# NORTH DAKOTA
## FRACK WASTE REPORT

The failure to safely manage oil and gas waste

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*Dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.*

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# NORTH DAKOTA
# FRACK WASTE REPORT

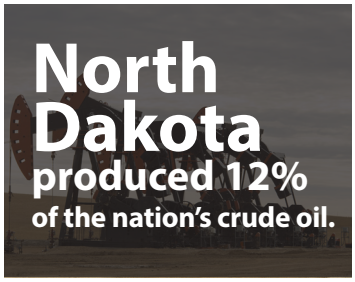
## June 2020 —Introduction

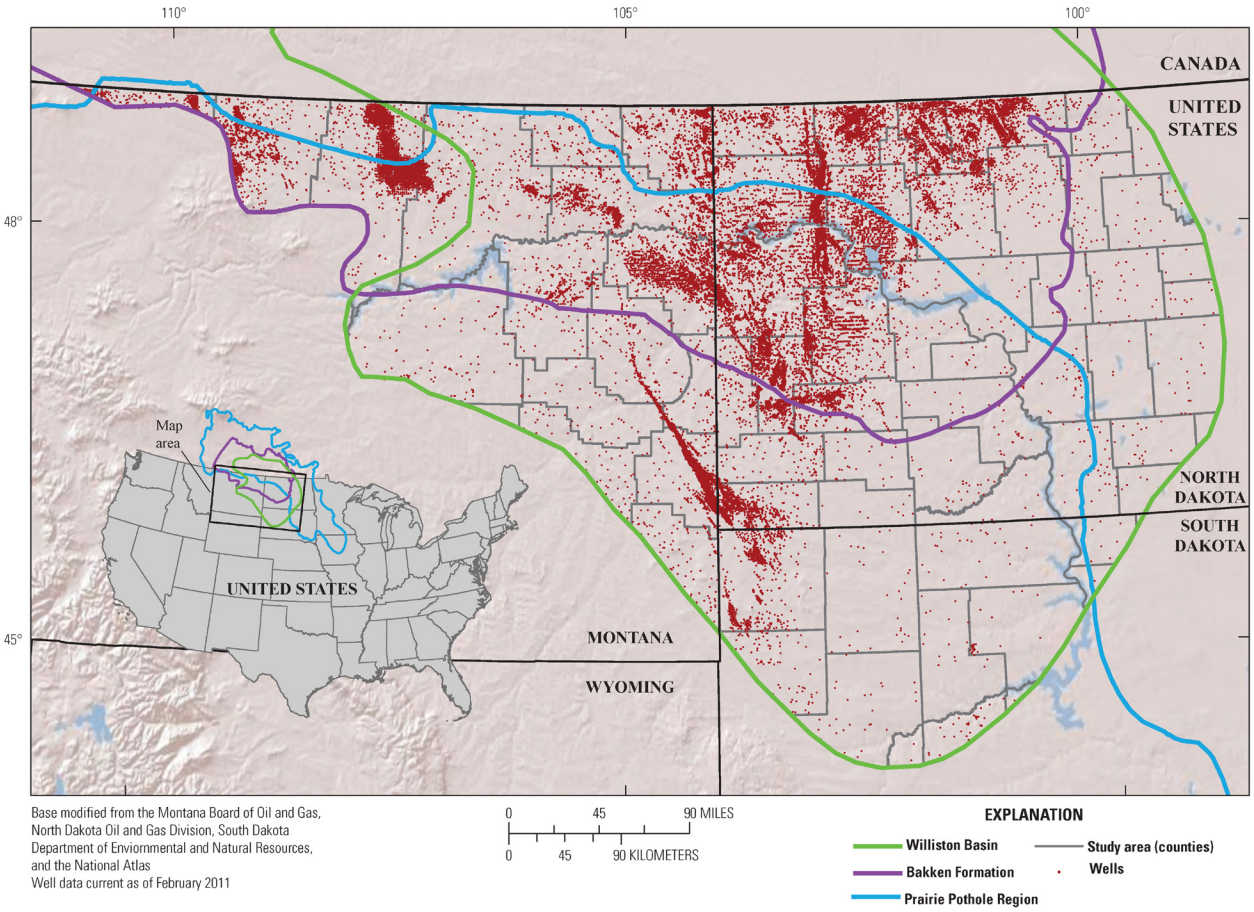
**North Dakota is a relative newcomer to large-scale oil and gas development. However, North Dakota is now the second largest crude oil producer in the United States, thanks to advances in fracking technologies and the state's significant oil reserves. This means North Dakota is also a major producer of oil and gas waste, which contains radioactive materials, secret chemicals, heavy metals and hydrocarbons. Increases in fossil fuel production have also led to an increase in spills, leaks, air, water and land pollution, which all pose risks to human and environmental health. While new rules for oil and gas have been created by the state, they are not enough to safeguard the people and places of North Dakota.**

## Background — Exploration and Waste

The first natural gas well was drilled in North Dakota in 1892. While some other states had oil exploration prior to 1900, the first commercial oil well in North Dakota wasn't drilled until 1951. The state, however, hasn't wasted any time in catching up to others. Within two months of that first wildcat oil well, 30 million acres were under lease. North Dakota's oil resources are located in the Bakken shale formation and the Three Forks tight sandstone formation, both found in the Williston Basin in the northwest part of the state.

North Dakota produces about 12 percent of the nation's total crude oil and about 2 percent of the natural gas.[1] As of September 2019, the state had more than 16,000 producing wells. Ninety percent are Bakken or Three Forks wells and ten percent are older conventional wells. North Dakota produced 43.3 million barrels of oil in September, an average of more than 1.4 million barrels/day, which was an all-time high. The vast majority of this oil—96 percent—came from the Bakken and Three Forks formations. North Dakota also produced a record amount of natural gas in August, 2019: 93 million cubic feet, or an average of three million cubic feet per day.[2] Given the number of active oil and gas wells in North Dakota, there are also large volumes of exploration and production waste generated.






90 percent of North Dakota's 16,000 wells (as of September 2019) are newer, fracked wells. Only 10 percent are older, conventional wells.

U.S. Department of the Interior, U.S. Geological Survey Updated: May 9, 2011

# Regulatory Trends

As in other states, the North Dakota fracking boom has been accompanied by a parallel boom in citizen complaints. Increases in leaks, spills, well blow-outs, and air pollution have led to a sustained outcry for officials to take action to protect citizens from threats to human and animal health, clean air and clean water, and public safety.[3] In response, state officials established some new rules for oil and gas operations in recent years, including the management of waste. While not adequate to provide the highest levels of environmental protection, the current rules offer increased safeguards as compared to the previous regulations.

In North Dakota, oil and gas waste may be stored and disposed of on-site, on land leased by the oil and gas operator, or it can be taken off-site to a different facility in North Dakota or in another state. The Department of Mineral Resources regulates waste management that occurs on an oil or gas well pad and the Department of Health regulates waste management off-site.

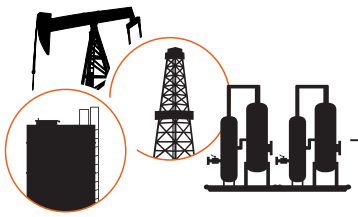
## Waste Regulations by Code

Chapter 43-02-05 of the North Dakota Administrative Code governs Underground Injection Control. Chapter 43-02-03 governs oil and gas waste operations overseen by the Oil and Gas Division of the North Dakota Department of Mineral Resources, including pits, as well as leaks and spills.

| Waste Regulations in North Dakota Administrative Code | |
|---|---|
| Section of Chapter 43-02-03 | Oil and gas operation |
| Section 43-02-03-19 | Pits |
| Section 43-02-03-30 | Leaks and spills |
| Section 43-02-03-29.1 | Wastewater pipelines (gathering lines) |
| Section 43-02-03-53 | Saltwater handling facilities, defined as any container and site used to handle, store, or dispose of saltwater, where saltwater is defined as "a waste product that is produced and separated from oil during the production process."[4] |

# Toxins in Oil and Gas Waste

**So what is oil and gas waste, exactly?** The waste streams from the extraction and production of oil and natural gas are a combination of solid, liquid and semi-liquid materials that contain both naturally-occurring and man-made toxins.



### Liquid Waste

Typically stored on-site in pits or tanks; some is reused; all ends up in underground "injection" wells, discharged to waterways after processing, or used for road or land applications.

**Wastewater**

- Flowback (includes fracking additives)
- Produced Water
- Brine
- Effluent from treatment facilities

**Leachate**

Leachate is wastewater that leaches from landfills, some of which accept oil an gas waste.

### In Between

**Drilling Muds, Sludge**

Material is added to these wastes for "solidification" before being sent to landfills.

**Pipe Scale**

Scale can either be disposed as solid waste, or dissolved and disposed of with liquid waste.

### Solid Waste

Disposed of in landfills. Drill cuttings have also been used as construction material.

- Drill cuttings (includes drilling additives)
- Fracking sand
- Fluid pit liners
- Filter socks
- Well site pad liners
- Contaminated soil
- Retired tanks and equipment

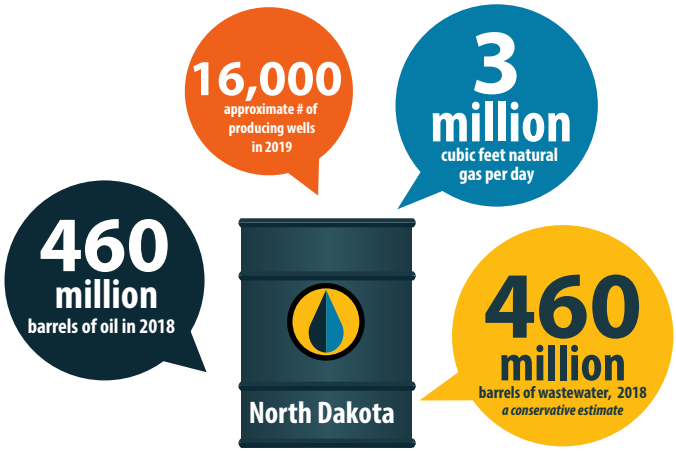
Because of exemptions from federal and state law, industry doesn't have to disclose the chemicals and additives they use.

Photo: Christopher Boswell/stock.adobe.com

Drilling pulls earthen material and underground water sources to the surface that contain heavy metals, like arsenic and lead, as well as carcinogenic, radioactive elements like radium-226, which has a half-life of 1,600 years and accumulates on equipment and in the environment. Both drilling and fracking (hydraulic fracturing – a technical process used to extract oil and gas from deep, tight layers of the earth) also typically involve the use of chemical additives that add harmful toxins like benzene to the mix.

Some waste streams, like drill cuttings and fracking sand, are generated once or twice during the lifetime of an oil or gas well. But others, like wastewater and retired equipment, are produced throughout the lifetime of an oil or gas well.

In order to properly treat oil and natural gas waste, you have to know what's in it, and because of exemptions from federal and state law, the industry doesn't have to disclose the chemicals and additives they use in North Dakota. In fact, there are no states that require full disclosure of drilling chemicals. Some states now require disclosure of fracking chemicals, but not all. And even fewer require any kind of disclosure of drilling chemicals. These undisclosed chemicals become part of the industry's waste stream.




**Just over one barrel of saltwater is produced for every barrel of oil in North Dakota.**

Like other states, North Dakota mirrors the federal exemption for hazardous oil and gas waste. Its definition of hazardous waste excludes drilling fluids, produced water, and any other wastes associated with exploration, development, or production of crude oil or natural gas.[5]

# Wastewater

Wastewater produced by oil and gas operations includes produced water, fracking flowback, and used drilling fluids. In North Dakota, wastewater is primarily disposed of by underground injection, but some of it may be spread on roads for ice or dust control.

According to the North Dakota Department of Mineral Resources, "just over one barrel of saltwater is produced for every one barrel of oil" in North Dakota.[6] In 2018, North Dakota reported more than 460 million barrels of oil produced.[7] An estimate of approximately 460 million barrels of wastewater, or 19 billion gallons, is therefore a conservative estimate of oil and gas wastewater produced in the state.

This enormous amount of waste has taken its toll on North Dakota's environment. A USGS study of three sites in North Dakota's "Prairie Pothole Region" examined 48 water quality samples in wetland areas and found that 34 samples were moderately or extremely contaminated with salt from produced water. Another seven were potentially contaminated, for a combined total of 41—or 85 percent of samples. The researchers concluded that much of the salt at two of the sites came from buried pits that contained waste from the 1960s, evidence that wastewater contamination can last for decades. While produced water is no longer allowed to be buried on-site in North Dakota, the USGS

**19 billion gallons or**
**237 million**
**BATHTUBS**
**wastewater in 2018 alone**

Massive installation of pumpjacks and storage tanks on the shore of Lake Sakakawea near Twin Buttes, North Dakota, photographed on August 20, 2014. Photo: © 2020 BruceFarnsworth.com / Support provided by Lighthawk.

Photo: Steve Oehlenschlager/stock.adobe.com

**Wastewater Spills 2018-2019:**

- 63,000 gallons of produced water near Killdeer
- 21,000 gallon spill into a tributary of the Missouri River
- 12,000 gallons onto pasture land near Epping
- 8,400 gallons of oil and produced water overflowed a tank near Williston

found that that there are still significant risks of contamination from current produced water management practices, including "breaks in transport pipelines, leaks or unregulated discharges from storage tanks or tankers trucks, and failures of well casings and aging infrastructure."[8]

North Dakota operators currently use pipelines to transport a lot of their wastewater. These pipelines, known as gathering lines, have been the cause of significant spills. In September 2018, a pipeline leak spilled more than 63,000 gallons of produced water near Killdeer and was reported to have contaminated rangeland.[9] In July 2019, two pipeline leaks resulted in a 21,000 gallon spill into a tributary of the Missouri River and another 12,000 spill onto pasture land near Epping.[10] The next month, 8,400 gallons of oil and produced water spilled when a tank overflowed near Williston.[11]

While oil and gas operators must submit information about their gathering lines to the Oil and Gas Division, they do not have to get a permit before beginning construction.[12]

# Solid Wastes

Solid oil and gas wastes can include drill cuttings, used drilling mud, tank sludges, fracking proppant, pipe scale, residual wastes from waste treatment, pit liners, filter socks, and more. In North Dakota these wastes are most often buried on-site or are taken to a landfill.

When solid waste from crude oil and natural gas exploration and production is taken to a landfill, North Dakota defines it as "special waste." The state's Department of Health currently regulates eleven active special waste landfills in North Dakota that are permitted to accept oil and gas exploration and production waste.[13] Reporting and record-keeping requirements may vary by facility and are not readily available on a public website, although they can be obtained through a formal records request process.

In addition to on-site burial or landfills in North Dakota, a lot of waste generated in the state is shipped to other states for disposal. Much of this waste is being shipped to a landfill in Montana that is permitted to take waste with a higher level of radioactivity than has been permitted at any North Dakota special waste landfills.[14]

North Dakota regulations require annual sampling of the leachate from these landfills.[15] The leachate must be sampled for more than 100 different potential contaminants, including heavy metals, naturally occurring radioactive material, volatile organic compounds, salts and other minerals.[16] According to the Department of Environmental Quality, most of the leachate is disposed of through evaporation in open air pits. When there is excessive leachate generated, for example due to heavy rains, the leachate may be transported to a disposal well and injected underground.[17] Sampling and monitoring information, as well as final disposition of leachate taken off-site, must be submitted in annual reports to the North Dakota DEQ.[18]

## Oil & Gas Waste Life Cycle

**DRILL CUTTINGS AND DRILLING MUDS**

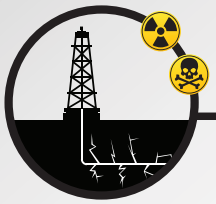
In some states, drill cuttings and the "muds" used to drill can be buried on site with little barrier between this waste and soil or groundwater. **Muds may contain petroleum products that can leach into groundwater and soil.**

**LANDFILL DISPOSAL**

Most of this (mostly) solid waste is sent to landfills for burial. **Despite the risk of radioactivity and toxicity, some states don't require radiation testing of waste or the LEACHATE that drains from landfills and can contaminate water and soil.**

**BENEFICIAL WASTE "RE PURPOSING"**

"Beneficial Reuse" REPURPOSING – Some states allow for the mixing of drill cuttings with other materials for use in construction, road building, and industrial development. **Somewhat experimental, there are few regulations to ensure this reuse isn't more harmful than "beneficial."**



**DRILLING & FRACKING**

When a well is drilled, rock and dirt that can contain naturally-occurring radioactive material (NORM) come to the surface as DRILL CUTTINGS. NORM that is "liberated" via industrial processes like drilling is sometimes called TENORM (Technically Enhanced Naturally-Occurring Radioactive Material). **When mismanaged, these radioactive materials can make their way into water, soil and air.** FRACKING FLUIDS containing trade-secret chemicals are pumped into wells and resurface as liquid waste. **These mystery toxins contaminate water and soil wherever they spill and complicate disposal.**

SOLID WASTE

LIQUID WASTE

**FLOWBACK AND PRODUCED WATER**

Drilling and fracking also produce liquid waste over the lifetime of a well. For the first 2-3 months, this waste is called FLOWBACK. Afterward, it's called PRODUCED WATER or BRINE, which is often saltier than seawater and contains heavy metals, hydrocarbons, fracking chemicals, and radioactive materials. Some of this wastewater can be recycling for further fracking. **Mismanaged liquid waste has contaminated drinking water supplies and rivers across the U.S.**

**TREATMENT AND DISCHARGE**

Wastewater can be processed to reduce, but not completely remove, pollutants & discharged to waterways. **This has led to the accumulation of toxins in rivers and threatened human and environmental health.** Toxins are concentrated into sludge left over from the treatment process which is then taken to landfills.

**ROAD & LAND SPREADING**

Many states allow spreading of PRODUCED WATER/BRINE from "non-fracked" wells on roads for dust suppression and deicing. **The radioactive materials, heavy metals and other toxins in this wastewater can accumulate in and pollute roadsides and nearby waterways or farm fields.** Some states also allow for the use of produced water for irrigation and livestock feeding.

**INJECTION WELLS**

Most wastewater from oil and gas operations ultimately ends up being injected underground for disposal. **These injection wells can leak and contaminate groundwater and cause earthquakes.**

**HEALTH ALERT**

At all stages of the oil and gas waste management process, toxins can enter the environment accidentally (spills, leaks, waste truck rollovers, and illegal dumping) or legally under current state and federal law (road spreading, discharge to rivers, landfill leaching). Oil and gas waste contains varying amounts of heavy metals, radioactive materials, salts, hydrocarbons, and other pollutants, some of which are carcinogenic and threaten human and environmental health. A list of oil and gas waste contamination cases can be found in our full report *Still Wasting Away* at Earthworks.org.

# Waste Storage and Disposal Methods

## Storage Pits

North Dakota regulations cover several types of pits used for oil and gas waste including drilling pits, reserve pits, pits for waste generated during well plugging, and pits for the liquid associated with the flaring of casing head gas.[19] Some of the rules pertaining to pits were last updated in 2012 and others in 2014.

In North Dakota, drilling and reserve pits can either be used for temporary storage or permanent disposal of solid waste. When permanent, the waste can be buried on the well pad. Drilling pits can be used to bury drill cuttings and any other solids generated during drilling and completion. The drill cuttings and other solids must be stabilized and encapsulated before being buried on-site.[20] Reserve pits are also used to contain drill cuttings and other solids but may also temporarily contain fluids generated during drilling and fracking. As

with drilling pits, solid waste can be buried on-site in reserve pits but any water or oil must be removed before reclamation.[21] While most pits are required to be lined unless there is a waiver from the Oil and Gas Division, there are no regulatory requirements for the thickness of pit linings. Liners that are too thin are more likely to tear and allow waste to leak out of the pit and potentially contaminate soil and groundwater.

A 1997 report found that about 95 percent of drilling waste generated in North Dakota, including drilling mud and drill cuttings, was buried on-site in reserve pits.[22] While there are no recent data, according to the North Dakota Oil and Gas Division, the majority of waste is now taken off-site for disposal.[23]

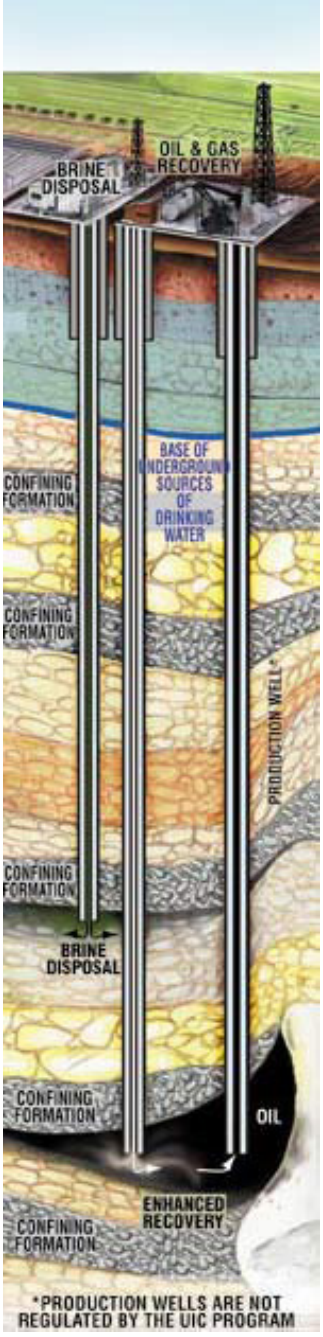
Other types of pits are used for temporary storage of waste. Lined pits are used to contain waste from well plugging operations, and the rules require that such waste be removed within 72 hours of the plugging operation. Pits can be used to contain fluids from the flaring of casing head gas but the fluids must be removed from the pit within 24 hours.

While there are not specific setbacks for pits in North Dakota, they are subject to the restrictions applied to the well pad. In North Dakota, wells and saltwater handling or treating facilities on a well pad have to be at least 500 feet from an occupied dwelling (although this can be waived by the homeowner or the North Dakota Oil and Gas Commission).[24]

## Underground Injection

Oil and gas wastewater can be injected underground in three primary ways: in a disposal well, used solely for waste disposal; for enhanced recovery (EOR) where it is used to increase pressure underground for better oil production; or used for fracking, where the wastewater is mixed with fracking chemicals. The first two categories are regulated under the Safe Drinking Water Act's Underground Injection Control (UIC) program, where they are considered Class II UIC wells. As of December, 2018, there were 1,255 active UIC wells in North Dakota, of which 684 were EOR and 571 were for disposal only. There is no evidence that wastewater is being reused for fracking or drilling in North Dakota.

A 2015 report found that "nearly all" North Dakota produced water in 2012 was injected underground, with 56 percent injected into a disposal well owned by the oil and gas producer, 26 percent sent to an off-site commercial disposal facility owned by a third party, and 18 percent used for EOR.[25]




**Oil and gas wastewater can be injected underground for disposal, or for increasing formation pressure for enhanced recovery (greater fossil fuel production).**

## Aquifer Exemptions

In 1980, the U.S. EPA established rules that created a process for exempting certain aquifers from protections under the Safe Drinking Water Act, claiming they did not have the potential—either the quality or quantity—to be used as drinking water sources. Through this process, EPA has exempted thousands of aquifers across the country from protection. This has allowed the oil and gas industry to dispose of oil and gas wastewater in aquifers that might have been an underground source of drinking water.

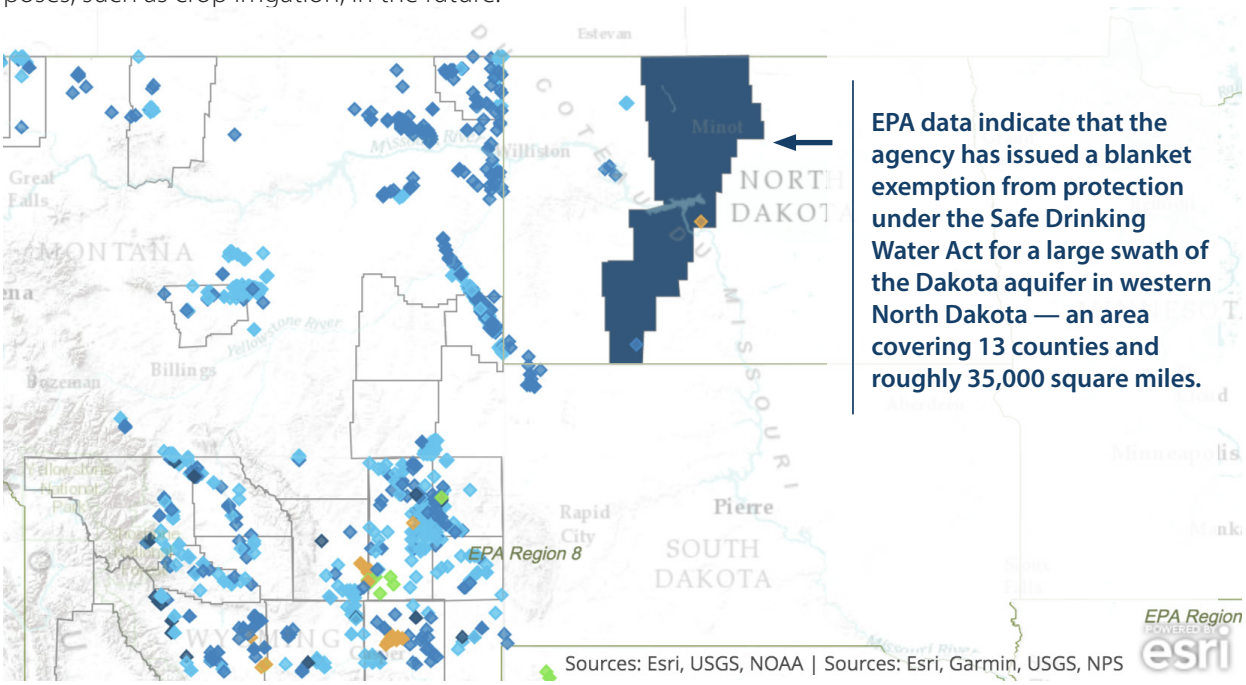
**Once an aquifer is used for oil and gas waste disposal, it can never be used for drinking water or other purposes, such as crop irrigation, in the future.**

The data quality available from the EPA regarding aquifer exemptions is inadequate, including missing information or imprecise locational data. However, while there are relatively few known aquifer exemptions in North Dakota, one of the aquifer exemptions is enormous.

EPA data indicate that the agency has issued a blanket exemption from protection under the Safe Drinking Water Act for a large swath of the Dakota aquifer in western North Dakota – an area covering 13 counties and roughly 35,000 square miles.[26]

While it may not currently be used for drinking water or agriculture, it is a massive water source that may be needed in the future. In addition, there are thousands of aquifer exemptions in neighboring Montana, many of them just along the North Dakota-Montana border[27]that may be used to dispose of oil and gas wastewater generated in North Dakota.

Once an aquifer is used for oil and gas waste disposal, it can never be used for drinking water or other purposes, such as crop irrigation, in the future.




**EPA data indicate that the agency has issued a blanket exemption from protection under the Safe Drinking Water Act for a large swath of the Dakota aquifer in western North Dakota — an area covering 13 counties and roughly 35,000 square miles.**

**MAP KEY**

- **The Dakota/Lakota aquifer exempt by EPA from protections and therefore used for Class II waste disposal by the oil and gas industry**
- **Class IID wells for oil and gas purposes**
- **Class IIR wells for oil and gas purposes**
- **Class I aquifer exemptions for municipal and industrial wastes**

## Treating Plants

North Dakota oil and gas companies use facilities known as "treating plants" to help process their waste. According to the Department of Mineral Resources, treating plants are facilities that separate solid wastes like drill cuttings and tank bottoms from wastewater and oil.[28] The oil is sent to market, the solid wastes are sent to a landfill or buried on-site, and the wastewater is sent to an underground injection well either on- or off-site. There are currently 24 active treating plants in North Dakota. Treating plants do not include facilities on a well pad that treat drilling mud, drill cuttings, or flowback water during drilling or fracking.[29]

## Road Spreading

North Dakota considers oil and gas wastewater to be "an effective substitute for commercial products" when it comes to dust suppression or de-icing and allows it to be sprayed or spread on roads for those purposes.[30] North Dakota guidelines specify that "[o]nly brine from production waters" can be used for ice or dust control. While this term is not defined, it appears to exclude the fracking flowback that is returned to the surface before production begins, and only includes the liquid waste produced over the lifetime of the well. This practice of road spreading is already occurring in the state.[31]

The current guidelines for the use of produced water for dust control and de-icing roads were issued in 2013, but this activity was authorized even prior to that.

Road spreading of oil and gas wastewater presents significant health risks. In 2018, Penn State University revealed that,

> *"[t]he spreading of brine from oil and gas drilling can threaten environmental and public health by leaching into the surface or groundwater. . . modifying soil chemistry, and migrating in air and dust."*

The criteria for brine use in North Dakota does not include sampling for radioactive materials. This presents a huge problem. Penn State's aforementioned study "indicated high levels of radium resulting from such spreading" in Pennsylvania.[32]

## Reuse/Recycling

There is very little data on the reuse of produced water from oil and gas wells for further fracking, in lieu of freshwater.

According to a June 2019 report by the Groundwater Protection Council, "only about 5 percent of the wells drilled in 2014 used produced water in their fracturing fluid. This is partly due to state regulations that prohibit storage of salty produced water in open-air pits and partly because the extreme salinity of produced water in this area makes treatment and reuse difficult and expensive."[33] The report also reveals that Hess Corporation reused approximately 2,000,000 barrels of produced water in 2017 for well workovers and maintenance, but there is no comprehensive analysis of annual water reuse statewide.

# Spills

One analysis of North Dakota spill data found that more than 8,000 spills of fluids were recorded from 2008 to 2015 and entailed almost 14 million gallons of "brine" or produced water.[34]

A study of spill sites in North Dakota found that all the vegetation where spills occurred on land and all aquatic life where waste was spilled into waterways "were destroyed and becoming lifeless." One of the study authors described North Dakota wastewater as the cause of "ecological disaster."[35]

An NBC News investigation of North Dakota spills found that over the past ten years there have been more than 800 oil and gas wastewater spills that traveled off of well pads into surrounding landscape.[36]

**2 gallons**
**PER MINUTE**
**wastewater spilled in North Dakota**

There is evidence in North Dakota of spills not being reported,[37] spills not being cleaned up in a way that returns the site to its original condition, landowners not being fully compensated for damages, and inaccurate reporting of the size of spills. One analysis found that the number of wastewater spills per well in North Dakota almost tripled between 2004 and 2013 and that the average spill rate comes out to be more than two gallons per minute. For example, a single 2015 wastewater pipeline leak spilled almost three million gallons of wastewater into Blacktrail Creek.[38]

North Dakota regulations require that all waste recovered from spills and leaks be immediately disposed of in an authorized facility, although the remediation of such material may be allowed on-site if approved by the director.[39] In the latter case, contaminated soil would be collected and then placed on a plastic liner to protect soil and groundwater. Once contained, it would be treated in some way, such as bioremediation. Once contaminant levels are reduced to meet agency standards, the soil can be returned to the site.

North Dakota has a public spill database that includes reports of incidents that occurred in the oilfield. In the twelve-month period ending December 5, 2018, there were 351 spills of produced water reported to have been contained within the boundaries of a production or exploration facility and 72 reported that were not contained, for a total of more than 400 reported spills in one year alone. The largest spill reported during this period was 4,050 barrels, or almost 128,000 gallons, in McKenzie County.[40]

**128,000 gallon fracking wastewater spill. Photographed on drainage above Bear Den Bay, Lake Sakakawea. Fort Berthold Indian Reservation, North Dakota on August 9, 2014.**

Photo: © 2020 BruceFarnsworth.com

# Radioactive Oil and Gas Wastes

Under North Dakota rules, TENORM, or technically enhanced NORM (naturally occurring radioactive material) is created when commercial activities like oil and gas extraction increase the radionuclide concentrations of NORM.[41] Common places where TENORM is found in the oil and gas industry include drill cuttings, tank bottoms, pipe scale, fracking proppant after use, flowback, filter socks and produced water.[42]

In 1997, a joint review by the U.S. EPA and the Interstate Oil and Gas Compact Commission (IOGCC) evaluated North Dakota's regulatory program for exploration and production wastes. The 1997 review found, among other things, that North Dakota did not have specific regulations for managing oil and gas wastes contaminated with NORM and recommended the promulgation of rules and regulations specific for this type of waste.[43]

## Filter Socks

In 2014, North Dakota's regulatory standards for radioactive oil and gas waste received widespread public attention when illegal dumping of radioactive "filter socks" was found at sites around the state. Filter socks are shaped like large "tube" socks and are used during wastewater treatment to filter out solids that can contain radioactive materials, including fracking proppant and naturally occurring materials like dirt or rock, from fracking flowback, sludge, or produced water.

At one site, tons of radioactive filter socks were found in leaking trailers outside of Watford City.[44] At another site in Noonan, hundreds of plastic bags stuffed with used, radioactive filter socks were found filling six rooms of an abandoned gas station.[45] In 2014, state officials estimated that the North Dakota oil and gas industry generated as much as 70 tons of used filter socks each day.[46]

Until 2014, the state had banned any landfill from taking waste that had a radioactivity level higher than 5 picocuries per gram. That standard led to a significant amount of North Dakota oil and gas waste that could not be accepted at landfills in the state. Much of that waste was shipped to landfills out of state, such as in Montana, but also to states as far away as Texas or Washington. Some of that radioactive waste, however, was instead dumped illegally, presumably to avoid the costs of legal disposal.

North Dakota officials recognized that the situation was becoming increasingly problematic and commissioned Argonne National Lab to investigate the issue and develop recommendations for a scientifically-based disposal standard for TENORM. Based on the results of the Argonne study published in 2014, the North Dakota Health Department proposed new rules in 2015.[47] These new rules allow landfills in the state with appropriate permits and standards to accept waste material with up to 50 picocuries per gram of radioactivity. The new rules also limit the amount

Oilfield worker disposes of dirty radioactive fracking filter socks at pump station. Near Keene, North Dakota, May 30, 2014.
Photo: © 2020 BruceFarnsworth.com

Radium-226 is the main radionuclide of concern in NORM. It is water-soluble with a half-life of 1,600 years.

Photo: Steve Oehlenschlager/stock.adobe.com

of waste that a facility can accept each year and require that the waste is buried at least ten feet below the surface.[48] New guidance also requires oil and gas operators using filters or filter socks to have a container on each well pad and at each UIC disposal well site to store the filters and socks until they are transported off-site. The containers must be leakproof and covered to prevent precipitation from entering the container.[49]

## Mounting Radioactivity Concerns

Despite protections outlined in North Dakota's radioactivity regulations, there is concern about the build up and leachability of radioactive materials in places like landfills. As of February 4, 2020, no landfills have been approved for disposal of radioactive oil and gas waste under the new rules.

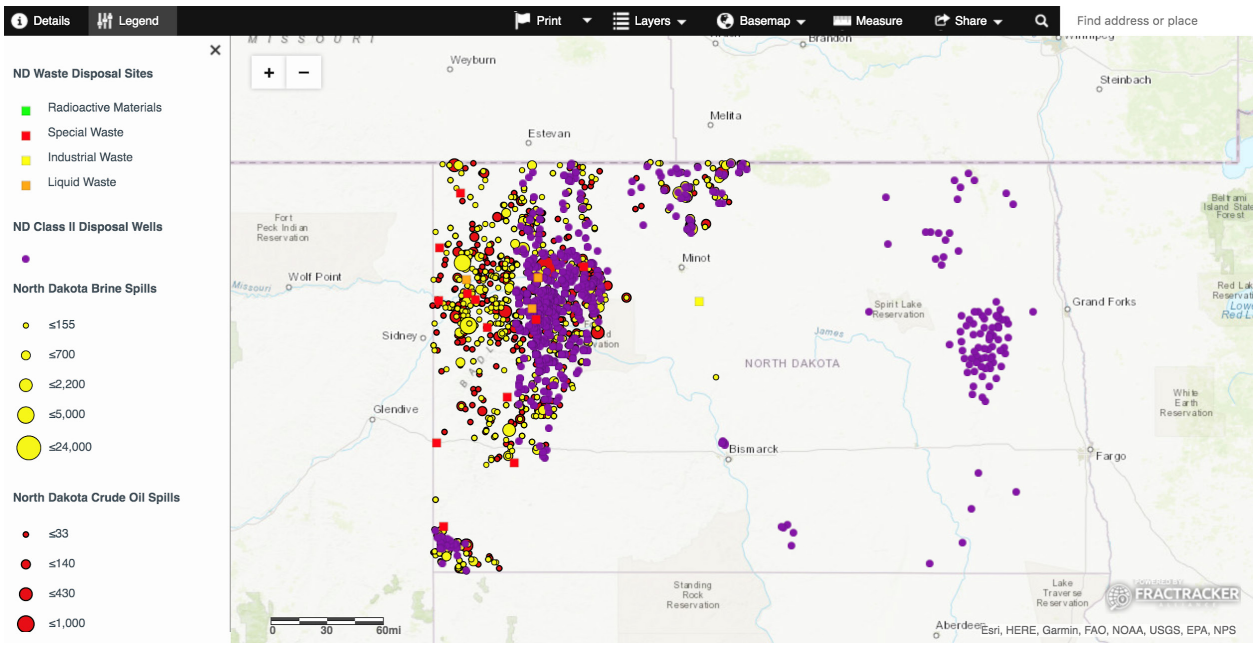
In August, 2019, the North Dakota Department of Environmental Quality held a public hearing on the first landfill in the state to request a permit to accept TENORM with up to 50 picocuries per gram. The facility is in Williams County.[50] However, in December 2019, Williams County officials denied the local permit required to build the facility and imposed a one-year moratorium on further plans for TENORM landfills until further study could be conducted.[51]

**Researchers found that soil downstream of oil and gas wastewater spill sites contained higher levels of radioactivity than soil at the spill sites themselves, suggesting that carcinogenic radium builds up in soil as wastewater flows through the environment.**

Filter socks are not the only source of dangerous NORM or TENORM. North Dakota's many wastewater spills increase the risk that radioactive material will be released into the environment. A recent study analyzed the water and soil quality in areas that had been impacted by oil and gas wastewater spills in the Bakken region. In addition to other contaminants found in the analysis, including dissolved salts, selenium, ammonia, and lead, the study found that soil and sediment sampled at the spill sites had elevated total radium that persisted even years after a spill.[52] The researchers also found that soil samples collected downstream from spill sites contained higher levels of radioactivity than soil at the spill sites themselves, suggesting that radium builds up in the soil as wastewater flows through the environment.[53]

Another scientific study looked at the impacts of the January 2015 wastewater pipeline leak that spilled more than three million gallons of wastewater into Blacktail Creek. The investigation found contaminants including elevated salts, lithium, strontium, semi-volatile hydrocarbons, barium and radium. The radium levels detected downstream from the spill site were up to fifteen times higher than upstream levels, and researchers wrote that their findings "support the conclusion that elevated concentrations in Blacktail Creek water are from the leaking pipeline."[54]

Radium is a cancer-causing, naturally-occurring material liberated by oil and gas operations that has a half-life of about 1,600 years.




FrackTracker Alliance has created a map of disposal sites for oil and natural gas waste, including injection wells, as well as crude oil and brine (wastewater) spills in North Dakota. All of these disposal and spill site locations present a potential danger to the environment through migration, leaching, and introduction of toxins like radium-226 and benzene. Use the interactive North Dakota Waste map here.

# Transparency

In addition to the spill database managed by the North Dakota Department of Health, the North Dakota Oil and Gas Division has a public GIS database available on its website. It also has a well database that is available by subscription. A basic subscription costs $50 per year and includes access to an index of all permitted wells, basic well information, completion data, initial production tests, cumulative production and injection volumes, forms, reports, and other miscellaneous information. A premium subscription costs $175 per year and includes all of the information available in a basic subscription plus field orders, case files, well logs, audio recordings of Commission hearings, and other data.[55]

While North Dakota provides more information than some other states, North Dakota's database is considered cumbersome to analyze and may not capture all violations or other important information.[56]

We must close the state's hazardous waste loophole for oil and gas waste by including drilling fluids, produced water, and any other wastes associated with exploration, development, or production of crude oil or natural gas.

Photo: Steve Oehlenschlager/stock.adobe.com

# Conclusion

North Dakota has had over 70 years to learn from the pollution that results from the mismanagement of the waste produced by oil and natural gas production. However, despite regulatory updates in recent decades, the state has left the public and the environment open to further exposure to toxins. The following policy recommendations must be implemented to ensure that further harm is prevented.

# Recommendations

- **No more hazardous waste exemption** – close the state's hazardous waste loophole for oil and gas waste by including drilling fluids, produced water, and any other wastes associated with exploration, development, or production of crude oil or natural gas in the definition of hazardous waste, until proven otherwise.
- **No more road spreading** – studies show that spreading brine from oil and gas wells laces the environment with radioactive materials and other potential toxins.
- **No more waste in pits** – prohibit the storage or disposal of oil and gas waste in earthen pits. All waste should be stored above ground in holding tanks with secondary containment measures in the event a tank fails.
- **No more disposal in aquifers** – stop using groundwater aquifers for the disposal of oil and gas waste.
- **No more guessing where waste is going** – publicly disclose and map facilities accepting, processing, and disposing of oil and gas waste, including landfills, pits, and injection wells.
- **Stop the spills** – North Dakota's spill rate is far too high. Operators who routinely spill (i.e. more than one per year) must be denied new permits.

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