

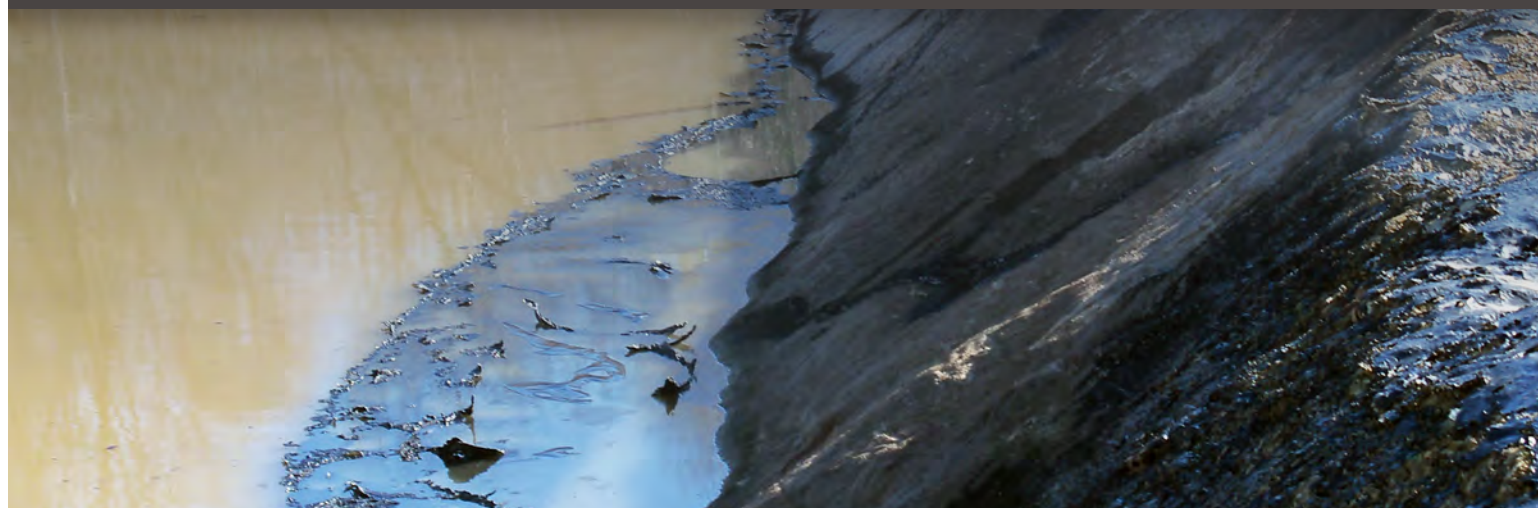


# NEW YORK FRACK WASTE REPORT

July 2019



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AUTHOR:

Melissa Troutman, Research & Policy Analyst, Earthworks

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EARTHWORKS • 1612 K St., NW, Suite 904 Washington, D.C., USA 20006  
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*Dedicated to protecting communities and the environment from the  
adverse impacts of mineral and energy development while promoting  
sustainable solutions.*

# Table of Contents

Introduction.....	4
New York State Prohibits Fracking, But Still Accepts Frack Waste.....	4
New York Imports Fracked Gas and Its Waste.....	5
New York Denies Taking Fracking Waste – The Data Shows Otherwise.....	5
Oil & Gas Waste Life Cycle .....	6
Solid Waste and Radioactivity.....	7
Liquid Oil & Gas Waste.....	8
Terrible Waste Tracking and Testing .....	9
NY’s Hazardous Waste Loophole for Oil & Gas .....	11
NY’s Landfills and Leachate .....	12
Spreading Waste on Roads.....	13
Conclusions and Recommendations.....	14
A Look Ahead: Legislation to Protect New York State.....	15
It’s Up to You!.....	15
Endnotes.....	16





# NEW YORK FRACK WASTE REPORT



## July 2019 —Introduction

Since Earthworks released our 2015 report on oil and gas waste management in New York State, improvements have been made in state law governing the industry's waste. However, several key policy gaps remain, putting New Yorkers at risk for exposure to toxins from the transport, storage, treatment, and disposal of unconventional oil and gas waste from Pennsylvania. This updated report offers the latest data and policy analysis, as well as changes still needed to protect the air, water, land and health of New York's people and environment.

## New York Prohibits Fracking, But Still Accepts Frack Waste

In December 2014, alongside his conservation and health officials, New York Governor Andrew Cuomo placed a prohibition on high volume hydraulic fracturing – aka fracking – for natural gas from shale formations. The decision came after the release of the state's long-awaited health impacts review, which considered hundreds of studies and reports from states nationwide,<sup>1</sup> and was also based on the decision to keep key watersheds and lands off limits to drilling activities.<sup>2</sup>

Referencing these health risks, New York Department of Health Commissioner Dr. Howard Zucker became the first top-level state health official to acknowledge the serious risks to air, water, and health posed by oil and gas development when he

recommended that fracking not be allowed to go forward. Then-Commissioner of the Department of Environmental Conservation Joseph Martens also emphasized that the risks far outweighed any potential benefits to the state.



Graphic: New Yorkers Against Fracking

In media interviews, Governor Cuomo defended the prohibition by stating that no child should have to live near a shale gas well, and that he would not trade people's health for jobs.<sup>3</sup> But while Cuomo may have protected residents from the risks that accompany drilling and high volume fracking operations, the Empire State has still pursued some of the financial benefits, and has reaped some of the costs.



# New York Imports Fracked Gas and Its Waste

Currently, New York imports both fracked natural gas and fracking waste from neighboring Pennsylvania, where residents have lodged over 9,000 complaints<sup>4</sup> of water, air, pipeline, noise and land pollution impacts since fracking began there in 2004. Many of these complaints involve contamination of drinking water, farmland, streams, forests, and more from frack waste spills, leaks, and blowouts.



During a blowout, an operator loses control of toxic waste that builds up in a well, spewing it into the air and surrounding environment.<sup>5</sup>

Unfortunately, the health and environmental concerns that have so far kept fracking out of New York have not been applied to oil and gas waste, despite the fact that dangers posed by fracking waste were cited in the summary Findings Statement that justified the 2014 prohibition.<sup>6</sup>

*“Residual fracturing chemicals and/or naturally-occurring constituents from the rock formation could be present in production brine and could result in treatment, sludge disposal, and receiving-water impacts. Salts and dissolved solids may not be sufficiently treated by municipal biological treatment and/or other treatment technologies which are not designed to remove pollutants of this nature.” (page 5)*

In this Statement, the state acknowledges the presence of fracturing chemicals and naturally occurring contaminants in liquid waste (production brine) but fails to mention the contaminants inherent to other waste streams, such as drill cuttings and servicing fluids (which include muds and foams), that are processed as “solid waste” in New York landfills.

The state also notes above that municipal or publicly owned treatment works (POTWs) that treat

wastewater are not equipped to remove fracking pollutants. Yet, New York still allows landfills accepting fracking-related waste to take leachate (waste-water) to ill-equipped POTWs for “treatment” and discharge into New York waterways.

## New York Denies Taking Fracking Waste – The Data Shows Otherwise

New York’s Solid Waste Management (Part 360) regulations govern oil and gas waste sent to landfills. These regulations continue to allow the disposal of solid oil and gas waste (e.g., drill cuttings) but specifically prohibit the disposal of fluid waste from oil and gas operations. However, New York’s Department of Environmental Conservation (DEC), which oversees waste disposal, has not actually tracked or monitored oil and gas waste streams until very recently. Instead, we must rely on data from Pennsylvania operators who are required to report their waste transport to that state’s regulatory agency. Those data show that fluids from fracking operations have been disposed of in New York landfills despite the prohibition.

During questioning by Assemblymember Brian Kavanagh (D-74th) at a legislative hearing on water quality in 2016, New York’s DEC Commissioner Basil Seggos denied that the state has accepted any fracking waste at all.<sup>7</sup>

**However, Pennsylvania data reveal otherwise.**



**“There’s no waste from the fracking process coming into New York.**

– DEC Commissioner Basil Seggos, September 2016.



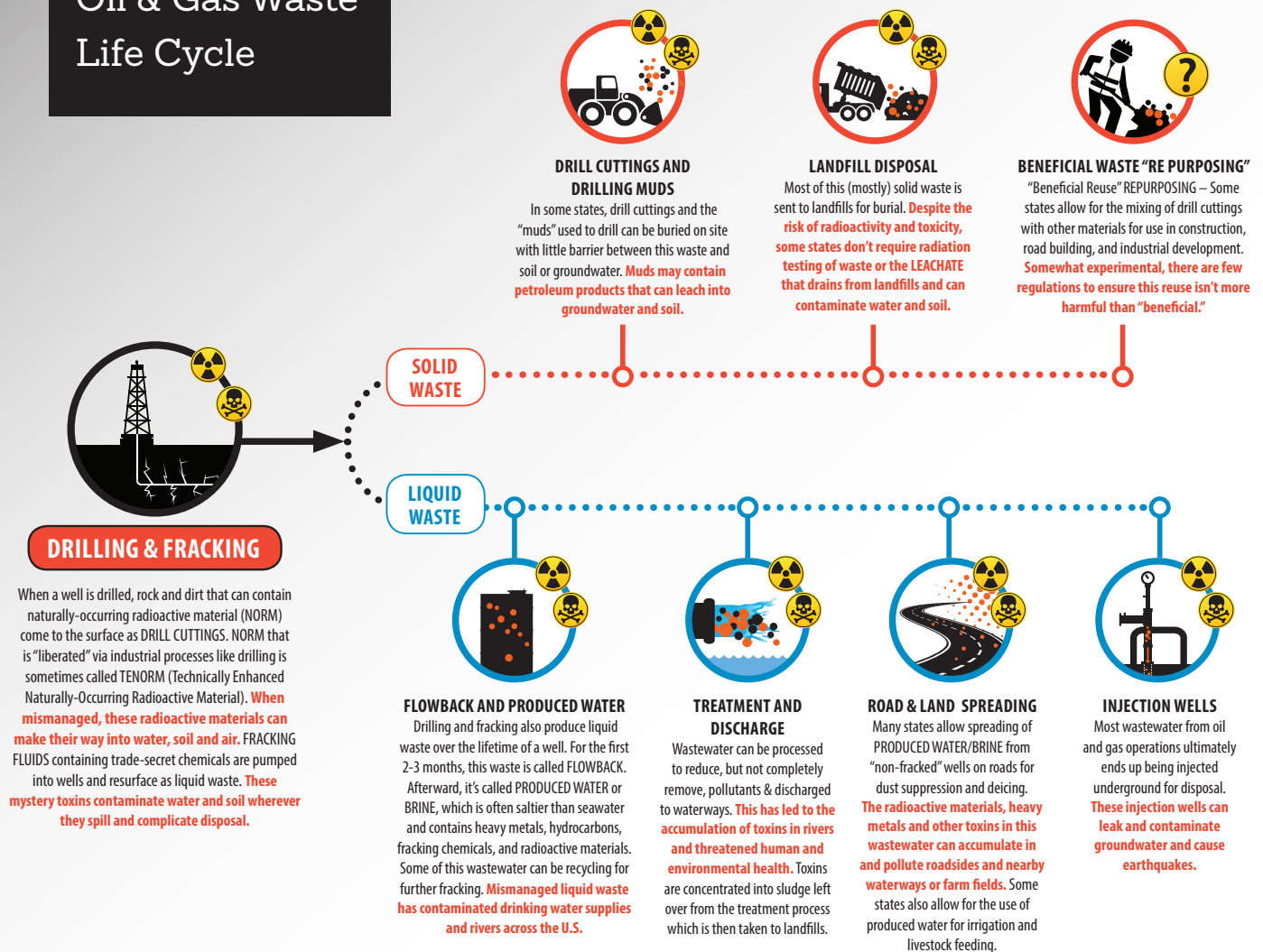
According to the Pennsylvania Department of Environmental Protection<sup>8</sup> (PA DEP):

- **“Fracturing fluid waste” was disposed of at NY landfills between 2011 and 2013 – over 335 tons and 1,320 barrels of it, along with another 970 barrels of “produced water”** from Marcellus operations. Produced water from Marcellus wells also contains varying amounts of chemicals left over from fracking.

- **Between 2011 and mid-2015, nearly 600,000 tons of solid oil and gas waste and over 23,000 barrels of liquid waste** were sent from the Keystone State to New York landfills. The DEC has implied this drilling waste has nothing to do with fracking; however, drilling waste often comes into contact with fracturing fluids and contains toxins of its own.

The numbers above reflect the past. What about now?

## Oil & Gas Waste Life Cycle



### 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.





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



Photo: Roger Downs

## Solid Waste and Radioactivity

The vast majority of Marcellus Shale waste being disposed of in New York is drill cuttings. Since 2011, over 635,169 tons of drill cuttings have been buried in New York landfills, with the annual volume steadily declining. In the first 9 months of 2018, just over 17,128 tons were accepted.

Drill cuttings are rock and other earthen material brought to the surface during the drilling process, in preparation for fracking, that contain naturally occurring radioactive material (NORM). However, New York DEC does not regulate NORM as radioactive waste and permits its disposal at municipal solid waste landfills.<sup>9</sup>

The New York DEC contends that Marcellus Shale drill cuttings contain “background concentrations”<sup>10</sup> of NORM that rival the amount of NORM in red brick, for example. However, studies apparently ignored by DEC show that radioactivity in drill cuttings from the Marcellus Shale can be up to 20 times higher than background.<sup>11</sup>

*“...the type of radioactive material found in the Marcellus Shale and brought to the surface by horizontal hydro fracking is the type that is particularly long-lived, and could easily bio-accumulate over time and deliver a dangerous radiation dose to potentially millions of people long after the drilling is over.” — E. Ivan White, Staff Scientist for the National Council on Radiation Protection<sup>12</sup>*

Facing public pressure about the radioactive nature of Marcellus Shale drill cuttings, NY DEC updated its Solid Waste Regulations in 2017 to require radiation detectors at landfills that accept oil and gas waste. DEC also lowered the allowed radiation limit from waste at non-hazardous landfills to 25 picocuries per gram (pCi/g). Any truck load of waste over 25 pCi/g must be investigated by the facility to determine the fate of the waste.

Radium-226 is the main radionuclide of concern in NORM. It is water-soluble with a half-life of 1,600 years,<sup>13</sup> which means it accumulates in places like landfills where it is deposited or waterways where waste is discharged.<sup>14</sup> In Pennsylvania, the U.S. Environmental Protection Agency has set a limit of 5 picocuries per liter (pCi/L) for any combination of radium-226 and radium-228 in drinking water and 5 pCi/g for radium in soil for cleanup efforts at contamination sites.<sup>15</sup>



# Liquid Oil & Gas Waste

Three landfills in New York still accept solid oil and gas waste from Pennsylvania. However, according to current PA DEP data, one landfill has also accepted over 473 tons of “unused fracturing fluid waste” between March 2017 and September 2018 – Chemung County Landfill in southern New York.

PA DEP defines *unused fracturing fluid waste* as “oil and gas fracturing/stimulation fluid waste and fracturing sand waste that has not been injected into a wellbore.”<sup>16</sup> A staff member of DEP’s Bureau of Waste Management added, “These could be fluids for fracturing that didn’t get used, including recycled fluids from other fracturing jobs.”



UNUSED FRACTURING FLUID WASTE ACCEPTED BY CHEMUNG COUNTY LANDFILL 2017-2018	
March 2017	256.73 tons
May - September 2018	217.1 tons
<b>March 2017 - September 2018</b>	<b>473.83 total tons</b>

Whether or not New York’s landfills are taking waste that is or has been in contact with fracking chemicals, or other toxic fluid waste, remains somewhat of a mystery. This is due to the fact that ***New York does not have a rigorous waste tracking and monitoring system in place.*** This is a key policy gap that must be filled in order to truly protect people and the environment.







Waste from Marcellus oil and gas operations in Pennsylvania have been disposed of in or by New York facilities.

Photo: Erik McGregor/Pacific Press/Alamy.com

## Terrible Waste Tracking and Testing

Until very recently, New York DEC did not require any oil and gas waste tracking whatsoever. This improved superficially on May 3, 2018, when a new policy began requiring waste transporters to submit a simple, one-page “Non-exempt Drilling and Production Waste Tracking Document” to disposal facilities. This form accounts for the volume of waste disposed, but does not specify the type of waste or include any chemical analysis.

As of January 2019, NYDEC has not received any waste tracking documents and therefore remains uncertain of the volume of oil and gas waste disposed of in New York landfills.<sup>17</sup>

**New York should require comprehensive testing of all oil and gas waste prior to disposal in order to ensure public health and safety.** Only then will there be certainty that oil and gas waste streams entering the state do not contain toxins that can pollute our air and accumulate in our land or water. These waste streams include:

- **Unused Fracturing Fluids** (defined by PA DEP as fracking fluids, flowback waste and/or flowback sand)
- **Servicing Fluid** (defined by PA DEP as well maintenance and workover fluids and/or oil/water-based mud and foam and/or well cellar cleanup waste)
- **Soil Contaminated by Oil & Gas Spills** (which PA DEP states is often due to contact with flowback, or fracking waste fluid)
- **Synthetic liners** (from containment pits and well pads where toxic waste and chemicals are stored and sometimes spilled)
- **Other oil and gas wastes** (unspecified wastes for which there is no other category)

Earthworks requested all waste tracking documents collected by NYDEC since the tracking policy was implemented in May 2018. On January 2, 2019, DEC responded: “[We] have not received any drilling and production waste tracking documents to date.”



### PA Marcellus Shale Waste Disposal in/by New York Facilities, January 2011 - September 2018

	TOTALS	2011	2012	2013	2014	2015	2016	2017	2018
Drill Cuttings (Tons)	635,169.08	213,938.44	123,552.49	69,336.33	104,367.97	60,695.23	27,108.08	19,042.27	17,128.27
Drilling Fluid Waste (Barrels)	20,499	8,950	11,547.58	—	—	—	—	1.31	—
Fracing Fluid Waste (Barrels)	3,963.48	1,320	—	2,623.20	19	1.28	—	—	—
Fracturing Fluid Waste (Tons)	335.22	229.47	55.7	50.05	—	—	—	—	—
Produced Fluid (Barrels)	1682.99	445	—	525	82.65	499.43	130.91	—	—
Basic Sediment (Barrels)	1.32	—	—	—	—	1.32	—	—	—
Other Oil & Gas Wastes (Barrels)	362.62	—	—	—	—	167.88	96.22	98.52	—
Other Oil & Gas Wastes (Tons)	13.2	—	—	—	—	1.76	7.84	3.6	—
Servicing Fluid (Tons)	176.86	—	—	—	—	114.73	21.81	40.32	—
Soil Contaminated by Oil & Gas Spills (Tons)*	1348.16	—	—	—	—	619.89	45.87	682.4	—
Synthetic Liner Materials (Tons)	2825.65	—	—	—	—	748.12	1,651.30	426.23	—
Waste Water Treatment Sludge (in Tons)	46.88	—	—	—	—	24.64	14.44	7.8	—
Unused Fracturing Fluid Waste (in Tons)	471.68	—	—	—	—	—	238.32	233.36	—

#### Transfer/Storage Facility

\*An additional 2.9 tons of contaminated soil was reported to a transfer/storage facility

Waste from Marcellus oil and gas operations in Pennsylvania that have been disposed of in or by New York facilities, January 2011 - September 2018. Data source: PA DEP Oil & Gas Reporting Website.

Between January 2016 and September 2018, New York landfills have accepted over 1,348 tons of “Soil Contaminated by Oil & Gas Spills.” According to Pennsylvania’s DEP, “any soil contaminated by an oil- or gas-related spill more often than not comes in contact with flowback water.”<sup>18</sup> Flowback is a mixture of water and chemicals that comes back to the surface after fracking operations.

It is well documented that fracturing and stimulation fluids contain chemicals that are carcinogenic and toxic.<sup>19</sup> In 2017, Yale Public Health studied 1,177 chemicals related to fracking and found that 55 unique compounds “were known, probable, or possible human carcinogens.”<sup>20</sup> Some fracking chemicals<sup>21</sup> – like hydrochloric acid and formaldehyde – are also classified as hazardous under federal law.

Hydrochloric acid and formaldehyde, commonly used for fracking, are both designated as an “extremely hazardous substance” under the Superfund Act (CERCLA), a hazardous air pollutant (HAP) under the Clean Air Act, and a hazardous substance under section 311(b) (2)(A) of the Federal Water Pollution Control Act.<sup>22</sup> According to PA Dept. of Environmental Protection, unused fracturing fluid waste from PA is being disposed of at Chemung County Landfill in New York, though it is unclear whether specific chemicals are identified prior to disposal.

Even though specific fracking chemicals are designated “hazardous,” oil and gas waste as a whole is categorically exempt from federal hazardous waste regulations. This means that, once fracking chemicals are pumped underground or used for oil and gas exploration and production, they magically become “non-hazardous” until proven otherwise.





## NY's Hazardous Waste Loophole for Oil & Gas

In New York, “hazardous waste” means a waste or combination of wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may:

- a. Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or
- b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed, or otherwise managed.”<sup>23</sup>

According to the U.S. Environmental Protection Agency (EPA), some oil and gas wastes “contain a variety of hazardous constituents”<sup>24</sup> even though they are exempt from hazardous waste laws.

However, ***New York State still excludes oil and gas industry waste from state hazardous waste regulations (mirroring the federal exemption)*** – despite requests made by Earthworks, other organizations and the public since 2008 to remove the state exemption for oil and gas waste. ***Closing this loophole in New York would subject all oil and gas waste to more rigorous testing, monitoring and tracking requirements.***

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In 2019, New York Assemblyman Steve Englebright reintroduced legislation to remove the oil and gas waste exemption from state law and close the loophole preventing proper management of potential hazardous oil and gas wastes.<sup>25</sup> Englebright’s bill – A2655 – reasonably requires “hazardous wastes produced from oil and natural gas activities to be subject to the requirements for treatment of hazardous wastes.”

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**If New York treated oil and gas waste like any other potentially hazardous waste, all types of waste coming into the state from Pennsylvania’s Marcellus operations would have to be characterized for toxicity and disposed of according to its physical properties.**







Photo: David Walczak

## NY's Landfills and Leachate

There are three landfills in New York that continue to accept waste from unconventional drilling and fracking operations in Pennsylvania. Like all landfills, these facilities produce leachate, a liquid formed when rain water filters through waste. This liquid leaches, or draws out, chemicals and other pollutants from those wastes.

In other words, if the waste contains radioactive materials, then the leachate can as well. In a review of data from two landfills in West Virginia that take large volumes of drill cuttings, Downstream Strategies found that leachate frequently contained concentrations of Ra-226 and Ra-228 that exceeded the federal Maximum Contaminant Level (MCL).

Wastewater treatment plants where landfill leachate is sent for disposal do not generally monitor for Radium-226 and Radium-228 prior to release into rivers and streams because federal National Pollutant Discharge Elimination System (NPDES) permits don't require them to. Nor is radium on the federal list of substances that landfills are required to test for as part of routine groundwater monitoring.

In New York, landfill leachate is tested semi-annually for radium-226, radium-228, total uranium and gamma spectrum. However, leachate is not being tested for all toxins present in the oil and gas wastes that are being disposed of in the following New York landfills, including drill cuttings, contaminated soil, and unused fracturing fluid wastes. Here are the total from January 2011 -- November 2018<sup>26</sup>.



### Chemung County Landfill

Lowman, Chemung County, NY – 354,721.54 tons

### Hakes C&D Landfill

Painted Post, Steuben County, NY – 63,427.3 tons

### Hyland Facility Associates

Angelica, Allegany County, NY – 60,071 tons

Given that hundreds of chemicals and naturally-occurring heavy metals and organics are present in drilling and fracking waste, and that New York DEC is unsure of how much waste is actually entering the state or what kinds, it is important to test all waste prior disposal. Radiation detectors alone will not determine whether waste contains potential carcinogens, such as benzene, that are often present in oil and gas waste.



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# Spreading Waste on Roads

During updates to New York's Solid Waste Regulations (Part 360) in 2016, Earthworks and allied organizations called on DEC to "prohibit application of liquid waste from oil and gas drilling and production sites on roads."<sup>27</sup> Rejecting our request, DEC's new regulations still authorize the use of wastewater from conventional oil and gas wells, which tend to be shallower and unfracked, for de-icing and dust suppression on roads.

The common belief is that this wastewater, called "brine," is just "salt," which is how DEC Commissioner describes it during a legislative hearing on water contamination in 2016.<sup>28</sup> Commissioner Seggos went on to state that anyone wishing to spread brine in New York must obtain approval through the state's Beneficial Use Determination (BUD) Process, which involves "extensive, scientific analysis of the what and the where and the volumes to determine if it's appropriate."

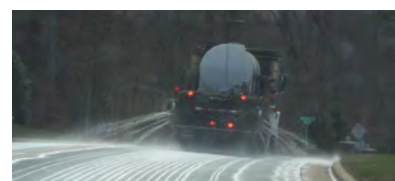
But this "extensive" analysis is more than a stretch. Oil and gas brine from conventional wells can contain toxic heavy metals such as arsenic, barium and chromium, as well as naturally occurring radioactive materials (NORMs.) In fact, its use on roads in Pennsylvania has led to elevated levels of heavy metals and radioactive elements in the surrounding environment.<sup>29</sup>

Despite the well-known presence of these contaminants, DEC does not require testing for all of these toxins as part of the BUD approval process...even when school districts ask to spread brine on school grounds.

In 2017, DEC approved Depew Union Free School District in Depew, NY to spread oil and gas brine on school grounds for de-icing, adjacent to the high school, elementary school and Cayuga Creek. To obtain its BUD approval, the school district complied with state regulations, which require testing of parameters in the table at right, to be spread on roads according to New York's solid waste regulations, 6 CRR-NY 360.12(f)(3)(iii).<sup>30</sup>

## However, this brine analysis does not protect public health and the environment:

- **List of parameters is missing tests for all key toxins, including chromium and radium-226, both of which are carcinogenic.** Radium-226 also has a half-life of 1,600 years and accumulates in the environment. Oil and gas brine must be tested for all toxins.
- **Limits for pollutants that are tested for are too high.** Earthworks contends that the contaminant limits should be set at concentrations that would make brine safe under the Safe Drinking Water Act. In the past, the DEC has opposed such limits, reasoning that drinking water standards can't be used for "a material that relies on a high concentration of salt to work..."<sup>31</sup> While this justification may explain the high concentrations sodium and calcium chloride depended on for operational effect, the other contaminants, such as lead, provide no benefit, but are instead highly toxic. These additional contaminants can and must be more strictly controlled.



Road Spreading Brine Parameters	Criteria mg/L
Total Dissolved Solids	>170,000*
Chloride	>80,000*
Sodium	>40,000*
Calcium	>20,000*
Iron	<250
Barium	<1.0
Lead	>2.5
Sulfate	<2500
Oil/Grease	<15
Benzene	<0.5
Ethylbenzene	<0.5
Toluene	<0.5
Xylene	<0.5





We must close the hazardous waste loopholes and prohibit the disposal of fossil fuel extraction waste in New York State.

Photo: Pennsylvania State University

## Conclusions and Recommendations

After a lengthy drafting and public response period, New York State finalized new Solid Waste Management rules (Part 360 series) governing oil and gas waste. Many improvements were made, including:

- A prohibition on the disposal at landfills of fluids produced from oil and gas wells (§363-7.1(o)(9)).
- Specific time periods and requirements for landfills to report water quality monitoring results to the Department (§363-4.6(10)).
- Submission of point of use samples of brine used for road-spreading to the department on an annual basis, rather than every three years (§360.12(f)(3)(viii)).
- New waste tracking provisions (§364-1.2(e)(6)).
- A requirement for landfills to report to the Department within 24 hours in the event where a radiation detection unit has been triggered (§363-7.1 (a)(5)(vi)).

**However, DEC's basic approach to managing these wastes is not enough.** The Department continues to define oil and gas wastes as residual and solid wastes. These wastes are inherently toxic and potentially radioactive and hazardous, and therefore should be prohibited for disposal at landfills or used for road spreading without complete chemical analysis.

**In order to take the environmental and public health hazards oil and gas wastes pose seriously, DEC should have taken the opportunity to do the following:**

- Close the loophole in state law that exempts oil and gas waste from ever being subjected to classification as hazardous.
- Prohibit disposal of all oil and gas drilling, exploration, and production wastes in municipal solid waste (MSW), industrial, and construction and demolition (C&D) landfills.
- Prohibit disposal of leachate from landfills accepting oil and gas drilling, exploration, and production waste at Publicly Owned Treatment Works (POTWs).
- Prohibit application of liquid waste from oil and gas drilling and production sites on roads as a de-icing and dust suppressant agent.





# A Look Ahead: Legislation to Protect New York State

Several bills have been reintroduced in New York State Legislature in 2019 that would greatly improve oil and gas waste management in the Empire State:

- A2655 (Englebright) & S3392 (May) - This bill would close New York's gaping hazardous waste loop-hole and requires hazardous wastes produced from oil and natural gas activities to be subject to the requirements for treatment of hazardous wastes.
- A2295 (O'Donnell) - This bill prohibits wastewater from oil and gas wells from being spread on New York roads.
- A101 (Buchwald) & S437 (Hoylman) - This bill prohibits the acceptance of high volume hydraulic fracturing wastewater from oil or natural gas extraction activities at wastewater treatment facilities and solid waste management facilities.

Consider calling your state senator or assembly person and ask what they are doing to keep toxic oil and gas waste out of New York State.

## It's Up to You!

Government officials can issue rules that protect our health and environment, but ultimately, that responsibility falls on us. Elected representatives and regulatory officials are often "under the influence" of industry, and even compelled by current law to bend to industry's needs. We, the people, have a job to do – to let our public officials know that we demand clean air, water, and healthy communities and hold them to it.

Protect yourself, your family, and your community by getting involved. Call and write to your elected officials, stay informed by subscribing to legislative updates and community groups, and follow the work of advocates like Earthworks. We are dedicated to the managed decline of fossil fuels and transition to a clean, healthy energy economy. Join us – visit [Earthworks.org](http://Earthworks.org) for more information.



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- 27 Earthworks, Environmental Advocates of NY & Riverkeeper Comments to Proposed Revised Part 360 Series Solid Waste Management regulations, July 21, 2017.
- 28 NY State Legislature Public Hearing: Water Quality, September 12, 2016, accessed December 18, 2018. Quoted at 04:02:23 in YouTube video: <https://youtu.be/Qpget2EX4qc?t=14653>
- 29 "Environmental and Human Health Impacts of Spreading Oil and Gas Wastewater on Roads," T. L. Tasker, W. D. Burgos, et al., *Environmental Science & Technology*, May 30, 2018, 52 (12), 7081-7091 DOI: 10.1021/acs.est.8b00716.
- 30 [https://govt.westlaw.com/nycrr/Document/Id4d60809dfe911e7aa6b9b71698a280b?viewType=FullText&originationContext=documenttoc&transitionType=Category-Pageltem&contextData=\(sc.Default\)](https://govt.westlaw.com/nycrr/Document/Id4d60809dfe911e7aa6b9b71698a280b?viewType=FullText&originationContext=documenttoc&transitionType=Category-Pageltem&contextData=(sc.Default)).
- 31 Assessment of Public Comment for Public Comments Received on the New York State Department of Environmental Conservation Comprehensive Revisions to Solid Waste Regulations Found in 6 NYCRR 360, Part 364, Part 369, and Associated Regulations 4 (2017).

