

## Public Health Concerns for Local Governments Regarding Oil and Gas Drilling Waste

Hydraulic fracturing waste contains high levels of naturally occurring radioactive material brought to the surface by drilling as well as a toxic mixture of chemicals used in the fracking process. Bringing this waste to a region will:

- **Contaminate landfills with radioactive material** that could last *thousands* of years
- **Risk human exposure to radioactive material** from road spreading, truck accidents, leaks, and spills.
- **Risk safety of drinking water aquifers** from runoff, inadequate processing and containment tank corrosion, leaks, and ruptures.
- **Risk viability of wastewater treatment plants** due to processing of hazardous chemicals.
- **Risk contamination of food supply** from runoff, a contaminated water supply, airborne radioactive particles and disposal on farmland.

Hydraulic fracturing, also known as “hydrofracking” or “fracking”, is a technology used for oil and gas extraction from shale formations which involves the injection of millions of gallons of fresh water mixed with hundreds of chemicals and sand forced under high pressure into the well bores to crack open the shale. The fissures created by this fracturing are held open by the sand particles so that oil or gas can be released up the drill shaft.

Ten to forty percent of this highly toxic chemical mixture is returned to the surface with the oil or gas and additional naturally occurring contaminants, including volatile organic compounds (VOCs), heavy metals (e.g., arsenic, lead, chromium, mercury), brine eight times saltier than seawater, and radioactive elements, including radium-226, radium-228 and radon.

The extraction process produces two types of wastewater: **Flowback water** is the chemically treated fracking fluid that returns to the surface shortly after a fracking operation. **Produced water**, also known as "formation water" or "fracking brine" is the fluid that comes out of the shale formation along with the oil or gas. The process also produces tons of semi-solid waste in the form of drilling muds, sludge and cuttings.

The **Marcellus Shale** contains potentially high levels of naturally occurring radioactive materials ("NORM").<sup>1</sup> Hence the gas from the region can contain high levels of **radon**, a proven carcinogen and the leading cause of lung cancer among non-smokers, and the produced water and semi-solids can contain high levels of **radium-226** and **radium-228**, both known carcinogens.<sup>2</sup> Radium-226 emits gamma radiation which can travel fairly long distances through air, raising risks for cancer in distant communities. It has a half-life of 1600 years, and is linked to anemia, cataracts, and bone, liver and breast cancers.

***There is no safe disposal plan*** for the billions of gallons of wastewater and tons of sludge and cuttings currently being produced by oil and gas drilling, extraction and storage operations:

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<sup>1</sup> Naturally occurring radioactive materials (NORM) are distributed through geologic formations and exist undisturbed in nature far below the surface. However, when NORM are disturbed and transported by human activity to human environments they are considered "technologically enhanced naturally occurring radioactive materials" (TENORM), and may result in concentration levels above background levels.

<sup>2</sup> According to a U.S. Geological Survey study, levels of total radium tested in the wastewater from eleven active New York vertical gas wells averaged over 8,400 pCi/L, exceeding the EPA's maximum contaminant level for drinking water by more than 1,000 times (5 pCi/L for combined radium-226 and radium-228).

- Congress has exempted oil and gas waste from the definition of hazardous waste, even though it routinely exceeds criteria for such classification. This eliminates tracking requirements for its handling, storage, treatment and disposal.<sup>3</sup>
- Truck accidents, spills, and leaks from unmarked vehicles can expose drivers, police, EMTs and the public to hazardous chemicals and radioactive materials.
- Public and private wastewater treatment facilities are not capable of processing the hazardous chemicals and radioactive materials produced by drilling, extraction, production and storage activities.<sup>4</sup>
- Road spreading of fracking wastewater for dust control and de-icing on roads increases risk of exposure to drivers and pedestrians and contamination of nearby fields and surface waters. It also impacts groundwater, increasing risk for human and livestock inhalation and ingestion of highly radioactive materials, and carcinogenic and endocrine disrupting chemicals.<sup>5 6</sup>
- Landfill disposal of radioactive sludge from oil and gas drilling operations could contaminate them for thousands of years. Storage in closed containment tanks could eventually result in permanent groundwater and surface water contamination.<sup>7</sup>
- Presence of highly radioactive materials and other contaminants in local food products could cause irreparable damage and serious impacts to the economy.

When NORM is brought to the surface by drilling it is considered “technologically enhanced naturally occurring radioactive material” (“TENORM”). There are no established federal regulations that govern TENORM waste from oil and gas drilling, extraction and storage operations. The potential of cumulative effects from simultaneous exposure to several radionuclides is unknown.

Regulators and operators may be grossly underestimating radium levels and other radioactive contaminants by using improper methodology to detect radiation.<sup>8</sup> The use of radium alone to predict radioactivity concentrations can greatly underestimate total radioactivity levels.<sup>9</sup>

**RECOMMENDATION: Prohibit the procurement, acquisition, storage, handling, treatment, processing, application or disposal of all treated or untreated oil and gas drilling, extraction, production and storage waste byproducts and their constituents for any purpose.**

*This report was prepared by Grassroots Environmental Education, a science-based non-profit educational organization. An index to the Digest of Independent Research on Hydrofracking is available at*

<http://grassrootsinfo.org/issues/hydraulic-fracturing-fracking/digest-of-independent-science-on-hydrofracking/>

<sup>3</sup> Exemptions for oil and gas drilling enacted by Congress as part of the Energy Act of 2005 include the Safe Drinking Water Act, the Clean Water Act, the Clean Air Act, the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Environmental Policy Act (NEPA) and the Toxic Release Inventory of the Emergency Planning and Community Right-to-Know Act.

<sup>4</sup> High bromide levels in oil and gas drilling waste byproducts are highly corrosive to equipment and can react during water treatment to form brominated trihalomethanes linked to bladder and colon cancers and are associated with birth defects. Once added to drinking water supplies, trihalomethanes are difficult to eliminate.

<sup>5</sup> Consideration of Radiation in Hazardous Waste Produced from Horizontal Hydrofracking, Ivan White, Staff Scientist for the National Council on Radiation Protection <http://www.grassrootsinfo.org/pdf/whitereport.pdf>

<sup>6</sup> New York accepts oil and gas waste byproducts from Pennsylvania and has approximately 11,000 active wells in Western New York that produce toxic waste. NYS Department of Environmental Conservation provides approval of the use of production brine from vertical wells in the state for road applications via Beneficial Use Determination (BUDs)

<sup>7</sup> Data from Pennsylvania Department of Environmental Protection reveal New York landfills have accepted more than 23,000 barrels of liquid waste and more than 500,000 tons of solid waste from fracking operations in Pennsylvania

<sup>8</sup> Matrix Complications in the Determination of Radium Levels in Hydraulic Fracturing Flowback Water from Marcellus Shale, Schultz, Nelson, et al, Environmental Science and Technology, February 2014: <http://pubs.acs.org/doi/abs/10.1021/ez5000379>

<sup>9</sup> <http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2015/4/ehp.1408855.acco.pdf>