related to industry operations, or otherwise carry out the Department's public health mission.

The Department's blanket muzzling of its employees at the outset of the fracking boom and general failure to meaningfully address the public health consequences of fracking operations was unprecedented. As the witness before us confirmed, the Department had never

before imposed comparable restrictions on its employees in response to any other public health issue during her 36-year career.

DOH continued to ignore the public health effects of fracking

The absence of any meaningful public health response from our government to the fracking phenomenon continued for years. We heard testimony from a witness who served as the District Executive Director for the Southwest District of DOH's Bureau of Community Health Services from January 2012 through April 2014 (District Director). This District Director oversaw the State Health Centers in ten southwest Pennsylvania counties at the center of the fracking boom.

DOH provides public health services to local communities through its State Health Centers, such as those the District Director oversaw. During his tenure with DOH, all phone calls or complaints involving unconventional oil and gas activity were forwarded to the Bureau of Epidemiology in Harrisburg. The District Director confirmed these referrals did not go to some team of public health professionals specially equipped to respond to fracking-related issues. Rather, they went into a proverbial "black hole." There was no protocol, there was no plan, and there was no meaningful response from DOH. The practice implemented at the beginning of the fracking boom continued for years thereafter.

DOH's approach to fracking-related health issues stood in stark contrast to the usual way State Health Centers respond to health outbreaks. The District Director described how DOH carries out its mission when communities experience a public health event. For instance, when he worked at DOH there were 74 diseases, conditions, and infections the Department was required to monitor and address as part of the National Electronic Disease Surveillance System, or "PA-NEDSS." The PA-NEDSS is integrated with local health providers and the federal

Centers for Disease Control and Prevention, and is part of a nation-wide system for monitoring outbreaks and risks to public health. When a public health issue included in the PA-NEDSS arises, DOH takes action to address the problem.

The Department's public health nurses, who work out of DOH State Health Centers, are its "boots on the ground" points of contact with the community. DOH nurses carry out their duties according to training and protocols developed by the Department for a wide variety of health issues, including those in the PA-NEDSS. These protocols include providing public health nurses with questionnaires to gather pertinent information from the community in response to an emergent health problem. When such a problem arises, DOH does not sit idly by, but goes out into the community to directly figure out what is happening. Once DOH acquires an understanding of the problem, it equips its staff with direction on how to advise the public accordingly, with the ultimate goal to figure out the source of the health issue in question and then execute a plan to stop the problem from continuing or spreading.

Despite DOH's capacity to address a wide variety of public health problems, nothing was developed to address the health effects of fracking. There were simply no resources or policies implemented to do so. Early versions of Act 13 included \$2 million to address the public health risks of fracking. When the Act ultimately passed, however, it allocated no money for public health. The District Director testified that he attended quarterly meetings in Harrisburg with the DOH Secretary and Department of Epidemiology leadership. A response to fracking was never discussed at these meetings. Thus, DOH's failure to take meaningful action in response to fracking was established as policy from the outset of the unconventional oil and gas boom and continued for years, despite persistent and widespread reports and public outcry about the harms to health industry operations were causing to so many Pennsylvanians.

Throughout our investigation, we heard Pennsylvanians express a sense that their government failed to acknowledge what they were experiencing because of shale gas operations occurring near their homes and in their communities. Accompanying this lack of acknowledgment was a lack of action, which fostered a feeling of hopelessness and distrust in their government. We find that DOH’s response – or rather lack of response – during the rapid expansion of the fracking industry contributed significantly to the pervasive sense of despair felt by so many people whose lives were upended, and health damaged, as a result of industry activities. While better efforts by DOH are now underway, this legacy continues to pose substantial obstacles to mounting an adequate response to the public health implications of fracking.

The current administration's approach

- ***The "enhanced" oil and gas health registry***

Our government’s first deliberate response to the public health harms caused by unconventional oil and gas operations was the development of a so-called “enhanced” oil and natural gas public health registry. The development of this registry began in 2015 with the current administration devoting \$100,000 to address the public health effects of fracking, which ultimately went to the enhanced registry. “Enhancing” DOH’s fracking-related health registry did not mean much, however, since from 2011 on, the Department logged citizen complaints involving shale gas activity on a Microsoft Word document. When the current administration assumed office in 2015, this Word document log was the totality of what DOH received in terms of fracking-related data or programs from prior administrations.

During our investigation, the Office of Attorney General shared evidence with DOH and the administration and welcomed feedback on this evidence. DOH accepted this opportunity by

submitting written submissions and live testimony for our consideration. The Office of Attorney General "ceded the floor" to the administration and allowed it to present its own evidence directly to us. With respect to the administration's public health approach to the shale gas industry, we heard from Dr. Rachel Levine, the current DOH Secretary.

Dr. Levine explained the circumstances surrounding the creation of the enhanced registry. Dr. Levine, who previously served as Pennsylvania's Physician General, testified she was tasked by her predecessor as DOH Secretary with developing a proposal for how to most effectively use the \$100,000 budgeted toward the administration's public health response to fracking. DOH developed two proposals. The money could be used for an enhanced oil and gas health registry, which was ultimately selected, or as "seed money" toward a more comprehensive health study, which would be done in partnership with a research university. Such a comprehensive study, if ultimately funded, would cost millions, however. Because there was no certainty more money would be budgeted toward this public health issue in the future, the administration opted to spend the \$100,000 toward the enhanced registry.

Virtually all of the \$100,000 in funding for the enhanced registry went toward paying the contract employee who administered it. This contractor initially worked with others in the DOH toward developing a more detailed questionnaire for collecting health complaint data involving shale gas operations. Once collected, the data is entered into a free software program provided by the Centers for Disease Control (CDC).

The CDC software used for the enhanced registry is an information repository capable of generating reports, which DOH issues quarterly. The software does not analyze data. The dataset in the registry includes only that self-reported by a citizen complainant. The program does not incorporate medical data and DOH does not engage with health providers in developing

the registry. While a letter sent in response to oil and gas complaints welcomes the recipient to have their doctor contact DOH, the contractor stated that had never occurred. In addition, Dr. Levine stated, "data reported by a doctor would be anecdotal and therefore not really useful." Assuming contaminants are found in the complainant's water at elevated levels indicative of a health risk, the contractor informs the complainant accordingly and describes the risks associated with the chemicals in question. A toxicologist is available to assist the contractor in that regard. Otherwise, the Department does not follow-up with complainants or doctors.

DOH has received an average of one complaint per month since establishing the enhanced registry in 2017. As of DOH's last report issued for 2019, the registry includes 164 inquiries related to fracking since March 2011. Of these 164 inquiries, only around 120 constitute specific complaints of fracking activity affecting someone's health. Most of these registered complaints carried over from the Word document dataset maintained by prior administrations, which gathered less data than the current registry. So, over three years the enhanced registry gathered around three dozen complaints.

The amount of complaints received by the enhanced registry fell far below the Department's expectations, which was partly a consequence of DOH failing to meet community expectations. As Dr. Levine acknowledged, despite DOH's concerted efforts to encourage those with fracking-related health complaints to participate in the enhanced registry, it was difficult to convince people to do so because the Department was not offering answers or solutions to their problems. People were not eager to spend upwards of an hour completing a detailed health survey when DOH had little assistance to provide them in return. We find that DOH's response, or in reality lack of response, contributed to citizens' feelings of hopelessness and created a lack of trust in the government that should have been interested in protecting them.

When Governor Wolf commenced his first term in 2015, he selected John Quigley to serve as DEP Secretary. The Senate confirmed Quigley as Secretary in June 2015 and he remained in that position until May 2016. Quigley testified that he also participated in the administration's discussions on developing a fracking-related public health registry.

Quigley had significant concerns about the harm to public health posed by shale gas operations. However, he understood that without data substantiating the connections between fracking and public health, DEP, the administration, and other actors were hamstrung in asserting the need for regulatory or government action to address this problem. In Quigley's view, the \$100,000 a year budgeted for such a registry was inadequate, and it would cost millions of dollars to build a sufficient registry. We find it self-evident that this level of funding was inadequate and did not rise to the level of importance of the problem at hand.

- ***Failure to work together***

The administration's failure to gather public health data effectively in relation to industry activities was further undermined by its own agencies' inability to work effectively together toward that end. DOH relies primarily on DEP referrals for oil and gas related health complaints. As the contractor who administers the enhanced registry testified, it was "perplex[ing]" how DEP had received thousands of complaints in relation to fracking activity, while DOH had registered only around 120 total health complaints. While under the current administration DOH and DEP have made some effort to collaborate and address this data gap, these efforts have fallen short.

At the outset of the current administration, DEP and DOH initiated monthly meetings aimed at getting DEP and DOH to work together to gather better public health data. The general approach developed during these meetings was to include health-related questions among those

asked when DEP takes an environmental complaint. If someone contacted DEP to report their belief that fracking operations were contaminating their water, air, soil, etc., they would also be asked whether they were experiencing any health problems. If so, that information could be shared and registered with DOH, and DOH could follow-up accordingly.

Efforts at incorporating health questions into DEP's environmental complaints culminated in a November 7, 2018 meeting between high-ranking DOH and DEP officials and policy experts. DOH had proposed adding an "active" box to DEP's water quality complaint form, which would require a DEP employee registering a complaint to ask the complainant whether they had any health concerns. DEP, principally through Scott Perry, the Deputy Secretary of the Oil and Gas Management Program, opposed this request because it would constitute a "leading question" and was outside the area of DEP's expertise. Ultimately, DEP agreed to a "passive" box on the complaint form; meaning if the complainant mentioned a health issue, unprompted, a notation to that effect would occur and be passed to DOH.

Additionally, DOH and DEP were only discussing adding a health question to water quality complaints, but health complaints regularly pertained to air quality, truck traffic, and other effects of unconventional oil and gas operations. DOH was interested in developing ways they could gather information about these health issues as well. So, while DEP was somewhat receptive to incorporating public health issues into its complaint processes, in DOH's view, there was a lot more it could do. DOH representatives continued to push DEP to take further action aimed at gathering public health information, including adding an "active" question on health. Ultimately, however, Scott Perry refused to agree to more than adding the passive box to the water quality complaint form, and the meeting, which was contentious at times, ended.

After the November 2018 meeting, DEP cancelled all future regularly scheduled meetings with DOH. There was no discussion about this; DEP simply deleted the meetings from a shared Outlook calendar.

When Dr. Levine testified before us in January 2020, she informed us that DEP and DOH had recently begun meeting again. That was not the case when Scott Perry testified in November 2019, however. Mr. Perry shared his view on the above-described meetings with DOH. According to Perry, it was important that DEP only provide information to DOH with the consent of the complainant because not all homeowners trusted the government or would welcome another agency reaching out to them following their interaction with DEP. Perry believed DEP's engagement with DOH accomplished that end because DEP now refers health complaints to DOH. Otherwise, at the time of his testimony, Perry was open to meeting with DOH again, but said he would want to see what agenda they had because he saw nothing more on the policy development side for them to discuss.

DOH saw a slight increase in complaint referrals from regional DEP field staff following the November 2018 meeting. While the creation of the enhanced registry and DEP agreeing to transmit some information to DOH was an improvement over nothing, the financial resources devoted to this enhanced registry and collaborative effort between DEP and DOH were grossly inadequate and did not constitute a legitimate public health response to the realities of fracking.

We learned that the current administration recently budgeted \$1 million a year to fund a study, in collaboration with a research university, of trends and clusters of acute health harms and cancer rates in southwest Pennsylvania. The administration anticipates dedicating \$1 million each year for three years. Once gathered, this data can be analyzed to determine whether public health trends correlate to unconventional oil and gas activity. While the administration has

finally budgeted funds sufficient to gathering and studying public health data associated with fracking, we are disturbed by the long-standing approach by our government to ignore or reject information that substantiates the health and environmental harms of shale gas operations.

Further, we understand that developing sound data on the health consequences of the unconventional oil and gas industry is important to implementing policies aimed at addressing this issue. The current \$1 million in funding to engage in a study of this issue may finally bring about some meaningful results. We fear that the unwillingness to gather data over the past decade, and years it will take to develop data under the currently-envisioned plan, have and will continue to allow further harm to Pennsylvanians.

We asked DOH its position on whether unconventional oil and gas operations harm public health. As the question was phrased, "Is it the DOH and administration's view that there is insufficient evidence proving that unconventional oil and gas operations, whether in the past or as they currently exist under the governing legal and regulatory scheme, harm public health?" DOH responded by stating, "[T]he science in this area is developing, and it is fair to say that it has not been proven that fracking harms public health." The Department further noted that "'association' is not the equivalent to 'causation,'" and that further research was required to substantiate a causal connection between fracking and harms to public health.

We do not contend that we are qualified to dispute medical professionals over whether there is a sufficient body of epidemiological research establishing a connection between fracking and public health. Indeed, officials at DOH co-authored a study in 2019 in which they reviewed the prevailing scientific literature on the issue and found it lacking. However, we also learned about studies concluding that health harms increase based on how close one lives to a fracking operation, and that the only dispute was over how far away from the site was far enough.

Regardless of which view is the correct one, we reject DOH and the administration's view on this issue for two primary reasons.

First, DOH, prior gubernatorial administrations, and our government as a whole failed to acknowledge or inquire into the public health effects of fracking since shale gas operations commenced in the Commonwealth years ago. No resources were put toward addressing this issue and executive level policies were implemented that prevented data gathering or a legitimate public health response. Recently, the current Administration made some effort, but the \$100,000 per year put toward the enhanced registry was inadequate and that endeavor was destined to fail, despite efforts by those at DOH to make the most with what they were given.

Only now, after a decade of fracking and the drilling of over 12,000 unconventional wells, has our government devoted resources to study the issue that may actually bring about some meaningful results. These results, assuming they do come about, are still years away. Thus, the absence of data and research DOH points to in saying there is insufficient evidence to find a connection between fracking operations and harms to public health is, in part, a consequence of DOH and our government's failure to look into this issue in the first place. In other words, our government made no effort to gather the data and points to the lack of data as a reason for not concluding there is a problem.

Meanwhile, we know that Pennsylvania families have been crying out to their government, and anyone who will listen, that fracking operations have made them sick. We heard many of their stories, and we find them credible.

Second, we do not accept that perceived inadequacies in available scientific research on the risks to public health posed by industry operations should result in placing those risks on Pennsylvania families. Under the status quo, the industry operates in close proximity to family

homes without those families knowing what is happening at the industrial site next door. They are exposed to harmful emissions and chemicals while we wait and see if research will definitively prove, and in what way, the harms to their health that may be occurring. We are not guinea pigs in an epidemiological study. If further research is necessary to understand this issue fully, so be it. In the meantime, our laws should protect Pennsylvania families. The recommendations we propose seek to impose some sanity and safety to how this industry operates in Pennsylvania.

Others actors fill the void

Given our government's failure to mount a meaningful public health response to the fracking phenomenon in Pennsylvania, concerned organizations have tried to fill this void. We heard testimony from Dr. David Brown, a public health toxicologist with the Southwest Pennsylvania Environmental Health Project (EHP), a nonprofit public health organization that offers services to southwestern Pennsylvanians who believe their health has, or could be, affected by unconventional oil and gas development. We learned from Dr. Brown's testimony what a typical, on-the-ground public health response looks like.

In approximately 2010, a philanthropic organization voicing community concerns about the health impacts of fracking contacted Dr. Brown. They flew him in to meet with physicians and residents in Greene and Washington Counties who believed they were experiencing health problems because of shale and gas operations. Dr. Brown met with multiple people living near unconventional gas sites who described illnesses befalling their animals and similar health problems they were experiencing personally; most notably headache symptoms associated with methane exposure. He saw no indication these people were colluding in describing their similar ailments and experiences. Dr. Brown was particularly concerned upon seeing reports signed by

DEP employees informing people their water was safe, rather than such assurance coming from a public health or medical professional, which he described as a "sin." In the doctor's view, the scenario looked like "a public health outbreak," and he put together a plan to mount a public health response, received immediate funding from a philanthropic organization, and the project commenced.

Dr. Brown had overseen responses to public health outbreaks before, for instance while working at the Centers for Disease Control and as the Director of Epidemiology for the Connecticut Department of Health. He educated us on how a public health response is carried out. The first step is to perform a "needs assessment," which entails finding out what is going on in the local population and whether the population has the resources to deal with the problem. That means gathering as much information as possible from local medical professionals, the Department of Health, and the community. To achieve that end, Dr. Brown hired a nurse practitioner and a professional to do environmental assessments at peoples' homes. They used a standardized questionnaire in an effort to develop a sound dataset to understand what was going on and develop possible solutions to the problem.

The chief obstacle at the outset of this public outreach effort was the sense of hopelessness felt by many suffering the health effects of oil and gas activities. Their government was not recognizing what they were experiencing or trying to offer some meaningful help, the industry continued to operate unabated, and they felt let down and abandoned as a result. For these and other reasons, there was significant distrust of anyone from outside of Washington County. To overcome this barrier, Dr. Brown's team brought on Raina Rippel, a local environmentalist and health organizer, who helped build trust with the community. Ms. Rippel insisted a social worker accompany medical and technical experts on home visits because the

focus of the organization was to help people. That is and remains the mission of EHP: to "do what public health organizations do," which is to look at health data, come up with solutions to the problem at hand, and educate the public on ways they can protect themselves.

Informing people on how to protect themselves from contaminants harmful to health requires determining the pathways of exposure. Cutting off these pathways is how a public health outbreak is stopped. In this instance, there were three possible pathways: (1) groundwater, which was the most frequent mechanism; (2) air; and (3) contamination through plants and food. What EHP learned about how oil and gas activity results in contamination via air pathways was of particular interest to us.

Consistent with the evidence we heard from homeowners living in close proximity to industry operations, people living near oil and gas operations regularly complained to EHP of repeated nosebleeds. These nosebleeds most often occurred at night. Children were affected most frequently. While kids getting nosebleeds is not unusual, they would also develop stomach distress and frequent headaches. Local doctors could not explain what was going on. People were traveling as far as the Cleveland Clinic for help. These complaints came from those with both well and public water supplies, so EHP looked to air emissions as a source.

EHP used meters to measure air quality in affected areas and determined that while emissions from unconventional gas sites may have been relatively constant, at night contamination levels would "peak," resulting in increased exposure. This was explained by "vertical mixing," which refers to the upward or downward movement of air because of temperature differences between the surface of the Earth and overlying air. At night, when there is no sunlight hitting the ground, there is less vertical mixing and air is stagnant and low-lying. On cloudy nights without wind, air was even more likely to stagnate and settle on the ground.

Under this combination of circumstances exposure levels would peak, contaminated air would enter homes, and symptoms like nosebleeds, stomach problems, and headaches would result. EHP confirmed this was occurring by monitoring air quality meters placed inside and outside of peoples' homes along with the health complaints experienced by those living in monitored homes.

Meanwhile, DEP's air monitoring program, which conformed to EPA's, was concerned with overall air emissions compliance over 24-hour periods. While overall emission reduction targets were reached under this program, it did not account for how peak contamination levels affected health in localized instances. As a result, when people complained to DEP about health problems – headaches, nosebleeds, burning eyes, etc. – they believed were caused by emissions from a nearby compressor station or impoundment, DEP would conclude there was no problem based on testing focused on emissions over 24-hour periods. DEP would deny the claim, but the health problems would persist.

Over the decade or so EHP has operated, it has identified 77 compounds emitted from the approximately 350 compressor stations, gas processing plants, and well pads operating in Washington County. Of these 77 compounds, five made up 90% of emissions. The most frequent was nitrogen oxide, which is an eye irritant that also causes cardiovascular problems and damage deep in the lungs and upper respiratory system. Carbon monoxide, which causes "anoxia," or reduced oxygen to the brain, headaches, and brain pain, is also common. In Dr. Brown's opinion, however, detected carbon monoxide levels – which were comparable to smoking three cigarettes a day – were not high enough to cause the reported health problems.

The most frequent compounds also include microscopic particulate matter, which moves like a gas, releases proteins in the blood called "kinins" that cause inflammation and affect blood

pressure, damage the lungs, and cause heart conditions. Particulate matter is also problematic because water-soluble compounds in the air can attach to it, causing it to act as a vector by which other toxins can travel deep into the lungs where they are far more damaging. Among the compounds that can attach to particulate matter are volatile organic compounds (VOC), like toluene, benzene, and xylene, which are also frequently found in gas emissions. These cause neurological and cardiovascular effects and intense fatigue. Also, when VOCs like iodine, chlorine, and bromine attach to a chemical like methane, they become even more toxic. Finally, formaldehyde, a carcinogen and irritant that results from methane as it breaks down, is also among the top five contaminants in oil and gas emissions.

The potential health risks of the remaining 72 compounds identified by EHP emitted by oil and gas operations are, in many cases, unknown.

Factors determinative of exposure risks to people living near oil and gas operations are necessarily nuanced and site-specific. For instance, EHP found that in Washington County, the particular chemicals emitted from any one oil and gas site would vary by a factor of 10; meaning chemicals from one well could be 10 times greater than that emitted by another. Whether someone lives uphill or downhill from oil and gas operations affects exposure. The number of peak exposures experienced within a short time-period is significant because if the body has not processed contaminants from one exposure before another occurs, the health effects can compound.

Health impacts also increase the closer someone lives to an oil and gas operation and as the density of pads around their property increases. The general range where exposure can be problematic is within two kilometers, or a mile-and-a-quarter, of a gas site. And the rates of emissions from well pads are not the same. Well pads emit contaminants from degassing tanks,

condensate tanks, and dehydrating tanks, which can emit periodically. These inconsistent emission events, both in frequency and volume, add additional unpredictability. Meanwhile, weather can be varied, with cloud cover, temperature, wind, and vertical mixing all having a significant influence on exposure risk. All these factors make reaching some comprehensive, uniform approach to understanding airborne exposure risks from oil and gas operations difficult, if not impossible, to determine. Risk is determined by location and constantly changing interactive factors.

Once EHP developed an understanding of the paths of airborne exposure from oil and gas operations and the factors influencing risk, they implemented means of educating the public on how to avoid these risks. EHP can identify a Washington County homeowner's exact latitude and longitude and determine their grams per hour exposure risk depending on their distance from the source and weather patterns. EHP developed an informational magnet people keep on their refrigerators that help them predict risk levels based on weather patterns. These are particularly useful to asthmatics because of their sensitivity to airborne contaminants and those with young children who need to avoid playing outside when the air is compromised.

Air quality monitoring techniques employed by EHP include providing homeowners with "SUMMA" canisters, which collect air over 24-hour periods for testing inside and outside of peoples' homes. Testing from SUMMA canisters has confirmed high levels of contamination inside residences. EHP recommends such minor approaches as not wearing shoes in the house to prevent dust from oil and gas activity tracking inside to recommending installation of advanced home filtration systems. Children are a particular concern with respect to airborne contamination because chemicals associated with oil and gas emissions can block development in their rapidly growing bodies, causing permanent damage. However, health data on the long-term effects of

oil and gas operations to children's health are incomplete, and likely will not be clear for years to come. In instances where air contamination levels are particularly high in a home, EHP has recommended that families with young children move. Dr. Brown confirmed it would be unethical for a public health organization, like EHP, to advise families that consistently exposing their children to airborne fracking contaminants is acceptable.

We find that EHP's actions stand in stark contrast to DOH's: the government agency charged with protecting public health. We further find it remarkable that a newly created organization like EHP swiftly gathered data and provided guidance to Pennsylvanians on how they could protect themselves from the effects of industry operations, while a long-established government entity, DOH, did not.

In addition to Dr. Brown's testimony on the work of EHP, we learned of efforts by the federal government to provide public health services to Pennsylvanians who suffered adverse health effects from fracking operations. We heard testimony from Dr. Karl Markiewicz, a Senior Toxicologist from the Agency for Toxic Substances and Disease Registry (ATSDR), which is a federal public health agency within the Centers for Disease Control. ATSDR partners with EPA and other agencies to provide public health oversight and responses to significant instances of environmental pollution or contamination.

As a public health agency, ATSDR works much like EHP. When assigned to look at a particular incident, usually via a referral from EPA, they first perform a public health assessment. In understanding the situation at hand, ATSDR most often gets data from states in which they work, medical records from patients, and other sources, although they gather their own data as well. Dr. Markiewicz repeatedly emphasized how critically important access to comprehensive, quality data is to understanding the possible health risks to a community in

relation to an incident of contamination. Like EHP, ATSDR tries to determine exposure pathways, with groundwater being the most likely path of exposure, but air as well, and then a means of interrupting that pathway to prevent ongoing harm from the given source of contamination.

ATSDR's first contact with the fracking phenomenon in Pennsylvania was in response to a stray gas migration incident that resulted in the contamination of numerous drinking water wells. DEP investigated the incident and determined the problem was resolved and drilling operations could continue. Meanwhile, EPA and ATSDR were brought in out of concern over possible ongoing health risks. ATSDR did its own independent water testing and recommended people not drink local groundwater pending further testing. They were the only agency advising the public as such.

According to Dr. Markiewicz, the divergence between ATSDR's recommendation and DEP's reflected, at least in part, the agencies' respective missions. DEP is a regulatory agency that performed testing according to the governing protocols of DEP. DEP is not specifically tasked with protecting public health or addressing public concerns outside its perceived regulatory mission. ATSDR is a public health agency with a different perspective, and their focus on public health led them to view the same phenomenon in a different light. There were apparent, serious risks to public health present, and ATSDR could not accept or disregard these risks without further understanding what was going on. These differences in perspective illustrate how the absence of any meaningful involvement by the Pennsylvania Department of Health in the fracking phenomenon has resulted in an ineffective response by our government to the realities of unconventional oil and gas operations experienced by many of its citizens.

ATSDR's inability to get data from DEP and industry operators frustrated efforts at mounting a public health response to the stray gas migration incident in question. ATSDR works most frequently with Superfund sites, where the norm is an open door policy with private companies and the government in sharing all available data and information. The fracking industry is different, however. The fracking industry resisted sharing information about its practices with ATSDR and legal mechanisms obstruct the sort of routine oversight other industries are subject to. Meanwhile, DEP's failure to collect data, and resistance to sharing what data they have, coupled with their narrow approach to testing when determining whether contamination has occurred, enables the industry to ignore residents' claims that oil and gas activity has contaminated their environment, air, or water supply. DEP's failure to adequately respond to homeowners' concerns builds distrust between the community and the government. That distrust has become entrenched in Pennsylvania, which further impedes a meaningful response to the problem.

With respect to the Pennsylvania Department of Health, ATSDR experienced the same disengaged, hands-off response consistently shown by DOH in relation to the fracking phenomenon. Pennsylvania has professionals capable of doing the same work ATSDR does and Dr. Markiewicz was in contact with DOH employees during their work involving fracking operations. While DOH employees wanted to know what was going on, "they were not allowed to work on it," and did not engage in an on-the-ground response to what was happening, despite being welcome to participate. Dr. Markiewicz could not verify whether there was any specific directive within DOH preventing its employees from working with ATSDR on a public health response to fracking-related contamination, but he frequently heard complaints from residents about DOH's absence from their community.

Like EHP, ATSDR also worked on air quality contamination from fracking operations. They used SUMMA canisters to collect data, but emphasized a significant lack of air quality data in Pennsylvania on oil and gas activity. They investigated emissions from a pigging station in collaboration with the criminal division of EPA, and found that when a pigging station releases rapidly at around 1000 psi, as opposed to gradually at 100 psi, there are significantly higher methane and benzene emissions. Using high-tech cameras, they observed the massive amount of emissions from when a PIG was removed at the station, and the plume of gas that would waft over nearby residents' homes.

Dr. Markiewicz expressed concerns that DEP was not looking into the combined impact of pigging stations, gas condensing units, and the combined effect of transporting gas from well pads through pipelines. Again, more data is needed to understand the reality of how fracking operations affect air quality and public health.

Testing must reflect how oil and gas operations impact air quality and the pathways of contamination that can result in harm to public health. Similar to the testimony we heard from Dr. Brown, Dr. Markiewicz recognized how air contamination occurs in "peaks" through a combination of factors, and that testing needs to reflect that reality. ATSDR was asked to review data gathered by DEP pursuant to a long-term air-monitoring project conducted at four locations in Washington County in 2012 and 2013. They found that because of where DEP placed air-monitoring devices in relation to wind and weather, the devices collected pertinent data only 20% of the time. Again, more data is essential, and testing must account for the inherently localized nature of air contamination from oil and gas operations.

Dr. Markiewicz's testimony also reflected Dr. Brown's concern over DEP informing people that based on its test results, it was safe to drink their well water. In his view, by

providing such assurances without consulting with medical or public health experts, they are putting peoples' health at risk. Moreover, you do not need to be an expert to see the wisdom of this view. As Dr. Markiewicz described an interaction he had with a homeowner who was told by DEP that his water supply was safe to drink:

He kind of looked at me and he stood up and his kids are sitting around. And he went over to the kitchen sink and he took a glass tumbler and filled it up and I mean, it looked like swamp water. And he said, you are telling me that I can drink this? And he didn't say, go ahead and drink it but he was holding it in front of me. And I said, [], I agree with what you are saying but based on the data -- and that is how I started the conversation. I said, based on the data, there wouldn't be any restrictions on this. It would be okay. He said would you drink this or give it to your kids? I said, no, I wouldn't.

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We appreciate DOH engaging with us in this investigation. We found their input extremely helpful, and the Department deserves credit for the efforts it has made in recent years given its available funding. For instance, in addition to the initiatives discussed above, in 2015 DOH hired an expert with a background in environmental health to head its Bureau of Epidemiology. It brought on additional staff over the past few years, most of whom were responsible for overseeing the enhanced registry. The Department also indicated it received funding in 2019-2020 for ten new positions dedicated to environmental health. It has engaged in direct outreach to communities and stakeholder organizations in an effort to encourage participation in the health registry. It provides useful information to the public via a website devoted to oil and gas activities. When DOH comes in direct contact with people who believe fracking operations have affected their health, it offers to review any available sampling results

to identify potential health risks, and provides referral information for environmental health physicians.

In our view, however, more can be done. We would like to see DOH not only fund research and provide feedback and referrals to those who reach out to the Department, but actively go out into communities and try to find solutions to the problems people are experiencing right now – not wait on the research. We learned that public health work is all about identifying pathways of contamination and cutting off these pathways so that people stop getting sick. This is what EHP has endeavored to do in Washington County, and they have had some success. We know DOH does this with other public health issues, and we would like to see DOH put forth the type of on-the-ground effort others are making in response to the public health consequences of fracking. Such an approach would provide Pennsylvanians with the kind of help they are looking for from their government.

We also understand DOH may not have the resources to do the sort of work we would like to see. Perhaps the increased staffing it expects will enable it to do more. Regardless, we remain troubled by the Department's belief "that it has engaged in an appropriate response to the potential health effects associated with fracking." Again, DOH's perspective appears rooted in its view that a connection between shale gas operations and public health remains "unknown," and "that it has not been proven that fracking harms public health." We know from our investigation what too many Pennsylvanians know from personal experience: that industry operations have made Pennsylvanians sick, and that the legal and regulatory regime governing shale gas extraction in the Commonwealth puts people's health at risk. Our proposed recommendations account for this risk as we develop a better understanding and approach to managing the relationship between public health and fracking.

Recommendations of the Forty-Third Statewide Investigating Grand Jury

We, the 43rd Statewide Investigating Grand Jury, based on a preponderance of the evidence before us and in some cases clear and convincing evidence, make the following recommendations. Our recommendations, though relevant to all living in the Commonwealth, are focused on the oil and gas industry, the Commonwealth of Pennsylvania's Department of Environmental Protection, the Department of Health, and the General Assembly.

One: Expand the No-Drill Zones

For all the arguments about the effects of fracking, we believe, and the evidence we gathered confirms, that there is one point that is impossible to deny. The closer people happen to live to a massive, industrial drilling complex, the worse it is likely to be for them. The more of a chance that their drinking, cooking, and bath water will be contaminated. The more harmful emissions they will breathe into their lungs. The more truck traffic and machinery they will have to hear, at all hours of the day and night. The more the effect on the health, safety, and welfare of their family and children.

And yet, under current law, an unconventional oil and gas company can drill a well as close as 500 feet from a person's home. That's only about 200 steps away. That means the well itself can be that close; the well pad and its accompanying equipment can come even closer. No one expects, when they find a place to settle, raise a family, live a life, that a steel mill might be constructed right next door, or a power plant. And local zoning laws will normally make sure that doesn't happen. When it comes to unconventional drilling, though, people have seen rigs sprout up almost in their backyard, along with all the equipment necessary to service them. In many parts of the state, local zoning practices have simply been inadequate to prevent such

development. There has to be a *statewide* minimum “set-back” – and the current minimum, 500 feet, just isn’t high enough.

We therefore recommend that the set-back statute be changed. Considering the size and scale of a fracking site, the no-drill zone should be at least 2,500 feet, not 500. Even that distance is still only a short stroll, within sight and sound of residences. We do not believe such a modest buffer zone is too much to ask when it comes to people’s health and homes.

But our concern is not just for residential settings. We were astonished to learn that the drilling set-back is no different even when it comes to sensitive sites, like a hospital, or an elementary school playground. It is the same 500 feet. We think the no-drill zone for schools and hospitals should be even bigger – 5,000 feet. We understand that fracking has its benefits. We just want to give it some separation from the places we eat and sleep, treat the sick, and educate our children.

Two: Stop the Chemical Cover-up

We heard repeatedly during this investigation the claims that there is no real danger from the use of complex chemical compounds manufactured for the fracking process – or at least that the risk is “unproven.” The time has come to provide for proof, one way or another; and the only way that can happen is to require disclosure.

We learned that under existing law, the oil and gas companies don’t have to say what chemicals they are using *until after they have already used them*. And even that disclosure rule only applies to chemicals used in the fracturing phase of the process – the stage after the well has been drilled, when the companies use high-pressure water and chemicals to break up underground rock formations in order to extract the gas. What goes down the hole, though, must

come up – much of the chemical-filled fluid that is used for fracturing makes its way, sooner or later, back to the surface.

But the companies also use potentially dangerous chemicals during the drilling process itself, before they even start the fracturing. And *those* chemicals don't have to be publicly disclosed at all – even though they often drill directly through water tables, where the chemicals may mix with water that someone is using and drinking.

In addition, every time these fracking chemicals are moved there is a risk of leaks or spills or escape onto the ground, into the water, and into the air. And if there is any kind of accident, the first people at risk are the first responders, followed by everyone else in the vicinity.

But in addition to these lax rules about disclosure, there is another problem. Companies also get an exception to the disclosure requirements for “trade secrets.” So if they say they have created some special chemical compound that gives them a competitive advantage over other gas companies, they don't have to reveal publicly what it is.

We find that unacceptable. The corporate bottom line does not outweigh the lives and health that may be at stake. We want the public to know the identity of all these chemicals being released into the environment, so their effects can be studied, and so government or individual citizens can choose to protect against them if they deem it necessary. We recommend that all chemicals employed in any stage of the unconventional oil and gas process must be publicly disclosed before they can be used.

Three: Regulate All Pipelines

With all the attention on pipeline problems in different parts of Pennsylvania, one would expect that government must have some role in how the system is operated. And it does – up to

a point. We were surprised to learn, however, that as of now regulations focus primarily on the *big* pipelines, the major “highways” that transport gas over long distances.

As with the road system, though, those gas highways are *not* the only pipelines. The gas has to have some way to get to the pipeline highways from the well. They don’t use tank trucks. They use a system of smaller pipelines, called “gathering lines.”

And those gathering lines are hardly regulated at all in the rural and semi-populated areas where most fracking takes place. In effect, it is a remnant of history: they didn’t need regulation for gathering lines in conventional drilling days, because those lines were low pressure, low volume, and no real hazard. Modern gathering lines are very different. Yet only the gas highways get full government oversight.

This deficiency is not defensible. These gathering lines operate under high pressure and can span hundreds of miles. They are subject to leaks, erosion, and even explosion, much like the bigger lines. And yet, outside of higher-population areas of the state, the companies are largely free to lay down whatever gathering lines they want.

We say the Commonwealth must start regulating gathering lines from unconventional drilling wells. *All* pipelines in *all* parts of Pennsylvania.

Four: Add Up the Air Pollution Sources

Fracking does not entail big belching smokestacks, like some factories. So we don’t think of it as a source for air pollution.

But it is. Fracking operations mean frequent releases of gas, not just accidental but intentional. The pipes must be cleaned out regularly, and every time that is done, billowing but invisible clouds of gas escape into the atmosphere. That gas can be hazardous in itself, and in

addition can be tainted with the man-made chemicals used to extract it from the ground, and with naturally occurring chemicals released from deep in the earth.

The problem is that most of the fracking industry air pollution comes from smaller clean-out stations, known as "pigging stations," and other sources that, *individually*, slip under the air pollution thresholds at which regulation would kick in. And that is true even though these oil-and-gas industry pollution sources are often clustered together; if aggregated, they would trigger requirements for pollution control. But they are not aggregated, and so they are frequently not regulated.

The solution is to stop looking in isolation at air pollution caused by unconventional drilling sources. The state has to begin using more common sense and logical standards for evaluating these sources. If air-polluting fracking facilities are stationed in close proximity, treat them as one source, and regulate accordingly. After all, if people live anywhere nearby, their lungs aren't going to care whether the chemicals in the air came from one large source or from many smaller sources all next to each other. It is reasonable to expect our regulatory agencies to take that into account.

Five: Transport the Toxic Waste More Safely

Among the many troubling aspects of unconventional oil and gas drilling is this one: its waste. Simply put, the fracking industry generates enormous quantities of noxious by-products. We learned that unconventional drilling creates two categories of waste requiring special disposal. The first is a significant problem; the second is an even more significant problem.

First, there are the drill cuttings – the rock and mud that is ground up and brought out to create the well. The drill cuttings are mixed in with the sludge of industrial chemicals used for the drilling processes. This is not just normal rubbish that can be tossed onto a regular garbage

dump. The chemicals in drill cuttings are potentially hazardous even beyond the standards of landfill sites used for municipal trash.

Second, there is the wastewater – which is not just water at all. The fluid injected into a fracking well cannot perform its function with mere H₂O. Frack fluid is an elaborate and, as we mentioned, secret chemical cocktail of lubricants, biocides, solvents, and other agents. And the issue isn't just the composition, but the *quantity*. A single well may create *millions* of gallons of contaminated water over its lifetime.

Yet this hazardous material is not treated as such. We learned of a striking example of the problem. When toxic chemicals are initially transported to a well, the tanker trucks are labeled as carrying hazardous material. But after these chemicals are injected into the ground, and then return to the surface in wastewater, the contaminated water is transported *from* the well as if any danger had ceased to exist. The very same chemicals that were identified as hazardous before they were used are now identified as non-hazardous “residual waste,” although their composition has not changed. Thus, the transportation of fracking-generated wastewater in Pennsylvania does not account for the toxic nature of this waste being hauled all over the Commonwealth.

This creates a serious problem. Fracking wastewater can be a relatively harmless briny concoction, an extremely dangerous combination of chemicals, or highly radioactive. Because it is labeled as “residual waste” – a classification that includes many sources of waste other than from fracking – there is no way to know whether a tanker came from a shale gas site or carries something that does not carry the same potential risk. If one of these trucks overturns and spills all over a roadway, the signage on the truck will not provide adequate notice to those at the scene about what they are dealing with. This system puts the public and first responders at risk.

Presently, there is no easy long-term solution for permanently disposing of waste generated from shale gas operations. And operators perform an elaborate shell game, moving fluid from one well to the next to fracture more shale. The movement of this waste presents a risk to the public. While regulators sort that out, at a bare minimum, Pennsylvania should require that trucks carrying waste from fracking sites display signage specifically identifying that which they are hauling as unconventional oil and gas waste.

Six: Deliver a Real Public Health Response

Our investigation showed that, for the better part of a decade, there were Pennsylvania citizens who suffered ill effects after fracking moved into their neighborhoods, and who basically received a cold shoulder from their government's official medical establishment. Now we have learned that in recent years the Department of Health has made more of an effort to address the problem, and has allocated a million dollars a year for a three-year study. That is encouraging. But it is not enough.

We understand the nature of the challenge. There are many potential health issues that fall under the "fracking" label, and many conflicting claims about what is or is not dangerous. That, however, is usually the case with public health issues. It is not always obvious up front, in any health crisis, what the real causes are, or what the consequences will be. But lack of knowledge should be a reason to do *more*, not less.

Consider the attention being paid to vaping, which the Pennsylvania Secretary of Health wants declared as a public health emergency. Consider the resources marshaled to study the spread and effects of a group of harmful substances known as PFAS from the former Willow Grove air base outside of Philadelphia. Consider the state government's call to arms over spotted lanternflies.

These are all significant issues, and we have no intention of minimizing them. But fracking has been going on for over a decade in Pennsylvania now. It has potentially affected the short- and long-term health of tens of thousands of people. By this point, we should know more than we do. It was as if our government didn't *want* to know.

Several other of our recommendations will serve to address the public health consequences of fracking, such as expanding the no-drill zone and requiring full disclosure of chemicals used in industry operations. We also call on DOH to unleash the full force of the public health apparatus in order to gather all the data and figure out the best medical responses. Don't just wait for people to report; they might not, or they might have tried repeatedly and given up because no one listened. Put boots on the ground and go out into the community. Mobilize health centers. Make public service announcements. Build a better website, and advertise the hotline. Reach out to doctors and hospitals in the affected areas. Issue declarations. Do what we do with other public health crises.

Seven: End the Revolving Door

We saw staffing issues at DEP that caused us concern. But among the most troubling was the fact that DEP employees were frequently lured away to work for the oil and gas operators they were supposed to be regulating. In a way, this should be no surprise. The industry is far better funded than government, and can offer far better compensation to state employees who have developed, at state expense, an expertise in this regulatory field. But the resulting potential for conflict of interest cannot be ignored. If DEP employees know there may be a big paycheck waiting for them on an operator's payroll, they may be reluctant, consciously or otherwise, to bring to bear the full force of the law. The solution is to do what Pennsylvania

has done in other areas: impose a “cooling-off” period that would prohibit DEP employees from jumping directly into a job with an oil and gas company.

To be clear, this would not be a complete solution to the personnel issues we saw at DEP. We believe the agency has been understaffed and undertrained; even the Department’s own representative testified to the need for more resources. DEP must have an appropriate, sustainable funding source in order to ensure that it can hire, train, and retain the people necessary to perform the challenging tasks required to regulate this complex industry.

In the meantime, however, a revolving door rule would be a simple and straightforward means of addressing at least one part of the problem. The Ethics Act provides that former public employees must wait one year after leaving state government before they can engage in lobbying before their former agency. And the Gaming Act provides an even more pertinent provision. A former employee of the Gaming Control Board cannot accept employment, for a period of two years, with any company that has applied to the Board for a license. The prohibition is particularly prudent in an industry awash in money, as is gambling. We have some of the same concern regarding the oil and gas industry. While energy prices may rise and fall, the profits in the good years are plentiful, and thus enhances the industry’s ability to pluck talent from the Department. We propose that a cooling-off period, as under the Gaming Act, will protect the Department’s work force and at the same time enhance integrity.

Eight: Use the Criminal Laws

Pennsylvania has a series of special environmental statutes that make it a *crime* for people to pollute the Commonwealth’s air or water, or dispose of industrial waste improperly. And yet, when it comes to unconventional drilling, these criminal statutes in effect do not exist; they are virtually never invoked. We wondered why.

As it turns out, the lack of criminal prosecution is not because no such crimes have been committed. As we learned during our investigation, most of this criminal conduct cannot go forward unless the Department of Environmental Protection refers it to law enforcement for criminal investigation. Local D.A.s have the authority to prosecute these environmental laws, but seldom the resources. The Attorney General's Office, on the other hand, has a special environmental crimes section for exactly this purpose – but it lacks the legal authority to prosecute unless DEP asks it to do so.

Yet, in recent years DEP has seldom asked. DEP employees testified to various explanations for this lack of criminal referrals for oil and gas violations. Some said they don't need to seek criminal prosecutions, because their own internal regulations provide sufficient deterrence. Some said they would refer more cases, if only prosecution didn't take so long. Some said they wanted to send out cases for prosecution, but supervisors didn't always approve.

Whatever the story, there is a simple fix. The legislature should amend the environmental laws, in particular the Solid Waste Management Act and the Clean Streams Law, to give the Attorney General direct jurisdiction over environmental crimes. That way the office will not have to wait for DEP to refer or not refer; it can begin an investigation on its own, whenever it has proper cause to do so. There are already a number of other specialized areas, such as child predator and computer crimes, where the Attorney General's Office has been given special jurisdiction. It would be a straightforward matter to do the same here.

We think, in appropriate cases, criminal charges can provide an effective way to help carry out the constitutional mandate of article 1, section 27: to conserve and maintain the people's right to clean air, pure water, and a healthy environment. The three presentments issued by this Grand Jury serve as a first step.

Response of the Pennsylvania Department of Environmental Protection

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COURT OF COMMON**
: **PLEAS CP-02-MD-0005947-2017**
INVESTIGATING GRAND JURY :
:
: **NOTICE NO. 42**

**RESPONSE OF THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL
PROTECTION TO REPORT 1 OF THE FORTY-THIRD STATEWIDE
INVESTIGATING GRAND JURY**

The Pennsylvania Department of Environmental Protection (“DEP”), by and through its counsel, Pietragallo Gordon Alfano Bosick & Raspanti, LLP, submits this response to Report 1 of the Forty-Third Statewide Investigating Grand Jury. The report was served upon DEP pursuant to an order by Supervising Judge Norman A. Krumenacker, III. DEP requests that this response be attached as an exhibit to the report prior to public disclosure and/or publication.

I. INTRODUCTION

A. The Boom of Unconventional Gas Well Development in Pennsylvania

The development of the unconventional gas industry posed a unique challenge for the Department of Environmental Protection. DEP rose to the challenge through the efforts of its dedicated staff of professional geologists, engineers, and biologists who were committed to creating a regulatory program that protected the citizens of Pennsylvania and their environment, while allowing responsible development of the resource. It is important for Pennsylvania’s citizens to know that these DEP employees care about, are engaged in, and have expertise in protecting the environment and public health and safety from the impacts of unconventional gas development. Citizens also need to know that the oversight of this industry now in place is comprehensive, responsive and protective.

In 2008, when the industry began significant development of the Marcellus Shale, an unconventional natural gas formation, DEP had in place a regulatory program for addressing the impacts of the historic conventional oil and gas industry that existed in rural areas of northwestern and southwestern Pennsylvania. That regulatory program, which has never had a federal counterpart, derived largely from the 1984 Oil and Gas Act. DEP quickly identified the need for an updated regulatory program for unconventional gas development.

Although the techniques used to produce natural gas from unconventional formations were not new to Pennsylvania - horizontal drilling had been used for years prior to the Marcellus Shale boom to stimulate coalbed methane wells, and hydraulic fracturing and the chemicals used in that process have been standard operating procedures for virtually every conventional oil and gas well in Pennsylvania for decades – the sheer scale of this new development was unprecedented. From the total acreage of the play across Pennsylvania (the productive area of the geologic formation) to the size of the well sites, the time it took to drill and hydraulically fracture each well, the amount of water used, and the amount of residual waste generated by developing these wells, this was a significantly different industry. The increased scale and rate of unconventional gas development resulted in new field practices which required DEP to develop new approaches to regulating the industry and to update DEP's existing regulatory program for conventional oil and gas development.

DEP's task was to adapt the existing regulatory program as this large and impactful industry grew exponentially, changing its methods and techniques as it grew. At every critical juncture, the environmental professionals at DEP committed themselves to doing the job right and created a regulatory program that ensures the public receives all the protections afforded them by Pennsylvania's strong environmental statutes. The cornerstones of the new regulatory program are the 2012 Oil and Gas Act (an updated 1984 Oil and Gas Act) and Pennsylvania's other

environmental statutes, including the Clean Streams Law, Solid Waste Management Act, Air Pollution Control Act, Dam Safety and Encroachments Act, and Radiation Protection Act, along with the regulations that implement these statutes, many of them amended in new rulemakings to address the potential risks and hazards presented by today's unconventional gas development.

To better administer this new program, DEP made changes within the agency, including restructuring the Oil & Gas Program, creating a new district office to serve northcentral and northeast Pennsylvania, increasing its staff, and training all staff members. DEP also made changes to ensure its regulation of this industry is transparent, participative, and collaborative. The agency enhanced the public's access to accurate factual and scientific information regarding its oversight of the industry, engaged the public's participation in a massive rulemaking process, and collaborated with many stakeholder organizations in developing its new program.

The regulatory program which DEP has developed, continuously improved, and implemented for this complex industry is recognized nationally and internationally for its features, which protect citizens and the environment while allowing responsible development. Over the past several years, representatives and officials from many countries have traveled to Pennsylvania to meet with DEP staff and learn more about its program and practices. As part of the Unconventional Gas Technical Engagement Program, the U. S. Department of State has sent DEP staff to other countries, including Mongolia, Poland, Lithuania, Argentina, and Columbia, to assist these countries in creating effective regulatory programs for this industry. .

Of no small note, DEP accomplished this work at the same time the federal government was reducing its involvement, oversight, and support of state environmental protection programs , the state legislature was focused on limiting DEP's budget and regulatory authority, and critics were shaping public opinion with fear and inaccurate information without respect for facts, law or science. Moreover, DEP has achieved this success as Pennsylvania has become the second largest

producer of natural gas in the U.S., behind only Texas. In 2019, 6.2 trillion cubic feet of natural gas was produced from unconventional wells in Pennsylvania, the largest volume of natural gas on record produced in Pennsylvania in a single year.

For certain, there have been and will continue to be concerns related to the impacts of unconventional gas development on the health and safety of the Commonwealth's citizens and our environment. DEP shares these concerns and is committed to continually improving the regulatory program to better protect and serve the citizens of the Commonwealth.

B. The Grand Jury Investigation

DEP's regulation of the unconventional gas industry recently has come under the scrutiny of a Statewide Investigating grand jury requested by the Pennsylvania Office of Attorney General ("OAG"). The grand jury was convened two years ago with the stated purpose of investigating whether private companies engaged in unconventional well development activities had committed criminal violations of Pennsylvania's environmental laws. In mid-December of 2019, 22 months into the grand jury's 2-year term, the OAG advised DEP, for the first time, that it had prepared a draft report that was critical of how DEP regulated the unconventional gas industry. The OAG agreed to share summaries of excerpts of the draft report applicable to DEP and to give DEP a limited time period to respond in writing and present testimony before the grand jury. Upon reading those excerpts, DEP was surprised by the extent of the factual inaccuracies and confused articulation of the relevant law in the excerpts of the draft report and submitted three written statements on the issues and purported facts in the short summaries. DEP also received a limited opportunity to present testimony by one DEP employee, Kurt Klappkowski, Director of the Bureau of Oil & Gas Planning and Program Management, based solely on the topics and contents of the short summaries provided by the OAG.

In the full report, which DEP obtained only after it sought court intervention, the grand jury made no findings of criminal wrongdoing by DEP. However, it presents an inaccurate and incomplete picture of Pennsylvania's regulatory program and how it is being implemented today. The report relies upon unidentified witness snapshots, in some cases from 10-15 years ago. It is critical of today's DEP regulatory program while demonstrating little knowledge or understanding of it. DEP respects the work of and the mission of the grand jury. However, accuracy is necessary before criticisms can be fairly made. Likely because of the limited information presented to them by OAG during the confidential grand jury investigation, the grand jurors were not able to develop an understanding of the current regulatory program or the related law and, consequently, made recommendations that are ultimately unproductive and/or inappropriately directed to DEP.

This false picture of DEP does a disservice to the citizens of the Commonwealth, generally, and to the dedicated employees of DEP, specifically. It undermines the public's right and ability to understand whether they are receiving the protections afforded them by law and erodes the public's trust in DEP. For this reason, DEP respectfully requests this Honorable Court attach this response as an exhibit to the report prior to public disclosure and/or publication.

DEP's response below consists of two sections. The first section, "Creation of a Modern Natural Gas Regulatory Program" describes DEP's regulatory program. It examines distinctions between the statutes, regulations, and policies; describes requirements of DEP's regulatory program; provides a timeline of critical events in the development of that program; describes organizational changes made in the Oil & Gas Program; and reviews the Program's successes. The second section, "DEP's Responses to the grand jury's Conclusions and Recommendations" identifies factual and legal inaccuracies in the report and presents DEP's responses to the individually articulated recommendations of the grand jury.

II. CREATION OF A MODERN NATURAL GAS REGULATORY PROGRAM

A. Governmental Authority to Regulate

The report starts by quoting the “Environmental Rights Amendment” of the Pennsylvania Constitution, which enshrines the peoples’ rights to a clean environment and creates a constitutional “trust” in Pennsylvania’s public natural resources. The Pennsylvania Constitution is the starting point for understanding Pennsylvania’s structure of government and the basic relationships between citizens and business and government. It is important to recognize however, that the Constitution also limits the power of the government by making clear that governmental “police power” must be spelled out in laws written by the Legislature. Unfortunately, the report stops at the Constitution and does not do the hard and complicated work of examining Pennsylvania’s laws that define governmental authority to regulate industry. It is easy to point to the Pennsylvania Constitution’s unique and powerful Environmental Rights Amendment, and then simply say the government and specifically, DEP, should have done more. This oversimplified approach is misleading and ultimately unhelpful.

If the objective of this report – which does not find any unlawful behavior by DEP – is to produce improvements to governmental policing of the industry, OAG should have first explained the rules, starting with the identification of the laws that give an agency specific “police powers” to regulate how industries operate. In addition to the laws, examination of policy statements and approval mechanisms are also relevant to understand whether the agency is doing its job. Once rules are explained, then the investigation should gather facts related to the agency’s performance under all of these requirements. No such effort is reflected in this report.

Despite the seriousness of the allegations in the report, there is no discussion of the environmental laws that establish – and in important ways limit – the scope of governmental oversight of the industry. There is no acknowledgment of the fundamental “checks and balances”

principle of government that the Legislature writes the laws, and the Governor and his agencies implement those laws. It is important to understand that the Environmental Rights Amendment cited at the beginning of the report does not give the Governor or the agencies the power to expand their authority beyond the laws passed by the Legislature.

Also absent from the report is any discussion of the regulations developed under the laws written by the Legislature. In fact, since the start of the unconventional gas boom in Pennsylvania, DEP and the Environmental Quality Board (also within the executive branch) have shepherded seven different regulatory packages through the Pennsylvania “regulatory rulemaking” process. This achievement is significant because the process agencies must follow, which was established by the Legislature in the Regulatory Review Act, the Commonwealth Documents Law, the Commonwealth Attorneys Act, and the Administrative Code is detailed and prescriptive, in order to ensure that the agencies do what the Legislature intended. DEP’s regulatory development process typically takes at least two years and includes public hearings, consultation with numerous advisory committees, public notice, public comment, DEP’s response to public comments, review by the Independent Regulatory Review Commission, review by the Legislative Committees, and review and approval by the Attorney General. At each step in the process, proposed regulations are scrutinized for consistency with the laws they are intended to implement, and regulatory rulemakings that are found to go “too far” and to exceed the statutory authority are not approved. Once a regulation makes it through the entire process, it does have the “force of law” – which means that it can be enforced like a statute passed by the Legislature, and agencies have the power to issue orders or take “enforcement action” when someone violates the regulation.

The report does discuss policies, but mistakenly implies that policies are interchangeable with statutes or regulations. On pages 52-53, the report suggests that DEP could have regulated the industry more quickly *by policy*, because agencies can write these themselves and no approval

is needed. The report cites the testimony of former Environmental Hearing Board Chief Judge and former DEP Secretary, Michael Krancer, as supporting this idea. In fact, the testimony quoted on page 52 of the report appears to have been taken out of context and should not be interpreted to support the conclusion that DEP on its own could have “created a comprehensive fracking policy” to regulate the industry. Pennsylvania law is clear that policies do not function like laws that can be enforced. An agency may not create binding rules to limit activities of individuals or industry without having been given the power to do so by the Legislature through statutes, and without having gone through the regulatory rulemaking process. In fact, it is unlawful for DEP to apply a policy to an industry as though it were a statute or promulgated regulation. Rather, policies, or “technical guidance documents” as they are often referred to by DEP, can only be used to explain an agency’s interpretation of the statutes and regulations and to make recommendations for how a party can demonstrate compliance with the laws.

Because the report does not provide a description of the statutory and regulatory framework, this section of DEP’s Response provides an overview of the current legal framework of DEP’s regulatory program, provides a timeline of the transformation of that program, and discusses some of the program’s successes, including the Pennsylvania courts’ conclusion that DEP’s regulation of the unconventional gas industry satisfies its constitutional duties under the Environmental Rights Amendment.

B. Pennsylvania’s Current Regulatory Program is Comprehensive

Under several Pennsylvania environmental statutes, DEP is empowered with permitting and inspecting unconventional gas development. The current program framework comprehensively anticipates a broad spectrum of potential environmental impacts and ensures protection of public health, safety and the environment. Specifically, the statutes and regulations that DEP administers address the potential impacts to land, water, air and natural resources during

each phase of the unconventional gas development: 1) planning and construction; 2) well drilling and hydraulic fracturing; 3) operation; and 4) plugging and restoration. (See **Exhibit A** for a complete list of laws, regulations, policies, and permitting forms relied on by DEP to oversee the unconventional gas industry). Key elements of the regulatory program, based in the statutory provisions and regulations, are briefly identified below.

1. Planning and Construction

Unconventional gas well operators must obtain several different permits or approvals from DEP before they can conduct any construction associated with unconventional gas well development. These applications require planning and investigation by the applicants and must include information related to geology, groundwater, surface waters, nearby structures and natural resources, soil information, stormwater runoff patterns and features in the area, as well as information regarding species that are protected under state and federal laws and past land uses. The applications must be prepared by licensed professionals. DEP reviews the applications, coordinates with other resource agencies as necessary, coordinates internally regarding other associated permit applications, considers comments from the public and local governments, and issues authorizations only if the applications satisfy all the requirements, and DEP is satisfied that the project will not cause unreasonable diminution, depletion or degradation of Pennsylvania's public natural resources. The permits or authorizations needed before commencement of unconventional well development activity are:

i. Well Permits

Under the 2012 Oil and Gas Act and the Chapter 78a regulations, to drill a new unconventional gas well, the operator must obtain a well permit from DEP and post a bond. The permit application must identify the well location and its proximity to buildings, water supplies, workable coal seams, gas storage reservoirs and landfills. An operator must comply with all

applicable laws, including requirements for site construction, drilling, water use, wastewater management, notification, spill reporting, and spill remediation.

ii. Water Withdrawals

Large volumes of water are required for drilling and hydraulic fracturing of an unconventional gas well. An operator withdrawing water for use in drilling or hydraulic fracturing must obtain approval of a Water Management Plan from DEP in accordance with the 2012 Oil and Gas Act, the Clean Streams Law, the Chapter 78a regulations, and approvals from the Susquehanna or Delaware River Basin Commissions if applicable.

iii. Earth Disturbance and Stream Crossings

Unconventional gas well development involves extensive earth disturbance, including roads, well sites and gathering, transmission and distribution pipelines, that can result in accelerated erosion and sedimentation. Under the Clean Streams Law and Chapter 102 regulations, an Erosion and Sediment Control General Permit authorization is required before construction. To obtain coverage under this general permit, the applicant must submit an application and detailed site-specific plans for review and approval.

Additionally, unconventional gas construction activities that are in or along wetlands and streams, also require a “water obstruction or encroachment” permit or approval from DEP before the operator may commence construction under the Clean Streams Law, the Dam Safety and Encroachments Act, and Chapter 105 regulations.

2. Drilling and Hydraulic Fracturing

After construction of the well site, drilling and hydraulic fracturing of unconventional gas wells must comply with permit conditions and regulatory requirements including those described below.

i. Well Casing and Cementing

Properly constructed and operated wells are critical to protecting water supplies and public safety. Under the 2012 Oil and Gas Act and the Chapter 78a regulations, operators must meet specific casing and cementing requirements tailored to unconventional well construction to protect groundwater from the fluids and natural gas that will be contained inside the well and to keep water from the surface and other geologic strata from mixing with and contaminating groundwater.

ii. Air Quality

In Pennsylvania, air emissions from unconventional gas development are regulated under the Pennsylvania Air Pollution Control Act, the 2012 Oil and Gas Act, the federal Clean Air Act, and the related air quality regulations. Prior to commencing construction of the air contamination sources, approval must be secured under either General Permit-5 or General Permit-5a, an individual permit, or undertaken in accordance with specific regulatory requirements.

iii. Wastewater

Large volumes of wastewater are generated during the drilling and hydraulic fracturing phases and during operation of unconventional wells. This wastewater is classified as a residual waste in Pennsylvania and is regulated by the 2012 Oil and Gas Act, the Solid Waste Management Act, the Clean Streams Law, and the Chapters 78a, 95, and 287 regulations. An unconventional gas well operator must identify in its Water Management Plan where wastewater will be stored, treated, and disposed. Wastewater must be recycled and treated at an authorized wastewater treatment facility or disposed at an authorized waste disposal facility. Operators must also provide monthly reports to DEP documenting wastewater generation, management and/or disposal.

iv. Disclosure to DEP of Chemicals Used

Under the 2012 Oil and Gas Act and the Chapter 78a regulations, unconventional gas well operators must submit to DEP all chemical information, including any designated trade secrets or

confidential proprietary information after the well is hydraulically fractured. Unconventional operators must also complete a chemical disclosure registry and post it on the publicly available website FracFocus.

v. Water Supply Restoration or Replacement

Disruption of water quality or flow in nearby water wells from drilling activities can occur. The 2012 Oil and Gas Act and the Chapter 78a regulations require operators to replace or restore affected water supplies. DEP investigates all complaints and issues orders as necessary to replace or restore impacted water supplies. Unconventional gas well operators are presumed responsible for any water supply impacts that occur within 2,500 feet of the vertical wellbore within a year of completion, drilling, stimulation, or alteration of the well. The presumption of liability may be rebutted by pre-drill survey or samples proving the operator's drilling did not cause the water supply impacts, or by the landowner's refusal to allow a pre-drill survey to be performed.

vi. Prevention of Spills and Releases and Remediation

Under the 2012 Oil and Gas Act, the Clean Streams Law, and the Chapter 78a regulations, before bringing chemicals to or generating waste at a well site, an operator must prepare and implement a Preparedness, Prevention and Contingency Plan, and must plan for the control and disposal of the waste generated and managed at the well site. Unconventional gas well sites must be completely lined so that wastes or fuels are always managed within competent secondary containment and operators must develop a containment plan for chemicals and fluids including fuels, drilling muds and additives and flowback. Among other reporting requirements, a person responsible for a spill or release causing or threatening pollution of waters of the Commonwealth must immediately notify DEP. When DEP concludes that a private water supply owner may be impacted by a spill, the agency provides notice to the owner and may gather additional information, including sampling water supplies potentially impacted by a spill, and may take enforcement

action. DEP oversees remediation of an area affected by a spill or release at a well site based on scientific criteria that are applicable to all contaminated sites in Pennsylvania.

vii. Air Monitoring

All unconventional gas operators must report air emission data annually to DEP, consistent with the 2012 Oil and Gas Act and the Chapter 135 regulations. DEP's air monitoring activities include operation of the Commonwealth of Pennsylvania Air Monitoring System to continuously monitor pollutant levels statewide. DEP continues to establish new monitoring sites in unconventional gas producing counties across the Commonwealth.

3. Operation and Well Integrity

After construction of the well and hydraulic fracturing, mechanical integrity testing is required quarterly, including the collection and submission of information on wellhead pressures, annular pressures and flows, leaks and severe corrosion in accordance with the 2012 Oil and Gas Act and the Chapter 78a regulations. Operators must take corrective actions to repair or replace defective equipment or casing or mitigate the excess pressure on casings.

4. Plugging and Restoration

Once a well is no longer producing gas, the operator must plug the well as prescribed by the 2012 Oil and Gas Act and the Chapter 78a regulations to stop vertical flow of fluids or gas within the well bore and must restore the well site within nine months of plugging the well.

5. DEP Monitoring and Inspections

DEP inspects unconventional gas well sites from construction to restoration after plugging to ensure that the site has proper erosion controls in place, the operator sites and drills the wells according to permit requirements and applicable laws, and any waste generated in drilling and completing the well is properly managed and disposed. Unconventional gas well operators are required to submit to DEP a variety of notices and reports regarding well drilling, completion,

production, waste disposal, and well plugging. DEP staff investigate complaints from the public that an unconventional gas activity may be causing environmental or public safety concerns. If necessary, DEP employs aggressive enforcement against operators to ensure that facilities are brought into compliance.

C. Timeline of Unconventional Gas Regulation in Pennsylvania

Much of the inaccuracy in the report stems from a failure to anchor events in time. The report does not differentiate between DEP's oversight of the industry as unconventional gas exploration started in 2004 subject to rules created in 1984 for a different industry versus the current oversight more than fifteen years later. In fact, since the beginning of unconventional gas well development in the Commonwealth, DEP has transformed the regulatory program, prioritizing updates around four categories: 1) safety concerns such as emergency planning, well construction and staffing; 2) health concerns, for example from wastewater and air emissions; 3) environmental impacts like those from increased erosion and water withdrawals; and finally 4) overall administration of the program including improvements to transparency and reporting associated with permitting and enforcement. To fully understand that transformation, DEP provides the following timeline which summarizes critical developments in the oversight of unconventional gas development in Pennsylvania:

Jan. 2003 – 2010 Governor Ed Rendell

- 2004-2007 Unconventional gas well industry conducts exploratory drilling in PA subject to DEP's 1984 regulatory requirements for the conventional oil and gas industry.
- 2008 Unconventional gas well development boom begins.

- 2008 DEP creates PA Clean Streams Law-based General Permit, “ESCGP-1,” continuing the requirement that PA gas developers obtain erosion and sediment control permits after Congress passes exemptions at federal level.
- 2009 DEP opens Williamsport Oil & Gas Program Office.
- 2009 EQB promulgates final regulations to increase permit application fees to hire additional technical staff to handle increased workload.
- 2009-2011 DEP hires approximately 137 new staff for the Oil & Gas Program.
- 2009 DEP initiates a new regulatory package to modernize well construction standards.
- 2010 EQB promulgates final regulations to codify requirement for erosion and sediment control permit in wake of federal exemptions, amending 25 Pa. Code Ch. 102.
- 2010 EQB promulgates final regulations to address Total Dissolved Solids pollution from natural gas well wastewater, amending 25 Pa. Code Ch. 95.
- 2010 DEP initiates a new rulemaking package addressing surface activities associated with both conventional and unconventional gas development (Surface Activities Rulemaking), proposing to amend 25 Pa. Code Ch. 78.
- 2010 Gov. Rendell issues Pa. Exec. Order No. 2010-05, placing a moratorium on additional leasing for gas development on lands owned and managed by the DCNR.

Jan. 2011 – 2014 Governor Tom Corbett

- 2011 DEP begins to receive electronic reporting of data from well operators.
- 2011 DEP establishes a new deputation, the Office of Oil & Gas Management, with direct oversight of both central office and district office operations.

- 2011 EQB promulgates final regulations to update well construction standards to address, inter alia, gas migration risks, amending 25 Pa. Code Ch. 78.
- 2012 General Assembly enacts Act 13 of 2012, (2012 Oil & Gas Act), updating DEP's oversight authority of oil and gas well development and preempting municipal authority to zone unconventional gas development activities.
- 2012 General Assembly enacts Act 9 of 2012 directing DEP and PA Emergency Management Agency (PEMA) to adopt emergency regulations requiring unconventional gas operators to plan and prepare for emergency response.
- 2012 DEP finalizes ESCGP-2, updating the permit for erosion and sediment control of earth disturbances associated with oil and gas activities.
- 2013 EQB promulgates final regulations authorized by Act 9 of 2012, related to emergency planning and response, amending 25 Pa. Code Ch. 78.
- 2013 DEP publishes Technical Guidance "Addressing Spills and Releases at Oil & Gas Well Sites or Access Roads," Document No. 800-5000-001.
- 2013 DEP announces new online oil and gas mapping tool to provide access to statewide data related to well location, status and permitting information.
- 2013 EQB proposes new oil and gas rulemaking package for conventional and unconventional gas well development ("Surface Activities Rulemaking"), which included a 90-day public comment period; 9 public hearings in all regions of the state with testimony from approximately 300 individuals; and 23,213 written comments.

- 2013 PA Supreme Court finds portions of Act 13 of 2012 unconstitutional, including the provision preempting municipal zoning of unconventional gas development.
- 2013 DEP finalizes amendments to the Air Quality General Permit (GP-5) for natural gas compression and processing facilities establishing emission limitations, and including leak detection and repair, emission control, recordkeeping and reporting requirements.
- 2014 EQB promulgates final regulations to increase permit application fees for gas wells, for DEP to hire additional staff in light of declining revenues and increasing workloads.
- 2014-2015 DEP hires approximately 24 new staff to Oil & Gas Program.
- 2014 Gov. Corbett issues Pa. Exec. Order No. 2014-03, allowing additional leasing for oil and gas development on DCNR lands – rescinding Pa. Exec. Order No. 2010-5.
- 2014 General Assembly enacts Act 126 requiring regulations under the 2012 Oil & Gas Act to differentiate between conventional and unconventional wells. DEP bifurcates proposed Surface Activities Rulemaking into two chapters: Ch. 78 (conventional wells) and 78a (unconventional wells).
- 2014 DEP launches e-Well permit to streamline oil and gas permitting process and allow the information to be accessed on DEP’s webpage.
- 2014 General Assembly enacts Act 173 of 2014, the Unconventional Well Report Act, requiring operators to report production on a monthly basis.

Jan 2015 – Present Governor Tom Wolf

- 2015 Gov. Wolf issues Pa. Exec. Order No. 2015-03, reinstating the moratorium on additional gas leasing on DCNR lands – rescinding Pa. Exec Order No. 2014-03.
- 2015 DEP updates Technical Guidance: “Standards and Guidelines for Identifying, Tracking and Resolving Oil and Gas Violations,” Document No. 820-4000-001.
- 2015 DEP publishes the TENORM report, analyzing the naturally occurring levels of radioactivity associated with unconventional gas development, leading to radioactive material action plan requirements to be included in the Surface Activities Rulemaking.
- 2015 EQB publishes the draft final Surface Activities Rulemaking for a second time, providing an additional 45-day public comment period; 3 additional public hearings, in the three oil and gas district office territories with testimony from 129 individuals; and 4947 additional written comments.
- 2015 DEP and DCNR fund expansion of a state seismic station network to record seismicity, in association with the Pennsylvania State University (PSU), in response to public concerns regarding induced seismicity from hydraulic fracturing and underground injection of oil and gas wastes. DEP’s and DCNR’s construction of the network expansion is completed in August 2016. PSU monitors network and maintains associated website.
- 2016 Gov. Wolf announces Methane Reduction Strategy, which includes new requirements for oil and gas operators to reduce air emissions.

- 2016 Independent Regulatory Review Commission approves Ch. 78 and 78a rulemaking after full day hearing; House and Senate standing committees issue resolutions disapproving the rulemaking; General Assembly's Joint Committee on Documents holds hearing on the propriety of the regulatory process.
- 2016 General Assembly enacts Act 52 abrogating the Surface Activities Rulemaking - Ch. 78 (conventional wells); OAG directs DEP to strike Ch. 78 amendments.
- 2016 DEP releases eSubmission system for electronic submission of forms required from unconventional operators. eSubmission data is publicly available and searchable.
- 2016 DEP publishes interim final Technical Guidance "Guidelines for Implementing Area of Review Regulatory Requirement for Unconventional Wells," Document No. 800-0810-001, to address the potential risks of hydraulic fracturing in proximity to other wells.
- 2016 DEP publishes interim final Technical Guidance "Policy for the Replacement or Restoration of Private Water Supplies Impacted by Unconventional Operations," Document No. 800-0810-002, to inform DEP staff, industry and the public how to comply with the water supply restoration and replacement requirements in the 2012 Oil and Gas Act, The Clean Streams Law, and 25 Pa. Code Chapter 78a.
- 2016 EQB promulgates as final regulations the Ch. 78a Surface Activities Rulemaking for unconventional well development, modernizing and strengthening environmental protection for these activities.
- 2016 One week after EQB promulgates final Ch. 78a Surface Activities regulations, the Marcellus Shale Coalition files a lawsuit to enjoin portions of the new regulations.

- 2016 PA Commonwealth Court temporarily enjoins DEP's enforcement of portions of the Surface Activities regulations in response to the Marcellus Shale Coalition's lawsuit.
- 2016 Gov. Wolf and the Governors of New York and Delaware pass a Delaware River Basin Commission proposed resolution to permanently ban hydraulic fracturing for oil and gas in the Delaware River Basin.
- 2017 DEP publishes interim final Technical Guidance "Guidelines for Chain Pillar Development and Longwall Mining Adjacent to Unconventional Wells," Document No. 800-0810-004, to facilitate appropriate unconventional well inactivation and re-entry procedures before and after longwall panel removal.
- 2017 DEP establishes "The Pipeline Portal" on DEP webpage providing public access to pipeline permit application and enforcement information.
- 2018 DEP finalizes ESCGP-3, updating the permit for erosion and sediment control of earth disturbances associated with oil and gas activities.
- 2018 DEP establishes the Office of Regional Permit Coordination as the lead office related to pipeline environmental permitting and enforcement.
- 2018 PA Supreme Court lifts portions of 2016 preliminary injunction of Ch. 78a Surface Activities Rulemaking, allowing DEP to implement most of the new regulations.
- 2018 DEP updates the Air Pollution Control Act General Permit GP-5 and finalizes a new General Permit GP-5a regulating emissions from unconventional gas well site operations and remote pigging operations.

- 2018 DEP releases Mechanical Integrity Assessment dataset (thousands of well assessments dating back to 2014) and an accompanying report.
- 2019 EQB approves proposed regulations to control and reduce Volatile Organic Compound emissions (and thereby reduce methane emissions) from oil and gas development activities, amending 25 Pa. Code Ch. 127.
- 2020 EQB approves final regulation to increase permit application fees for unconventional wells to fund retention of DEP staff complement in light of decreasing revenues and increasing workloads.

This timeline details DEP's persistent efforts from 2008 to the present to create a more robust and modern regulatory scheme to address and minimize new and different impacts from unconventional gas development and to make information available and accessible to the public. It counters the report's allegations that DEP did very little to make needed changes in the Oil and Gas Program until recently.

D. DEP Made Internal Changes to Support Its Modern Regulatory Program

While an updated regulatory framework was critical to DEP's regulating the unconventional gas industry more effectively and better protecting the public, DEP could not have accomplished its goals without also making organizational changes to expand and restructure the Oil & Gas Program, in terms of physical capital and human resources, and to enhance the transparency of the activities of both the agency and the industry.

Prior to 2008, the Oil & Gas Program had three offices, a small central office in Harrisburg and two regional offices in northwestern and southwestern Pennsylvania. There was no DEP Oil & Gas Program presence in northcentral or northeastern Pennsylvania, the location of the heaviest unconventional gas development. In 2008, DEP created a third regional Oil & Gas office in

Williamsport, which allowed inspectors and technical staff to more effectively inspect and address problems at well sites in that region and gave the people most affected by that well activity greater access to DEP.

DEP's next priority was to increase staff dedicated to the Oil & Gas Program and to train them. The dramatic increase in the number of wells drilled required correspondingly greater numbers of permit reviewers and inspectors to handle oversight activities. Using funds generated by increasing the application fees for unconventional well permits, DEP enlarged the Oil & Gas Program staff from 64 to 202 employees. The new employees were allocated among the four Oil & Gas Offices. Approximately 80 percent of the new employees became inspectors or were assigned to engineering or scientific-related work for permitting; the remaining 20 percent were assigned to clerical, administrative, or legal work to support the program.

All inspectors and permitting staff received on-the-job training by shadowing experienced employees and participated in formal in-house training on unconventional industry practices and identifying and addressing the environmental and health and safety impacts of gas development. Between 2009 and 2012, over 34 training classes were held. Class instructors included representatives of DEP's Oil & Gas and Water Programs, U.S. E.P.A., and PA Department of Conservation and Natural Resources. In later years, DEP expanded staff training by accessing the educational opportunities presented by the many stakeholder and professional organizations with which the Oil & Gas Program collaborated, including the PA Groundwater Association, American Association of Petroleum Geologists, NELAC Institute, North American Coalbed Methane Forum, Interstate Oil and Gas Compact Commission, TOPCORP, and the Shale Network. Between 2014 and 2019, Oil & Gas Program staff attended 73 different educational trainings.

The physical growth of the Oil & Gas Program magnified the need for a restructuring. Before 2011, the Oil & Gas Program was split between two DEP management units whose Deputy

Secretaries reported to the DEP Secretary. Oil & Gas Program planning had been part of the Mineral Resources deputation, but the three regional Oil & Gas offices were part of the Field Operations deputation. In 2011, DEP created a new management unit, the Office of Oil & Gas Management, to unify the planning and program management staff with the permitting, inspection and enforcement staff under one Deputy Secretary. The Office of Oil & Gas Management now consists of two bureaus: the Bureau of Oil & Gas Planning and Program Management, which is responsible for administrative, policy and regulatory development functions, and the Bureau of District Oil & Gas Operations, which consists of the three district offices and performs all permitting, inspection and enforcement tasks. The 2011 restructuring gave the Oil & Gas Program a more substantial DEP Central Office presence, centralized management of O&G personnel, and streamlined collaboration between the two Bureaus. The reorganization also advanced development of a core group of technical staff with industry-specific expertise.

To accomplish its goal of creating a program that balanced the need for resource development by private industry with the need to protect citizens and the environment, it was important for DEP to be as transparent as possible about how the regulatory program worked and whether the industry was complying with the law. The citizens needed to know that their interests mattered and were being protected. Locating Oil & Gas district offices in each of the three regions of unconventional gas development and expanding DEP's field staff was the first step.

Next, DEP responded by making information about its regulation of the industry as accessible to the public as possible. In addition to the permit file information available for review at the three district offices and information DEP provides in response to requests under the Pennsylvania Right to Know Law, DEP recognized that the public needed even greater accessibility to information regarding this industry and created a webpage that includes the numbers and locations of issued well permits, dates when wells are drilled, dates when wells are

completed, the identity of chemicals used to hydraulically fracture each well, the volume of gas produced at each well, the volume of waste produced, quarterly reports on well integrity, data on air emissions, emergency response plans for well sites, inspection reports, results of water supply impact investigations, water samples collected and analyzed by DEP, Notices of Violations, and enforcement actions taken by DEP. In 2013, DEP's Oil & Gas Program migrated to an electronic well permitting platform to increase efficiency, improve data integrity, and improve DEP's ability to quickly locate records and provide timely responses to information requests.

Over the last twelve years, the webpage has been expanded and improved and now includes more information regarding oversight of this industry than has ever been publicly available, such as links to other DEP data management systems that provide compliance information (eFACTS), as well as a report generator for inspections and violations; a notice service (eNotice) to receive emails of each permit application submitted to DEP; and eMapPA, which shows where wells are located using detailed and specific Geographic Information System tools. As part of the 2016 Surface Activities rulemaking, DEP developed an eSubmission system for electronic submission of most required forms, which system is also publicly available and searchable. In addition to links to all the applicable laws, forms, policies and Technical Guidance Documents, also posted are the Office of Oil & Gas Management's Annual Reports which analyze much of this information. In 2017, DEP added the "Pipeline Portal" to its website, which contains detailed information on the status of major gas pipeline permit application reviews, compliance and enforcement matters. And, in 2018, DEP released a new mobile inspection application and a new inspection view report tool, which enables the agency to publish its inspection reports on line in real time. All these developments have enhanced the transparency of this regulatory program and help the public to better understand how they are being protected.

E. DEP Has Successfully Implemented Its Modern Regulatory Program

By repeatedly adapting its strategies to meet the new challenges this industry presents and strengthening its organizational capacity, DEP has successfully implemented a modern regulatory program. Important progress has been made in permitting and enforcement activities and DEP has shaped the overall program to be transparent, participative and collaborative.

1. The Oil and Gas Permitting Program Satisfies the Environmental Rights Amendment

DEP's protective permitting procedures for unconventional wells have been validated by Pennsylvania's courts. In the case of *Brockway Borough Municipal Authority v. DEP*, 2015 EHB 221, the Pennsylvania Environmental Hearing Board ("EHB") not only dismissed an administrative challenge to DEP's issuance of a drilling permit located near a water well of a public water supply but expressly found that DEP had satisfied its trustee obligations under the Environmental Rights Amendment in its review of the permit application. The EHB noted that it was appropriate for DEP to first determine whether the application satisfied all applicable regulations pertaining to the drilling of unconventional gas wells because the regulations were specifically designed to minimize the risks associated with the drilling. The EHB further approved of DEP's imposing special permit conditions relating to drilling techniques and the casing and cementing plan because they gave additional protection to the water well and of requiring supplemental monitoring because it ensured that any problem that did arise could be quickly identified and corrected. On appeal, the Pennsylvania Commonwealth Court affirmed the EHB's ruling. *Brockway Borough Municipal Authority v. DEP*, 131 A.3d 578 (Pa. Cmwlth. 2016).

2. The Oil and Gas Enforcement Program is Driving Compliance

DEP has been vigorously enforcing the law. By increasing staff, providing them with appropriate training, and creating clear enforcement protocols, such as the Technical Guidance Document "Standards and Guidelines for Identifying, Tracking, and Resolving Oil and Gas

Violations,” Document No. 820-4000-001, DEP has conducted more monitoring activities and pursued significant and impactful enforcement. The metrics alone tell a positive story. Over the past two years, DEP has conducted record numbers of inspections, responses to complaints, and water samplings, as set forth below. All these investigations give DEP important information about the industry’s compliance with the law and whether enforcement action is needed.

2018 and 2019 Inspection Numbers:

- In 2018, DEP’s Office of Oil & Gas Management conducted 36,907 inspections;
- In 2019, DEP’s Office of Oil & Gas Management conducted 35,371 inspections;
- In 2018, DEP’s Office of Oil & Gas Management received and responded to 879 complaints;
- In 2019, DEP’s Office of Oil & Gas Management received and responded to 815 complaints;
- In 2018, DEP’s Office of Oil & Gas Management collected and analyzed 1,372 water samples; and
- In 2019, DEP’s Office of Oil & Gas Management collected and analyzed 1,686 water samples.

DEP has continued to successfully use Notices of Violation and civil penalty assessments to address many of the more straightforward violations which DEP identifies, as reflected in the chart below.

2018 and 2019 Notices of Violation (“NOV”) and Civil Penalties

- In 2018, DEP’s Office of Oil & Gas Management issued 575 NOVs;
- In 2019, DEP’s Office of Oil & Gas Management issued 407 NOVs;

- In 2018, DEP's Office of Oil & Gas Management collected \$4,140,382 in fines and penalties related to non-compliance at oil and gas sites; and
- In 2019, DEP's Office of Oil & Gas Management collected \$4,097,545 in fines and penalties related to non-compliance at oil and gas sites.

Complementing the metrics are the complex enforcement actions which DEP takes to address more egregious conduct. Two cases from the last several years stand out. In 2014, EQT Production Company allowed an impoundment full of production and flowback fluids to leak into and degrade the groundwater, a wetland, and a stream. Fortunately, the incident was identified by careful inspection/surveillance by the field staff in DEP's Williamsport Office, and DEP filed a complaint for civil penalties under the Clean Streams Law against EQT. EQT challenged DEP's claim for civil penalties, and the litigation that ensued was contentious and resource-intensive. It included a ten-day evidentiary hearing, at which seven expert witnesses testified about the hydrogeologic aspects of the site, the impact of the pollutorial discharge on surface and groundwaters, and the impact of the degraded surface and groundwater on aquatic communities. In 2018, DEP prevailed and the EHB assessed, and the Commonwealth Court affirmed, a civil penalty in the amount of \$1,137,295.76 against EQT. *DEP v. EQT Production Company*, 2017 EHB 439; *EQT Production Company v. DEP*, 181 A.3d 1128 (Pa. Cmwlth. 2018) Of note, while this litigation was pending, DEP banned the practice of these onsite impoundments, in the Surface Activities Rulemaking.

More recently, DEP took an unprecedented civil enforcement action against Energy Transfer Corporation ("ETC"), one of the largest oil and gas companies in the world which is building an extensive gas transportation pipeline through Pennsylvania. ETC provided inaccurate information in its permit application concerning the slide-prone nature of the soils at a portion of

the pipeline site. The permit was issued and once the pipeline was installed it became compromised and exploded. DEP imposed a civil penalty of \$31 million against the company for this violation, one of the largest civil penalties in state history. But, more importantly, DEP imposed a permit bar statewide on ETC and all its subsidiaries for one year, preventing them from receiving any permits from DEP during that time period. For an extractive industry which is dependent upon receiving a steady stream of permits, such as the unconventional gas and associated pipeline industries, a bar on the receipt of permits has a far greater deterrent effect on future behavior than any single penalty ever could.

All of DEP's enforcement actions together drive compliance with the law, which is the primary objective of the enforcement program. DEP is now seeing the raw numbers of violations and "violations per inspection" decrease over time even as the regulations have become more stringent and more requirements have been placed on the unconventional operators. This fact speaks more to the success of DEP's enforcement program than any other consideration. These activities collectively describe an agency that is actively and aggressively enforcing the law.

3. The Oil & Gas Program is Transparent, Participative and Collaborative

Although there is a strong tendency to measure a regulatory program which is very data oriented, such as the Oil & Gas Program, exclusively by metrics, there is another measure of success that is equally important. That is the ability of the Program to embrace the values of transparency, participation, and collaboration. Those values focus on the relationships which the agency has with its stakeholders and can greatly affect the agency's ability to be trusted, to be deemed credible, and to grow and improve, all of which impact the agency's effectiveness. The stakeholders of the Oil & Gas Program include the industry, residential communities located near well sites, environmental consultants, municipal governments, environmental groups, academia and other research institutions, other Pennsylvania state agencies, and other state oil and gas

regulatory agencies. The Oil & Gas Program has made significant strides in building professional relationships with its stakeholders from which it can learn and teach and explore solutions to the difficult issues it must address.

DEP's commitment to making its regulation of the unconventional gas industry transparent is discussed above. All stakeholders benefit from the agency's transparency, but particularly those who experience the impacts of the industry directly. In its annual plan for 2020, the Oil & Gas Program has committed to continued improvements related to data collection and transparency including: 1) adding functionality to the mobile GIS applications that staff use while conducting field investigations; 2) continued enhancements to the eSubmission system; and 3) continued improvement to electronic data collaboration tools related to gas storage fields and underground mines. DEP's insistence on continual improvements in data collection, management and access speaks to the integrity and openness of the agency. The credibility and value of DEP's electronic data systems was recently acknowledged in a Memorandum Opinion by the U.S. District Court for the Eastern District of Pennsylvania. In the case of *Delaware Riverkeeper Network, et al. v. Sunoco Pipeline, L.P.*, Civ. No. 18-447, Judge Diamond, in ruling on a motion for summary judgment concerning the environmental permitting needed by Sunoco to construct its Mariner East II Pipeline, relied upon DEP's Pipeline Portal to support important facts concerning Sunoco's compliance with DEP's regulations for pipeline construction. (Slip Opinion of 4/16/2020 at p.13).

Public participation is also an agency priority. DEP's success in encouraging the public's participation was borne out during the 2016 Surface Activities Rulemaking which proposed significant changes to modernize the regulatory program. DEP was able to finalize this rulemaking in part due to the very engaged participation of the general public, which balanced the strong opposition from industry and two separate legislative enactments to thwart DEP's efforts. The public participation process was unprecedented and featured 135 days of public comment, 12

public hearings held across the Commonwealth, at which many individuals presented oral testimony, and the submission of almost 28,000 written comments. The individuals who participated were well-informed, mirroring DEP's extraordinary outreach and the significant volume of information provided by the agency to support and explain the proposed regulation. Many citizens argued for enhanced protection of their safety, their water supplies, their communities, and the public resources. Many of the changes made to the regulations after the two public comment periods were in response to and specifically implemented changes requested by the public, which is explained in the Preamble to the rulemaking. 46 Pa. B. 6431. The written Comment and Response document and other supporting documents for the final rulemaking can be found on the Environmental Quality Board's 2016 webpage.

As to collaboration, the Oil & Gas Program has developed an extensive network of professional relationships with a broad range of technical, scientific, regulatory, and academic organizations. Some of these collaborations are more established, such as the Oil and Gas Technical Advisory Board, which has a specific structure, statutory mandate, and scheduled meetings with the Oil & Gas Program to consult with and advise the Program. Others are less formal and are convened to address a particular problem, such as the Coal-Gas Industry-Agency Stakeholder Committee, which consists of representatives of DEP District Oil and Gas Operations, DEP Division of Subsurface Activities, DEP Bureau of Mine Safety, National Institute of Occupational Safety and Health ("NIOSH"), U.S. Mine Safety and Health Administration ("MSHA"), coal and unconventional gas operators, and West Virginia and Ohio regulatory agencies, which was formed to identify best practices for coordinating the intersection of the coal and natural gas industries. All these collaborative relationships enlarge the expertise of the Oil & Gas Program by bringing in a broader range of knowledge and experiences to inform the Program's decision-making. These collaborative relationships also have served to formally and informally

educate the Oil & Gas Program's scientists and experts, thereby strengthening the Program's capacity to address the difficult science and technology issues that arise on a daily basis. These many relationships have played a significant role in helping the Oil & Gas Program to create a modern, proactive, and protective regulatory program.

III. DEP'S RESPONSES TO THE GRAND JURY'S CONCLUSIONS AND RECOMMENDATIONS

A. The Grand Jury Report Is Not Reliable

DEP respects the time-consuming work of the grand jury and recognizes the importance of the grand jury investigation. DEP shares the grand jury's goal of ensuring that the oil and gas industry is appropriately regulated. However, in many aspects the grand jury report is both factually and legally inaccurate. If the grand jury had been presented with complete and credible evidence, as well as the applicable law, it likely would never have written the report in its current form. The citizens of Pennsylvania need to know the report is unreliable and does not support the grand jury's recommendations. This section identifies numerous factual and legal errors in the report and discusses DEP's responses to the recommendations.

1. The Report Relies Upon Hearsay and Anecdotes

The report asserts that its findings are based on evidence meeting the legal standard of "a preponderance of the evidence," and, in some instances, the standard of "clear and convincing evidence." The evidence cited, however, consists of untested anecdotal accounts from a limited group of witnesses. However, even these accounts cannot and do not support the report's broad sweeping statements about legally complex and nuanced scientific issues. There are no dates, places, or times identified, no references to sampling or testing data, no corroborating testimony from medical professionals, no evidence of chemical disclosure requests denied to medical professionals, and no evidence that the complaints recounted to the grand jury were provided to

DEP staff for resolution. The timing of events, which is critical to substantiating any of the claims, is obscured such that events that may have occurred fifteen years ago seem to have occurred yesterday. Some examples that exemplify the unreliability of the information in the report are:

a. Vibrations

On pages 3 and 30, the report states that vibrations from hydraulic fracturing were so intense that “worms were forced up out of the ground” or that “worms would crawl out from the ground” into people’s yards and basements. There is no testimony or other evidence verifying this statement – no photos, no dates, times, nor locations. There is no evidentiary support from biologists or engineers addressing whether such incidents are a cause for concern or associated with pollution or indicative of some type of environmental harm. Since 2011, DEP staff have been on more than 250,000 site inspections, including inspections during hydraulic fracturing, and have never witnessed this phenomenon nor heard anything about this sort of occurrence.

b. Undocumented Health Effects

The report contains accounts of rashes and other concerning health problems that witnesses believed were connected with living in close proximity to unconventional gas well sites. These stories are distressing and serious, but unsubstantiated by names, dates, times, places, air or water sample results, medical tests, or any testimony of medical professionals. While the report states that the evidence was clear and convincing, there is no documentation of these occurrences nor any evidence to associate these health effects with unconventional gas development. DEP further notes that the report does not include medical testimony regarding the reported health problems. DEP is certainly concerned with the potential health impacts of unconventional drilling, but this report does not contribute to a scientific or medical understanding of whether there was, is, or possibly could be an association between unconventional gas development and observed health problems.

c. Collaboration Between Department of Health and Department of Environmental Protection

Another concerning mischaracterization in the report, at pages 77-78, relates to the coordination and collaboration of the PA Department of Health (“DOH”) and DEP regarding public health complaints. The descriptions of DEP and DOH interactions are plainly incorrect. DEP and DOH in fact closely collaborated on how best to gather public health information and agreed upon the associated operational policies put in place in 2018. In particular, the report was critical of Scott Perry, the Deputy Secretary of the Oil and Gas Management Program, for “opposing requests” and refusing to make changes to DEP’s inspection procedures to collect health-related information for DOH. The report does not tell the whole story, and had the OAG asked, DEP would have provided the documentation of the agencies’ informal 2018 agreement, which is attached in **Exhibit B**.

d. Public Notifications

On page 60, in the “Failure to notify” section of the report, unidentified representatives of DEP are cited for general and non-specific incidents of failing to notify landowners of pollution incidents that could impact them. No specific instances or details are provided. DEP Deputy Secretary Perry is the only witness identified by name, and is quoted under oath describing DEP’s practice, which is to give notice to landowners who could be affected. It is simply not true that the DEP policy is not to conduct case-specific investigations and notify or to require notification to potentially impacted landowners.

e. Impoundments

The discussion of impoundments on pages 50-51 of the report implies that no permit was required for centralized impoundments which held flowback or produced waters. That is incorrect. Permits for centralized impoundments were required starting in 2008 under the authority of the

Dam Safety and Encroachments Act. DEP later decided to eliminate the permit and instead require these facilities to be properly closed or permitted under DEP's residual waste regulations in the Chapter 78a rulemaking, at 25 Pa. Code § 78a.59c. The new Chapter 78a regulations for impoundments provide a higher level of environmental protection than the prior centralized impoundment requirements. These new impoundment rules have been challenged by industry before the Commonwealth Court and DEP continues to defend and protect the new standards against the industry attack.

f. Photos

There are numerous photos in the report and none of them have any identifying information, prompting many questions. Who took the photos? Where were the photos taken? When were the photos taken? Have the photos been altered electronically? Are the photos true and accurate representations of what specifically identified witnesses (testifying under oath) observed in Pennsylvania? For the civil investigations that DEP staff routinely undertake, simple protocols are in place and routinely followed regarding photographic evidence documentation, to ensure reliability if used in actions to enforce Pennsylvania's environmental laws. DEP and the public should expect no less from the OAG when undertaking a criminal investigation.

These examples of false or incomplete information in the report are particularly troubling because it would have been easy for the OAG to obtain current information about DEP's regulatory program and about the performances of both DEP and the industry. As discussed above, much of this information is publicly available, consistent with Governor Wolf's overarching goal of full transparency for all state government activities. There is no reference in the report to the voluminous information on DEP's webpage regarding oversight of the industry, including links to applicable law, well development data, DEP's enforcement activities, and the Oil & Gas Program's Annual Reports. It appears that none of the objective and publicly available data and information

was shared with the grand jury. Moreover, the lack of supporting, verified, and contextual information, otherwise required in court proceedings, makes it impossible to respond to the allegations in a meaningful way.

2. The Report Is Legally Erroneous, Which Compromises its Conclusions

Apart from the factual inaccuracies in the report, three important legal errors re-occur throughout the report and prevent readers from reaching a clear understanding of DEP's assigned responsibilities for oversight of unconventional gas development. Two of these issues are discussed above but bear a brief mention here. First, there is the lack of information about what each statute and regulation requires. The absence of that information leaves the readers of the report to guess at the legal framework and to assume that DEP has ignored the law when something unfavorable occurs. The second error is ignoring the constraints on DEP as a regulatory agency to function within the authority given to it by the General Assembly through statute. Several requirements of the regulatory program which the grand jury criticizes, such as setbacks for wells, are established by statute and can be changed only through new legislative action by the General Assembly.

Finally, the report fails to acknowledge the roles of other agencies and commissions in regulating the unconventional gas industry. While DEP has one of the larger roles in regulating the industry, other agencies and commissions also have responsibilities. Unconventional gas development in Pennsylvania is conducted with oversight by numerous Pennsylvania agencies and commissions, including the Department of Conservation and Natural Resources, Department of Health, PA Emergency Management Agency, PA Public Utility Commission, PA Fish and Boat Commission, and PA Game Commission and municipalities. In addition, the Federal Energy Regulatory Commission and other federal agencies regulate the safety of interstate natural gas

pipelines. Each agency, commission, and municipality has a distinct set of responsibilities regarding the unconventional gas well development.

Together, these errors create a confusing picture of exactly what DEP is charged with doing by statute, what it has the authority to do through the rulemaking process, what it has the ability to do through policies and permits, and what it is prohibited from doing because the General Assembly has established the basic boundaries of the law (such as how close a well site can be to a building) or given it to another agency (such as the Public Utility Commission, designated as the authority to regulate the safety of intrastate gas pipelines). These errors set the stage for the grand jury's recommendations.

B. The Grand Jury's Recommendations Miss the Mark As to DEP

DEP has carefully evaluated the recommendations in the Report. The recommendations are generally directed to the industry, DEP, DOH, and the General Assembly, and it is unclear to which entity each recommendation is specifically directed. DEP is responding to recommendations one, two, three, four, five, seven, and eight, but not recommendation six, which appears to be directed at DOH.

The fact that the grand jury was not provided with clear or accurate information about the regulatory requirements for the unconventional gas industry is evident from the recommendations which DEP reviewed. Several of the recommendations make the case for a change in statutes, many of which DEP might support, but is a task beyond the authority of the agency. Several other recommendations are based on a mischaracterization of existing law, and when the existing law is examined, it is clear that it already provides what the grand jury now recommends. Other recommendations urge policy positions that are unwise.

1. Recommendation One: Expand the No-Drill Zones
DEP's Response: Only the General Assembly Can Expand No-Drill Zones

Recommendation One addresses the established setbacks, or distances that an operator must maintain between an unconventional well and buildings, private water supplies and public water supplies. These setbacks were established by the General Assembly when it amended the 1984 Oil and Gas Act in 2012 and are set forth in Section 3215 of the statute. The setback provision specifically mandates that: 1) No unconventional well may be drilled within 500 feet of a building or private water well, and 2) No unconventional well may be drilled within 1000 feet of a public water supply well, surface water intake, reservoir or other water supply extraction point used by a water purveyor, without the consent of the building or water well owner. The grand jury proposes enlarging the setbacks because it believes that unconventional well development activities occur too close to where citizens live, attend school, and recreate.

Before examining the merits of the recommendation, it is important to remember that DEP has no authority to enact or modify a statute. Only the General Assembly can modify or eliminate these statutory limitations, and this recommendation should be re-directed exclusively to the General Assembly. To the extent that the report blames DEP for these setbacks, the report is erroneous and misleading.

As to the merits of the recommendation, the grand jury proposes to create a setback of 2,500 feet (from what, is not identified) and a 5,000-foot setback from schools. The proposed setbacks are not supported with any information that establishes that these particular distances afford an appropriate level of protection and appear to have been chosen arbitrarily. Any proposal for new setbacks should include a scientific or technical rationale for the distances chosen.

DEP also notes that local governments have the authority under the Municipalities Planning Code to zone areas within their boundaries where natural gas facilities can and cannot be located and can play a role in the siting of natural gas facilities.

2. Recommendation Two: Stop the Chemical Cover-up

DEP's Response: There is No Chemical Cover-Up; Operators are Required to Provide All Chemical Information to DEP and Maintain That Information Onsite

Recommendation Two is based on the premise that the law does not require all chemicals used in the development of unconventional wells to be disclosed. This premise is wrong. An unconventional well operator is required by Section 3222 of the 2012 Oil and Gas Act to disclose to DEP all chemicals, and all amounts of those chemicals, used to hydraulically fracture a well. Under Section 3222.1 of the statute, unconventional operators must also complete a chemical disclosure registry of that same information and post it on the publicly available website FracFocus. Separately, an operator is required by both state and federal law to maintain onsite Safety Data Sheets which identify all chemicals and their amounts used and located at the well site. All information regarding fracking fluids used in Pennsylvania is available to the agency.

The one limitation on public disclosure of these chemicals pertains to the operator's ability under both the 2012 Oil and Gas Act and the Pennsylvania Right to Know Law to designate information as a trade secret. If an operator claims that part of the chemical information is a trade secret and requests DEP to treat it as confidential, DEP must treat it as confidential. Any recommendation to eliminate the trade secret provision must be re-directed exclusively to the General Assembly.

Moreover, contrary to the allegations in the report, DEP regulations related to disclosure and use of chemicals are not lax. The report alleges that there are hazardous chemicals used in drilling a well, that water contamination occurs most frequently during drilling when water

supplies are most at risk, and that this activity is largely unregulated. This is all incorrect. The 2011 well-construction rulemaking at 25 Pa. Code Chapter 78a, Subchapter D, was specifically aimed at protecting groundwater and preventing gas migration and set standards of performance for how a well is to be drilled and hydraulically fractured. The regulations prohibit the use of chemicals in well drilling in the shallower depths where the drilling could come into contact with fresh groundwater and prescribe the specifications that must be met related to casing and cementing of wells. DEP's regulations concerning disclosure and use of chemicals are protective of public health and the environment.

3. Recommendation Three: Regulate All Pipelines

DEP's Response: DEP Already Regulates All Pipelines for Environmental Impacts; Only the General Assembly Can Expand the PUC's Oversight of the Safety of Gas Transportation Lines to Include Gathering Lines

In Recommendation Three, the grand jury suggests that gas pipelines are not adequately regulated and that the safety of gathering lines, in particular, should receive greater oversight. Two facts need to be clarified here. The first fact is that DEP comprehensively regulates the environmental impacts of all pipelines in Pennsylvania, including gathering lines, the smaller pipelines which carry natural gas from a well to a transmission pipeline. Construction of all these pipelines requires an erosion and sediment control permit under the Clean Streams Law and 25 Pa. Code Ch. 102 regulations. In fact, Pennsylvania is at the forefront of state and federal regulation of environmental impacts from all pipelines. A similar permit does not exist in many other states. As discussed above in Part II, this permit requirement was established by DEP in the wake of the federal government's 2005 exemptions for oil and gas activities from the federal Clean Water Act's NPDES permit requirements.

In Pennsylvania, the environmental impacts of construction and operation at all natural gas pipelines including gathering lines are also regulated by permits for hydrostatic testing, wetland

and stream crossings, air emissions, as well as the cleanup of spills and releases, under the Oil and Gas Act, Clean Streams Law, Dam Safety and Encroachments Act, Air Pollution Control Act, Solid Waste Management Act, and the associated regulations. For example, 25 Pa. Code § 78a.68, imposes specific requirements for gathering pipelines.

The second fact is that DEP has no responsibility for regulatory authority regarding the *safety* of gas pipelines. By the decision of the General Assembly, the responsibility to address the safety of Pennsylvania's intrastate natural gas pipelines largely falls to the Pennsylvania Public Utility Commission. Responsibility for the safety of the large interstate natural gas pipelines lies with the Federal Energy Regulatory Commission ("FERC"), the Pipeline and Hazardous Materials Safety Administration ("PHMSA"), or one of the other federal agencies with jurisdiction over the transportation of natural gas.

DEP agrees that the oversight of pipeline safety and the approval process for what can be transported in pipelines and where they may be located could be improved and clarified and that it would be useful for the General Assembly to expand the PUC's oversight authority on safety issues to include gathering lines.

4. Recommendation Four: Add Up the Air Pollution Sources

DEP's Response: Air Emissions from Sources Which Are Not Under Common Control Cannot Be Aggregated; **DEP's Air Requirements Are Among the Most Stringent in the Nation**

In the Fourth Recommendation, the grand jury expresses concerns with what it perceives as uncontrolled air emissions from the natural gas industry, particularly from small equipment such as pigging stations (devices for cleaning pipes which convey natural gas). Concerned that these small devices may escape regulation under Pennsylvania's Air Pollution Control Act, because of their size, the grand jury recommends that DEP alter its regulatory requirements by not treating those small devices individually, and instead treat a group of them situated in some close proximity

as a single facility and require them to comply with stringent emission limits. While this approach may have some facial appeal, it is unworkable: one party cannot be held responsible for controlling emissions when it has no control over the source of the emissions. Put another way, DEP cannot impose liability or duties on one person because of the emissions of another person, who the first person cannot control. Moreover, the law does not support this approach. Each pigging location is an “air contamination source” as defined in the Air Pollution Control Act. A “facility” is a collection of sources that are “on contiguous or adjacent properties” and are under “common control,” that are regulated as a unit. 25 Pa. Code 121.1. Absent common control, regulating multiple air contamination sources as a single facility would not be lawful.

That being said, it appears that DEP’s goals with regard to the control of emissions from the natural gas industry align with those of the grand jury. Following the early years of unconventional gas development, DEP’s goal has been to comprehensively regulate all air emission sources associated with the industry, and it is working aggressively toward that goal. Since unconventional well development began in Pennsylvania DEP has updated and revised its regulatory and permitting requirements for the industry to reflect its understanding of the air quality impacts of the industry. In 2013, DEP established regulatory requirements for air emission sources at unconventional well sites, including leak detection and repair, emission controls, recordkeeping and reporting requirements for sources that had previously been unconditionally exempt from emission controls under the air quality regulations. In 2018, DEP revised those requirements, in part, to update the leak detection and repair requirements. Also, in 2018, DEP revised one existing General Permit, GP-5, and created a new General Permit, GP-5a, for the unconventional gas industry so that the General Permits address all types of natural gas facilities and require the use of best available technology to control emissions from each source. GP-5 applies to larger facilities such as mid-stream gas processing, and gas transmission facilities,

and any pigging devices and other equipment associated with those facilities that cause emissions. GP-5a, on the other hand, regulates air emissions from well site operations and remote pigging operations, i.e., those not associated with a larger facility. These permits are the first of their kind in the U.S. and are innovative in controlling air emissions which have often escaped control in the past. Large facilities may also be regulated through individual case-by-case permitting, under 25 Pa. Code Chapter 127. Well sites which have emissions below the threshold in GP-5a are still required to comply with the regulatory requirements, which include emission controls, leak detection and repair, recordkeeping and reporting.

Although DEP has made important strides in regulating air emissions it continues to assess the overall effectiveness of the air quality regulatory program to determine how it can improve the program. Further refinements depend in significant part on a better understanding of the impacts of the various controlled emissions from the gas industry on ambient air quality. To this end, DEP is gathering information through a variety of data collection and air monitoring activities. Since 2012, in accordance with the Oil and Gas Act, and 25 Pa. Code Ch. 135, all unconventional well operators must report air emission data on a quarterly basis to DEP. DEP operates the Commonwealth of Pennsylvania Air Monitoring Network, a Pennsylvania statewide ambient air monitoring network. DEP is conducting short-term and long-term studies of a suite of constituents from oil and gas operations, including benzene emissions, as well as a two-phase study of methane emissions assisted by a grant from the U.S. Environmental Protection Agency (“EPA”).

DEP has even used its enforcement authority to obtain additional data about the impact of air emissions from the unconventional industry. In 2018, DEP and EPA entered into a landmark settlement of numerous violations related to pigging emissions at several MarkWest Liberty Midstream & Resources, LLC sites. In the Consent Decree, DEP and EPA waived a portion of their claims for civil penalties in exchange for MarkWest’s undertaking a “Supplemental

Environmental Project” to study air quality in the vicinity of its Harmon Creek Station gas processing plant. Harmon Creek Station is located in Smith Township, Washington County where many different types of natural gas facilities are concentrated, a prime location for evaluating the ambient impacts of natural gas emissions. The design and details of this multi-year study were reviewed by DEP and EPA experts and will employ state of the art monitoring equipment, which will be given to DEP at the end of the study for its continued use. This unique study, in combination with several other ongoing and planned research and data projects will advance DEP’s understanding of the cumulative ambient air impacts of natural gas development in Pennsylvania and facilitate the development of additional measures to address natural gas impacts and protect the citizens of Pennsylvania.

**5. Recommendation Five: Transport the Toxic Waste More Safely
DEP’s Response: Unconventional Well Wastes Must Be Transported in
Compliance with the Residual Waste Regulations Which Provide for Safe
Transportation**

Recommendation Five implies that the transportation of unconventional gas related waste and wastewater, specifically drill cuttings and flowback and produced waters, is not safe because the vehicles are marked as carrying “residual waste” and not as “hazardous” or as “unconventional oil and gas waste.” The discussion contains factual mistakes and misstates the existing law and existing permitting requirements related to management and transportation of wastes generated in unconventional gas drilling. This waste is exempt by definition from the federal hazardous waste requirements under the Resource Conservation and Recovery Act and the corresponding state hazardous waste requirements under the Pennsylvania Solid Waste Management Act. Under Pennsylvania’s regulatory framework, this waste constitutes residual waste. Contrary to what the report suggests, the classification of waste as residual waste does not mean that the waste is handled carelessly or could be disposed of at a municipal waste landfill. In fact, Pennsylvania’s

residual waste regulations are among the most robust and protective non-hazardous waste management regulations in the nation. The residual waste regulations, among other things, require specified transportation signage and include provisions related to the special handling and disposal of radioactive waste. In short, waste transported in compliance with Pennsylvania's residual waste regulations is being transported safely.

Recommendation Five also references "an elaborate shell game" whereby operators move waste fluids from one well to another to reuse the fluids in fracturing a new well. While it is true that operators do move waste fluids from one well to another for reuse, there is no shell game involved. The 2010 TDS rulemaking (mentioned above) requires operators to develop a plan for maximizing the recycling of wastewater to fracture other wells. In fact, recycling wastewater is one of the solutions to disposal issues and recycling minimizes freshwater withdrawals thereby protecting surface water and groundwater sources. Significantly, the 2016 Surface Activities Rulemaking imposes additional and more stringent requirements related to storage, transportation, use, and disposal of waste from unconventional well development, as well as new requirements related to preventing and responding to spills and releases. These regulations fully regulate management of drill cuttings and unconventional gas wastewater. As a result, virtually all unconventional well wastewater is now recycled in the next hydraulic fracturing operation or taken to disposal wells out of state.

DEP notes that portions of this section of the rulemaking are being challenged by the Marcellus Shale Coalition in Commonwealth Court.

**6. Recommendation Seven: End the Revolving Door
DEP's Response: There Is No Revolving Door; Dedicated DEP Employees
Developed and Implemented This Comprehensive Regulatory Program**

Recommendation Seven suggests that DEP has not properly managed the employees who have worked in the Oil & Gas Program and recommends a legislative response. Recommendation

Seven suggests there is “a revolving door” whereby DEP employees who are trained to work in the Oil & Gas Program, take advantage of their position to favor the industry in some way, thereby paving their way into lucrative employment with the industry. To address this, the grand jury suggests enactment of legislation prohibiting former employees from working in the industry for a period of time after leaving DEP.

Before examining the merits of the recommendation, it is important to remember that DEP has no authority to enact or modify a statute. Only the General Assembly can legislate. This recommendation must be re-directed exclusively to the General Assembly.

As to the merits, there is no evidence of any such revolving door at DEP, nor is the proposed legislation supported by any information that establishes that it will have the effect that the grand jury is seeking. With regard to all individuals across the agency who have left the Commonwealth’s employment, DEP has responsibly enforced the Pennsylvania Public Official and Employee Ethics Act, including Section 1103(g), which prohibits a former public official or public employee from representing a person, with promised or actual compensation, on any matter before DEP for one year after that official or employee leaves DEP.

What all Pennsylvanians should know about DEP’s employees is that the Oil & Gas Program has been developed and implemented largely by a handful of dedicated individuals, most of whom have worked with the agency since the arrival of the industry in Pennsylvania and are career employees who choose to remain in public service because they believe in the mission of the agency. Together they have fought battle after battle, before the General Assembly, in the regulatory review process, before the courts, and with the industry to craft and implement an effective regulatory program that protects the environment and the public health and safety. Those individuals should be recognized for their work and not indirectly denigrated by this investigation.

7. Recommendation Eight: Use the Criminal Laws

DEP's Response: DEP Has Consistently and Appropriately Referred Criminal Matters to the OAG for Many Years; the Referral Process Is Not Broken and Does Not Need to Be Fixed

In Recommendation Eight, the grand jury proposes a significant change to a long-standing division of authority between the Governor and the Attorney General. Since 1980, the Commonwealth Attorneys Act has defined the powers and duties of the Governor and the OAG and gives the OAG jurisdiction to prosecute criminal charges referred by a Commonwealth agency as part of its duty to enforce statutes or by a county District Attorney. The grand jury now recommends that the OAG be given *concurrent* jurisdiction to investigate and prosecute matters involving environmental violations without the required referral from a Commonwealth agency or District Attorney. DEP believes that recommendation is unwise, and notes, again, that only the General Assembly can legislate.

The limitation on the OAG's jurisdiction to prosecute a matter involving the responsibilities of a Commonwealth agency reflects the General Assembly's understanding that a Commonwealth agency implementing a regulatory statute is best suited to decide when to seek a criminal prosecution for a violation of that statute. Leaving this decision to the regulatory agency avoids selective enforcement, which could occur when a prosecuting agency lacks sufficient experience with a regulatory program and a complex body of law to make prudent decisions to prosecute. Leaving the decision to the regulatory agency also avoids the risk of inconsistent interpretations of substantive law, which can arise when two agencies have concurrent jurisdiction.

DEP believes that criminal prosecution plays an important role in implementing Pennsylvania's environmental statutes. However, as a government agency, DEP must use, and does use, appropriate discretion and does not misuse the legal system by referring matters for

criminal prosecution where facts and circumstances do not warrant it. To do otherwise would constitute an abuse of power.

Throughout several Gubernatorial administrations and DEP Secretaries, DEP has approached the criminal referral process consistently. Both the evaluation process and the referral procedures have remained the same, and the number of referrals made by DEP has varied little from year to year and from administration to administration. The referrals have involved violations of a broad array of environmental statutes, including the Solid Waste Management Act, Clean Streams Law, Oil and Gas Act, Surface Mining Conservation and Reclamation Act, Bituminous Mine Subsidence and Land Conservation Act, Bituminous Coal Mine Safety Act, Air Pollution Control Act, Radiation Protection Act, Safe Drinking Water Act, Waste Tire Recycling Act, Waste Transportation Safety Act, and Water and Wastewater Systems Operators' Certification Act. Included in these referrals are several matters involving the development/operation of unconventional wells and the construction/operation of natural gas pipelines.

DEP has exercised judgment and discretion in all its referral decisions. DEP regards the decision to refer a matter as an important one for both the public and the subject of the referral. DEP has always made decisions to refer a matter on a case by case basis and with the belief that a criminal prosecution is an extraordinary remedy which should be limited to cases where there is a strong indication of serious misconduct. DEP never refers a matter without conducting its own investigation and determining there is a solid basis in fact and law for a referral. As to Pennsylvania environmental law, DEP is undeniably the expert and is in the best position to decide if the law and the facts will support a prosecution.

The OAG can accept referrals of environmental matters from sixty-seven county District Attorneys' Offices, all Executive branch agencies, the PA Fish and Boat Commission and PA Game Commission, as well as referrals from citizens and environmental groups across the

Commonwealth through referrals from District Attorneys. Of all the parties authorized to refer criminal environmental matters to the OAG, DEP has referred the most environmental matters and likely the most materially significant environmental matters. Because DEP best understands how to use its statutes in different legal contexts, DEP can be most successful in identifying environmental cases for criminal prosecution and the OAG can be most successful in accepting the DEP referrals.

DEP's extensive experience in deciding when to refer a matter to the OAG, coupled with the General Assembly's considered decision to give the OAG jurisdiction to prosecute a matter only upon a referral from an agency should not be changed based on undocumented, unsubstantiated and unchallenged accusations in a grand jury report. This is particularly true where a grand jury report reflects substantial misunderstanding of the underlying law and of what constitutes probative evidence. The criminal referral process has satisfied the legislature, DEP, and the numerous prior gubernatorial administrations and Attorneys General. DEP administers all statutes within its authority evenhandedly, as the public should expect. The referral system is not broken and should not be changed.

V. CONCLUSION

The grand jury report fails as an exposé of a government agency ignoring its statutory duties and constitutional obligations. In this regard, it is important to remember that the OAG did not find any wrongdoing on the part of DEP. The report also fails as a meaningful tool for improving the regulation of the unconventional gas industry, because the report is not at all informed by the applicable law or facts. Had the jurors been provided with accurate information about the existing laws, the scientific and policy underpinnings of the regulations, and the commitment of DEP staff to create and implement a comprehensive and effective regulatory

program that protects the citizens and environmental resources from the impacts of natural gas development in Pennsylvania, the report would likely never have been written the way it was.

Although the grand jury believed it was advancing the public good in preparing and planning to publicize its report, it actually does the public a disservice. The inaccuracies in the report provide Pennsylvania's citizens with a false picture of DEP and encourage them to believe their government is incompetent and/or places the economic well-being of various corporations above their health and well-being and that of the Commonwealth's public natural resources. Perhaps Kurt Klappkowski put it best when he appeared before the grand jury in January 2020, after the grand jury had already drafted its report through the Office of Attorney General. Mr. Klappkowski testified that in 26 years of working for DEP, through six Governors and 9 Secretaries, he has never worked with anyone at the DEP who did not believe in the Department's mission. To carelessly erode the citizens' trust and confidence in their government threatens the foundation of our democratic society and should not be tolerated. Pennsylvania's citizens deserve and have been provided regulation based on sound facts, science and public policy. They are entitled to know this.

Respectfully submitted,

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Dated: May 7, 2020

EXHIBIT A

STATUTES, REGULATIONS, TECHNICAL GUIDANCE DOCUMENTS, AND PERMITTING PROGRAMS BY WHICH PENNSYLVANIA REGULATES THE UNCONVENTIONAL NATURAL GAS INDUSTRY

The Department of Environmental Protection regulates unconventional well development activities under the following Pennsylvania oil and gas laws and environmental protection laws and their implementing regulations as well as a framework of technical guidance documents and applicable permitting programs.

Statutes

2012 Oil and Gas Act, 58 Pa.C.S. §§ 3201-3274
Air Pollution Control Act, 35 P.S. §§ 4001-4005
Clean Air Act, 42 U.S.C. § 7401 *et seq.*
Coal and Gas Resource Coordination Law, 58 P.S. §§ 501-518
Dam Safety and Encroachments Act, 32 P.S. §§ 693.1-693.27
Delaware River Basin Compact, 32 P.S. §§ 815.1010815.106
Environmental Laboratory Accreditation Act, 27 P.S. § 4101
Land Recycling and Environmental Remediation Standards Act, 35 P.S. §§ 6026.101-6026-901
Noncoal Surface Mining Conservation and Reclamation Act, 52 P.S. §§ 3301-3326
Oil and Gas Conservation Law, 58 P.S. §§ 401-419
Pennsylvania Grade Crude Development Act, 58 P.S. §§ 1201-1208
Pennsylvania Public Official and Employee Ethics Act, 65 Pa.C.S. §§ 1101-1113
Pennsylvania Safe Drinking Water Act, 35 P.S. §§ 721.1-721.17
Radiation Protection Act, 35 P.S. §§ 7110.101-7110.703
Right-to-Know Law, 65 P.S. §§ 67.101-67.3104
Solid Waste Management Act, 35 P.S. §§ 6018.101-6018.1003
Susquehanna River Basin Compact, 32 P.S. §§ 820.1-820.8
The act of February 2, 2012, P.L. 67, No. 9, 35 P.S. § 7321
The act of July 10, 2014, P.L. 1053, No. 126, 72 P.S. § 1741.1-E
The act of July 13, 2016, P.L. 664, No. 85, 72 P.S. § 1690-E
The act of November 7, 2019, P.L. 634, No. 85, 58 P.S. § 34.2
The Administrative Code of 1929, 71 P.S. §§ 232, 510-20
The Clean Streams Law, 35 P.S. §§ 692.1-691.1001
The Commonwealth Attorneys Act, 71 P.S. §§ 732.101-732.506
Commonwealth Document Law, 45 P.S. §§ 1102-1208
Water Resources Planning Act, 27 Pa.C.S. 3101-3136
Unconventional Well Report Act, 58 P.S. §§ 1001-1003

Regulations

25 Pa. Code Chapter 77 (relating to Non-coal Mining)
25 Pa. Code Chapter 78a (relating to Unconventional Wells)
25 Pa. Code Chapter 79 (relating to Oil and Gas Conservation)
25 Pa. Code Chapter 91 (relating to Water Resources-General Provisions)
25 Pa. Code Chapter 95 (relating to Wastewater Treatment Requirements)
25 Pa. Code Chapter 102 (relating to Erosion and Sediment Control)
25 Pa. Code Chapter 105 (relating to Dam Safety and Waterway Management)
25 Pa. Code Chapter 109 (relating to Safe Drinking Water)

- 25 Pa. Code Chapter 110 (relating to Water Resource Planning)
- 25 Pa. Code Chapter 121 (relating to Air Resources–General Provisions)
- 25 Pa. Code Chapter 127 (relating Air Resources–Construction, Modifications, Reactivation and Operation of Sources)
- 25 Pa. Code Chapter 135 (relating to Air Resources–Reporting of Sources)
- 25 Pa. Code Chapter 129 (relating to Standards for Sources)
- 25 Pa. Code Chapter 250 (relating to Administration of Land Recycling Program)
- 25 Pa. Code Chapter 287 (relating to Residual Waste Management–General Provisions)
- 25 Pa. Code Chapter 299 (relating to Storage and Transportation of Residual Waste)

Technical Guidance Documents

- *Addressing Spills and Releases at Oil & Gas Well Sites or Access Roads*, Document No. 800-5000-001
- *Standards and Guidelines for Identifying, Tracking, and Resolving Oil and Gas Violations*, Document No. 820-4000-001
- *Stormwater Management at Oil and Gas Well Sites*, Document No. 800-2100-008
- *Guidelines for Implementing Area of Review (AOR) Regulatory Requirement for Unconventional Wells*, Document No. 800-0810-001
- *Policy for the Replacement of Private Water Supplies Impacted by Unconventional Operations*, Document No. 800-0810-002
- *Policy for Implementing the Department of Environmental Protection Permit Review Process and Permit Decision Guarantee*, Document No. 021-2100-001
- *Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation*, Document No. 021-0200-001

Permit and Authorization Packages

- *Affidavit – Request for Unconventional Well Permit Renewal*, Document No. 8000-PM-OOGM0109B
- *Application and Instructions for Transfer of Erosion and Sediment Ctrl GP – ESCGP – Approval*, Document No. 8000-PM-OOGM0012
- *Application for Coal Pillar Permit*, Document No. 8000-PM-OOGM0007
- *Application for a Permit to Drill or Alter an Oil or Gas Well*, Document No. 8000-PM-OOGM0001
- *Application for Transfer of Well Permit or Registration*, Document No., Document No. 5500-PM-OG0010
- *Authorization of Coverage Under the Erosion and Sediment Control General Permit (ESCGP-3)*, Document No. 8000-PM-OOGM0006
- *Co-Permittee Liability Release Form*, Document No. 8000-PM-OOGM0160
- *Conditional Chain Pillar and Well Pillar Plan in Association with Longwall Mine*, Document No. 8000-PM-OOGM0012 & 112A
- *Coordination of a Well Location with Public Resources (Unconventional Operations Only)*, Document No. 8000-PM-OOGM0076U
- *Environmental Good Samaritan Project Proposal for Abandoned Well Plugging*, Document No. 8000-PM-OOGM0111
- *Post-Plugging Well Site Restoration Report (Unconventional Operations Only)*, Document No. 8000-PM-OOGM0075U

- *Proposed Alternative Method of Casing, Plugging, Venting, or Equipping*, Document No. 8000-PM-OOGM0024
- *Request for Approval of Waste Management Practices – Unconventional Operations Only*, Document No. 8000-PM-OOGM0071U
- *Water Management Plan Approval – Renewal Request – Unconventional Operations Only*, Document No. 8000-PM-OOGM0087U
- *Well Location Plat*, Document No. 8000-PM-OOGM0002
- *Well Pillar Plan*, Document No. 8000-PM-OOGM0007A
- *Well Site Restoration Report*, Document No. 8000-PM-OOGM0075

- *GP-05 AND GP-05A and Supporting Documents*, Document No. 2700-PM-BAQ0269
- *GP-05, Compliance Certification Forms*, Document No. 2700-PM-BAQ0205
- *GP-05, Natural Gas Compression Stations, Processing Plants, and Transmission Stations*, Document No. 2700-PM-BAQ0267
- *GP-05A, Unconventional Natural Gas Well Site Operations and Remove Pigging Stations*, Document No. 2700-PM-BAQ0268
- *Form U – Request to Process or Dispose of Residual Waste*, Document No. 2540-PM-BWM0395
- *Form 26R – Chemical Analysis of Residual Waste Annual Report by the Generator*, Document No. 2540-PM-BWM0347
- *Processing & Beneficial Use of Gas Well Wastewater from Hydraulic Extraction of Natural Gas*, Document No. 2540-PM-WMGR123

- *05 GP-5 Utility Line Stream Crossings*, Document No. 3150-PM-BWEW0505
- *07 GP-7 Minor Road Crossings*, Document No. 3150-PM-BWEW0507
- *08 GP-8 Temporary Road Crossings*, Document No. 3150-PM-BWEW0508
- *11 GP-11 Maintenance, Testing, Repair, Rehabilitation or Replacement of Water Obstructions and Encroachments*, Document No. 3150-PM-BWEW0511

EXHIBIT B

Note: Stephanie Hasanali, Anil Nair, Sharon Watkins and Farhad Ahmed were employees of the Pennsylvania Department of Health in 2018 and were involved in the discussions surrounding notification from DEP to DOH of oil and gas-related health complaints.

From: Ryder, John <jryder@pa.gov>

Sent: Wednesday, May 2, 2018 1:37 PM

To: Lobins, Craig <slobins@pa.gov>; Lichtinger, Joseph <jlichtinge@pa.gov>; Dudzic, Scott <sdudzic@pa.gov>; Neville, Richard <rneville@pa.gov>; Means, Jennifer <jenmeans@pa.gov>; O'Donnell, Michael <miodonnell@pa.gov>; Wharton, Stephanie <swarton@pa.gov>; Counahan, Daniel <dcounahan@pa.gov>; McDermott, David <davmcdermo@pa.gov>; Milcic, Kareen <kmilcic@pa.gov>

Cc: Hasanali, Stephanie <c-shasanal@pa.gov>; Nair, Anil <annair@pa.gov>; Watkins, Sharon <shawatkins@pa.gov>; Ahmed, Farhad <fahmed@pa.gov>; Perry, Scott (DEP) <scperry@pa.gov>; Klapkowski, Kurt E <kklapkowski@pa.gov>; Brokenshire, Stephen <sbrokenshi@pa.gov>; Wallace, Todd <twallace@pa.gov>

Subject: DEP Oil and Gas Complaint Investigations and Pennsylvania Department of Health Coordination

Importance: High

All,

When DEP Oil & Gas staff are investigating a water supply complaint and encounter a complainant with human health concerns, our current practice (in accordance with the C&E Policy, Doc# 820-4000-001 and the Final Interim Water Supply Replacement TGD, Doc# 800-0810-001) is to provide that complainant / citizen with the appropriate Pennsylvania Department of Health (PA DOH) contact information so the complainant may contact that agency at their discretion. Oil & Gas staff have done a great job with this, and I ask that all staff continue this practice.

In addition, at the time that the Oil & Gas staff encounter a complainant with human health concerns, the Oil & Gas staff will now provide the following information about the complainant to both Stephanie Hasanali and Anil Nair with the PA DOH:

- Name
- Phone number
- Email
- Street address and county
- Initial date of complaint to DEP

This is a change from our past practice of first notifying PA DOH when O&G program staff make a positive determination (in accordance with the TGDs mentioned above).

PA DOH has indicated to us that Name, Phone number, and Email are the only fields absolutely needed. If staff encounter complainants without email address contact information, name and phone number will suffice. It is appropriate for Oil & Gas staff to let the complainant know they will be sharing this contact information with the PA DOH.

It is important to note that any time an Oil and Gas employee encounters a complainant with health concerns during the course of a complaint investigation, the employee should forward that individuals contact information to PA DOH, not just when a water supply investigation is being conducted. Only complaints involving human health concerns should be forwarded to PA DOH. All other complaints received and investigated by the Department's Oil & Gas Program should be handled using current Department practices.

It is also important that Oil & Gas staff document that the complainants contact information has been provided to PA DOH. Please provide this information to Stephanie (c-shasanal@pa.gov) and Anil (annair@pa.gov) via e-mail (they are also both copied above) and be sure to CC the appropriate District Oil and Gas Manager as well as supervisor / manager. A copy of the email notification should be uploaded to CTS as part of the investigation documentation.

Please share this important message with the appropriate program field staff.

John

John Ryder | Bureau Director
Department of Environmental Protection
Bureau of District Oil and Gas Operations
208 West Third Street Suite 101 | Williamsport PA 17701
Phone: 570.327.0533 | Fax: 570.327.3420
www.dep.pa.gov

Response of the Pennsylvania Department of Health

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COURT OF COMMON**
: **PLEAS CP-02-MD-0005947-2017**
INVESTIGATING GRAND JURY :
:
: **NOTICE NO. 42**

Response on behalf of the Pennsylvania Department of Health

The Pennsylvania Department of Health (“DOH”) has reviewed Report 1 of the Forty-Third Statewide Investigating Grand Jury (“the Report” or “the Grand Jury Report”) and respectfully submits this response and requests that it be attached to the Grand Jury Report.

I. Introduction

DOH respects the comprehensive work performed by the grand jury. DOH has studied the grand jury’s report carefully and will continue to do so, and takes all of its observations and recommendations with the utmost seriousness. In that regard, DOH appreciates the observations that “things have improved under the current gubernatorial administration,” and that “the Department deserves credit for the efforts it has made in recent years given its available funding.”

The grand jury also recognizes the challenges that limited state resources present. This is made all the more challenging by the absence of any meaningful federal action, funding, studies or response to the many environmental and health questions raised by fracking. That said, DOH must always strive to do better in realizing its vision of “a healthy Pennsylvania for all.”

As such, DOH welcomed the opportunity to engage in the grand jury process with the aim that the Report would be accurate and the Report's recommendations and observations would be a useful tool in examining and improving DOH's work related to fracking. To that end, when offered the opportunity by the Office of Attorney General, DOH provided written statements and exhibits to the grand jury. In addition, the Secretary of Health welcomed the opportunity to testify before the grand jury, testified extensively, and answered all of the questions asked her by the grand jury.

Unfortunately, the secret nature of the grand jury process has resulted in a Report that contains some factual errors and (in some instances) erroneous conclusions. Further, DOH has not been provided with the transcripts of testimony or the documents or other materials presented to the grand jury. These troubling times have underscored many things, including that transparency, objectivity, facts and science will always be among the critical pillars of effective public health. It is in that spirit that the following observations are provided. But, the ensuing comments are not intended in any way to detract from the important work performed by the grand jury here.

In the current administration DOH has listened and will continue to listen, with even greater intensity, to the concerns of Pennsylvanians who express health concerns related to fracking. As evidenced by the Report, fracking is a challenging and complex topic that requires a thoughtful, coordinated approach. DOH therefore would like to take this opportunity to once more encourage Pennsylvanians to contact DOH and report their health concerns related to fracking by telephone at 717-787-3350 or e-mail at env.health.concern@pa.gov :

DO YOU HAVE A HEALTH CONCERN ABOUT THE ENVIRONMENT?
Could contaminated air, soil or water be affecting your health?



Have questions about environmental health? The department has epidemiologists available to answer questions about a range of environmental health issues.



Have a health concern related to oil and gas production? The department has a registry to track health complaints. Call 717-787-3350 to add your information.



Need community resources? The department has relationships with state and local stakeholders that can help you address your environmental health concerns.

CONTACT US:
717-787-3350 or env.health.concern@pa.gov

VISIT OUR WEBSITE:
<https://www.health.pa.gov/topics/envirohealth>



This is not an empty invitation. DOH relies on these submissions to gather health data that is vital its work to study this topic and ensure an informed and effective approach.

To the degree that the Grand Jury Report suggests that DOH does not share the grand jury’s concerns and is not invested in solutions, that is neither fair nor accurate. While DOH is constantly seeking ways in which to improve its response to fracking, DOH under the current administration has always been committed to understanding and responding to the potential health effects associated with fracking. As such, DOH would like to provide additional information about its programming and strategy, particularly as it relates to fracking.

II. Overview of DOH’s Public Health Response to Fracking

A. Background

DOH is an agency comprised of medical professionals, policy experts, scientists, and staff who work to achieve DOH’s mission to: “promote healthy behaviors, prevent injury and disease, and to assure the safe delivery of quality health care to all people in Pennsylvania.”

DOH is currently led by the Pennsylvania Secretary of Health, Dr. Rachel Levine. Dr. Levine

first joined the Wolf administration in 2015 as Physician General. In July 2017, Governor Wolf named Dr. Levine the Acting Secretary of Health. She was confirmed as Secretary of Health in March 2018.

Of course, currently, DOH is deeply engaged in addressing one of its paramount responsibilities – to address acute public health emergencies. It is, therefore, coordinating Pennsylvania’s comprehensive response to the COVID-19 pandemic, a public health emergency the like of which has not been experienced since the influenza pandemic of 1918. Additionally, DOH operates many ongoing programs related to a multitude of significant public health issues. Among these are programs addressing environmental health issues (including fracking), the opioid epidemic, HIV, quality care in health care facilities, school health, emergency preparedness, maternal and child health, obesity, sexual violence, and many more.

Funding for DOH programming comes from a combination of sources. Approximately one-third of DOH’s budget comes from state government funding, which, by necessity, is allocated based on a consideration of a variety of competing needs. The remaining two-thirds of DOH’s budget comes from the federal government through specific program grants. Unfortunately, there has not been a single grant from federal sources to address the health effects of fracking.

By contrast, there are federal grants provided to study health effects associated with other environmental concerns, such as “PFAS” (or “poly-fluoroalkyl substances” which are manufactured chemicals included in many household products). The Report highlights DOH’s health work on PFAS in an effort to contrast that work to fracking. Specifically, the Report directs readers to compare DOH’s fracking-related program to “the resources marshaled to study the spread and effects of a group of harmful substances known as PFAS.” (Report at p. 99.) For

its PFAS-related program, however, DOH received funding through the Centers for Disease Control and Prevention (“CDC”), as well as the Association of State and Territorial Health Officials. With this funding, DOH was able to implement three PFAS-related studies – the testing of a response toolkit, an exospore assessment project, and a multisite health study. However, while DOH has federal funding available for its PFAS work, there is no federal funding for fracking, an absence of resources which necessarily impacts DOH’s capabilities with regard to fracking.

Despite these and other resource constraints, since the beginning of Governor Wolf’s Administration in January 2015, DOH sought to markedly change the prior administration’s approach, and to bring a much greater focus to bear on both fracking and environmental health issues more generally.¹ And these efforts are ongoing. For example, at Dr. Levine’s request, in 2019, the Administration granted DOH funding of over \$1 million per year for three years to study the health effects associated with fracking.

B. Environmental Health Program Development

Beginning in 2015, DOH brought in new staff to the Bureau of Epidemiology to reassess needs, including those related to environmental health. Since then, DOH has continued to build its staff and expertise to better address existing and emerging issues in environmental health, such as fracking, lead, and PFAS. Thus, DOH hired Dr. Sharon Watkins as its Director

¹ DOH notes that much of the discussion in the Report relates to conduct that occurred before January 2015 under the prior Administration. The current DOH Administration is not able to fully comment on the circumstances surrounding that purported conduct. However, DOH does understand generally that, prior to 2015, DOH focused its epidemiology resources on disease investigations with an emphasis on pandemic flu, anthrax, emergency response, and food and water borne disease. While the Report makes some distinction between the prior Administration and the current Administration, it largely conflates time periods. For example, certain comments and opinions voiced by Karl Markiewicz from the Agency for Toxic Substances and Disease Registry (“ATSDR”) and Dr. David Brown from the Southwest Pennsylvania Environmental Health Project (“SPEHP”) may have related in part or in whole to activity prior to 2015. However, as DOH was not present for their testimony and has not had the opportunity to ask questions, DOH does not have sufficient information to fully respond to their observations.

of the Bureau of Epidemiology. Dr. Watkins is a nationally-recognized epidemiologist who previously served as the Chief of the Bureau of Epidemiology for the State of Florida, and who is currently the president of the Council of State and Territorial Epidemiologists. Dr. Watkins has a strong background in environmental health.

DOH hired Dr. Anil Nair as the Director of the Environmental Health Division of the Bureau of Epidemiology. A PhD-level consultant also has been retained by DOH to focus specifically on fracking. Moreover, DOH hired a full-time toxicologist with expertise in reviewing environmental testing samples and assessing the associated health risks.

Currently, the Environmental Health Division is comprised of five staff members and two contractors, as well as one intern and one annuitant. DOH has requested and received approval for funding in the 2019-2020 year for ten new positions dedicated to environmental health, including fracking. Eight of those positions are in the Bureau of Epidemiology and two are in the Bureau of Laboratories. DOH is currently recruiting for those positions.

C. Development of the Fracking Questionnaire and Data Registry

Starting in 2015, DOH developed a complaint questionnaire to gather and analyze information from individuals with health concerns related to fracking.² DOH then contracted with a PhD-level consultant to be the Department's point person on fracking. The consultant refined the questionnaire so that it would gather more useful and standardized information, and developed the data registry so that the information can be stored and analyzed. (See the questionnaire template at **Exhibit A**). DOH uses this information to improve its understanding of the causal links that may exist between fracking and specific health effects.

² DOH receives \$100,000 per year in state funding to develop and operate this registry. In 2019, the Administration budgeted a much larger amount, over \$1 million per year for the next three years, for DOH to work with an academic partner to conduct two comprehensive studies on health effects associated with fracking.

DOH routes all health complaints related to fracking to the Bureau of Epidemiology. Once routed to the Bureau of Epidemiology, staff members contact every person who reports a fracking-related health concern to gather additional data as well as to respond to the individual concern.³ DOH does not take a “wait and see” approach to fracking. Instead, DOH proactively seeks to gather the information by encouraging individuals impacted by fracking to participate and report their concerns. DOH’s proactive approach has taken many forms. For example, DOH spoke directly with individuals within concerned communities about the data registry at public meetings. DOH also met with the Southwest Pennsylvania Environmental Health Project to seek their assistance in referring complaints to DOH for purposes of the data registry. DOH created flyers to publicize the data registry, and placed the flyers at each of DOH’s six Bureau of Community Health district offices, and all 60 state health centers, as well as the district offices of the Department of Environmental Protection (“DEP”). (Flyer attached as **Exhibit B**). DOH publicized the data registry on its website and publicly invited individuals to contact DOH to report concerns by email, phone, fax or mail. (See **Exhibit C**; available at: <https://www.health.pa.gov/topics/envirohealth/Pages/Contact-Environmental-Health.aspx>). DOH set up regular meetings with DEP to facilitate coordination between the agencies and to receive health complaint referrals. The health complaint reporting information was also included on DEP’s website, and the information was shared with the Agency for Toxic Substances and Disease Registry and environmental health physicians to whom DOH refers individuals. Additionally, DOH regularly conducts statistical analyses of the

³ These complaints do not go to a “black hole” as alleged in the Report. (Report at p. 71). That allegation appears to refer to policies under the prior Administration rather than the current Administration. Nonetheless, DOH is providing information about its current policies and practices.

public health data it collects, and publishes reports of that data on an anonymized basis. These reports are made available on DOH's website and provide the public with information on the reported health effects associated with fracking. This includes data on the number of complaints, location of the complaints and wells (by county), the environmental source of concern (such as water or air), health symptoms reported (such as cardiovascular or dermatological), and demographic and other information. (See **Exhibit D**; available at https://www.health.pa.gov/topics/Documents/Environmental%20Health/Q32019_ONGP.pdf). Pennsylvania is one of the few states that maintains a data registry of fracking-related health concerns and reports that data publicly.

Despite these measures, the number of reports DOH received for the data registry was less than anticipated or desired. As of December 2019, DOH received 125 formal health complaints relating to 263 individuals. The Grand Jury Report acknowledges that DOH publicized its registry and encouraged participation through a variety of means (Report at p. 91), yet it suggests that the reason individuals did not report their concerns to DOH was because "the Department was not offering answers or solutions to their problems." (Report at p. 75).

That conclusion is not correct. As Secretary Levine explained in her testimony, DOH's process for collecting scientifically useful information for the registry necessarily depended on individuals providing information in response to a detailed survey. That information provides significant value to the public, as it is used by DOH to study the issue and to inform the public at large. However, individuals may have been deterred from participating in the survey because it did not provide an immediate tangible benefit to the person on the phone. Rather the information gleaned from the survey was meant to provide useful data for DOH to study and educate the public. Dr. Levine further explained that, in response to low participation

rates, DOH has since evolved its strategy, and will be conducting two comprehensive studies using health data maintained by an academic partner.

D. Support and Referrals for Individuals

In addition to gathering health information for purposes of analysis, DOH also directly responds to individuals who report health concerns. When DOH receives a complaint, a staff member of the Bureau of Epidemiology contacts the individual. The staff member gathers information about the complaint and obtains any environmental sampling results in that person's possession. DOH also seeks any available sampling results from DEP. DOH's toxicologist reviews those results to determine if any potential health risks are identified. DOH informs the complainant of the results, including the toxicologist's interpretation of the results related to health risks, and refers the individual to physicians with particular expertise in environmental health issues. Additionally, DOH provides educational resources through FAQs on fracking issues and the contact information to make a report related to Pennsylvania's drinking water. Finally, where needed, DOH will request that DEP do further sampling.

E. Other Public Information-Sharing, Research, and Education

DOH has also continued to engage in scholarship, education, and information-sharing on fracking. Like most government agencies, DOH requires that its employees seek approval before attending conferences or participating in speaking engagements. Such rules are in place to ensure that resources are used wisely and that employees do not violate the Commonwealth-wide ban on gifts to public employees (such as free admission to conferences, compensation for speaking engagements, or other items that could be considered gifts). It would be irresponsible not to have them. However, the rules apply across the board and are neither

specific to fracking, nor in any way designed or utilized to chill participation in fracking related programs.⁴

Furthermore, since 2016, DOH has been presenting fracking data at state and national conferences, and discussing fracking issues in connection with other state programs. For example, DOH staff attends the annual conference of the Council of State and Territorial Epidemiologists, including participating in roundtables and workshops related to fracking. From 2016 to 2018, DOH personnel attended the annual Shale in Public Health Conference hosted by the Pennsylvania League of Women Voters. In 2017 and 2018, DOH staff attended the Shale Network Conference at Penn State and, in 2018, participated in a fracking-related workshop by the National Academy of Science. These efforts help keep DOH up to date on the latest developments in public health related to fracking, and provide an opportunity for DOH attendees to educate others.

DOH staff also engage in research to advance the understanding of health effects associated with fracking. For example, in 2019, under Dr. Levine's direction, DOH and the State of Colorado published a study titled "A Systematic Review of the Epidemiologic Literature Assessing Health Outcomes in Populations Living near Oil and Natural Gas Operations: Study Quality and Future Recommendations."⁵ This piece surveyed the most in-depth peer-reviewed literature on health effects associated with fracking to date. Additionally, DOH is currently completing a report evaluating the occurrence of a rare form of cancer, Ewing's Sarcoma, in communities experiencing fracking issues.

⁴ The Grand Jury Report alleged that DOH "muzzles" its staff in relation to fracking, which was clearly a reference to the prior administration. (See Report at p. 70). Since the new administration, DOH has never muzzled its staff, but has engaged in the numerous efforts to educate itself and the public about ongoing fracking concerns, as detailed in the Response.

⁵ The paper can be found at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616936/#>

In Spring 2019, DOH began to develop a new initiative for fracking-related research, which was approved by the Administration in November 2019. This initiative involves two studies based in southwestern Pennsylvania, where the most fracking activity occurs. The first study will focus on the potential acute effects of fracking (i.e. asthma and birth defects). The second study will focus on incidents of cancer in these areas. For both studies, instead of relying on data that DOH collects from individual complainants, DOH will work with an academic partner and with existing health system databases, including the Pennsylvania Cancer Registry and data from regional healthcare systems. DOH will use that data to analyze health trends in proximity to fracking sites. This initiative is budgeted at just over \$3 million for three years (approximately \$1 million per year). DOH has requested to receive this funding in its 2020-2021 budget.

The Grand Jury Report incorrectly claims that these upcoming studies “will attempt to gather and analyze already existing data from prior complaints. And because DOH effectively discouraged such complaints in the past, there may be little data to review.” (Report at p. 9). To the contrary, these studies will not rely on the fracking-related health data that has been collected by DOH thus far. As detailed above, the studies will rely on robust existing healthcare system data, which is not limited to individuals who made complaints related to fracking. This misunderstanding causes the Report to erroneously imply that the studies will not be sufficiently useful.

To the contrary, these studies will accomplish many of the goals for DOH outlined in the Report. For example, the Report recommends that DOH “[s]end out the nurses and doctors to interview health care professionals. Advertise in affected areas. Collect sophisticated data and conduct sophisticated analysis.” (Report at p. 10). The studies described

above will accomplish those aims even more effectively by gathering medical data from health care professionals in a much more comprehensive manner, rather than through anecdotal interviews that may vary in accuracy or opinion. The studies will also allow DOH to conduct sophisticated analyses of detailed data that will be published and made available to the general public.

III. The Science of Health Effects Associated with Fracking

A fundamental criticism of DOH in the Report is that DOH is in a “state of denial” about the health effects associated with fracking and that it has taken a “wait and see” approach to the issue. (See Report at p. 2, 9). As explained above, that criticism is unfounded. DOH has proactively invited people to report health concerns related to fracking, collected scientifically-useful data, conducted research, collaborated with DEP, published data to inform the public, referred individuals to doctors expert in environmental health, made available other resources, and more. While DOH has improved its response to fracking over time, and will continue to do so, it is wrong to suggest that DOH is sitting idly by or, worse, purposefully ignoring evidence of the health effects associated with fracking. That suggestion is both untrue and damaging to the public interest.

The Report cites the following question posed by the grand jury to DOH:

Is it the DOH and administration’s view that there is insufficient evidence proving that unconventional oil and gas operations, whether in the past or as they currently exist under the governing legal and regulatory scheme, harm public health?

In response, DOH explained that “the science in this area is developing, and it is fair to say that it has not been proven that fracking harms public health.” That is true, and no amount of grand jury investigating will change the science. Importantly, however, what the Report omits is the remaining portion of DOH’s response on this point. Immediately after this

statement, DOH explained: “That said, the number of peer-reviewed epidemiological studies in this area has increased in recent years, and studies have shown some association between fracking and a limited number of health-related effects in select areas, though the strength and the nature of the association still requires further research.” DOH further explained that it had conducted a detailed review of the existing studies, and provided a copy of that review to the grand jury. (See “A Systematic Review of the Epidemiologic Literature Assessing Health Outcomes in Populations Living near Oil and Natural Gas Operations: Study Quality and Future Recommendations” attached as **Exhibit E**). That review concluded:

There currently exists limited research and conflicting scientific information on the health risks for those living next to these operations.

Twenty (20) studies met our criteria of a human health epidemiologic study evaluating the potential health effects associated with living near ONG [oil and natural gas] operations in the United States. Weight-of-evidence conclusions were developed for a total of 32 different health effects, and ranged from insufficient evidence to limited evidence. Across all health outcomes, four of the 20 studies received a moderate level of certainty rating. All others received a rating of low certainty.⁶

In further contradiction of the erroneous conclusion of the Grand Jury Report that DOH is “in denial” about fracking, DOH provides a summary of what is known about the potential health effects associated with fracking on its public website:

Recently there has been increased interest in UONGD by academic researchers. When most people think of unconventional oil and natural gas development (UONGD) they only think of wells and well pads, but there is an entire network of compressor stations, natural gas processing plants and pipelines in addition to the drill rigs and accompanying access roads that make for several points of

⁶ “A Systematic Review of the Epidemiologic Literature Assessing Health Outcomes in Populations Living near Oil and Natural Gas Operations: Study Quality and Future Recommendations” at pp.1 and 6 (references omitted).

concern from a health perspective. UONGD may negatively impact water, air and soil quality. It may also involve excessive noise, light and vibrations from seismic testing and cause vehicular injuries from increased truck traffic or other injuries or emergencies from well explosions or flooding. What is more are the mainly mental health impacts related to the disruption of rural communities and the influx of young male workers. Together these factors may directly impact health or indirectly impact health through increased stress, anxiety and reduced sleep. For workers and their families and sensitive populations (e.g., pregnant women, children and elderly), the health consequences of UONGD may be more severe.

Most epidemiologic research to this point has compared the health outcomes of those living varying distances from unconventional well sites as a substitute for exposure to UONGD. There have been very few studies that have measured exposure directly. Overall, epidemiologic work has found some limited evidence of relationships between living near UONGD and poor infant health and worsening respiratory symptoms. Infant health is unique in that the timing of exposure can be pinpointed (within a 9-month period) more precisely than for other health symptoms or outcomes.

(available at: <https://www.health.pa.gov/topics/envirohealth/Pages/OilGas.aspx>)

There is no doubt that DOH relies on scientific methods and evidence to shape its policies and programs. But this does not lead to inaction by DOH. Instead, it is the reason that DOH's multi-prong strategy for fracking has included a particular focus on improving the research and public understanding of the health effects associated with fracking. It is also the reason that the Administration agreed to spend \$1 million per year for three years to conduct two comprehensive studies on the health effects associated with fracking.

DOH does not address every public health concern with a one-size-fits-all approach. DOH's responses differ depending on the specific disease, infection or condition, how deadly it is, how quickly and easily it spreads, and what is known about the causes of the disease. For example, DOH takes a different approach to highly-infectious diseases than it does for a disease that is not infectious. Similarly, DOH takes a different approach to diseases where the cause or method of transmittal is known versus one that is that is subject to evolving scientific and medical understanding. DOH is committed to serving the interests of Pennsylvanians, and

addressing the many public health issues that Pennsylvanians face including those related to fracking. DOH's response to fracking has continued to evolve and improve, and DOH will continue this trend into the future.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I am this day serving one copy of the foregoing Response on behalf of the Pennsylvania Department of Health upon the below by electronic mail:

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EXHIBIT A

**Oil and natural gas production health complaints registry: A project of the Pennsylvania
Department of Health, Bureau of Epidemiology, Division of Environmental Health Epidemiology**

The Division of Environmental Health Epidemiology at the Department of Health evaluates possible connections between the environment someone lives in and their health outcomes. The Division compares medical information it collects with environmental data provided by other state and federal agencies, like the Department of Environmental Protection. While the Division and our toxicologist who evaluate concerns are not able to provide specific medical advice and/or medical care, we are able to collaborate with constituents' medical providers and federal, state, county and local officials to address environmental health issues and protect communities.*

It is also important to note that the information you provide and the records we keep related to constituent reports will be kept confidential subject to the provisions of both the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and Pennsylvania's Right to Know Law (RTKL).

* Note as of July 15, 2017: Before the interview, please obtain verbal consent from constituents to discuss case with PADEP or ATSDR, if applicable. Also, please obtain written (through email) consent from constituents following the interview.

- Verbal consent received Written consent received

Staff member who initiated report	Date of initial report	2011-2016 "drilling log" case number(s)
<input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Name of Complainant (person or organization)	Ever presence of a patient advocate
<input type="text"/> <input type="checkbox"/> Non Household	<input type="text"/>

Referral source: How did you reach us?	If other, specify:	<input type="checkbox"/> ATSDR DCS case only
<input type="text"/>	<input type="text"/>	

General complaint type

Incident/event related	Describe incident/event	Incident code (ICODE)
<input type="text"/>	<input type="text"/>	<input type="text"/>

Source of concern (Check all that apply)

<input type="checkbox"/> Air pollution	<input type="checkbox"/> Soil pollution	<input type="checkbox"/> Truck traffic
<input type="checkbox"/> Water pollution	<input type="checkbox"/> Noise	<input type="checkbox"/> Other

If other, specify:

Which of the following aspects of oil and natural gas production are you concerned about? (Check all that apply)

<input type="checkbox"/> Oil or gas well	<input type="checkbox"/> Compressor station
<input type="checkbox"/> Pipeline	<input type="checkbox"/> Impoundment, wastewater storage
<input type="checkbox"/> Processing plant	<input type="checkbox"/> Other

If other, specify:

Please provide brief summary of complaint

- Complaint specific to conventional oil and natural gas production
 Complaint misspecified

Current Contact Information

Cell Phone

Home Phone

Work Phone

Email Address

Mailing Address

City

State

Zip Code

Address Corresponding to Health Complaint

Street Address

City

Zip Code

Township/Borough/Municipality

County

County FIPS

Is this a home, school, work, or other address?

How many people are included/involved in your health complaint? (i.e., number of people with health symptoms, etc.)

If N/A, explain:

Would you like to report on animals' health also?

Confirm number of people in household

Confirm number of people in household with health symptoms

Respondent 1 Demographics

Date data entered if different from date of initial report
Person deceased at time of initial report

First Name <input type="text"/>	Last Name <input type="text"/>	Sex <input type="text"/>
Date of Birth <input type="text"/>	Age <input type="text"/>	Race/Ethnicity <input type="text"/>
Relationship to Interviewee		
<input type="checkbox"/> Self <input type="checkbox"/> Spouse <input type="checkbox"/> Child <input type="checkbox"/> Other		
If other, specify: <input type="text"/>		
Educational Attainment <input type="text"/>	Occupation <input type="text"/>	Industry <input type="text"/>
Health Insurance Status <input type="text"/>	General Health Status <input type="text"/>	Smoking Status <input type="text"/>

Respondent 2 Demographics

Date data entered if different from date of initial report
Person deceased at time of initial report

First Name <input type="text"/>	Last Name <input type="text"/>	Sex <input type="text"/>
Date of Birth <input type="text"/>	Age <input type="text"/>	Race/Ethnicity <input type="text"/>
Relationship to Interviewee		
<input type="checkbox"/> Self <input type="checkbox"/> Spouse <input type="checkbox"/> Child <input type="checkbox"/> Other		
If other, specify: <input type="text"/>		
Educational Attainment <input type="text"/>	Occupation <input type="text"/>	Industry <input type="text"/>
Health Insurance Status <input type="text"/>	General Health Status <input type="text"/>	Smoking Status <input type="text"/>

Respondent 3 Demographics

Date data entered if different from date of initial report
Person deceased at time of initial report

First Name <input type="text"/>	Last Name <input type="text"/>	Sex <input type="text"/>
Date of Birth <input type="text"/>	Age <input type="text"/>	Race/Ethnicity <input type="text"/>
Relationship to Interviewee		
<input type="checkbox"/> Self <input type="checkbox"/> Spouse <input type="checkbox"/> Child <input type="checkbox"/> Other		
If other, specify: <input type="text"/>		
Educational Attainment <input type="text"/>	Occupation <input type="text"/>	Industry <input type="text"/>
Health Insurance Status <input type="text"/>	General Health Status <input type="text"/>	Smoking Status <input type="text"/>

Respondent 4 DemographicsDate data entered if different from date of initial report
Person deceased at time of initial report

First Name

Last Name

Sex

Date of Birth

Age

Race/Ethnicity

Relationship to Interviewee

 Self Spouse Child Other

If other, specify:

Educational Attainment

Occupation

Industry

Health Insurance Status

General Health Status

Smoking Status

Respondent 5 DemographicsDate data entered if different from date of initial report
Person deceased at time of initial report

First Name

Last Name

Sex

Date of Birth

Age

Race/Ethnicity

Relationship to Interviewee

 Self Spouse Child Other

If other, specify:

Educational Attainment

Occupation

Industry

Health Insurance Status

General Health Status

Smoking Status

Health Symptoms believed to be (potentially) related to UONGD

---Neurological		Frequency	Date of onset	---Respiratory		Frequency	Date of onset
<input type="checkbox"/>	Headache/migraine	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Allergies/sinus problems	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dizziness/balance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nosebleeds	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Memory loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nose congestion/runny	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Difficulty concentrating	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sneezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Numbness/tingling	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sore throat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Confusion	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Dry/irritated mouth	<input type="text"/>	<input type="text"/>
---Psychological				<input type="checkbox"/>	Cough	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Anxiety/stress	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Shortness of breath	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Irritability	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Wheezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Depressed	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/asthma	<input type="text"/>	<input type="text"/>
---Eye				<input type="checkbox"/>	Exacerbation/COPD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Trouble seeing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/Bronchitis	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Itchiness	<input type="text"/>	<input type="text"/>	---Gastrointestinal			
<input type="checkbox"/>	Watery	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nausea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dry	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Vomiting	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Diarrhea	<input type="text"/>	<input type="text"/>
---Ear				<input type="checkbox"/>	Abdominal pain	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Hearing loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exac./ulcer/reflux/GERD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	ringing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Indigestion	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	---Dermatological			
---General Systemic				<input type="checkbox"/>	Rash	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Sleep disturbance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hives	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fatigue/malaise	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Skin irritation	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fever	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hair loss	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Chills	<input type="text"/>	<input type="text"/>	---Cardiovascular			
<input type="checkbox"/>	Night sweats	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Chest pain/tightness	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Shaking	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	High blood pressure	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Weight loss/gain	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Irregular heartbeat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Decreased appetite	<input type="text"/>	<input type="text"/>	Notes on symptoms:			
<input type="checkbox"/>	Muscle aches/cramps	<input type="text"/>	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/>	Joint pain	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Loss of consciousness	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Swelling	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Urogenital problem	<input type="text"/>	<input type="text"/>				

Diagnosed Health Conditions believed to be (potentially) related to UONGD

<input type="checkbox"/>	Arthritis	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Kidney disease/fail	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Asthma/COPD	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Liver disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Cancer	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Mental health	Date diagnosed	<input type="text"/>
	Cancer site	<input type="text"/>		<input type="checkbox"/>	Neurological disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Heart disease and/or hypertension	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Thyroid condition	Date diagnosed	<input type="text"/>
				Medications taken (type, frequency, how used, date started)			
				<input type="text"/>			

Health Care

Sought medical care for concern?	Have you had any toxicological tests done?	Notes on health care:
<input type="text"/>	<input type="text"/>	<input type="text"/>
Did you receive a diagnosis?	Describe diagnosis	
<input type="text"/>	<input type="text"/>	

Health Symptoms believed to be (potentially) related to UONGD

---Neurological		Frequency	Date of onset	---Respiratory		Frequency	Date of onset
<input type="checkbox"/>	Headache/migraine	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Allergies/sinus problems	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dizziness/balance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nosebleeds	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Memory loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nose congestion/runny	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Difficulty concentrating	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sneezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Numbness/tingling	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sore throat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Confusion	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Dry/irritated mouth	<input type="text"/>	<input type="text"/>
---Psychological				---Cough			
<input type="checkbox"/>	Anxiety/stress	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Shortness of breath	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Irritability	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Wheezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Depressed	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/asthma	<input type="text"/>	<input type="text"/>
---Eye				<input type="checkbox"/>	Exacerbation/COPD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Trouble seeing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/Bronchitis	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Itchiness	<input type="text"/>	<input type="text"/>	---Gastrointestinal			
<input type="checkbox"/>	Watery	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nausea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dry	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Vomiting	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Diarrhea	<input type="text"/>	<input type="text"/>
---Ear				<input type="checkbox"/>	Abdominal pain	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Hearing loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exac./ulcer/reflux/GERD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Ringing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Indigestion	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	---Dermatological			
---General Systemic				<input type="checkbox"/>	Rash	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Sleep disturbance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hives	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fatigue/malaise	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Skin irritation	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fever	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hair loss	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Chills	<input type="text"/>	<input type="text"/>	---Cardiovascular			
<input type="checkbox"/>	Night sweats	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Chest pain/tightness	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Shaking	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	High blood pressure	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Weight loss/gain	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Irregular heartbeat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Decreased appetite	<input type="text"/>	<input type="text"/>	Notes on symptoms:			
<input type="checkbox"/>	Muscle aches/cramps	<input type="text"/>	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/>	Joint pain	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Loss of consciousness	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Swelling	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Urogenital problem	<input type="text"/>	<input type="text"/>				

Diagnosed Health Conditions believed to be (potentially) related to UONGD

<input type="checkbox"/>	Arthritis	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Kidney disease/fail	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Asthma/COPD	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Liver disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Cancer	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Mental health	Date diagnosed	<input type="text"/>
	Cancer site	<input type="text"/>		<input type="checkbox"/>	Neurological disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Heart disease and/or hypertension	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Thyroid condition	Date diagnosed	<input type="text"/>
Medications taken (type, frequency, how used, date started)							
<input type="text"/>							

Health Care

Sought medical care for concern?	Have you had any toxicological tests done?	Notes on health care:
<input type="text"/>	<input type="text"/>	<input type="text"/>
Did you receive a diagnosis?	Describe diagnosis	
<input type="text"/>	<input type="text"/>	

Health Symptoms believed to be (potentially) related to UONGD

---Neurological		Frequency	Date of onset	---Respiratory		Frequency	Date of onset
<input type="checkbox"/>	Headache/migraine	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Allergies/sinus problems	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dizziness/balance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nosebleeds	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Memory loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nose congestion/runny	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Difficulty concentrating	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sneezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Numbness/tingling	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Sore throat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Confusion	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Dry/irritated mouth	<input type="text"/>	<input type="text"/>
---Psychological				---Cough			
<input type="checkbox"/>	Anxiety/stress	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Shortness of breath	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Irritability	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Wheezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Depressed	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/asthma	<input type="text"/>	<input type="text"/>
---Eye				<input type="checkbox"/>	Exacerbation/COPD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Trouble seeing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exacerbation/Bronchitis	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Itchiness	<input type="text"/>	<input type="text"/>	---Gastrointestinal			
<input type="checkbox"/>	Watery	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Nausea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Dry	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Vomiting	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Diarrhea	<input type="text"/>	<input type="text"/>
---Ear				<input type="checkbox"/>	Abdominal pain	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Hearing loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Exac./ulcer/reflux/GERD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Ringing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Indigestion	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Pain/discomfort	<input type="text"/>	<input type="text"/>	---Dermatological			
---General Systemic				<input type="checkbox"/>	Rash	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Sleep disturbance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hives	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fatigue/malaise	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Skin irritation	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Fever	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Hair loss	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Chills	<input type="text"/>	<input type="text"/>	---Cardiovascular			
<input type="checkbox"/>	Night sweats	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Chest pain/tightness	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Shaking	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	High blood pressure	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Weight loss/gain	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	Irregular heartbeat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	Decreased appetite	<input type="text"/>	<input type="text"/>	Notes on symptoms:			
<input type="checkbox"/>	Muscle aches/cramps	<input type="text"/>	<input type="text"/>	<div style="border: 1px solid black; height: 80px;"></div>			
<input type="checkbox"/>	Joint pain	<input type="text"/>					
<input type="checkbox"/>	Loss of consciousness	<input type="text"/>					
<input type="checkbox"/>	Swelling	<input type="text"/>	<input type="text"/>				
<input type="checkbox"/>	Urogenital problem	<input type="text"/>	<input type="text"/>				

Diagnosed Health Conditions believed to be (potentially) related to UONGD

<input type="checkbox"/>	Arthritis	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Kidney disease/fail	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Asthma/COPD	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Liver disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Cancer	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Mental health	Date diagnosed	<input type="text"/>
	Cancer site	<input type="text"/>		<input type="checkbox"/>	Neurological disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/>	Heart disease and/or hypertension	Date diagnosed	<input type="text"/>	<input type="checkbox"/>	Thyroid condition	Date diagnosed	<input type="text"/>
Medications taken (type, frequency, how used, date started)							
<div style="border: 1px solid black; height: 30px;"></div>							

Health Care

Sought medical care for concern?	Have you had any toxicological tests done?	Notes on health care:
<input type="text"/>	<input type="text"/>	
Did you receive a diagnosis?	Describe diagnosis	
<input type="text"/>	<input type="text"/>	<div style="border: 1px solid black; height: 50px;"></div>

Health Symptoms believed to be (potentially) related to UONGD

---Neurological			---Respiratory		
	Frequency	Date of onset		Frequency	Date of onset
<input type="checkbox"/> Headache/migraine	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Allergies/sinus problems	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Dizziness/balance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nosebleeds	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Memory loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nose congestion/runny	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Difficulty concentrating	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Sneezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Numbness/tingling	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Sore throat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Confusion	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Dry/irritated mouth	<input type="text"/>	<input type="text"/>
---Psychological			---Gastrointestinal		
<input type="checkbox"/> Anxiety/stress	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nausea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Irritability	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Vomiting	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Depressed	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Diarrhea	<input type="text"/>	<input type="text"/>
---Eye			<input type="checkbox"/> Abdominal pain	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Trouble seeing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Exac./ulcer/reflux/GERD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Itchiness	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Indigestion	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Watery	<input type="text"/>	<input type="text"/>	---Dermatological		
<input type="checkbox"/> Dry	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Rash	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Hives	<input type="text"/>	<input type="text"/>
---Ear			<input type="checkbox"/> Skin irritation	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Hearing loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Hair loss	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Ringing	<input type="text"/>	<input type="text"/>	---Cardiovascular		
<input type="checkbox"/> Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Chest pain/tightness	<input type="text"/>	<input type="text"/>
---General Systemic			<input type="checkbox"/> High blood pressure	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Sleep disturbance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Irregular heartbeat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Fatigue/malaise	<input type="text"/>	<input type="text"/>	Notes on symptoms: <input type="text"/>		
<input type="checkbox"/> Fever	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Chills	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Night sweats	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Shaking	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Weight loss/gain	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Decreased appetite	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Muscle aches/cramps	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Joint pain	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Loss of consciousness	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Swelling	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Urogenital problem	<input type="text"/>	<input type="text"/>			

Diagnosed Health Conditions believed to be (potentially) related to UONGD

<input type="checkbox"/> Arthritis	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Kidney disease/fail	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Asthma/COPD	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Liver disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Cancer	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Mental health	Date diagnosed	<input type="text"/>
Cancer site:	<input type="text"/>		<input type="checkbox"/> Neurological disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Heart disease and/or hypertension	Date diagnosed:	<input type="text"/>	<input type="checkbox"/> Thyroid condition	Date diagnosed	<input type="text"/>
Medications taken (type, frequency, how used, date started)					
<input type="text"/>					

Health Care

Sought medical care for concern?	Have you had any toxicological tests done?	Notes on health care: <input type="text"/>
<input type="text"/>	<input type="text"/>	
Did you receive a diagnosis?	Describe diagnosis	
<input type="text"/>	<input type="text"/>	

Health Symptoms believed to be (potentially) related to UONGD

	Frequency	Date of onset		Frequency	Date of onset
---Neurological			---Respiratory		
<input type="checkbox"/> Headache/migraine	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Allergies/sinus problems	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Dizziness/balance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nosebleeds	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Memory loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nose congestion/runny	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Difficulty concentrating	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Sneezing	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Numbness/tingling	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Sore throat	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Confusion	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Dry/irritated mouth	<input type="text"/>	<input type="text"/>
---Psychological			---Gastrointestinal		
<input type="checkbox"/> Anxiety/stress	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Cough	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Irritability	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Shortness of breath	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Depressed	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Wheezing	<input type="text"/>	<input type="text"/>
---Eye			<input type="checkbox"/> Exacerbation/asthma	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Trouble seeing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Exacerbation/COPD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Itchiness	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Exacerbation/Bronchitis	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Watery	<input type="text"/>	<input type="text"/>	---Dermatological		
<input type="checkbox"/> Dry	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Nausea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Vomiting	<input type="text"/>	<input type="text"/>
---Ear			<input type="checkbox"/> Diarrhea	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Hearing loss	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Abdominal pain	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Ringing	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Exac./ulcer/reflux/GERD	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Pain/discomfort	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Indigestion	<input type="text"/>	<input type="text"/>
---General Systemic			---Cardiovascular		
<input type="checkbox"/> Sleep disturbance	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Rash	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Fatigue/malaise	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Hives	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Fever	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Skin irritation	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Chills	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> Hair loss	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Night sweats	<input type="text"/>	<input type="text"/>	---Notes on symptoms:		
<input type="checkbox"/> Shaking	<input type="text"/>	<input type="text"/>	<input type="text"/>		
<input type="checkbox"/> Weight loss/gain	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Decreased appetite	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Muscle aches/cramps	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Joint pain	<input type="text"/>	<input type="text"/>			
<input type="checkbox"/> Loss of consciousness	<input type="text"/>	<input type="text"/>	<input type="text"/>		
<input type="checkbox"/> Swelling	<input type="text"/>	<input type="text"/>	<input type="text"/>		
<input type="checkbox"/> Urogenital problem	<input type="text"/>	<input type="text"/>	<input type="text"/>		

Diagnosed Health Conditions believed to be (potentially) related to UONGD

<input type="checkbox"/> Arthritis	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Kidney disease/fail	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Asthma/COPD	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Liver disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Cancer	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Mental health	Date diagnosed	<input type="text"/>
Cancer site: <input type="text"/>			<input type="checkbox"/> Neurological disease	Date diagnosed	<input type="text"/>
<input type="checkbox"/> Heart disease and/or hypertension	Date diagnosed	<input type="text"/>	<input type="checkbox"/> Thyroid condition	Date diagnosed	<input type="text"/>
			Medications taken (type, frequency, how used, date started)		
			<input type="text"/>		

Health Care

Sought medical care for concern?

Have you had any toxicological tests done?

Did you receive a diagnosis?

Describe diagnosis:

Notes on health care:

Pregnancy

Record the last three pregnancies/births in the household (can go back as far as 2004)

Pregnancy/baby #1

Respondent number of pregnant/recently pregnant woman Out of household

Estimated date of delivery (if baby already born, use birth date) Miscarriage

Birth weight lbs oz 5 minute APGAR score

Gestational age at birth completed weeks Birth defect? Describe

Pregnancy/baby #2

Respondent number of pregnant/recently pregnant woman Out of household

Estimated date of delivery (if baby already born, use birth date) Miscarriage

Birth weight lbs oz 5 minute APGAR score

Gestational age at birth completed weeks Birth defect? Describe

Pregnancy/baby #3

Respondent number of pregnant/recently pregnant woman Out of household

Estimated date of delivery (if baby already born, use birth date) Miscarriage

Birth weight lbs oz 5 minute APGAR score

Gestational age at birth completed weeks Birth defect? Describe

Housing

How long in this home?

Seasonal residence

Year home built

Size of lot (in acres)

Radon testing

Do you have central heating?

Pesticide or insecticide use

If yes, how much of the year do you spend in this home?

Describe any remodeling or renovations (e.g., area of home, date, etc.)

Date of test

Test result

If no, describe heating system

If so, describe (e.g., type of pesticides/insecticides, domestic or farm-related, etc.)

Have you changed residences following health concern?

Date of move

Do/did you have an oil & gas lease on your property?

Effective date of lease

Water Date data entered if different from date of initial report

Primary source of water for ingestion Treated or not?

Primary source of water for bathing Treated or not?

Date treatment system installed Describe treatment system

Change in taste, appearance, odor? Date first noticed change in water

Describe changes in taste, appearance, odor

Any water tests?

Number of water tests completed

----- Three most recent water test results (list most recent first) -----

Date	Laboratory name	DEP obtained	Contaminants of concern	Adverse health effects suspected
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>

Notes on water testing:

Air

Unusual odor? Date first noticed odor

Describe odors (include frequency)

Describe visible emissions, if any Flaring

Any air tests?

Number of air tests completed

----- Three most recent air test results (list most recent first) -----

Date	Laboratory Name	DEP obtained	Contaminants of concern	Adverse health effects suspected
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>

Notes on air testing/DEP air monitoring:

Soil

Have you ever eaten produce grown in the soil on your property?

Are you concerned about garden produce? Describe concerns

Have you stopped eating produce grown in the soil on your property?

Any soil tests?

Number of soil tests completed

..... Three most recent soil tests (list most recent first)

Date	Laboratory name	DEP obtained	List of chemicals that exceed comparison value	Adverse health effects suspected
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>

Notes on soil testing:

Animals

Species	Number	% 24hr outside	Water source	Species ill?	Onset date	Seen vet?	Diagnosis
<input type="checkbox"/> Canine (dogs)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Feline (cats)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Equine (horses)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Bovine (cattle)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Swine (pigs)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Caprine (goats)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Ovine (sheep)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Avian (birds)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Other	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If other, specify:

Describe illness in animals (respiratory, digestive, skin, eyes, neurologic, other)

Describe extent of animal deaths

Actions Taken by the Department of Health

Documented complaint, no further action required

Requested environmental testing results, medical records, laboratory (blood, urine) results, etc.

Describe request: (Include date requested, type of sample or record requested, etc.)

Waiting for aforementioned results?

Obtained environmental testing results, medical records, laboratory results, etc.

Describe what was obtained: (Include date samples collected and date received, type of samples collected, etc.)

Reviewed environmental samples, medical records, lab results, etc.

Describe process: (Include date of review, conclusion reached, if further action is necessary, etc.)

Other action(s) taken by DOH

Describe action(s): (Include relevant date, parties involved, etc.)

Discuss actions taken by external groups, including complainant, O&G company, PADEP, etc.:

Further steps needed:

List all DOH employees who contributed to investigation:

In addressing this complaint, did DOH directly contact or advise the complainant to contact the following:

	Date referred	Contact person
<input type="checkbox"/> Dept of Environmental Protection	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Dept of Agriculture	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Occupational Safety and Health Admin	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> DOH-approved Environmental Medicine affiliates	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Medical professional(s)	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Other	<input type="text"/>	<input type="text"/>

Referral notes:

Case Summary

State ID **County ID** **Household #** **Case #** **Unique ID**

Please fill out 'Case Outcome' as follows:

Open = awaiting further communication from or in process of communicating with complainant

Closed = communicated to complainant about outcome of investigation, no further action planned at this time

Never open = complaint/information documented, no further action required by complainant at this time

Case Outcome

If applicable, case outcome communicated to complainant via:

Mail Date letter sent:

Email Date email sent:

Phone Date of phone call:

Briefly list what hard copy files and/or digital media we have at DOH:

Date data entered if different from date of initial report

Number of active wells < 1/2 mile

Number of active wells < 2 miles

Name of closest UONGD well of concern

Distance to closest well of concern

Current stage of closest well of concern

Date pad development began:

Date drilling began ("spud date"):

Date stimulation began:

Date production began:

Date well plugged:

Name of closest pipeline

Distance to closest pipeline

Date of onset

Name of closest compressor station

Distance to closest station

Date of onset

Name of closest impoundment, H2O storage

Distance to closest impoundment

Date of onset

Name of closest processing plant

Distance to closest processing plant

Date of onset

Name of trucking company

Distance to truck traffic

Date of onset

Notes on nearby drilling infrastructure:

Other industries/companies close by that could contribute to health concerns?

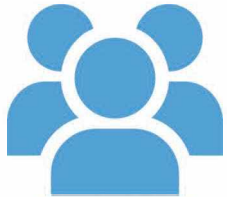
Name of closest superfund site

Distance to closest superfund site

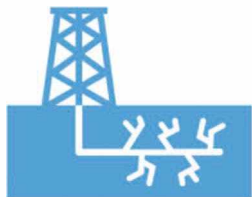
EXHIBIT B

DO YOU HAVE A HEALTH CONCERN ABOUT THE ENVIRONMENT?

Could contaminated air, soil or water be affecting your health?



Have questions about environmental health? The department has epidemiologists available to answer questions about a range of environmental health issues.



Have a health concern related to oil and gas production? The department has a registry to track health complaints. Call 717-787-3350 to add your information.



Need community resources? The department has relationships with state and local stakeholders that can help you address your environmental health concerns.

CONTACT US:

717-787-3350 or env.health.concern@pa.gov

VISIT OUR WEBSITE:

<https://www.health.pa.gov/topics/envirohealth>



pennsylvania

DEPARTMENT OF HEALTH

EXHIBIT C

Contact Environmental Health

Ways to Contact Us Report an Environmental Health Concern ONGP Health Registry

The Division of Environmental Health Epidemiology is part of the Bureau of Epidemiology in the Pennsylvania Department of Health. All programs within the division – the Health Assessment Program, Environmental Public Health Tracking Program, Adult Blood Lead Epidemiology and Surveillance Program and Unconventional Oil and Natural Gas Development Program – can be contacted at the bureau office.

Ways to Contact

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Mail: Pennsylvania Department of Health
Division of Environmental Health Epidemiology
Bureau of Epidemiology
Room 933, Health and Welfare Building
625 Forster Street
Harrisburg, Pennsylvania 17120-0701

Phone: 717-787-3350

Fax: 717-346-3286

env.health.concern@pa.gov

Email: (<mailto:env.health.concern@pa.gov>)

Hours: Monday-Friday, 8 a.m. to 4 p.m.

Reporting an Environmental Health Concern

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The Division of Environmental Health Epidemiology is part of the Bureau of Epidemiology in the Pennsylvania Department of Health (DOH). Pennsylvania residents are encouraged to report environmental health concerns to the Division, where they will be evaluated and referred to an appropriate program area for potential investigation and follow-up. If applicable, we will analyze environmental sampling data and/or clinical (i.e., toxicological) data. If environmental sampling data are not available, we will work with the Department of Environmental Protection (DEP) to collect data, when indicated and as appropriate. Lack of environmental sampling data may limit the department's ability to conduct a thorough investigation.

While we do not offer primary health care services, we can provide advice based on the nature of the complaint and work closely with the individual who filed the complaint and, if applicable,

their healthcare providers to address health concerns. Depending on the nature of the concern, DOH environmental health staff members will collaborate with federal, state, county and local officials, healthcare providers and the public on a regular basis to address environmental health issues throughout the commonwealth.

Before Contacting Us

If you have an environmental health concern, the tips below are intended to help us address your concern in the most efficient way possible. Please be patient, as it takes time to investigate the many variables at play in environmental health concerns and to conduct a health evaluation. You can expedite the department's response by having the following things in place before you file a complaint:

- Visit your healthcare provider or doctor first.
- Have environmental test results available.
- Be prepared to speak about your family's current health and health history.
- Be prepared to talk about your health symptoms.

Difference between DOH and DEP

Both DOH and DEP receive and respond to environmental complaints. Citizens should know that, in matters of environmental concern, DOH is an advisory agency, not a regulatory one.

Environmental regulation concerns are primarily managed by DEP or, on a national level, the EPA. The following is a rough guide for when to contact DEP versus DOH. It is possible that you would contact both departments.

DEP works to protect the state's air, land and water from pollution and ensure a clean environment. DEP is the agency to which you primarily direct your complaint or questions if your concern involves drinking water or the waterways, air quality issues or potential soil pollution believed to be related to UONGD. Additionally, DEP takes reports of spills, accidents and other releases of hazardous substances and contaminants. DEP will test the air, water or soil to determine if there is a problem.

DOH examines how different environments affect a person's well-being. The health effects of breathing air, drinking water and more are researched in relation to specific sites where they are reviewed and investigated. Your complaint should also be directed to DOH's Division of Environmental Health Epidemiology if you have an environmental concern that is specific to your health or the health of a family member or friend, which may be caused by the air, water or soil.

DEP has separate contact information for

<http://www.dep.pa.gov/About/ReportanIncident/Pages/default.aspx>

reporting an incident

(emergency) and **197 of 235**

ONGP Health Registry

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The Division of Environmental Health Epidemiology manages the oil and natural gas (ONG) health complaints registry. If you have a health concern related to the oil and gas industry in your area, please contact the division to be included in the registry. DOH environmental health staff are also available to answer general questions about health impacts of the oil and gas industry.

Mail: Pennsylvania Department of Health

Division of Environmental Health Epidemiology

Bureau of Epidemiology

Room 933, Health and Welfare Building

625 Forster Street

Harrisburg, Pennsylvania 17120-0701

Phone: 717-787-3350

Fax: 717-346-3286

env.health.concern@pa.gov

Email: (<mailto:env.health.concern@pa.gov>)

Hours: Monday-Friday, 8 a.m. to 4 p.m.

EXHIBIT D

Oil and Natural Gas Production (ONGP) Health Concerns

ONGP in Pennsylvania

ONGP is a significant industry in Pennsylvania. The latest wave of ONGP activity in the state began in 2005 with the start of unconventional oil and natural gas development (UONGD). Unconventional wells are distinct from conventional wells by the geologic formation being tapped. They use horizontal and vertical drilling and hydraulic fracturing (“fracking”) to access traditionally unavailable reservoirs of oil and natural gas.

As of Dec. 31, 2019, the Pennsylvania Department of Environmental Protection (DEP) reported there were 10,819 active unconventional wells in the state. Thirty-four of Pennsylvania’s 67 counties had active unconventional wells, with Washington (1,772), Susquehanna (1,601) and Greene (1,367) counties having the greatest numbers of active unconventional wells.*

ONGP Health Registry

In response to growing concerns about UONGD, the Pennsylvania Department of Health (DOH) developed a confidential health registry to better track and respond to public health complaints related to ONGP.

As of Dec. 31, 2019, DOH received 164 ONGP-related health complaints, with Washington (41), Susquehanna (31) and Bradford (22) counties having the most health complaints.

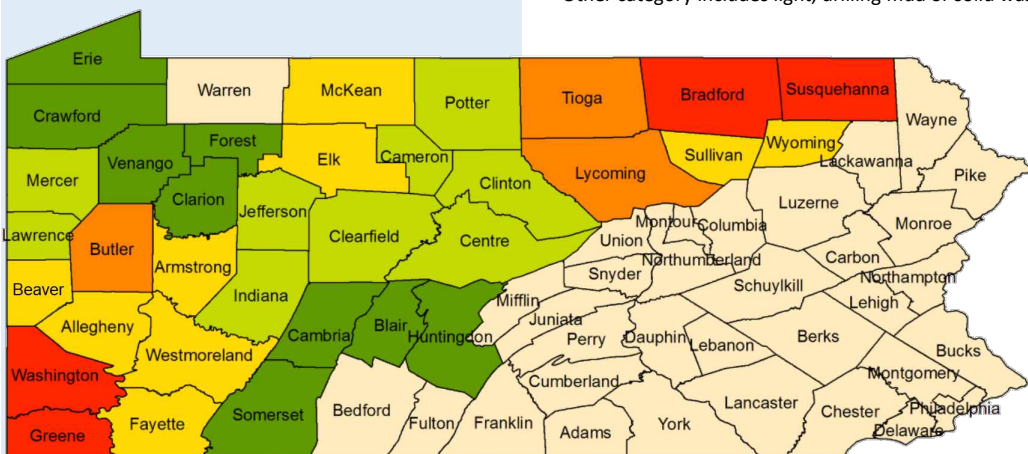


Figure 2. Active Unconventional Oil and Natural Gas Wells in Pennsylvania, as of Dec. 31, 2019*

*Based on the number of active wells from DEP Spud Data Report, Wells Drilled by County

Figure 1. Total Health Complaints Logged by DOH Division of Environmental Health Epidemiology Since 2011 (N=164)

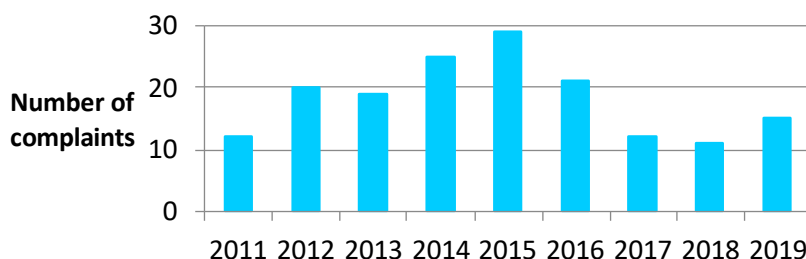


Table 1. Reason for Contact (N=164)

Reason	Q4 2019	2019 YTD	Total since 2011	% of Total since 2011
General inquiry	0	0	24	14.6%
News update/alert	0	0	3	1.8%
Information sharing	0	0	12	7.3%
Formal health complaint ^a	2	15	125	76.2%

^aGeneral inquiries, news updates/alerts and information sharing cases were no longer logged in the health complaints registry effective March 2017.

Table 2. Environmental Source of Concern^a (N=164)

Source	Q4 2019	2019 YTD	Total since 2011	% of Total since 2011
Water	2	14	115	70.1%
Air	0	5	96	58.5%
Soil	1	7	31	18.9%
Noise	0	2	54	32.9%
Truck traffic	0	2	50	30.5%
Other ^b	2	3	48	29.3%
Missing	0	0	9	5.5%

^aMore than one environmental source of concern may be selected per complaint.

^bOther category includes light, drilling mud or solid waste, vibrations or seismic testing, etc.

Referrals

One hundred % of Q4 2019 health complaints were referred by DEP.

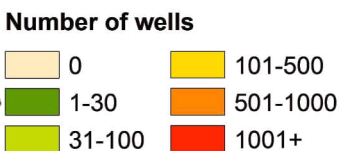


Table 3. Demographic Information of Individuals in ONGP Registry With a Formal Health Complaint (N=125 formal health complaints, 263 individuals*)

Characteristic	Q4 2019	2019 YTD	Total since 2011	% of Total since 2011
Female	1	11	136	51.7%
Male	2	15	123	46.8%
Missing	0	0	4	1.5%
Non-Hispanic white	3	22	109	41.4%
Non-Hispanic black	0	0	0	0.0%
Hispanic	0	0	0	0.0%
Other	0	2	3	1.1%
Missing	0	2	151	57.4%
0-17 years old	0	4	43	16.3%
18-64 years old	3	16	130	49.4%
65+ years old	0	4	41	15.6%
Missing	0	2	49	18.6%
Any private insurance	3	20	79	30.0%
Public only insurance	0	3	28	10.6%
Uninsured	0	1	6	2.3%
Missing	0	2	150	57.0%

Demographic Summary

This table summarizes the demographic and health insurance information of individuals included in the formal health complaints received for Q4 2019, YTD 2019 and total since 2011. This does not necessarily reflect the demographic characteristics of the entire community.

*Table excludes general inquiries, news updates and information sharing complaints. Each health complaint may pertain to more than one individual.

Race/ethnicity, age and health insurance were not systematically collected until March 2017. Percentages within each group may not sum to 100% due to rounding.

Table 4. Health Information of Individuals in ONGP Registry With a Formal Health Complaint (N=125 formal health complaints, 263 individuals*)

Symptom Group	Q4 2019	2019 YTD	Total since 2011	% of Total since 2011
Cardiovascular	1	2	42 (11) [†]	16.0%
Dermatological	2	10	100	38.0%
Ear	0	2	32	12.2%
Eye	1	5	54	20.5%
Gastrointestinal	0	9	93	35.4%
General systemic ^a	2	10	95	36.1%
Neurological	2	10	115 (6) [†]	43.7%
Psychological	0	4	60 (8) [†]	22.8%
Respiratory	0	10 (2) [†]	140 (22) [†]	53.2%
Urogenital	0	1	26 (6) [†]	9.9%
Missing	0	0	36	13.7%

Symptom Summary

This table summarizes the symptoms reported by individuals for Q4 2019, YTD 2019 and total since 2011.

*Table excludes general inquiries, news updates and information sharing complaints. Each health complaint may pertain to more than one individual.

^aIncludes sleep disturbance, fatigue, fever, chills, night sweats, shaking, weight loss/gain, decreased appetite, muscle aches/cramps, joint pain, fainting and swelling

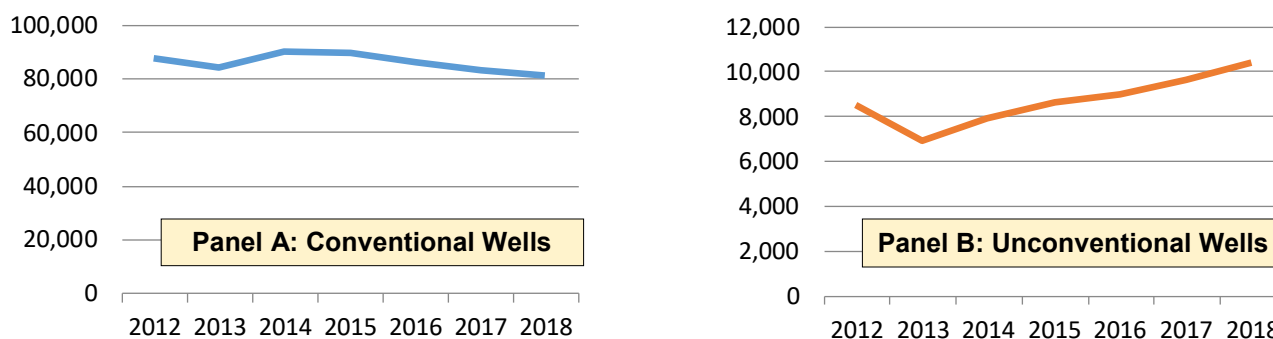
[†]Numbers in parentheses correspond to newly diagnosed conditions relevant to that symptom group: heart disease and/or hypertension (cardiovascular group), neurological disease (neurological), psychological disease (psychological), asthma or COPD (respiratory), kidney disease or failure (urogenital). They do not represent pre-existing conditions. Therefore, someone could report that UONGD exacerbated their asthma (noted in the respiratory count) but was diagnosed before UONGD activity started in their area (not reflected in number of parentheses).

Health Overview 2019 Year-to-Date Based on Formal Health Complaints (N=15 complaints, 26 individuals)

- 42% of individuals reported being in poor or fair health.
- 8% of individuals reported being disabled.
- 0% of individuals reported being diagnosed with cancer since the beginning of 2019.
- 65% of individuals visited the doctor for their health concerns.
- Five (33%) of 2019 YTD complaint cases had concerns about animal health (livestock or pets).



Figure 3. Total Number of Active Oil and Natural Gas Wells in Pennsylvania, 2012 to 2018



The tables below show data for counties with more than 500 active unconventional oil and natural gas wells as of Dec. 31, 2019.

Washington (1,772) Susquehanna (1,601) Greene (1,367)
Bradford (1,326) Lycoming (919) Tioga (769) Butler (576)

Table 5. Environmental Source of Concern by County (All Complaints Since 2011)

Source	Washington	Susquehanna	Greene	Bradford	Lycoming	Tioga	Butler
Water	24	26	7	20	2	4	3
Air	32	17	4	6	4	2	2
Soil	9	5	2	4	0	1	0
Noise	21	10	4	4	0	1	1
Truck traffic	21	9	3	4	1	2	1
Other ^a	21	10	2	5	0	0	1
Missing	3	0	0	0	1	0	0

County-specific numbers of complaint cases are as follows: 41 (Washington), 31 (Susquehanna), 8 (Greene), 22 (Bradford), 6 (Lycoming), 4 (Tioga) and 3 (Butler). More than one environmental source of concern may be selected per complaint.

^aOther category includes light, drilling mud or solid waste, vibrations or seismic testing, etc.

Table 6. Health Symptoms by County (Individuals With a Formal Health Complaint Since 2011)

Symptom Group	Washington	Susquehanna	Greene	Bradford	Lycoming	Tioga	Butler
Cardiovascular	6	8	3	12	0	1	0
Dermatological	23	26	10	11	6	1	0
Ear	7	5	0	3	2	1	0
Eye	15	11	2	5	3	2	0
Gastrointestinal	22	23	6	14	0	3	2
General systemic ^a	24	19	9	10	0	3	2
Neurological	29	19	6	15	1	5	3
Psychological	22	13	2	4	3	0	2
Respiratory	37	29	12	15	4	6	2
Urogenital	6	6	2	4	3	0	1
Missing	16	2	3	8	0	0	1

County-specific numbers of individuals are as follows: 66 (Washington), 59 (Susquehanna), 20 (Greene), 34 (Bradford), 8 (Lycoming), 8 (Tioga) and 5 (Butler).

^aIncludes sleep disturbance, fatigue, fever, chills, night sweats, shaking, weight loss/gain, decreased appetite, muscle aches/cramps, joint pain, fainting and swelling

By far, most oil and natural gas-related complaints received by DOH have been related to UONGD. We have received four complaints related to conventional oil and natural gas development since 2011.

Figures in this report may slightly differ from previous reports due to the potential for ongoing data collection. Please contact the Division of Environmental Health Epidemiology for more details at 717-787-3350 or env.health.concern@pa.gov.

EXHIBIT E



Review

A Systematic Review of the Epidemiologic Literature Assessing Health Outcomes in Populations Living near Oil and Natural Gas Operations: Study Quality and Future Recommendations

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Abstract: A systematic method was used to review the existing epidemiologic literature and determine the state of the scientific evidence for potential adverse health outcomes in populations living near oil and natural gas (ONG) operations in the United States. The review utilized adapted systematic review frameworks from the medical and environmental health fields, such as Grading of Recommendations, Assessment, Development and Evaluations (GRADE), the Navigation Guide, and guidance from the National Toxicology Program's Office of Health Assessment and Translation (OHAT). The review included 20 epidemiologic studies, with 32 different health outcomes. Studies of populations living near ONG operations provide limited evidence (modest scientific findings that support the outcome, but with significant limitations) of harmful health effects including asthma exacerbations and various self-reported symptoms. Study quality has improved over time and the highest rated studies within this assessment have primarily focused on birth outcomes. Additional high-quality studies are needed to confirm or dispute these correlations.

Keywords: oil and natural gas; hydraulic fracturing; fracking; unconventional oil and gas; environmental health; epidemiology; systematic literature review

1. Introduction

The United States has significantly increased its capacity for oil and natural gas (ONG) development through the technological advancements of directional drilling and hydraulic fracturing, with natural gas production reaching a high in 2017 and 2018 [1]. In 2016, more than two-thirds of the 977,000 producing ONG wells in the U.S. used these technologies to access energy reserves in shale and tight oil sands [2]. In places like the Colorado Front Range and Dallas-Fort Worth, Texas, ONG operations are occurring directly alongside population growth. It is estimated that 17.6 million people in the U.S. live within 1 mile of an active ONG well [3].

There currently exists limited research and conflicting scientific information on the health risks for those living next to these operations. The industry surrounding ONG expanded faster than evidence-based epidemiologic research could respond [4,5]. Early community health assessments and surveys of health symptoms in people living near ONG operations raised concerns about the potential chemical hazards, including exposures to air and water pollution [6–8]. Additional studies pointed

to non-chemical stressors, including psychosocial stress, from living near ONG operations [9–11]. These early hypothesis-generating studies gave way to a growing body of observational epidemiologic literature that has quantified associations between residential proximity to ONG operations and the potential for certain adverse human health effects. Several review articles published within the last five years summarize this literature [5,12–14].

Our study is the first of its kind to systematically review the entirety of existing epidemiologic literature on the associations between living near ONG development and the potential for harmful health effects. We weigh the level of evidence for each health outcome and aim to present a clear assessment of the methodological rigor, study strengths, and weaknesses, to identify approaches to future research. The scholarship published to date varies in the types of ONG operations studied, the populations of interest (e.g., based on their geography, time period, or demographic characteristics), the health outcomes measured, and the quality of the methods used. While Saunders and colleagues do raise important methodological concerns about many of the articles they review [14], no existing review addresses study quality in a systematic way. In research on the health effects of potential environmental contaminants, where randomized controlled trials are neither ethical nor appropriate, study quality, or certainty in the study aligning with its stated objectives, is integral to interpreting scientific results and extrapolating them for regulatory and other science-based decisions.

The need for public health scientists to systematically evaluate the body of a literature base for an important issue, with limited resources, is necessary to assist in science-based regulatory decision making. Often, these issues are not entirely characterized and may include multiple chemical stressors (which are typically unknown) and variable health outcomes. The current established systematic review frameworks focus on an in-depth evaluation of the toxicological and epidemiological literature for a specific chemical and/or health outcome, however, this approach is unable to be applied directly to the epidemiological literature surrounding ONG development. Therefore, we have adapted these approaches to better answer this environmental health question.

The steps used to conduct the review were adapted from various established systematic review frameworks for the medical and public health fields, including as Grading of Recommendations, Assessment, Development and Evaluations (GRADE) [15] and Meta-analyses Of Observational Studies in Epidemiology (MOOSE for observational studies) [16], and emerging methods in environmental health as outlined by the Navigation Guide [17], and Office of Health Assessment and Translation (OHAT) [18] guidance (Figure 1). Each study was evaluated using 14 study evaluation questions to assess the level of certainty in, or scientific plausibility of, the study findings. The overall weight of evidence was determined for each health outcome separately. This review is not intended to replicate any previous frameworks nor is it to be the single word on study quality in this area of research. Our aim is to be objective and transparent, in a way that can be understood by community members, government and non-government public health and environmental officials and policymakers.

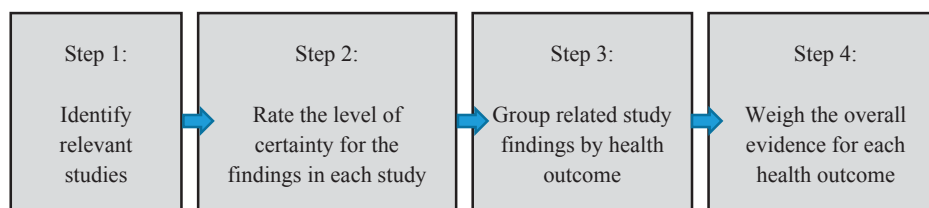


Figure 1. Steps in the current systematic review of epidemiologic literature.

2. Materials and Methods

2.1. Scope of Analysis

The scope of this literature review is defined by a PECO (populations, exposures, comparators, and outcomes) question [19]: “In humans (including unborn fetuses) living in the U.S., is exposure to

chemicals emitted from ONG operations, compared to people who are not exposed (or who are exposed at lower levels), associated with adverse changes in health?” (Figure 2). Unborn fetuses were included as a population of interest to account for the possibility of ONG activities affecting fetal development within the mother’s womb. The term “oil and natural gas operations” (or development) was defined to include all upstream processes involved in the extraction of ONG resources using any combination of vertical drilling, directional/horizontal drilling, and hydraulic fracturing to access energy reserves from conventional and unconventional geologic formations. This review does not include studies evaluating mid- and downstream processes. Since October 2011, the majority of new ONG wells in the U.S. overall have been hydraulically fractured horizontal wells, typically referred to as unconventional wells [2]. Study authors will often use a variety of these terms, and the distinction between conventional and unconventional wells—in source rock, depth, or drilling technique—is muddled in practice [20]. We sought to look across a range of comparators since exposures to ONG-associated chemicals occur along a continuum and it may not always be clear what the pathway of exposure is, how far that pathway reaches, or whether multiple exposure pathways produce synergistic effects on health [5,19]. We then considered whether any and all adverse changes in health occur with these exposures. While it is plausible that ONG may impact health through indirect pathways such as income (e.g., from monetary gains from leasing land or mineral rights), or investment in community infrastructure such as healthcare services [10,21,22], indirect effects were not included in this paper.

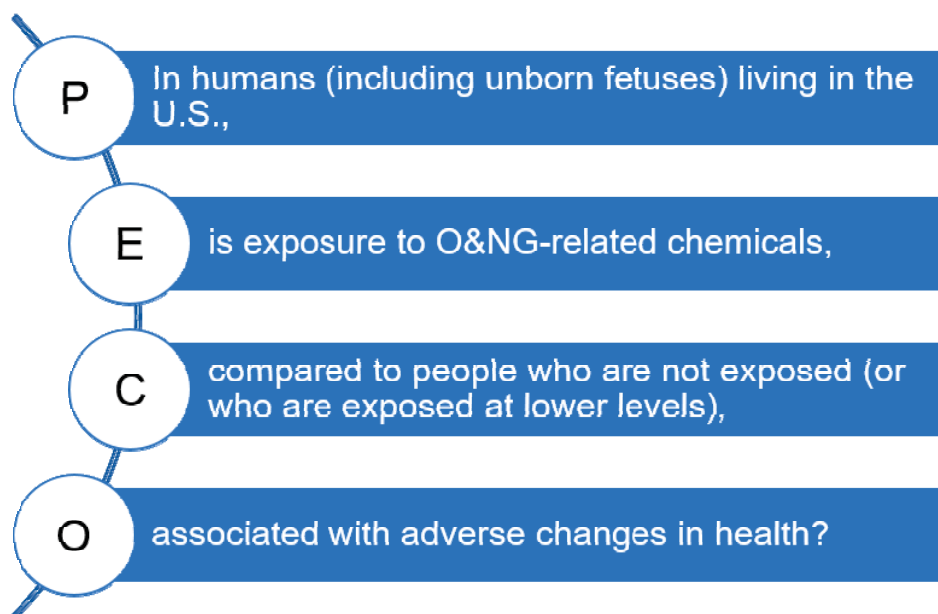


Figure 2. Populations, exposures, comparators, and outcomes (PECO) statement.

The PECO question informed our exclusion criteria and studies were excluded if one or more of the following five criteria were met: (1) exposure to ONG chemicals was not directly measured in, or estimated for, study subjects (i.e., excluded studies focused on indirect health effects including community stressors such as degradation of rural life, sexually transmitted infections from newly arrived young male workers, and traffic accidents from increased heavy truck traffic); (2) the study failed to quantify associations between exposures and a specific health outcome (i.e., excluded studies did not measure odds ratios, relative risk, etc.); (3) the study did not include original data or observations (e.g., review articles, commentaries); (4) the study did not define ONG operations to include any or all processes associated with the upstream development and production of ONG, including but not limited to horizontal drilling and hydraulic fracturing; or (5) the study did not take place in the U.S.

2.2. Data Search

PubMed was the primary research database used to obtain articles. We identified relevant records using the following PubMed search terms: (“Oil and Gas Industry”[Mesh] OR “Natural Gas”[Mesh]) AND (epidemiolog* or symptom*) OR ((oil OR natural gas) AND (epidemiolog* OR health OR symptom*) AND (unconventional OR drilling OR shale OR coal OR production OR development) NOT (“Occupational Health”[Mesh] OR “Animal Experimentation”[Mesh]) AND (“2013/01/01”[PDAT]: “2018/10/01”[PDAT])) AND Humans[Mesh]. We verified that no relevant study was published before 2013, and any studies published after our search date of October 1, 2018 were not included in the assessment. In total, 1253 articles were returned by the search and all were screened for eligibility (Figure 3). Review articles, risk assessments, and included studies were also screened for references and identified six additional studies. The majority of articles (98%) did not meet our study inclusion criteria because they were related to the fields of environmental engineering, geology, hydrology or biomedical topics such as plant-based oil extracts/lipids. We kept the search terms broad in an effort to capture the wide variety of terminology that has been used within the interdisciplinary ONG health effects field.

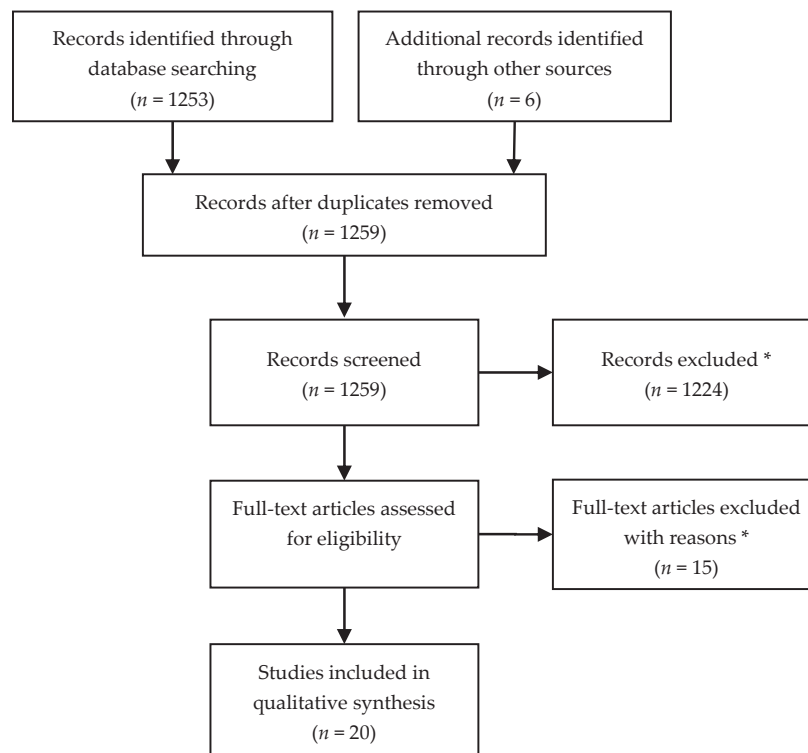


Figure 3. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for study inclusion. * Exclusion criteria is detailed within the methods.

2.3. Level of Certainty Rating and Level of Evidence Conclusions for Individual Studies

A modified systematic review framework was used to rate the level of certainty (or the certainty in an estimate of effect) for each health outcome (Figure 4). We developed our framework based on established methods of systematic reviews for the medical, public health and environmental health fields. These frameworks incorporate, either explicitly or implicitly, most of Bradford Hill’s criteria for causation such as studies with specificity and biological plausibility and that were temporal and consistent [23]. We consulted these classic criteria to develop a meaningful scope of review (as reflected in the PECO question) and determine criteria for study certainty and weight of evidence [24].

1. Establish Initial Level of Certainty			2. Consider Raising Level of Certainty		3. Final Level of Certainty Rating
Study design	Initial certainty in an estimate of effect		Higher certainty if:		Certainty in an estimate of effect
Randomized control trials *	High certainty	⇒	Percentage of study evaluation questions adequately addressed in the study	⇒	High
	Moderate certainty				Moderate
Observational studies	Low certainty				Low

Figure 4. The approach used for developing level of certainty ratings for each study outcome.
 * No randomized control trials were identified in this review.

We rated study findings as having low, moderate, or high certainty that the estimated effect was close to that of the true effect. The findings of observational epidemiologic studies were initially ranked as low certainty and were upgraded according to fourteen (14) study evaluation questions that assessed various domains (Table 1). These criteria were based on established frameworks which specify the domains, questions, or study limitations used to evaluate individual studies for use in a systematic review [17,18,25–27]. We categorized the study evaluation questions into five groups: population and sample, exposure, health outcomes, confounders, and reporting. Two or more authors reviewed each study evaluation question with a yes-or-no response for each study (Supplementary Tables S1–S20). Conflicting responses were resolved through discussion and additional review of the study. Studies with greater than 50% “yes” answers (i.e., 8 “yes” answers out of 14) were considered for potential upgrade of their findings to moderate certainty; studies with greater than 75% “yes” answers (i.e., 11 “yes” answers out of 14) were considered for potential upgrade to high certainty [28]. All findings of each study were ascribed the same level of certainty after evaluations were complete.

Table 1. Key study evaluation questions to determine the level of certainty ratings for health outcomes.

Study Evaluation Questions
Population and Sample
1. Does the control group match the exposed group?
2. Is the sample generalizable to the population of interest?
3. Did the study a priori quantify sample and power?
4. Were missing data addressed and tested?
Exposure
5. Was exposure directly measured and quantified?
6. Was the exposure or proxy/surrogate of exposure measured from a point location?
7. Does the proxy/surrogate adequately estimate exposure?
8. Was there a temporal relationship between exposure and outcome?
Health Outcomes
9. Was the health outcome determined by a medical provider?
10. Was a dose-response relationship seen in any outcome?
Confounders
11. Did the study design or analysis account for important confounding and modifying variables?
12. Did the study design or analysis adjust or control for other environmental exposures that were anticipated to bias results?
13. Were sensitivity analyses attempted for population, outcome, or exposure?
Reporting
14. Did the study conclusions match the results?
Final level of certainty rating: Low/Moderate/High

We derived weight-of-evidence conclusions using standards outlined in GRADE [29], the Cochrane Handbook [30], and developed by the Institute of Medicine [31]. For each health outcome, relevant

findings from individual studies were grouped and evaluated to derive one of the following weight-of-evidence levels: substantial, moderate, limited, mixed, failing to show an association, or insufficient (Table 2).

Table 2. Weight-of-evidence determinations.

Evidence Level	Definition
Substantial	Strong scientific findings that support an association between oil and gas exposure and the outcome, with no credible opposing scientific evidence.
Moderate	Strong scientific findings that support an association between oil and gas exposure and the outcome, but these findings have some limitations.
Limited	Modest scientific findings that support an association between oil and gas exposure and the outcome, but these findings have significant limitations.
Mixed	Both supporting and opposing scientific findings for an association between oil and gas exposure and the outcome, with neither direction dominating.
Failing to show an association	Body of research failing to show an association—indicates that the topic has been researched without evidence of an association; is further classified as a limited, moderate or substantial body of research failing to show an association.
Insufficient	The outcome has not been sufficiently studied.

3. Results

Twenty (20) studies met our criteria of a human health epidemiologic study evaluating the potential health effects associated with living near ONG operations in the United States (Table 3, Supplementary Table S21). Weight-of-evidence conclusions were developed for a total of 32 different health effects, and ranged from insufficient evidence to limited evidence (Table 4).

Across all health outcomes, four of the 20 studies received a moderate level of certainty rating. All others received a rating of low certainty. The majority of the studies were retrospective cohort (six studies) or ecological (six studies) study designs. There were five cross sectional studies, two nested case controls, and two case-controls. The average score across all studies was 6, with a score range from 2 to 9 (Supplementary Table S22).

3.1. Birth Defects and Birth Outcomes

This review identified nine studies comprising 12 low to moderate certainty findings that identified the relationship between women who lived near ONG operations and the likelihood that their child was born with birth defects or other types of adverse health outcomes at birth.

Two studies evaluated birth defects (congenital heart defects, oral clefts, and neural tube defects) in infants of mothers who lived at varying proximities to ONG development during pregnancy [32,33]. These low-certainty studies resulted in insufficient evidence to determine if living near ONG operations during pregnancy is associated with birth defects since there was only one study per outcome.

Eight studies evaluated adverse birth outcomes [32,34–40]. These studies examined commonly used indicators of infant health status such as preterm birth, gestational age, Apgar score, birth weight, infant mortality, and fetal death. Overall, there are conflicting findings across studies resulting in either mixed or insufficient evidence of adverse birth outcomes associated with living near ONG operations during pregnancy (Table 4). Three of the eight studies and their findings were upgraded to a moderate level of certainty rating due to strength in their study designs that reduced risk-of-bias [35,37,38]. These studies demonstrated both positive and null associations for multiple health outcomes. All three were retrospective cohort studies that demonstrated evidence of a dose-response relationship and included a valid exposure surrogate as taken from a point location. All other studies were ranked as low certainty because of limitations within the study design or missing key elements. For example, most studies failed to adequately quantify exposure either directly, or through a proxy/surrogate estimate. In many cases, this measure of exposure was limited to either presence or absence of wells in a county or was

solely proximity-based. Although some studies calculated inverse distance-weighted well counts, they failed to quantify other metrics such as well development phase or total natural gas volume [39].

Birth outcomes have received the most scholarly attention for this topic, due to the relatively easy access to birth certificate or birth health records data, and the ability to pinpoint exposures to ONG operations during the 40-week gestation period [36]. While the overall evidence is rated as mixed or insufficient for various outcomes, the most recently published studies on ONG and birth outcomes have used innovative methodologies that improve or alleviate some of the weaker assumptions in early work. For example, Hill in 2018 took advantage of the little assumed difference between pregnant women living near permitted but not yet drilled wells and those living near active wells to define a better comparison or control group [37]. Additionally, three of the four moderate certainty studies evaluated birth outcomes and have identified positive associations between living near ONG operations and these adverse health outcomes.

ONG operations can emit volatile organic compounds (VOCs) into the air and contribute to increased particulate matter 10 micrometers or less in diameter ($\leq\text{PM}_{10}$) during upstream development activities. Some of these VOCs have the potential to cause developmental effects in test animals following high levels of exposure—generally at much higher levels than what has been observed for individual VOCs at ONG operations [41]. Systematic reviews of a broad set of data have identified positive associations between maternal exposures to fine particulate matter in ambient outdoor air pollution in urban areas and adverse birth outcomes. Other studies have documented adverse developmental and reproductive health outcomes in animals exposed to ONG-related chemicals used as fracturing fluids in the hydraulic fracturing process [42–45]. Although these substances may be released from operations, the exposure concentrations and complete routes of exposure have not been well characterized.

3.2. Cancer

We identified seven low certainty study outcomes from three studies that assessed the relationship between living near ONG operations and the likelihood of developing cancer [46–48]. The studies examined various types of both adult-onset and childhood cancers. Specifically, they looked at the incidence of cancers of the urinary bladder and thyroid, leukemia, all childhood cancers, childhood leukemia (and specifically acute lymphocytic leukemia), childhood non-Hodgkin's lymphoma, and childhood central nervous system tumors. Overall, the weight of evidence is insufficient for all but one of the cancer outcomes since there is only one study for each. There is mixed evidence for childhood leukemia owing to conflicting study findings.

None of the three cancer studies and their findings were upgraded to a moderate level of certainty rating. Two of the studies were ecological, conducted at the county level in Pennsylvania, and did not control for potential confounding variables [46,47]. For example, it is probable that there are social characteristics of county populations (e.g., race or ethnicity, occupation, smoking status, etc.), differing access to medical care and screening, and other environmental exposures (e.g., major roadways, particularly in a place like Allegheny County where Pittsburgh is located) that would explain some of the study findings. Fryzek et al. also incorrectly interpreted their standardized incidence ratio results, as has been noted by Saunders et al. [14]. McKenzie et al. used a case-control design to study childhood cancers in rural Colorado [48]. However, their data source was exclusively the state's cancer registry and therefore there was no comparison group made up of children without cancer. Additional research on this topic might consider incorporating a more appropriate comparison group from household surveys [49]. For studies of cancer, it is crucial for researchers to consider what would be an appropriate time frame from exposure to ONG operations to the potential development of cancer. ONG operations began in earnest in the late 2000s in Pennsylvania, but Fryzek et al. used data only through 2009; this truncated period between community exposure and cancer endpoint is a major limitation [47]. As noted elsewhere [50], the study period was not matched to the theoretical lag period or latency period for adult carcinogenesis.

ONG operations may release chemicals into the air and water, such as benzene, polycyclic aromatic hydrocarbons, and diesel exhaust [51]. Although long-term exposure to these substances, such as benzene, may increase the risk of developing certain types of cancer, the development of cancer is complex because many other non-environmental influences, such as genetics and lifestyle behaviors, also contribute to cancer risk.

3.3. Respiratory Health Outcomes

There were three low to moderate rated health outcomes from six studies evaluating the associations between living near ONG and respiratory health effects [52–57]. A single moderate certainty study with one study outcome indicated a limited weight of evidence for an association with asthma exacerbations [56]. The current literature provides a link between regulated air pollutants (ozone and particulate matter) and lung, heart disease and other respiratory health effects [58]. The influence, specifically, of ONG contributing to respiratory health outcomes is not fully understood, particularly within the context of other behavioral/lifestyle influences (e.g., smoking) exacerbating the deleterious effects of air pollutants. Additionally, there may be many other environmental sources of emissions for air pollutants including vehicles and wildfires.

Five other low-rated studies evaluated the occurrence of respiratory effects (various self-reported symptoms and hospitalizations) and found conflicting evidence for both categories. The two hospitalization studies used ecological study design, which is limited since the estimation of exposure is based on an average in the population. The three other studies documented self-reported symptoms. Health outcomes were not determined by a medical provider.

3.4. Neurological Health Outcomes

We identified four studies that assessed the relationship between living near ONG development and the likelihood of neurological health effects [52,53,55,57]. Three studies identified self-reported neurological symptoms (Elliott et al. [52]: severe headaches, dizziness; Rabinowitz et al. [55]: neurologic problems, severe headache/migraine, dizziness/balance problems, depression, difficulty concentrating/remembering, difficulty sleeping/insomnia, anxiety/nervousness, seizures; Tustin et al. [57]: migraine headache, fatigue) and yielded a limited weight of evidence for a null association with neurological health effects. The other outcome, neurological hospitalizations, had insufficient evidence, with only one positive study published [53]. VOCs are known to produce neurological effects, such as central nervous system damage, headaches, dizziness, visual disorders, loss of coordination, and memory impairment in test animals and humans [59].

Table 3. Summary details of epidemiologic studies included in this systematic review.

First Author	Year	Title	Publication	State	Study Type	Health Finding Category	Positive Associations	Null Associations	Level of Certainty
Busby [34]	2017	There's a World Going on Underground—Infant Mortality and Fracking in Pennsylvania	Journal of Environmental Protection	Pennsylvania	Ecological	Birth outcomes	Early infant mortality	NA	Low (3)
Casey [35]	2016	Unconventional Natural Gas Development and Birth Outcomes in Pennsylvania, USA	Epidemiology	Pennsylvania	Retrospective cohort	Birth outcomes	Preterm birth and high-risk pregnancy ^a	Apgar score, small for gestational age, term birth weight	Moderate (9)
Casey [60]	2018	Associations of Unconventional Natural Gas Development with Depression Symptoms and Disordered Sleep in Pennsylvania	Scientific Reports	Pennsylvania	Case-control and cross-sectional	Self-reported symptoms and diagnoses	Depression symptoms (self-reported)	Disordered sleep (diagnoses)	Low (6)
Currie [36]	2017	Hydraulic Fracturing and Infant Health: New Evidence from Pennsylvania	Science Advances	Pennsylvania	Retrospective cohort	Birth outcomes	Low birth weight, decreased birth weight, decreased score on infant health index	NA	Low (5)
Elliott [52]	2018	A Community-based Evaluation of Proximity to Unconventional Oil and Gas Wells, Drinking Water Contaminants, and Health Symptoms in Ohio	Cross-sectional	Ohio	Cross-sectional	Self-reported symptoms	General symptoms (stress, fatigue, muscle or joint pain, any other self-reported health symptoms)	Respiratory, neurological ^b , dermal, gastrointestinal symptoms (self-reported)	Low (6)
Finkel [46]	2016	Shale Gas Development and Cancer Incidence in Southwest Pennsylvania	Public Health	Pennsylvania	Ecological	Cancer	Urinary bladder cancer	Thyroid cancer, leukemia	Low (2)
Fryzek [47]	2013	Childhood Cancer Incidence in Pennsylvania Counties in Relation to Living in Counties with Hydraulic Fracturing Sites	Journal of Environmental Medicine	Pennsylvania	Ecological	Cancer (child)	Central nervous system tumors	All childhood cancer incidence and leukemia	Low (2)
Hill [37]	2018	Unconventional Natural Gas Development and Infant Health: Evidence from Pennsylvania	Journal of Health Economics	Pennsylvania	Retrospective cohort	Birth outcomes	Low birth weight, decreased term birth weight, premature birth small for gestational age, Apgar score less than 8	Gestation periods	Moderate (9)

Table 3. Cont.

First Author	Year	Title	Publication	State	Study Type	Health Finding Category	Positive Associations	Null Associations	Level of Certainty
Jemielita [53]	2015	Unconventional Gas and Oil Drilling is Associated with Increased Hospital Utilization Rates	PLOS ONE	Pennsylvania	Ecological	Hospitalizations	Cardiology and neurology hospitalizations	Hospitalizations for various medical categories, including pulmonary hospitalizations	Low (7)
Ma [33]	2016	Time Series Evaluation of Birth Defects in Areas with and without Unconventional Natural Gas Development	Journal of Epidemiology and Public Health Reviews	Pennsylvania	Interrupted time series	Birth defects	NA	Birth defects prevalence	Low (5)
McKenzie [32]	2014	Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado	Environmental Health Perspectives	Colorado	Retrospective cohort	Birth outcomes and birth defects	Congenital heart defects and neural tube defects	Oral clefts, preterm birth +, term low birth weight +, decreased term birth weight +	Low (6)
McKenzie [48]	2017	Childhood Hematologic Cancer and Residential Proximity to Oil and Gas Development	PLOS ONE	Colorado	Case-control	Cancer (child)	Childhood acute lymphocytic leukemia	Childhood non-Hodgkin's lymphoma	Low (8)
Peng [54]	2018	The Health Implications of Unconventional Natural Gas Development in Pennsylvania	Health Economics	Pennsylvania	Ecological	Hospitalizations	Pneumonia hospitalizations	Hospitalizations for acute myocardial infarction, chronic obstructive pulmonary disease (COPD), asthma, upper respiratory infections	Low (6)
Rabinowitz [55]	2015	Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania	Environmental Health Perspectives	Pennsylvania	Cross-sectional	Self-reported symptoms	Dermal and upper respiratory symptoms (self-reported)	Lower respiratory, cardiovascular, gastrointestinal, neurological symptoms (self-reported)	Low (7)
Rasmussen [56]	2016	Association Between Unconventional Natural Gas Development in the Marcellus Shale and Asthma Exacerbations	JAMA Intern Med.	Pennsylvania	Nested case-control	Respiratory diagnoses	Asthma exacerbations	NA	Moderate (8)

Table 3. Cont.

First Author	Year	Title	Publication	State	Study Type	Health Finding Category	Positive Associations	Null Associations	Level of Certainty
Stacy [38]	2015	Perinatal Outcomes and Unconventional Natural Gas Operations in Southwest Pennsylvania	PLOS ONE	Pennsylvania	Retrospective cohort	Birth outcomes	Decreased birth weight and small for gestational age	Premature birth+	Moderate (8)
Steinzor [61]	2013	Investigating Links Between Shale Gas Development and Health Impacts Through a Community Survey Project in Pennsylvania	New Solutions	Pennsylvania	Cross-sectional	Self-reported symptoms	Throat irritation, sinus problems, nasal irritation, eye burning, persistent cough, frequent nose bleeds, loss of sense of smell, severe headaches, skin rashes, swollen painful joints symptoms (self-reported)	Joint pain, sleep disturbances, shortness of breath, forgetfulness, sleep disorders, feeling weak and tired, increased fatigue, lumbar pain, muscle aches or pain, diarrhea symptoms (self-reported)	Low (3)
Tustin [57]	2016	Associations between Unconventional Natural Gas Development and Nasal and Sinus, Migraine Headache, and Fatigue Symptoms in Pennsylvania	Environmental Health Perspectives	Pennsylvania	Cross-sectional	Self-reported symptoms	Chronic rhinosinusitis (CRS), migraine headache, and fatigue symptoms in combination (self-reported): CRS and fatigue, migraine headache and fatigue, and all three symptoms together	NA	Low (5)
Whitworth [39]	2017	Maternal Residential Proximity to Unconventional Gas Development and Perinatal Outcomes among a Diverse Urban Population in Texas	PLOS ONE	Texas	Retrospective cohort	Birth outcomes	Preterm birth and fetal death	Small for gestational age and term birth weight	Low (7)
Whitworth [40]	2018	Drilling and Production Activity Related to Unconventional Gas Development and Severity of Preterm Birth	Environmental Health Perspectives	Texas	Nested case-control	Birth outcomes	Preterm birth	NA	Low (9)

NA = Not applicable (no result). + Denotes evidence of a significant negative relationship (i.e., with increasing exposure, poor health outcomes improved). ^a High risk pregnancy was an a priori conclusion and is not a direct effect and therefore was not included in a weight of evidence determination. ^b Elliot et al. defined the neurologic category to include symptoms of frequent headaches or migraines, dizziness or balance problems, feeling down, difficulties with concentration or memory, difficulty sleeping or insomnia, feeling anxious or nervous, and seizures. Some of these symptoms are traditionally categorized as psychological.

Table 4. Summary of the overall weight-of-evidence determinations for each health outcome.

Health Outcome Categories	Total Number of Studies	Health Outcomes	Reference	Number of Studies Per Certainty Rating				Weight of Evidence	
				Positive Association		Null Association			
				High	Moderate	Low	Moderate	High	
Birth defects	2	Congenital heart defects	McKenzie [32]			1			Insufficient
		Oral clefts	McKenzie [32]				1		Insufficient
		Neural tube defects	McKenzie [32]			1			Insufficient
		Birth defects prevalence	Ma [33]				1		Insufficient
		Decreased term birth weight or low birth weight	Casey [35]; Currie [36]; Hill [37]; McKenzie [32]; Stacy [38]; Whitworth [39]	2	1	2		1	Mixed
Birth outcomes	8	Early infant mortality	Busby [34]			1			Insufficient
		Fetal death	Whitworth [39]				1		Insufficient
		Gestation period	Hill [37]					1	Insufficient
		Low infant health index	Currie [36]			1			Insufficient
		Low APGAR score ^a	Casey [35]; Hill [37]	1				1	Mixed
		Preterm/premature birth	Casey [35]; Hill [37]; McKenzie [32]; Stacy [38]; Whitworth [39,40]	1	3	1	1	1	Mixed
		Small for gestational age	Casey [35]; Hill [37]; Stacy [38]; Whitworth [39]	2		1	1	1	Mixed
		Cancer incidence (childhood)	Fryzek [47]				1		Insufficient
Cancer	3	Leukemia (childhood non-specific and acute lymphocytic leukemia)	Fryzek [47]; McKenzie [48]			1	1		Mixed
		Non-Hodgkin's lymphoma (childhood)	McKenzie [48]				1		Insufficient
		CNS tumors ^b (child)	Fryzek [47]			1			Insufficient
		Urinary bladder	Finkel [46]			1			Insufficient
		Thyroid	Finkel [46]				1		Insufficient
		Leukemia	Finkel [46]				1		Insufficient
Cardiovascular	3	Hospitalizations	Jemielta [53]; Peng [54]			1	1		Mixed
		Self-reported symptoms	Rabinowitz [55]				1		Insufficient
Dermal	2	Self-reported symptoms	Elliott [52]; Rabinowitz [55]			1	1		Mixed
Gastrointestinal	2	Self-reported symptoms	Elliott [52]; Rabinowitz [55]				2		Limited- failing to show an association

Table 4. Cont.

Health Outcome Categories	Total Number of Studies	Health Outcomes	Reference	Number of Studies Per Certainty Rating						Weight of Evidence	
				Positive Association			Null Association				
				High	Moderate	Low	Low	Moderate	High		
Neurological	4	Hospitalizations	Jemielita [53]		1						Insufficient
		Self-reported symptoms	Elliott [52]; Rabinowitz [55]; Tustin [57]					3			Limited- failing to show an association
Psychological	2	Self-reported symptoms	Casey [36]; Tustin [57]		1				1		Mixed
		Diagnosed sleep disturbances	Casey [36]		1						Insufficient
Respiratory	6	Self-reported symptoms	Elliott [52]; Rabinowitz [55]; Tustin [57]		1				2		Mixed
		Hospitalizations	Jemielita [53]; Peng [54]		1				1		Mixed
		Asthma exacerbation	Rasmussen [56]			1					Limited
Other	2	Self-reported symptoms (multiple)	Elliott [52]; Tustin [57]					2			Limited
		Hospitalizations (all)	Jemielita [53]						1		Insufficient

^a APGAR score: Appearance, Pulse, Grimace, Activity and Respiration score. ^b CNS: Central Nervous System.

3.5. Other Health Outcomes

We found limited evidence of a positive association between general multiple self-reported symptoms and living near ONG development, with two studies assessing this relationship [52,57]. The two studies however characterized symptoms differently: Elliott and her colleagues combined feeling stress, fatigue, muscle or joint pain, or any other health symptom into a “general health symptom” grouping [52]; while Tustin and his co-authors found significant effects only when at least two of the three symptoms they considered—chronic rhinosinusitis, migraine, and fatigue—were experienced jointly [57].

Two epidemiologic studies evaluated a variety of indicators of psychological well-being, including depression, anxiety and sleep disturbances [60,61]. Measures of mental health are not necessarily a result of direct exposure to substances emitted from oil and gas operations but could be indirectly associated with non-chemical environmental stressors such as noise, light, odors, or social stress of living near a hotly debated, politicized, and potentially risky industry. For example, studies have shown associations between living in areas with increased noise and traffic, such as by airports, with increased psychological symptoms [62–65].

There was mixed evidence for self-reported dermal symptoms, self-reported psychological symptoms, and cardiovascular hospitalizations. Other health effects, including neurological and all hospitalizations, diagnosed sleep disturbances, and self-reported cardiovascular symptoms, had insufficient evidence due to a single low-rated study per outcome. There was a demonstrated lack of evidence (no association) for gastrointestinal self-reported symptoms. Three studies evaluated self-reported dermal symptoms, such as rash, irritation, burning, itching, and hair loss, in relation to ONG in Pennsylvania, resulting in mixed evidence [52,55,61]. Skin-related health effects may be possible due to direct exposure to soil or water. However, the routes of exposure to ONG-related chemicals were not well characterized in these studies and encounters with other skin irritants were not documented, making it difficult to interpret these conclusions.

4. Discussion

In this paper, we summarized the observational epidemiologic literature on the health effects of populations living near ONG operations and assessed the methodological rigor of the studies published to date. Specifically, we used a modified systematic review framework, adapted from GRADE, the Navigation Guide, and guidance from OHAT, to determine the level of certainty that the study findings represent the true effect of exposures to ONG-related substances, and to make overarching weight-of-evidence determinations for a variety of health outcomes.

The strength of our review lies in its transparency and objectivity. We adapted previous systematic review guidelines to make the criteria for evaluating studies as clear as possible. We considered a wide variety of study evaluation questions to represent those domains. Our review framework can also be applied to other research questions in environmental health. For researchers, policymakers, and public health practitioners, this type of review can swiftly help elucidate key findings and gaps in the knowledge base that need to be addressed.

We found 20 published epidemiologic studies that evaluate potential associations between ONG operations and health outcomes. These studies assessed 32 different health outcomes ranging from self-reported symptoms to confirmed disease diagnoses. Since only a few outcomes were covered by multiple studies, there was insufficient weight of evidence for most health outcomes. We found studies of populations living near ONG operations provide limited evidence (modest scientific findings that support the outcome, but with significant limitations) of harmful health effects including asthma exacerbations and various self-reported symptoms. For all other health outcomes, we found conflicting evidence (mixed), insufficient evidence, or in some cases, a lack of evidence of the possibility for harmful health effects.

There are important limitations to our approach. First, it is not a meta-analysis as the current line of inquiry, including different exposure measures (and surrogates), health outcomes, and

geographic/geologic locations, is not suited to conducting a meta-analysis. Second, although we clearly stated our criteria for upgrading a study to a moderate or high level of certainty ranking, the number of study evaluation questions and the ranking cutoffs may still be viewed as arbitrary since Rooney et al. (2016) compares these systematic review methods and notes that the scoring of studies may be influenced by the number of elements and may not account for the differences in relative importance across the risk of bias domains [66]. Study certainty is difficult to quantify, but we used a quantifiable framework and did not allow factors such as media coverage or other publicity (positive or negative) to color our ranking system.

The majority of findings from the studies were ranked as low certainty, primarily due to limitations of the study designs that make it difficult to establish clear links between exposures to substances potentially emitted directly from ONG operations and the health outcomes evaluated. These limitations are inherent to observational epidemiologic studies and include indirect exposure measurements, confounding bias, and subjective methods to determine health outcomes. The field of environmental health incorporates these types of studies along with exposure and risk assessments to inform public health and policies. In addition to these factors, differences in the observational epidemiologic study types (e.g., retrospective cohort, case-control, ecological) make it difficult to compare results across studies with various health outcomes. These epidemiologic studies may also reflect the interactions of non-chemical or chemical stressors that may or may not be related to ONG operations that can contribute to adverse health outcomes in a population. Study quality has improved in recent years with better exposure measures and more thorough methods to account for possible confounders.

Although these observational epidemiologic studies alone are not sufficient to determine causality, they provide helpful information to direct further investigation into the public health implications of ONG activity near residential areas. Taken together, these studies make it clear that the identities and exposure levels of substances people are exposed to when living, working, or going to school near ONG development have not been well characterized. Epidemiologic studies that include more controlled designs with direct measurement of exposure and diagnosed health outcomes are needed to confirm or dispute the associations published in the literature. Incorporating a health impact assessment framework within an epidemiologic study may be useful. One such framework, developed by the Agency for Toxic Substances and Disease Registry (ATSDR) can be used to assess the health impacts of multiple chemicals and stressors [67].

Additionally, we have little empirically driven understanding of the factors (biological, geological, meteorological, and social) that drive ONG-related exposure patterns and vulnerability to such exposures. For example, there may be regional differences across the U.S., with varying technological controls or regulatory environments. Researchers should integrate community members [68–70] and concepts of health equity and environmental justice [69] into their research approaches. They should also consider using policy as a starting point rather than the conclusion in order to evaluate policies and ONG industry practices that have been implemented thus far (e.g., setback distances, number of wells drilled per well pad, etc.). Having an understanding and familiarity with the populations at risk for health effects from ONG development across states and regions within states is also important to prioritize evidence-based health-protective policy interventions and to improve public health prevention strategies [52,68–71].

ONG regulatory policy has not been informed by robust epidemiologic research literature. Now, 15–20 years since the widespread application of hydraulic fracturing and horizontal drilling in states as diverse as Colorado, Pennsylvania, Texas, and Kansas, the epidemiologic literature on the potential health effects of ONG operations is still inadequate to definitively guide policy, as evidenced by the mainly low certainty and conflicting studies reviewed here. Regulators and policymakers, then, should work with public health researchers to pose specific questions that need to be answered, and partner with public health officials to evaluate the public's concerns. Public health officials should continue to monitor health concerns in areas with substantial ONG operations through centralized data collection and analysis. Multi-state collaborations should be considered to collect consistent data from differing

oil and gas basins across the United States with the aim to more comprehensively evaluate the potential for adverse health effects.

Supplementary Materials: The following materials are available online at <http://www.mdpi.com/1660-4601/16/12/2123/s1>, Tables S1–S20: Study evaluation individual assessments, Table S21: Full summary details of epidemiologic studies included in systematic review, Table S22: Summary of answers to study evaluation questions.

Author Contributions: A.M.B., T.S.M., M.V.D., and D.I.V. initiated the manuscript and developed the overall strategy. A.B. and S.H. conceptualized the systematic review study evaluation questions and coded the articles for study quality (certainty). A.M.B. and S.H.H. wrote the first draft of the manuscript. A.S.N., S.M.W., M.V.D., K.R., T.S.M., and D.I.V. revised the final manuscript.

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Conflicts of Interest: The authors declare no conflict of interest.

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Response of Michael Krancer

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COMMON PLEAS**
INVESTIGATING GRAND JURY : **CP-02-MD-5947-2017**
:
: **NOTICE NO. 42**

**RESPONSE TO CERTAIN ALLEGATIONS
IN INVESTIGATING GRAND JURY REPORT NO. 1**

Pursuant to the Court’s April 7, 2020 Order, and by his undersigned counsel, respondent Michael Krancer hereby responds to the allegations in the report that may be construed as offering constructive or critical guidance to him. Such allegations are found at pages 6-7 and 62-63 of the report, and state as follows.

Mr. Krancer was the Secretary of the Department of Environmental Protection (“DEP”) from January 18, 2011 through April 13, 2013. The gravamen of the allegations is that, based upon a March 23, 2011 email from DEP’s then Executive Deputy Secretary John Hines, “any actions, NOVs, and such” required approval of the Executive Deputy Secretary and Dana Aunkst, with “final clearance from” then Secretary Krancer.

The report accurately and fairly states that Mr. Krancer testified before the Grand Jury that this was a “misunderstanding.” However, the report unfairly omits reference to an email authored the very next day by Dana Aunkst, an email that was presented to the Grand Jury, in which Mr. Aunkst apologized for the confusion caused by the Hines email of the day before. Although we are unable to have access to that email because it is a Grand Jury document, that email, as Mr. Krancer recalls it, specifically clarified that no such “final clearance” by the Secretary was necessary. Mr. Krancer was shown this email in the Grand Jury; yet no mention of it is made in the report. Given (i) the immediate correction that was made to Hines’s email,

and (ii) the fact that the Grand Jury report specifically emphasizes that, although the communication was based upon a misunderstanding, “employees who learned of the email did not take it that way,” this omission leaves an unfair, incomplete, inaccurate, and impression. Even if “employees who learned of the email did not take it that way,” it was corrected the very next day. In fairness, the next day email (and this Response) should be added to the report.

It is also important for context to note that, at the time of the Hines email, as Mr. Krancer recollects it now, nine years later, the Department was specifically undertaking (or was about to undertake) a formal consistency review regarding the different Regional Offices of DEP for NOV's and enforcement actions in the Oil and Gas program. That accounts for particular attention's being directed toward DEP actions at that time relating to oil and gas operations. The results of that review process were released in November 2011. This, Mr. Krancer believes, is the background and context of the Hines email.

Accordingly, for the foregoing reasons, respondent Krancer respectfully requests that this Response, and the next day Aunkst email, be attached to the report before it is made part of the public record.

Respectfully submitted,

/s/ Joseph G. Poluka
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Dated: April 28, 2020

-----Original Message-----

From: Aunkst, Dana
Sent: Thursday, March 24, 2011 12:30 PM
To: Taber, Nels; Burch, Kelly; Jugovic, George
Subject: Clarification on NOV Issue

John asked that I forward this message to you and your staff.

This message is to clarify my directive from March 23, 2011, regarding NOVs related to Marcellus Shale activities. It appears that message has caused significant confusion and consternation, and for that I apologize.

To be clear, we have in place an established MAA process. That process should be continued to be followed, as it provides appropriate notification to the Deputy Secretary and the Secretary regarding high-profile actions proposed by field staff

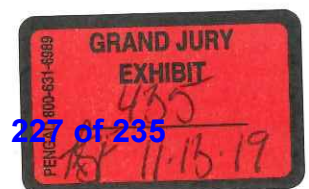
Field inspections are to continue as they have always been done. When violations are discovered, they should continue to be documented in inspection reports. For Marcellus-related violations that do not rise to the MAA level, however, prior to sending an NOV, that NOV must be forwarded to the Deputy Secretary for Field Operations. Staff will be notified when they may proceed with taking the notice action by sending the NOV.

Thanks for your cooperation.

John Hines

Let me know if you have any questions, guys. Thanks.

Dana



Response of Scott Perry

**IN THE COURT OF COMMON PLEAS
ALLEGHENY COUNTY, PENNSYLVANIA**

IN RE: : **SUPREME COURT OF PENNSYLVANIA**
: **71 W.D. MISC. DKT. 2017**
THE FORTY-THIRD STATEWIDE :
: **ALLEGHENY COUNTY COMMON PLEAS**
INVESTIGATING GRAND JURY : **CP-02-MD-5947-2017**
:
: **NOTICE 42**

**MOTION FOR INCLUSION OF RESPONSE OF DEPARTMENT OF
ENVIRONMENTAL PROTECTION WITNESS SCOTT PERRY
TO GRAND JURY REPORT**

1. The Forty-Third Statewide Investigating Grand Jury has produced a Report that outlines the Commonwealth's findings on, *inter alia*, the issues that Department of Environmental Protection ("DEP") has had in exercising its regulatory authority against companies that use hydraulic fracturing ("fracking") to harvest natural gas in Pennsylvania. That report has been referred to by this Court in prior orders as Investigating Grand Jury Report No. 1.

2. DEP Deputy Secretary of the Office of Oil and Gas Management, Scott Perry, testified before the grand jury, and his testimony is quoted in Investigating Grand Jury Report No. 1. He is also specifically named in multiple places in the Report.

3. On April 7, 2020, this Court entered an Order stating that pursuant to 42 Pa.C.S. § 4552(e), Mr. Perry would be permitted to prepare and submit a response to allegations made against him in Investigating Grand Jury Report No. 1 that "may be construed as offering constructive or critical guidance to him."

4. On April 20, 2020, this Court entered an Order permitting disclosure of the transcript of Mr. Perry's own testimony in front of the Forty-Third Grand Jury pursuant to 42 Pa.C.S. § 4549 so that he could properly prepare his Response to the Report in accordance with this Court's April 7, 2020 Order.

5. This Court further granted Mr. Perry until May 8, 2020 to file his Response.

6. Mr. Perry has reviewed the Report and his Grand Jury Testimony.

7. Pages 77-78 of the Report do not provide a complete and accurate description of the joint efforts by the Pennsylvania Department of Health (DOH) and the Pennsylvania Department of Environmental Protection (DEP) to incorporate health questions into DEP's forms used when registering complaints from complainants. Accordingly, Mr. Perry, who is specifically identified in an unfavorable light in those paragraphs of the Report, asks that Attachment A (which is the information set forth in ¶¶ 8-13 below) be appended as his Response to any public release of the Report, which to date, has remained under seal.

8. The Grand Jury Report at pp. 77-78 talks about efforts at incorporating health questions into DEP's environmental complaints. At page 77, the Report states that "DOH had proposed adding an 'active' box to DEP's water quality complaint form, which would require a DEP employee registering a complaint to ask the complainant whether they had any health concerns." The Report further states that this idea was opposed by "DEP, principally through Scott Perry, the Deputy Secretary of the Oil and Gas Management Program" because "it would constitute a 'leading question' and [a health complaint] was outside the area of DEP's expertise." The Report then states that DEP agreed to a 'passive' box on the complaint form; meaning if the complainant mentioned a health issue, unprompted, a notation to that effect would occur and be passed to DOH."

9. The Report states at page 77 that “[a]dditionally, DOH and DEP were only discussing adding a health question to water quality complaints, but health complaints regularly pertained to air quality, truck traffic, and other effects of unconventional oil and gas operations[.]” and “DOH was interested in developing ways they could gather information about these health issues as well.”

10. The Report further states at page 77 that DOH “continued to push DEP to take further action aimed at gathering public health information, including adding an ‘active’ question on health. Ultimately, however, Scott Perry refused to agree to more than adding the passive box to the water quality complaint form, and the [November 2018] meeting, which was contentious at times, ended.” The Report states at page 78 that after the November 2018 meeting, DEP cancelled all future regularly scheduled meetings by DOH without discussion and by deleting meetings from a shared outlook calendar.

11. These allegations of the Report do not accurately reflect what occurred. The decision to include a “passive” box to the DEP water quality complaint form regarding health concerns - as opposed to an “active” box - was not a unilateral decision made by Mr. Perry or by DEP but rather a joint decision by DEP *and* DOH. Mr. Perry and his counterpart at DOH - a DOH Deputy Secretary - discussed this matter and jointly agreed that the best procedure to employ would be the passive box, and not an active box. The DOH Deputy Secretary told Mr. Perry that he did not support adding an “active” box because it would constitute a “leading question.” The use of the phrase, leading question, originated with the DOH Deputy Secretary; not with Mr. Perry.

12. DEP did not limit the health question to water quality complaints but expanded it to include all investigations conducted by DEP where the DEP employee encountered a

complainant with health concerns. In all such matters, DEP would forward the complainant's contact information to DOH.

13. Moreover, the meetings between DEP and DOH stopped because DOH had not asked for another meeting and also because the objective of the meetings - to make sure there was a flow of information from DEP to the DOH registry - was accomplished. Mr. Perry notes that he would be willing to meet in the future with DOH provided there was an agenda with new matters to discuss.

WHEREFORE, for the reasons set forth above, Scott Perry respectfully requests that the Court include his Response (Attachment A) to the Investigating Grand Jury Report No. 1 if and when such Report is publicly released.

Respectfully submitted,

/s/ Linda Dale Hoffa

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Dated: 5/8/2020

ATTACHMENT A

**RESPONSE OF MR. SCOTT PERRY,
DEPUTY SECRETARY,
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PRODUCTION.
TO GRAND JURY REPORT #1
43rd STATEWIDE INVESTIGATING GRAND JURY**

The Grand Jury Report at pp. 77-78 talks about efforts at incorporating health questions into DEP’s environmental complaints. At page 77, the Report states that “DOH had proposed adding an ‘active’ box to DEP’s water quality complaint form, which would require a DEP employee registering a complaint to ask the complainant whether they had any health concerns.” The Report further states that this idea was opposed by “DEP, principally through Scott Perry, the Deputy Secretary of the Oil and Gas Management Program” because “it would constitute a ‘leading question’ and [a health complaint] was outside the area of DEP’s expertise.” The Report then states that DEP agreed to a ‘passive’ box on the complaint form; meaning if the complainant mentioned a health issue, unprompted, a notation to that effect would occur and be passed to DOH.”

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times, ended.” The Report states at page 78 that after the November 2018 meeting, DEP cancelled all future regularly scheduled meetings by DOH without discussion and by deleting meetings from a shared outlook calendar.

These allegations of the Report do not accurately reflect what occurred. The decision to include a “passive” box to the DEP water quality complaint form regarding health concerns - as opposed to an “active” box - was not a unilateral decision made by Mr. Perry or by DEP but rather a joint decision by DEP *and* DOH. Mr. Perry and his counterpart at DOH - a DOH Deputy Secretary - discussed this matter and jointly agreed that the best procedure to employ would be the passive box, and not an active box. The DOH Deputy Secretary told Mr. Perry that he did not support adding an “active” box because it would constitute a “leading question.” The use of the phrase, leading question, originated with the DOH Deputy Secretary; not with Mr. Perry.

DEP did not limit the health question to water quality complaints but expanded it to include all investigations conducted by DEP where the DEP employee encountered a complainant with health concerns. In all such matters, DEP would forward the complainant’s contact information to DOH.

Moreover, the meetings between DEP and DOH stopped because DOH had not asked for another meeting and also because the objective of the meetings - to make sure there was a flow of information from DEP to the DOH registry - was accomplished. Mr. Perry notes that he would be willing to meet in the future with DOH provided there was an agenda with new matters to discuss.

DATED: 5/8/2020