WASTEDIVE

PFAS DISPOSAL SERIES

Toxic PFAS waste that lasts ‘forever’ poses financial, logistical challenges for landfills

Some worry PFAS could have National Sword-level implications for landfills. Stakeholders are aiming to avoid blame for contamination, while seeking out solutions to address the mounting crisis.

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By **E.A. Crunden**

Danielle Ternes/Waste Dive; Photograph by Volodymyr Kalyniuk via Getty Images

Meleesa Johnson can trace her costly and mounting problems with one notorious family of chemicals back to a letter she received last year.

For decades, the Marathon County Solid Waste Department in Wisconsin sent leachate from all three of its landfills for treatment to a facility along the Wisconsin

River. Last year, that facility sent a letter to the county through an attorney stating they would no longer accept the leachate. Johnson, the department's director, said they cited concerns about PFAS and "the potential for litigation." Wisconsin's Department of Natural Resources has said those owning properties that are the source of PFAS will be responsible for taking action; the facility indicated it did not want to be found responsible for any contamination.

The letter shocked Johnson, who said she found herself suddenly seeking a home for as much as 17 million gallons of leachate annually. She negotiated for another nine months with the facility while her department "scrambled" to find an alternative. Ultimately, the county settled on sending leachate to three different municipalities whose wastewater treatment facilities all discharge along the river. Those additional treatment and transportation costs have tripled Johnson's leachate budget, from $350,000 to now over $1 million a year.

"It doesn't even change the amount of PFAS being discharged into the Wisconsin River, it changes the location," said Johnson.

Late last year, Johnson and other solid waste stakeholders in Wisconsin took an unusual approach and formed a coalition with the aim of shifting conversations about PFAS contamination. They say they want to communicate to policymakers and communities that solid waste and wastewater entities did not create the problem, but do want to be part of the solution.

What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a family of thousands of chemicals known for their non-stick properties. Sometimes referred to as “forever chemicals” due to their all but indestructible and persistent nature, PFAS appear in a wide array of household items like frying pans, rain jackets, and dental floss. They are often measured in parts per trillion (ppt) and occasionally in parts per billion (ppb) or parts per million (ppm).

That work has ramped up as public awareness and concern about PFAS has grown. Financial filings show some public companies see PFAS disposal as a potential business opportunity. But landfill operators and others in the solid waste world broadly are growing more alarmed about financial implications, including the potential for dramatic changes to leachate costs and a wave of state and federal regulation.

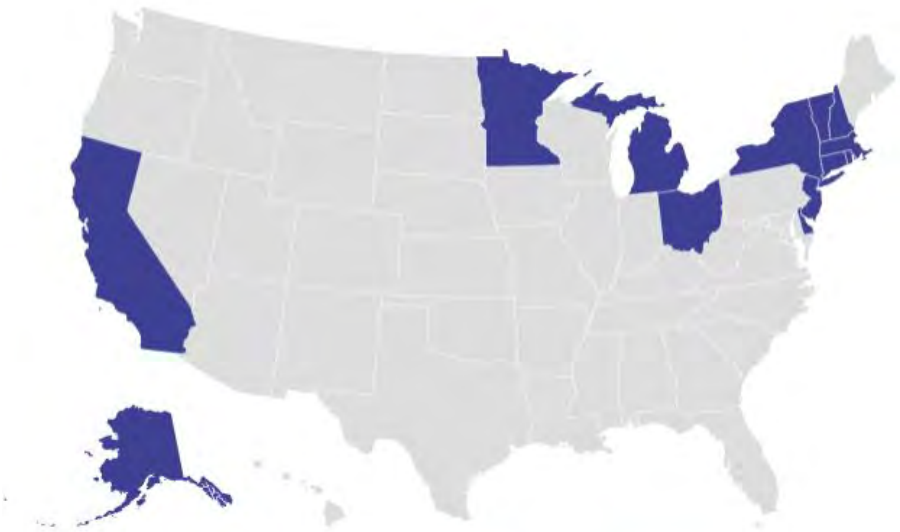
“PFAS have the potential to impact landfills in a way that is similar to what National Sword has done to recycling,” said David Biderman, president and CEO of the Solid Waste Association of North America (SWANA). “Whether it does depends on the science and law, rules, and regulations enacted at the federal, state, and local levels.”

Like many of her peers, Johnson expressed concern about the severe health implications of PFAS and acknowledged public outcry as valid and legitimate. But she also

remained candid about struggling with costs and the need for unity across her field as it grapples with a crisis. All methods of PFAS disposal currently involve landfills at some point. With regulations on the horizon, the issue is rapidly becoming among the most complex to face the industry in decades.

As concerns mount over PFAS in drinking water, some states have instituted MCL regulations, screening or action levels

States that regulate PFAS in drinking water through a maximum contaminant level (MCL), screening level, or action level



Map: Nami Sumida/Waste Dive; Research by Jakob Geiger • Get the data • Created with Datawrapper

Public companies lobby as rising costs leave small players vulnerable

Many conversations about PFAS in the waste stream center on responsibility and questions about who will shoulder the costs associated with cleanup and mitigation. Public

companies have largely remained quiet about the issue, even as they have moved to address it with lawmakers.

Most public landfill companies, including Waste Management and Republic Services, either declined to comment or did not elaborate on how PFAS are impacting their operations. But federal lobbying records show the issue has been of note for the two giants.

Waste Management's lobbying focus has been on PFAS incineration and U.S. Department of Defense conversations around PFAS, which appear in firefighting foam used at military installations. That lobbying took place from 2019 into this year, according to the most recent filings. Republic similarly lobbied on a range of issues including PFAS during the same time frame, with the company's most recent filing reflecting ongoing interest in the issue.

Both companies have also addressed PFAS in their annual 10-K filings. In the previous two years, Waste Management noted the U.S. EPA's 2016 health advisories for PFOS and PFOA, and in its filing for 2018 the company said it was working with the agency to ensure compliance and anticipated future expenses. In its subsequent 2019 filing, Waste Management referenced an increase in regulations at the state level is expected to result in additional expense, but also "potential business opportunities" in the areas of treatment, management, and disposal.

Republic similarly named compliance with potential PFAS regulations as a risk factor in both its 2018 and 2019 filings, one that "could accelerate or increase expenditures" for activities like landfill capping and post-closure actions,

among other implications. Waste Connections has not noted concerns about PFAS in many of its major filings, nor has GFL Environmental, which went public in March. Neither company responded to requests for comment about how PFAS have impacted their business.

Industry filings reflect growing national awareness of PFAS and how the chemicals have impacted communities. Health experts have linked cancer clusters and other severe health issues in places like Hoosick Falls, New York, and Parkersburg, West Virginia, to PFAS exposure from chemical facilities. Subsequent public attention has focused on proximity to those manufacturing plants, but as testing for PFAS becomes more common so has scrutiny of waste sites.

PFAS have already become an issue at multiple landfills. In Michigan, sampling at the Republic-operated Adrian Landfill yielded groundwater amounts of 85.7 ppt of PFOA and PFOS, exceeding EPA drinking water guidance. Samples of the chemicals near the Waste Connections-operated Dunn Landfill in Rensselaer, New York, similarly contained PFAS. Meanwhile, Casella Waste Systems has been working in collaboration with the Vermont Department of Conservation (DEC) to address PFAS in its Coventry Landfill. State regulators in New Hampshire have also pushed the company about PFAS levels at its Bethlehem site.

Public companies may be in a better position to address what could ultimately be an extremely costly problem, experts say. Municipalities and smaller operators, by contrast, are concerned about the survival of their operations as they currently exist.

Among the most vulnerable players are wastewater treatment facilities, which inevitably receive PFAS from sources including leachate and have struggled with mounting costs amid contamination concerns. Local politicians have called for federal scrutiny of facilities in places like St. Louis County, Minnesota, due to the presence of chemicals like PFAS in treated wastewater. Other facilities in states like Maine and Massachusetts have attracted widespread media attention over accepting PFAS-laden leachate, leading some to cancel their contracts with municipalities and companies.

Those reactions are creating issues for waste departments in places like Wisconsin's Marathon County, according to Director Johnson, who is concerned about how PFAS are impacting her budget. The North East Biosolids & Residuals Association (NEBRA) has also been tracking rising costs associated with growing pressure on wastewater treatment facilities.

NEBRA study

In surveying its membership, NEBRA has found a few instances of dramatic cost spikes, including in Concord, New Hampshire, where such issues have led to an increase of half a million dollars in sludge management expenses. Senior NEBRA staff said they are now devoting large amounts of their time to working on PFAS, including engaging lawmakers in several states. Among those is Maine, which has effectively banned land application of biosolids due to PFAS contamination.

Johnson is one of a growing number of people hoping to unite solid waste and wastewater interests as they seek a solution to PFAS. She agreed with NEBRA that banning biosolids from land application could lead to significant disposal problems. Viraj deSilva, a national PFAS management expert who previously worked for the firm SCS Engineers, similarly noted the symbiotic relationship between landfills and wastewater treatment facilities.

“These wastewater treatment plants, most of them send their biosolids back to the landfill,” he said. “It’s a big practice. It becomes a racetrack when biosolids contain PFAS and the leachate received by wastewater treatment plants do as well.”

That symbiotic relationship between landfills and wastewater facilities is also informing PFAS research within the industry. The Environmental Research and Education Foundation (EREF) is closely studying issues around PFAS disposal, including the presence of the chemicals in leachate. EREF President Bryan Staley said there are still many questions around PFAS and wastewater. Primary human exposure to PFAS, he also said, occurs through contaminated food.

“Consider that leachate most times is pre-treated at the landfill before going to a wastewater treatment plant, where additional treatment occurs before discharge,” he said, adding “the relative impact of leachate as a human exposure pathway needs further evaluation to understand its relative degree of importance as it relates to health implications.”

The Lowell Regional Wastewater Utility in Massachusetts terminated its contract with the Turnkey Landfill following controversy over PFAS in leachate.

Jason Turgeon

Controversy stemming from one Waste Management landfill

Recent flash points in Northeastern states offer a preview of what may be coming as governments ramp up scrutiny of PFAS, including one well-publicized event last year involving Waste Management's Turnkey Landfill in New Hampshire.

Documents obtained through public records requests to Maine and Massachusetts show a November 2019 article in The Boston Globe about the presence of PFAS in Turnkey's leachate spurred numerous conversations and actions in both states.

Fallout in Massachusetts

Public outcry following the article led the Lowell Regional Wastewater Utility in Massachusetts to terminate its contract with the Turnkey Landfill over the issue, despite an initial permit renewal. Up to 100,000

gallons of leachate per day was permitted to be treated at the facility prior to that decision. According to Ken Moraff, a water director for EPA Region 1, actual discharge at the time from the facility was around an average of 25,000 gallons per day.

Janette Micelli, a spokesperson for Waste Management, said the company does not disclose information on specific facilities and did not offer comments in response to questions about the Turnkey Landfill. But emails show officials in Maine had conversations similar to those in Massachusetts over Turnkey, with some predating widespread media coverage. Waste Management sent around 250,000 gallons of leachate potentially containing PFAS from that landfill to the Anson-Madison Sanitary District (AMSD) in Maine, which empties into the Kennebec River.

Kennebec River study

Maine DEP staff also discussed a department effort studying PFAS found in Kennebec River fish, conducted earlier in the summer of 2019 and including an area upstream from AMSD. When asked about the results of that effort, DEP spokesperson David Madore said the testing was part of a biennial report to be published in late April 2021. The findings, shared for this story, show higher levels of PFOS found in some fish in certain areas,

including for smallmouth bass (SMB) sampled in Fairfield (KFF), which had the highest levels of PFOS.

AMSD discussed its sludge utilization license with the Maine Department of Environmental Protection (DEP) and "its future in regards to PFAS/PFOA," asking in a June 11, 2019 email to surrender the license. Months later, the Globe article spurred multiple emails between DEP staff regarding the leachate sent to AMSD.

Turbulence in Maine

In one exchange, DEP officials referenced discussions with Waste Management and said AMSD received reverse osmosis (RO) permeate from the company during the months of December 2018 and January 2019. Amounts totaled 152,000 gallons and 104,000 gallons, respectively — less than 1% of total flow for the month. AMSD later clarified it also received 335,950 gallons from Turnkey in 2017.

Other conversations involved AMSD Assistant General Manager Peter Elias, who was asked about specifics regarding the facility's approach to leachate. In a Nov. 6, 2019 email, Elias clarified the process and the nature of AMSD's relationship with Turnkey.

Casella's Coventry Landfill faces PFAS and local pushback

One state over from the Turnkey Landfill is the Coventry Landfill (NEWSVT) — the only active landfill in Vermont, owned and operated by Casella. Vermont's increasing scrutiny of PFAS has presented some obstacles for the company as it seeks an expansion of the site.

Testing released in February by the Vermont DEC found PFAS in 95% of waste samples throughout the state, including at NEWSVT. Under Vermont's Act 21, passed in 2019, the state established drinking water standards for several types of PFAS with limits set at 20 ppt. Vermont is also looking into PFAS levels in all public water systems and Casella has been working with the government on certain monitoring reports.

Sam Nicolai, Casella's vice president of engineering and compliance, said the company has been closely monitoring developments around PFAS for the past few years. He said Casella works with different states to track the compounds per respective regulations, which are in place in all states where Casella operates.

"We do not accept certain waste materials that have very high concentrations of these compounds," he said, listing examples like firefighting foam and waste from manufacturing sites that use PFAS. Despite those restrictions, he said PFAS remain inevitable in the waste stream.

The presence of PFAS at NEWSVT has added to consternation for one local group, Don't Undermine Memphremagog's Purity (DUMP). Teresa Gerade, a member of DUMP's advisory committee, said increasing public awareness about PFAS and the potential for the

chemicals to enter drinking water alarmed her. A wastewater treatment facility in Newport received NEWSVT leachate for processing before discharge into the Clyde River, which feeds into Lake Memphremagog, from which over 175,000 Canadians draw drinking water.

Lake Memphremagog, a water source for over 175,000 Canadians across the border from Vermont.

Michael Filion

DUMP has objected to Casella's planned 51-acre expansion of NEWSVT, which has been in the works for years. As part of the permitting process for that expansion, Casella is required to have a testing plan for PFAS. According to reporting by VT Digger, a consulting firm hired by the company estimated additional treatment for PFAS prior to sending leachate to a wastewater plant could cost between $32 million to $394 million over 20 years. Casella Vice President Joe Fusco confirmed those numbers.

DUMP fought the expansion on many grounds, including PFAS contamination, before dropping its appeal against the site's permit last November. As part of a mediation agreement between DUMP and Casella, the Newport facility will not receive NEWSVT leachate until 2024 or

until there is a regulatory requirement for leachate treatment at the landfill. That date marks the point when state legislators are set to develop a standard for PFAS in surface water under Act 21.

“As part of that [process], there were some additional monitoring and research studies that were done,” said Nicolai. “We met those commitments, and we have more detailed evaluations of waste coming into that facility.”

Email exchanges obtained through a public records request show DUMP, Casella, and DEC have been in contact since the settlement. All three parties have also participated in landfill oversight meetings, including one on Feb. 12. Gerade said a more recent meeting occurred in September. Kasey Kathan, a DEC analyst, confirmed Casella is meant to be sharing copies of reports sent to the department with DUMP as well, primarily through its semi-annual water quality reports.

Gerade said those reports are through self-monitoring, although the state may perform an inspection at random.

“The landfill, they’ve been pretty good about it, [although] I wouldn’t say I necessarily trust them to be sharing everything with us,” Gerade said.

Still, she expressed concerns about the state’s approach to PFAS at the landfill. While NEWSVT PFAS concentrations are tested as part of semi-annual monitoring, DEC has not recommended initiating a pilot landfill leachate treatment system independent of the regulatory processes.

“Clearly the state is not actively pursuing this, and time is running out,” said Gerade, noting DUMP has pressed DEC on the issue but has not received feedback on a timeline for a leachate treatment option.

Kathan said DEC requested NEWSVT evaluate options for PFAS treatment and report back on those options to the department. “Consideration of that report is ongoing and to date no further requirements or recommendations have been made to the NEWSVT landfill,” Kathan said.

Vermont did publish a state plan for producing a surface water standard in February, which also concerned DUMP. The group provided comments calling for more references to landfills, along with underscoring the potential for PFAS contamination due to wastewater treatment facilities accepting leachate. Kathan said all of the state’s lined landfills manage leachate through discharge to wastewater treatment facilities.

A pivot from panic to problem solving

Incidents like those Waste Management and Casella have faced underscore why mitigating PFAS in leachate is top of mind for many landfill operators. Solutions-oriented presentations have become commonplace at industry conferences like WASTECON and WasteExpo, along with SWANApalooza and the biannual Global Waste Management Symposium (GWMS).

Speakers at this year’s GWMS in February repeatedly emphasized the prospect of regulations, along with opportunities to be pragmatic. But operators in states that have been slower to crack down are debating how swiftly to

act. Gomathy Radhakrishna Iyer, a landfill leachate and design expert for SCS Engineers, said some operators are waiting to see what regulations may come even as they work to account for potential compliance issues and seek solutions.

“When the clients are thinking of upgrading their treatment plans, some are definitely taking into consideration PFAS treatment,” Radhakrishna Iyer said.

PFOA and PFOS — the two most notorious PFAS — each have a half life of at least a decade. While some of them may break into smaller chains, others can remain unchanged. Even if they are phased out now, other PFAS will linger in landfills for many years to come, something Radhakrishna Iyer said operators should take into consideration.

“You’re spending millions of dollars, you need to do your due diligence, right? At this point, consideration should be given to PFAS treatment during the feasibility stages,” she said.

For those looking to act swiftly, treatment options are cropping up more frequently, although leachate remains a lower priority in emerging science than drinking water.

Biological treatments like membrane bioreactors are available, but physical-chemical methods are more popular. Those include RO, in which leachate passes through a membrane and leaves behind separated PFAS which must then be disposed. Another often-mentioned treatment is granular activated carbon (GAC), wherein PFAS is adsorbed into the carbon of a GAC vessel — an

energy-intensive process that does not remove inorganics and is more effective for long-chain PFAS. Ion exchange (IX), which requires offsite disposal like RO, allows PFAS to pass through resins which then bind the chemicals.

Leading treatment options

Granular activated carbon (GAC)

The U.S. EPA considers GAC the most-researched PFAS treatment for PFAS removal. GAC adsorbs — or accumulates a substance — and is highly porous. The process can remove long-chain PFAS more easily than short-chain.

Ion exchange (IX)

Resins used in this process are highly porous and act as small, strong magnets. IX can be highly efficient at removing some PFAS, but the process can be more costly than others.

Reverse osmosis (RO)

Using tight high-pressure membranes, RO can be more than 90% effective at removing certain PFAS, including the short-chain chemicals that can be harder to remove with GAC. The process results in a high-strength waste stream that can prove challenging to dispose of in large quantities.

An EPA spokesperson listed all three of those technologies as avenues the agency is researching as it studies PFAS disposal options. Experts say multiple forms of treatment are necessary for leachate, as it is complex and the

presence of other substances may inhibit any technology targeting PFAS. The carbon-fluorine bond present in the chemicals is among the strongest in nature, posing an additional challenge. But costs remain the biggest hurdle, according to many stakeholders.

Ivan Cooper, a wastewater practice leader with the firm Civil & Environmental Consultants, offered some estimates around costs at this year's WasteExpo. During a session devoted to PFAS, Cooper elaborated on multiple treatment options, including separation or concentration technologies like ozofractionation foam and electrocoagulation. He said costs can hover around five to six cents per gallon for pretreatment, prior to additional PFAS treatment before discharge, while PFAS-specific treatment can be half that cost or less. Still, he said prices remain "site-specific, technology-specific" with some operators perhaps looking at much higher numbers.

Pilot testing of modified clay has also shown promising results and could be more affordable, Cooper said. "But there's a lot of information and a lot of technology evaluation that still needs to be done," he continued.

Up to 100,000 gallons of leachate per day was permitted to be treated at the Lowell Regional Wastewater Utility before it terminated its contract with Turnkey Landfill.

Jason Turgeon

In a follow-up email, Cooper said deep well injection and thermal destruction are among the most well-known technologies along with GAC, IX, and RO. He also mentioned technologies like chemical reduction and electro-oxidation as other options for operators.

Radhakrishna Iyer similarly said treatment price points range and are often based on cost per gallon, which depends on plant size, technologies used, operations and maintenance costs, and other factors. One example she gave involved an RO treatment for a facility generating 125,000 gallons per day, costing around six to nine cents per gallon. She advised operators to seek treatment designs customized for their landfill's leachate.

DeSilva, the PFAS management expert, agreed leachate management can be expensive, running between one to 20 cents per gallon with transportation costs a contributing factor. "Rather than listing it in millions, I would go with that combination of costs," he said, referring to volume, location, and level of water quality.

Wastewater treatment technology company HTX Solutions says it can help solve many of these problems. The company is a frequent presence at waste conferences, drawing attention to its patented electrocoagulation technology and customized onsite landfill leachate treatment solution. Sales Director Steve Butel said the company's goal is to change the practice of sending leachate to publicly-owned treatment facilities and mitigate the potential for leachate contaminants like PFAS to enter drinking water sources.

In addition to removing other contaminants, the company offers a patent-pending add-on PFAS removal technology Butel said removes the majority of long-chain PFAS. Recent bench testing on raw leachate from a landfill in Minnesota achieved between 91% and 99% removal of six PFAS compounds including PFOA and PFOS. Butel said "added polishing" with IX or GAC can achieve 100%

removal. HTX has also developed and filed a patent for a PFAS sequestration and encapsulation technology where the removed liquids and spent polishing adsorbents are sequestered into a solid non-leachable form for disposal back into a landfill.

A one-time mobilization fee is required for the company's treatment, Butel said, with subsequent costs determined by cents per gallon of leachate treated, sometimes far below 10 cents per gallon.

HTX Solutions CEO Brendan Ryan said the company is involved in more than 100 conversations at various stages with clients interested in the company's technology, including its PFAS offerings. "One of our quests is to get more visibility to say, there are solutions," he said, observing that regulations may accelerate interest.

Some remain skeptical of those solutions. Johnson of Marathon County, Wisconsin, said her department has looked into potential treatments but found them extremely cost intensive with little guarantee of true success.

For one GAC system, Johnson said she was quoted a price estimate of $2 million in infrastructure or capital costs, and an additional $350,000 to $450,000 annually in operating costs. That quote is among the lowest she has been given, and still comes with other realities — filters then need to be disposed, which sends them right back to a landfill. Wastewater treatment would also remain a necessity afterward, as the process would not clean leachate to the point of acceptable surface water disposal.

An RO process followed by taking concentrated PFAS and locking it into concrete has also been proposed to the department. Johnson said they have additionally looked into incineration but not conducted a cost analysis. That last option would likely involve transportation to Eugene, Oregon, and a dramatic spike in costs. Johnson said recent research indicating PFAS may be escaping incinerator stacks is another factor giving her pause about that alternative, and, as with other proposed technologies, she worries about significant costs accompanied by few guarantees.

“If we’re going to spend millions, I’d kind of like to know that it will work,” said Johnson. “And nobody’s proven that to me yet.”

Johnson has instead focused her efforts on outreach and building a cohesive response to PFAS across the waste industry. When she presents webinars and other presentations to local officials, she emphasizes an underlying point: the waste industry did not create PFAS, but it can be a part of solutions around their disposal.

“We need to start being at the head of the line in the discussion,” she said.

Landfills at a crossroads

Across the industry, stakeholders agree the next few years will be critical in shaping not only how landfills deal with PFAS but also how they are perceived by the public. The issue could turn into a public relations fight, even as industry members and environmental groups alike

maintain responsibility should fall on chemical manufacturers.

Waste trade groups, scientists, and a host of organizations are in the midst of conducting a number of studies looking closely at the issue. Biderman of SWANA said upcoming research will help provide guidance to landfill operators, waste-to-energy facilities, state agencies, and elected officials. The National Waste & Recycling Association declined to comment for this story, but the organization frequently releases briefs relating to PFAS. EREF's current fall series also focuses on PFAS and emerging contaminants.

Industry research is emerging alongside outside reports by environmental groups and others. In an upcoming study already available online in the journal Chemosphere, experts with the Environmental Working Group (EWG) found groundwater contamination from older landfills remains a concern. Their report concludes methods ensuring safe disposal of PFAS are unknown, even as landfills present a potentially safer option than incineration.

That conclusion hints at the reality PFAS disposal poses for landfills. If the chemicals are incinerated, the ash will need to go somewhere; landfills will also be the likely destination if organics are redirected for disposal due to PFAS. Regardless of their perspectives, stakeholders agree: the sector has no way of avoiding the issue.

For their part, landfill operators say they are in a better position to manage PFAS disposal than anyone else. Phillip Retallick, senior vice president of compliance and

regulatory affairs for Clean Harbors, pointed to other chemicals that endure in the waste stream despite being phased out. He said PFAS would likely follow the trajectory of PCBs and dioxins. While operators wait for regulations to offer guidance, he said, they can still take steps to address the problem as they would another similar issue.

MassDEP found far lower amounts of PFAS at the Lowell Regional Wastewater Utility after it stopped taking leachate from Turnkey Landfill.
Jason Turgeon

"It's important that we listen to the public about their concerns and it's important that we have empathy, but also important that we educate the public about what the science is," Retallick said, adding his company has "managed carbon-fluorine compounds for decades."

Stifel Managing Director Michael E. Hoffman similarly told attendees at GWMS this year they needed to "control the dialogue" around PFAS and emphasized the waste industry is "part of the solution, not part of the problem." He also offered the area could represent "an enormous opportunity" for business, as Waste Management also indicated in financial filings. In a WasteExpo session

months later, Hoffman again mentioned the chemicals, stating the industry is “doing a good job of staying in front of this,” while adding the presence of PFAS at waste sites will still draw attention.

Outside groups are more focused on pushing forward regulations and legislation enshrining stricter permits and testing requirements. The Conservation Law Foundation (CLF), which is based in New England, has offered testimony and comments in multiple states regarding proposed actions on PFAS. While CLF has strongly criticized PFAS incineration, landfilling the chemicals also remains a point of concern.

“PFAS will end up in landfill leachate and is likely to contaminate ground or surface water via a number of pathways,” said CLF Vermont Vice President and Director Jen Duggan.

CLF supports phasing PFAS out of consumer products as well as industrial processes. The organization also maintains all facilities should be barred from discharging or dumping PFAS-laden waste materials, with robust environmental reporting mechanisms initiated to address compliance and clean-up.

Duggan suggested major lawsuits against PFAS manufacturers like 3M and DuPont could help generate substantial support to compensate states and public entities seeking to clean up PFAS sites. But she also said waste site operators have an “independent obligation” to remove PFAS from any discharge, including leachate. DuPont and Chemours did not respond to a request for

comment, while a spokesperson for 3M declined to comment.

The question of who will pay is among the biggest the industry will face in the next decade. Retallick of Clean Harbors said he anticipates real action from EPA in the next two years. But the scope of any federal government decisions could range dramatically, and multiple sources agreed the upcoming November election will play a major role in determining the extent of future regulations.

One long-term scenario could see some PFAS designated as hazardous substances under federal Superfund law, a move supported by EWG and other groups as well as some lawmakers.

Melanie Benesh, an EWG legislative attorney, said it is possible certain landfills could become Superfund sites due to PFAS in the future. But she also said such sites are "complex" and that EPA could exercise discretion in any litigation.

"It's unlikely that PFAS would be the only contaminant at issue," she said, adding a site owner would likely not be held financially responsible for the contamination.

But the issue remains a concern for companies. In February, the law firm Jones Day said such a designation could have "major consequences" for entities that produce, use, or transport PFAS as the Resource Conservation and Recovery Act (RCRA) gives EPA control over hazardous waste from "cradle to grave."

EPA has promulgated Significant New Use Rules for PFAS under the Toxic Substances Control Act, but they primarily target future manufacturing and importation. A RCRA hazardous waste designation would automatically list PFAS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act, or Superfund law.

Such uncertainties will only mount in coming years. Many experts said they anticipate regulations to ramp up, creating a patchwork across the country until Congress or EPA takes broad action. More destructive technologies may emerge in the meantime and a number of consultants and scientists said the next five to seven years could yield an effective solution to PFAS disposal issues.

In the meantime, Nicolai of Casella said the industry can shape its approach to PFAS around ongoing realities, just as it would any other serious concern.

“These waste materials do exist and are going to be handled over coming decades, so it’s very important that we handle them properly,” he said. “That needs to be part of our sustainable waste management practice.”

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