Aggregate/Combination Air Pollution and Shale Gas Development

EHP ENVIRONMENTAL HEALTH PROJECT SOUTHWEST PENNSYLVANIA

Shale gas facilities are permitted for pollution emissions as stand-alone entities and are not required to consider emissions across facilities that are close to each other. This is due in part to exemptions for oil and gas in the Clean Air Act, which put public health at risk.

Shale gas extraction from shale formations using hydraulic fracturing (fracking) produces significant emissions (air pollution) that can have a negative impact on health. As well pads and related development become regionally concentrated, these emissions are potentially more damaging. Individuals exposed to pollutants from multiple sources simultaneously may experience negative cumulative effects on air quality and health. However, regulators only consider the impact of each individual facility in isolation.

At issue is how to determine what's known as aggregation, or considering multiple pollution sources as one, which is allowed under the federal Clean Air Act. When multiple smaller sources of air pollution become regulated as one large source of air pollution, they can be subject to stricter air emissions standards. In considering the public health impact, the net effects of aggregate emissions on air quality need to be considered. A complicating factor is determining the appropriate unit of aggregation (e.g. by company, geographical region, analysis of interdependence and/or how near facilities are to each other).

Since public health depends on **what** is in the air **where** people are breathing, aggregating over **geographical regions** is most appropriate for public health.

Bob Donnan. Truck Transport.

Bob Donnan. Compressor Station.

Bob Donnan. PIG Operations.

Sources of potential air emissions related to shale gas development:

- Site preparation (building roads and clearing pads)
- Diesel fumes from heavy truck traffic, road dust, silica dust (delivering materials including silica sand, rigs and chemicals, and removing wastes from the site)
- Fugitive emissions from all infrastructure (cracks or leaks)
- Separation and treatment (removing water from shale gas and separating shale gas from other hydrocarbons)
- Flaring (burning off contaminated, noncommercial gas)
- Compressor stations (pressurizing shale gas in gathering and transport pipelines)
- Blowdown and venting (pressure relief)
- Metering stations (analysis of shale gas transferred via pipeline)
- PIG operations (cleaning and inspecting pipes)

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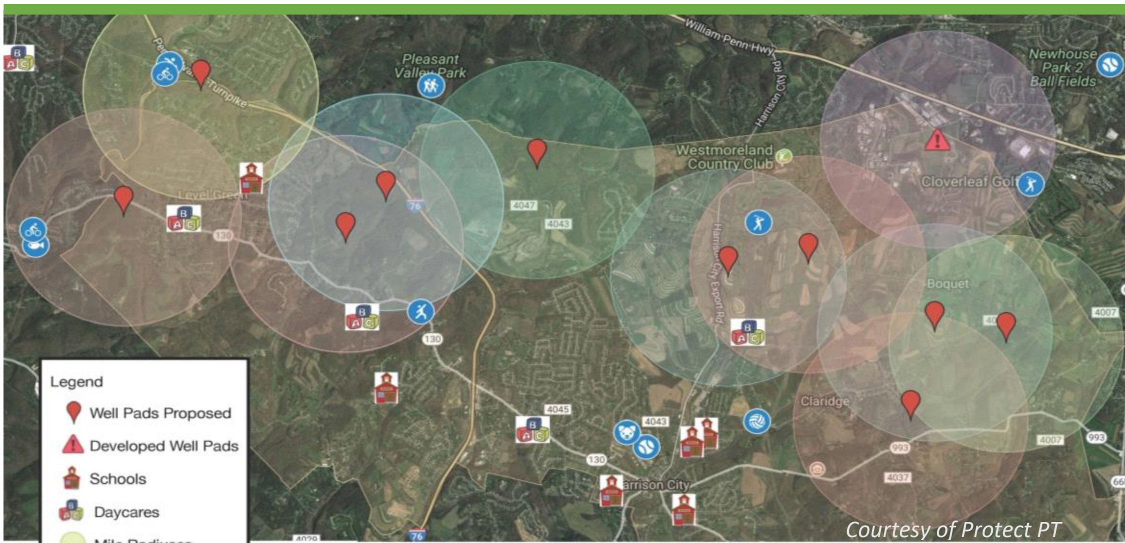

At the left is a visual example of combined air emissions affecting day cares, schools, recreational facilities and neighborhoods in a community. This picture shows a region in Penn Township, Westmoreland County, PA, with a developed well pad and 10 proposed well pads with overlapping 1 mile evacuation radiuses.

The health impacts of the combined emissions in these overlapping regions are not considered during the permitting process, putting residents at risk.

Shale Gas Air Pollutants and Their Potential Health Impacts

- **Criteria pollutants (Clean Air Act, EPA, 2012)** – six common pollutants that are regulated based on human health and environmental impacts. Shale gas emissions include five: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), ozone (smog), particulate matter (PM). SO_2, NO_x, and ozone contribute to respiratory effects. Long-term effects could include heart and lung disease among others.
- **Hazardous Air Pollutants (HAPs or toxic air pollutants)** – pollutants known or suspected to cause cancer, birth defects or other serious health or environmental impacts. Shale gas emissions include particulate matter, formaldehyde, and VOCs (such as benzene, toluene, ethylbenzene, xylene), to name a few. Short-term symptoms associated with these pollutants include asthma attacks, eye, nose, throat, lung irritation, and dizziness. Long-term symptoms could include cancer, and neurological and developmental effects.

Analysis of shale gas emissions data taken from the PA Inventory (industry reported emissions from gas facilities) indicates that the level of emissions in a region is dependent upon factors such as: the types of facilities, the number of facilities, and the quantity of gas being produced. Emissions released into the air from one gas facility mix with emissions from other gas infrastructure in the region. People living in the region breathe these combined emissions.

The proposed limit for emissions when calculating new facilities should consider all existing sources of pollutants in the region so as not to exceed federal levels of hazardous air emissions. Lay of the land and weather patterns are also important in determining if and where air will settle in a region. Regulations that take into account all such factors will better protect public health.

Recommendations to Regulatory Agencies to Better Protect Residents from Shale Gas Emissions

Consider existing shale gas emissions in an area before permitting additional infrastructure:

- Calculate the combined emissions within a specified distance from a source, taking into account:
  - Periods of significant emissions (levels that could plausibly induce acute health effects) that occur regularly within 1.2 miles (2 km) for well pads and small compressors; and
  - The range of significant emissions extends to 3.1 miles (5 km) or more for processing plants/larger compressor stations and compressor station complexes.

Resources:
https://www.ncbi.nlm.nih.gov/books/NBK201897/
https://www.epa.gov/clean-air-act-overview
http://iopscience.iop.org/article/10.1088/1748-9326/8/1/014017/meta
http://www.dep.pa.gov/business/air/baq/businesstopics/emission/pages/marcellus-inventory.aspx
http://www.tandfonline.com/doi/full/10.1080/10962247.2015.1056888
http://www.marcellushealth.org/final-report.html
http://dx.doi.org/10.1080/10934529.2015.992663
https://www.epa.gov/haps/what-are-hazardous-air-pollutants
https://earthworks.org/publications/loopholes_for_polluters/

February 2019

Funded by 11TH HOUR PROJECT THE SCHMIDT FAMILY FOUNDATION