



Solid Waste Landfill PFAS Data Secretaries' Science Advisory Board December 3, 2025



Background on PFAS and Landfills

- Types of landfills in NC where PFAS would likely be present based on waste type(s) accepted:
 - Pre-Subtitle D municipal landfills (unlined)
 - Industrial landfills (unlined and lined depending on waste)
 - Construction and Demolition landfills (unlined unless new after 2007)
 - Subtitle-D MSW landfills (lined)
- Landfills, like Publicly Owned Treatment Works (POTWs) are receivers of PFAS containing materials and are not the producers or original sources
 - PFAS in landfills is regulated across 3 NCDEQ Divisions (Air, Water, and Waste)
 - Landfills and POTWs have been historically co-dependent (leachate treatment and sludge disposal)
- Early grad student university research and other state's regulation of PFAS in leachate (Vermont 2016) started raising awareness
- February 2019 - NCDEQ met with landfill industry representatives to discuss the potential presence of PFAS and 1,4-dioxane in MSWLF leachate and influence on leachate treatment/disposal practices
 - Industry produced a study of primarily privately owned MSWLFs showing levels in landfill leachate in NC
- Most publicly owned landfills opted to participate in an NCSU-based study on landfill leachate and POTWs.
 - “Release of Per- and Polyfluoroalkyl Substances from Municipal and Construction and Demolition Waste Landfills and Wastewater Treatment Plants in North Carolina” - Thelusmond et al. 2025

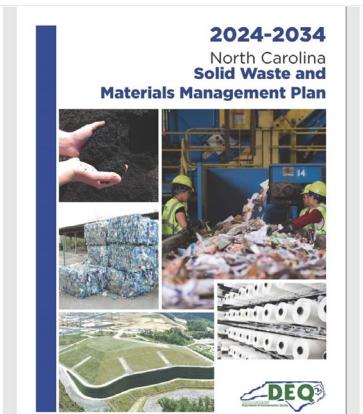


DEQ Prioritization on PFAS and Landfills

- Landfills are a priority focus in the DEQ PFAS Action Strategy
- Managing PFAS and its potential impacts from landfills and other solid waste facilities is an area of focus in the 2024-2034 Solid Waste and Materials Management Plan (published 9/16/2024)

North Carolina DEQ Action Strategy for PFAS

June 7, 2022



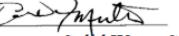
PFAS Monitoring at Landfills

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MICHAEL SCOTT
Director



March 13, 2023

MEMORANDUM

To: Solid Waste Directors and Landfill Owners/Operators
From: Ed Mussler, Section Chief 
NC Division of Waste Management, Solid Waste Section
Re: PFAS Monitoring Requirements for Solid Waste Sanitary Landfills

Background

Per- and polyfluoroalkyl substances (PFAS) are a group of manufactured compounds used in a variety of industries, such as aerospace, automotive, textiles, and electronics, and are widely used in commercial and consumer products such as food packaging, water- and stain-repellent fabrics, nonstick products, and firefighting foams. Many of these products and by-products are commonly disposed in solid waste landfills. PFAS, including perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), are a concern because they:

- do not break down in the environment,
- can move through soils and contaminate drinking water sources,
- build up (bioaccumulate) in fish and wildlife, and
- have been linked to adverse health effects in humans and animals.

PFAS Sampling

The Solid Waste Section (Section) is requiring that all groundwater, surface water, and leachate samples collected at solid waste sanitary landfills **after July 1, 2023** be analyzed for per- and polyfluorinated substances (PFAS), in accordance with the requirements and procedures for groundwater and surface water monitoring established under 15A NCAC 13B Rules .0601, .0602, .0544, .0545, .1623, and .1630 through .1637, 15A NCAC 02L, and the provisions of G.S. 143-215.1(a). This includes any active, inactive, or closed sanitary landfill currently conducting and reporting water quality and/or leachate sampling results to the Section.

- March 13, 2024 – Section memo requiring all SW sanitary landfills to monitor for PFAS in groundwater, surface water, & leachate.
- July 17, 2024 – Section clarification memo responding to feedback & questions regarding the required PFAS monitoring.
- 276 landfills were initially required to conduct PFAS monitoring
- Analytical Methods
 - EPA Method 1633 (draft and final) for majority of data
 - EPA 537.1 Mod for subset of samples



Landfill PFAS Sampling Initiative



- To collect data and evaluate the presence of PFAS in the environment from the management of these permitted facilities.
- PFAS sampling was allowed to be conducted during each facility's regular scheduled site monitoring (i.e., semiannual)
- Landfill facilities were initially required to conduct PFAS monitoring for two events, then Section would evaluate further assessment, continued monitoring, etc.
- All groundwater monitoring reports received have been uploaded to our online public facing document system (Laserfiche)

PFAS Data Management

- PFAS data uploaded to DEQ's EQuIS Data Processor (EDP) v7.23.1
 - Groundwater monitoring well identification numbers at each landfill facility
 - Constituents sampled for in each groundwater monitoring well
 - Analytical result for each constituent sampled for in each groundwater monitoring well
- EQuIS data queries used for determining further regulatory action at specific landfills based on reported PFAS detections.
- Data queries also used to get a better understanding of types, concentrations, and prevalence of PFAS associated with solid waste landfills.



Reported PFAS Minimum/Maximum Detections in Groundwater for Permitted Solid Waste Landfills - as of March 31, 2025 (See NOTES at bottom of the Table)

			GenX		PFOA		PFOS		PFBA		PFBS		PFHxA		PFHxS		PFNA					
CAS Number			13252-13-6		335-67-1		1763-23-1		375-22-4		375-73-5		307-24-4		355-46-4		375-95-1					
2L Groundwater IMAC *			10		0.001		0.7		7000		2000		4000		10		10					
Existing Laboratory PQL			5		4		4		5		3		3		3		4					
Federal MCL Drinking Water Standard*			10		4		4		n/a		n/a		n/a		10		10					
Permit ID	Facility Name	County	MIN Detect	MAX Detect	MIN Detect	MAX Detect	MIN Detect	MAX Detect	MIN Detect	MAX Detect	MIN Detect	MAX Detect	MIN Detect	MAX Detect	MIN Detect	MAX Detect	Facility Type	Ownership Status	Operational Status	Construction Type		
0101-MSWLF-1979	Alamance County Landfill	Alamance	1.2	11	0.5	6830	1.2	11800	1.1	452	0.2	262	0.2	1440	0.2	581	0.3	973	MSWLF	Public	Closed	Unlined
4502-INDUS-	Kimberly Clark Industrial Waste Landfill	Henderson	BDL	BDL	1.6	4000	17.0	15000	1.4	500	1.1	770	8.4	4600	1.0	1700	0.7	100	INDUS	Private	Closed	Unlined
7407-CDLF-2009	C & D Landfill Inc	Pitt	BDL	BDL	3.5	1400	1.1	610	7.8	1000	4.7	970	15.0	2100	1.3	650	2.4	55	CDLF	Private	Active	Unlined

***NOTES:**

In March 2023 the NC Solid Waste Section required all sanitary landfills to conduct PFAS groundwater monitoring for at least two regularly scheduled monitoring events. The data in this table represents the single lowest and single highest PFAS values detected in groundwater at each landfill facility that has submitted PFAS data to date. The table only includes the results of the 8 pFAS constituents for which IMACs have been established.

MCL (Maximum Contaminant Level) - National primary drinking water standards per Safe Drinking Water Act under 40 CFR Part 141

2L Groundwater IMAC - On October 15, 2024 the NC DEQ Division of Water Resources established interim maximum allowable concentrations (IMACs) in groundwater for eight per- and polyfluoroalkyl substances (PFAS) in accordance with 15A NCAC 02L .0202(c). Within 12 months of this date, the Director will make a recommendation to the NC EMC as to whether any IMAC should be replaced by a new 2L groundwater standard or expire.

PQL (Practical Quantitation Limit) - The lowest concentration of a given material that can be reliably achieved by a particular analytical technique operated within specified parameters of a given analytical method during routine laboratory analysis while following all applicable state or federal quality assurance and quality control requirements [15A NCAC 02L .0102]. PQLs listed on this table are based on national laboratory validation results documented in U.S. EPA's Method 1633. NOTE: Rule 15A NCAC 02L .0202(b)(1) states in part: "Where the standard for a substance is less than the practical quantitation limit, the detection of that substance at or above the practical quantitation limit constitutes a violation of the standard."

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BDL = Below (Method) Detection Limit. The method detection limits for each sample and each PFAS could vary depending upon a multitude of factors specific to each sample run, analytical laboratory, method, compound, interferences, and other factors.

FACILITY TYPES:

MSWLF = Municipal Solid Waste Landfill

CDLF = Construction & Demolition Landfill

INDUS = Industrial Landfill

TIRE = Tire Monofill Landfill

INDUS (CCR) = Coal Combustion Residuals Landfill

DISCLAIMER: The North Carolina Department of Environmental Quality (DEQ) shall not be held liable for any errors in this data. This includes errors of omission, commission, errors concerning the content of the data, and quality assurance and quality control of the data. These data cannot be construed to be a legal document. Primary sources from which these data were compiled must be consulted for verification of information contained in these data. Laboratory reports including data qualifiers and quality assurance and quality control information can be found on the NCDEQ Division of Waste Management's (DWM) online document storage site, Laserfiche, which can also be accessed through DWM's Site Locator Tool.

Internal Data Evaluations

DWM PFAS Signature Tool

- Excel-based tool used to analyze PFAS data and create pie charts showing relative distribution of PFAS constituents in a sample set.
- Staff will be using to create leachate PFAS signatures specific to each lined landfill (about 55 total).
- Can also be used to create individual well sample PFAS signatures – for use in possible source determination evaluations.

Landfill PFAS Trends/Characterization

- Preliminary analysis on data to identify any general landfill-PFAS characterization
 - Most prevalent PFAS constituents in groundwater
 - PFAS detections by landfill type, lined/unlined, age, etc



Establishing a Regulatory Framework

- Notice of Regulatory Requirement (NORR) letters are being issued in subsets of facilities for exceedance of applicable 15A NCAC .02L standards
 - prioritized based on magnitude of detections, offsite migration (if applicable), and potential offsite receptor exposure level
 - November 2024: 24 NORR Letters
 - September 2025: 53 NORR Letters
- Letter outlined requirements for:
 - Updated Receptor Survey to identify/verify offsite receptors (including public/private drinking water wells).
 - Assessment Workplan to determine extent of PFAS groundwater migration onsite and to determine whether offsite migration has occurred.
 - Determine if offsite drinking water well sampling is warranted and provide alternative drinking water if results indicate need (i.e., PFAS detections > MCLs).
- If there is an immediate receptor identified, Division staff may conduct well and/or surface water sampling



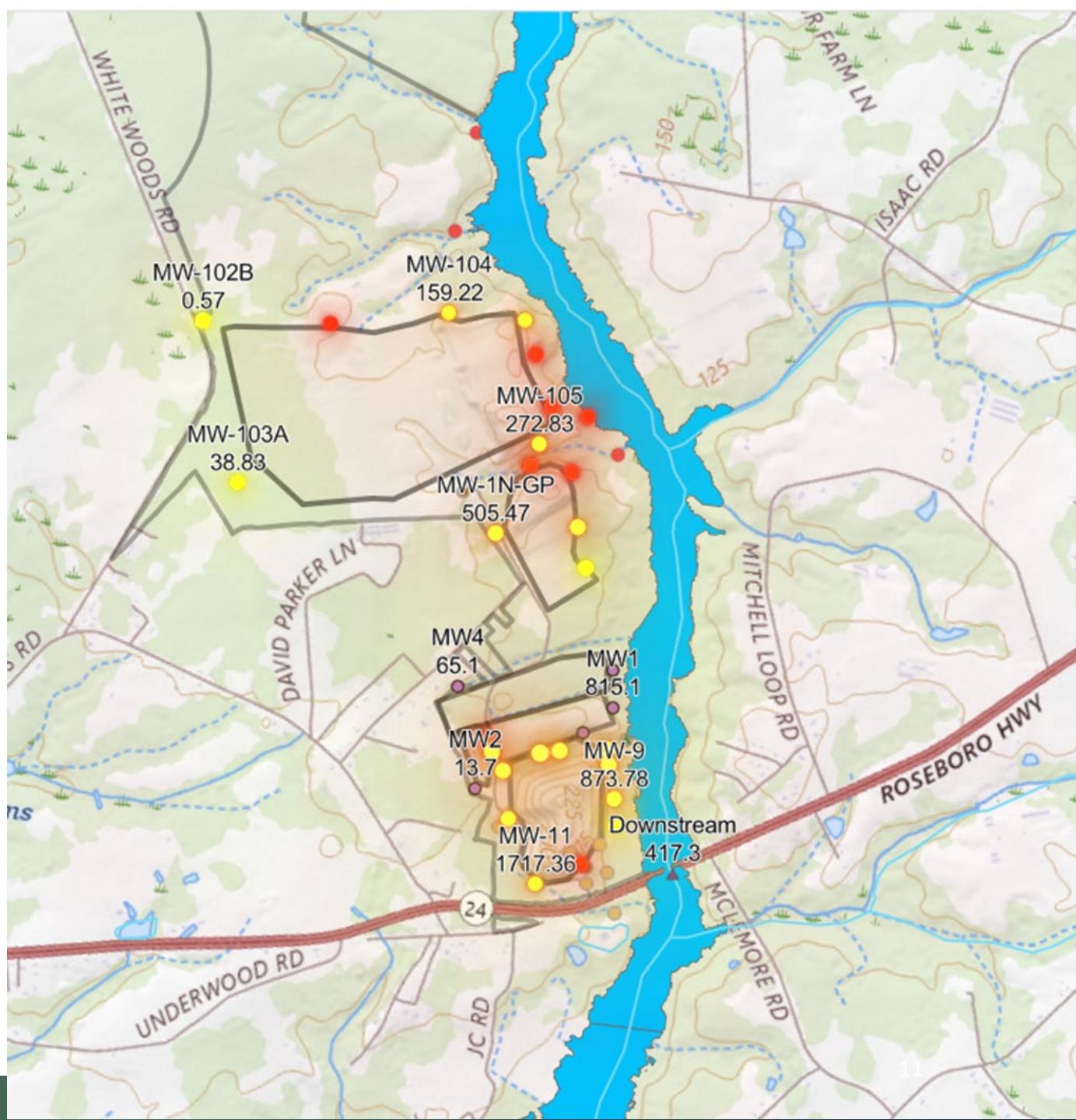
Regulatory Next Steps

- Navigating 2L standard changes as we seek to establish policy, guidance, and potentially future rule considerations
 - PQL → IMACs → 2L standards
- Implementation of Subset 1 workplans
 - 50% contain some level of offsite private well sampling
 - Alternative water supply if warranted provided by the facility or DWM Bernard Allen
- Hydro team is working with facility consultants on subset 2 work plan submittals
- Anticipation is on-going landfill monitoring will continue in perpetuity at most facilities
- Interagency coordination on
 - Pre-regulatory landfills
 - WWTP influent sampling and biosolids
 - Landfill Gas systems
 - Onsite leachate and groundwater treatment options
 - Pre-treatment costs are beyond scope of most local government budgets
- Engaging industry to investigate why PFAS is present at certain facilities, and how that impacts the design, construction, operations and maintenance of landfills in the future.
- Working with facilities, local government leadership, and special interest groups on landfill permitting concerns and challenges.



GFL - Sampson Co Landfill

- Site has four Landfills, 2 C&D and 2 MSW, both lined and unlined units
- GFL was already working with Division of Water Resources on a pretreatment Reverse Osmosis (RO) system for leachate
- Initial PFAS sampling per memo (Fall 2023) - significant amounts of PFAS contamination in the groundwater monitoring networks
 - DWM proactively identified private drinking water wells in the area and analyzed them for PFAS impacts under the Bernard Allen Program
 - Held Public Meeting in Nov 2023
 - 30+ private wells within 2000ft of landfill were sampled and some residences were placed on bottled water
 - Discussions with County about extension of water line to area
- DWM staff collected soil, sediment, and surface water samples in Bear Skin Swamp adjacent to landfill (March 2024)
- GFL submitted an updated receptor survey and installed 9 piezometers to better understand groundwater flow
- DEQ issued NORR letter in June 2024 requiring further assessment due to elevated PFAS for specific areas of site (primarily groundwater intercept system(GGI))
- GFL submitted an action plan to include a 2nd treatment system for GGI groundwater
- EMC approved Special Order of Consent in November for GGI treatment system



Questions?



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Division of Waste Management

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