



Drilling Site

Radioactive Waste Material From Tapping Natural Resources

Rocks around oil and gas and mineral deposits may contain natural radioactivity. Drilling through these rocks and bringing them to the surface creates radioactive waste materials.

- Once minerals have been removed from ore, the radionuclides left in the waste are more concentrated.
- Scientists call this waste Technologically Enhanced Naturally Occurring Radioactive Material. It is generally referred to as TENORM (pronounced tee' norm).

About Radioactive Waste Material From Tapping Natural Resources

Radionuclides are found naturally in almost all soils and rocks. Usually they are safely below the surface, away from people. However, below the surface is also where many natural resources we use are located. Mining operations that bring resources to the surface also bring up materials containing radionuclides.

The naturally radioactive materials brought to the surface and/or concentrated by industrial processes are a special kind of waste. Scientists call it Technologically Enhanced Naturally Occurring Radioactive Material, or simply TENORM (pronounced tee' norm). Radionuclides in TENORM are mostly radium-226, radium-228ⁱ and radon gasⁱ. The level of radioactivity in TENORM can vary widely.

TENORM can exist in solids, liquids, muds and/or gases. They can come from different parts of the mineral extraction processes. Here are a few examples:

- **Overburden** – Soil and rocks that have been moved out of the way to get to the necessary ores are called overburden. In areas where there are high concentrations of radionuclides in the rock, overburden may contain relatively high levels of radioactivity. Typically, it contains little radioactive material.
- **Tailings** – Tailings or mill tailings are left over from processing ore to extract a desired mineral. The mineral may be radioactive, like uranium, or not, like gold. Taking out part of the ore leaves a smaller, but more concentrated volume of radionuclides.
- **Pipe Scale** – When water is pumped in and out of well and storage tanks a coating called pipe scale is created. Pipe scale is made up of the natural minerals found in water, which sometimes include radionuclides. Radioactivity in pipe scale can be quite high.



Oil drilling rig.



Abandoned Davis mine in Colorado with pile of overburden shown in front

Mining wastes must be properly contained. Otherwise, the radionuclides in these wastes can spread to surrounding areas. The movement of radionuclides in the environment depends on how well they dissolve in water (solubility). For example, radium is more soluble than uranium. Therefore, it more easily spreads around the environment.

Rules and Guidance

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA is responsible for setting federal radiation standards for exposure to TENORM. While there is not a single comprehensive TENORM regulation, EPA has developed standards for the oil and gas industries through several laws. Laws include:

- Clean Air Actⁱⁱⁱ.
- Clean Water Act^{iv}.
- Resource Conservation and Recovery Act (RCRA)^v.
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)^{vi}.

THE STATES

Some states set limits to control TENORM that is produced through oil and gas drilling extraction. Most states also use the federal Clean Air Act, Clean Water Act and other environmental laws to protect people from drilling wastes.

U.S. DEPARTMENT OF ENERGY (DOE)

DOE provides funding for research on the use and disposal of radioactive materials that come from developing energy sources.

What you can do

TENORM is not typically a hazard for the general public. Workers are the most likely group to be exposed to TENORM. To learn more about oil and gas drilling sites in your area, you can search online or contact your state geological survey or health department. Also, be sure to avoid mining or oil and gas production sites and abandoned equipment and never handle, dispose of or re-use abandoned equipment used at drilling sites.

Where to learn more

You can learn more about radioactive waste material from tapping natural resources by visiting the resources available on the following webpage: <http://www3.epa.gov/radtown/tapping-natural-resources.html#learn-more>.

ⁱ <http://www2.epa.gov/radiation/radionuclide-basics-radium>

ⁱⁱ <http://www2.epa.gov/radiation/radionuclide-basics-radon>

ⁱⁱⁱ http://www3.epa.gov/airquality/peg_caa/

^{iv} <http://water.epa.gov/action/cleanwater40/cwa101.cfm>

^v <http://www2.epa.gov/learn-issues/learn-about-waste>

^{vi} <http://www2.epa.gov/laws-regulations/summary-comprehensive-environmental-response-compensation-and-liability-act>