CASE STUDY

An Integrated PFAS Removal, Concentration, and Destruction Solution for Landfill Leachate at a Wastewater Treatment Plant

CLIENT
Passaic Valley Sewerage Commission (PVSC)

FACILITY
Wastewater Treatment Plant (WWTP)

LOCATION
Newark, New Jersey

WATER MATRIX
Landfill Leachate - Mixture from Several Landfills in the Northeast and Mid-Atlantic

CAPACITY
Proposed Treatment Plant Capacity of 500,000 gpd

PFAS TREATMENT TECHNOLOGIES
Olift™ Foam Fractionation
Obreak™ Electro-Oxidation

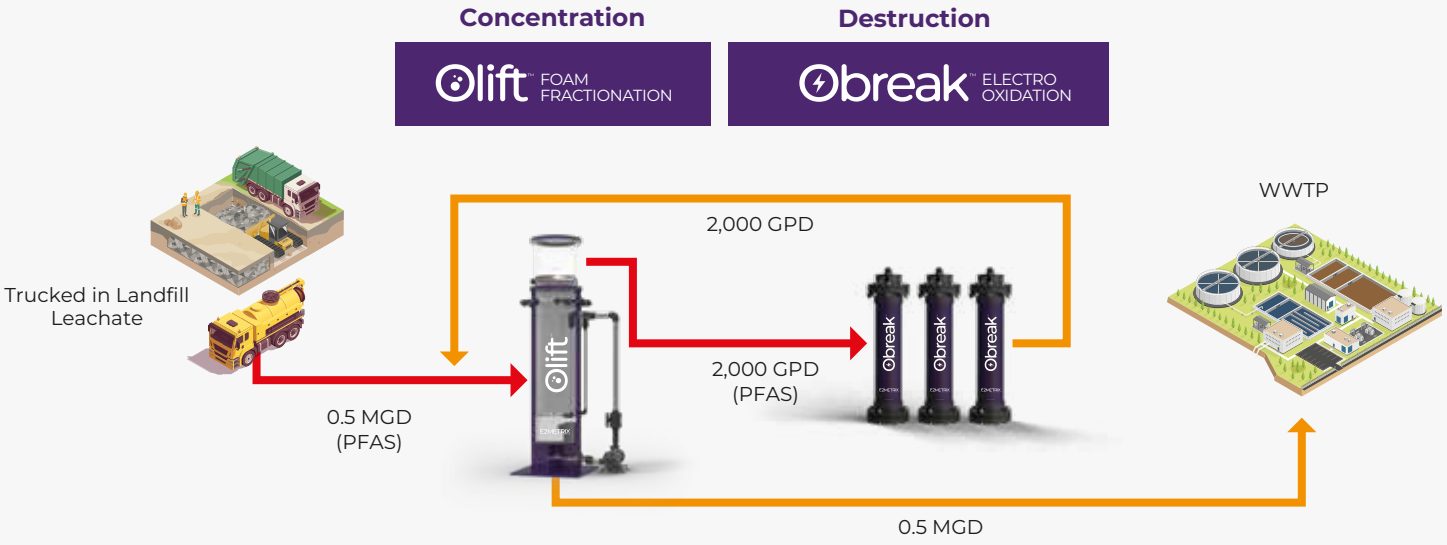
BREAK FREE FROM PFAS™

Olift™ FOAM FRACTIONATION

Obreak™ ELECTRO OXIDATION

SUMMARY

Located in Northern New Jersey, the Passaic Valley Sewerage Commission (PVSC) processes an average of 240 million gallons per day (MGD) with a rated capacity of 330 MGD, making it the largest wastewater facility in New Jersey and fifth largest in the country. PVSC has noted that incoming waste streams containing PFAS may result in discharged effluent exceeding future NJPDES permit limits. PVSC's consultant, Black & Veatch, selected E2METRIX (an Ovivo Company) to demonstrate a closed-loop PFAS removal system for treating trucked-in waste, including landfill leachate prior to mixing with domestic sewage at the PVSC WWTP. The E2METRIX integrated treatment solution demonstrated that it could meet all PVSC's PFAS removal requirements and enabled onsite PFAS destruction, eliminating the need for offsite disposal.



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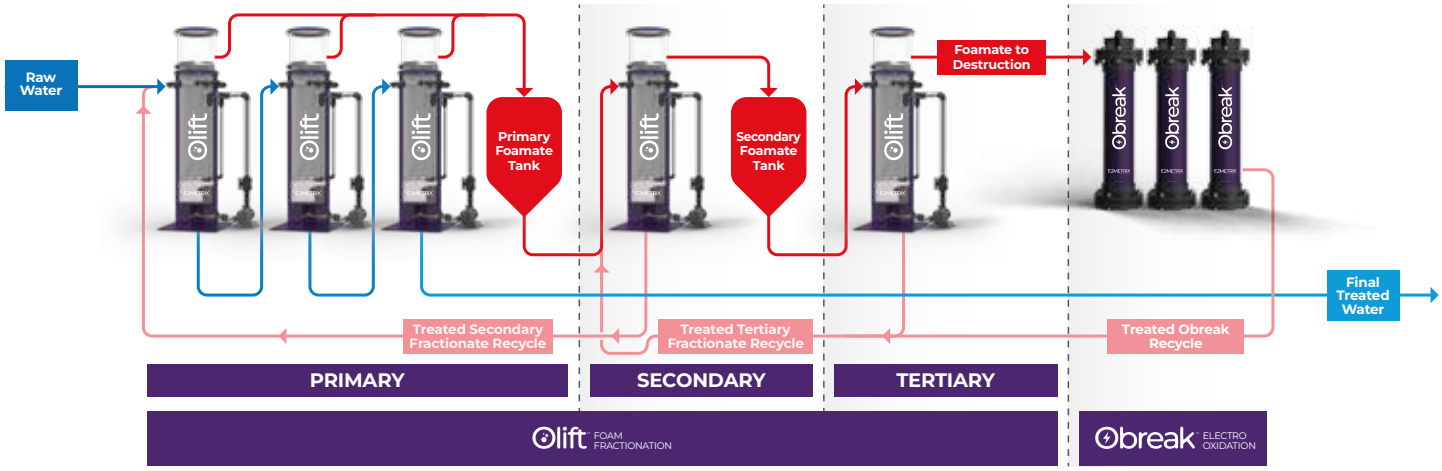
THE CHALLENGE

After sampling influent waste streams for PFAS, PVSC identified landfill leachate as a PFAS source. In preparation for anticipated NJPDES effluent permit requirements, PVSC is taking proactive measures to lower PFAS concentrations from the trucked-in landfill leachate. PVSC performed a study by redirecting trucked-in landfill leachate to a dedicated PFAS pretreatment facility that would pretreat landfill leachate and the effluent would be sent to the wastewater treatment plant for further processing. The strategy includes using advanced water treatment systems to remove a minimum of 70% of total detectable PFAS as measured by EPA Method 1633.

THE DEMONSTRATED SOLUTION

The E2METRIX integrated solution combines Olift™ Foam Fractionation to remove and concentrate PFAS as foamate and Obreak™ Electro-Oxidation to destroy PFAS in the foamate, using an integrated, closed-loop approach. To demonstrate the effectiveness of the closed-loop process, a pilot container incorporating both Olift™ and Obreak™ solutions was mobilized to PVSC in November 2024 for a six-week field demonstration. E2METRIX carried out multiple trials using the 2 gpm-10 gpm continuous Olift™ system and collected the foamate generated across the trials to evaluate PFAS destruction with Obreak™.

The demonstrated Olift™ system comprises three primary Olift™ columns operating in series to remove PFAS from the effluent and concentrate the PFAS into a primary foamate. A single secondary Olift™ column was then utilized to further extract PFAS from the primary foamate and concentrate it into a reduced secondary foamate volume. Additionally, a smaller offsite Olift™ bench unit was used to trial a tertiary Olift™ column to treat the secondary foamate, enabling enhanced volume reduction and further concentration of the PFAS-containing foamate. Both the secondary and tertiary foamate were collected and sent to evaluate PFAS destruction via the Obreak™ Electro-Oxidation system.

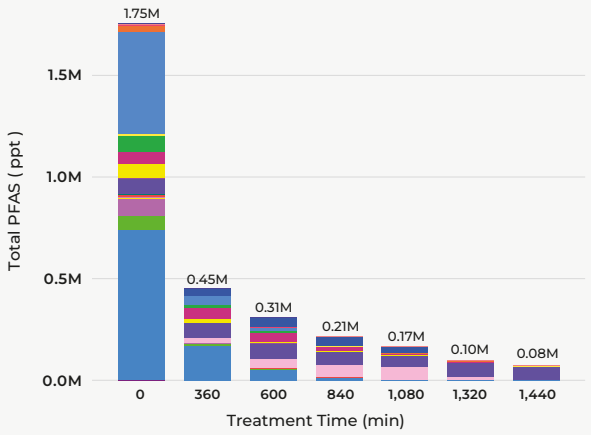


HOW WE MADE A DIFFERENCE

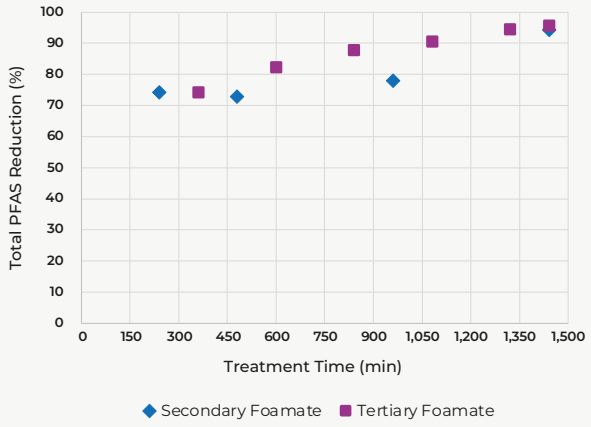
The Olift™ system was able to meet the project goals including individual PFAS removal targets in addition to removing 93% of total detectable PFAS as measured by EPA Method 1633. The Olift™ secondary and tertiary stages were able to successfully concentrate PFAS and reduce volume into 1% and 0.4% of foamate compared to influent-treated leachate volume, respectively.

Both the secondary and tertiary foamate from the Olift™ system were collected and processed through the Obreak™ destruction system to compare destruction efficiencies and determine the benefit of an additional tertiary Olift™ concentration step. The secondary foamate exhibited a Total PFAS concentration of approximately 1.38 M ppt and achieved a final destruction efficiency of about 94%, with the majority of PFAS destruction occurring during the initial treatment time. In contrast, the tertiary foamate exhibited a higher Total PFAS concentration of approximately 1.75 M ppt, and destruction had a more gradual but steady degradation, achieving a slightly greater destruction efficiency of 96% within the same treatment time.

PFAS Destruction on Tertiary Foamate

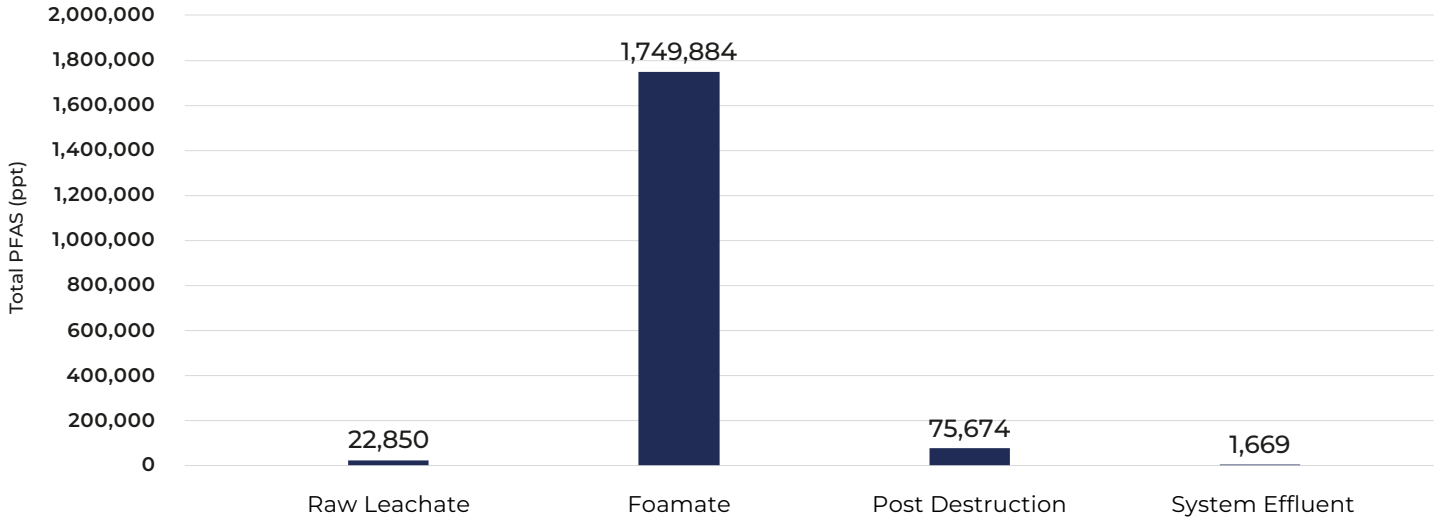


PFAS Destruction Efficiency of Secondary and Tertiary Foamate



The integration of a tertiary Olift™ concentration stage proved beneficial in a closed-loop approach, as it provided a higher concentrated stream of less volume that was well suited for Obreak™, thereby increasing overall treatment efficiency. These results highlight the value of staged tertiary Olift™ Foam Fractionation in combination with Obreak™ Electro-Oxidation treatment, offering a more efficient and targeted pathway for PFAS removal, concentration, and destruction.

PFAS Concentrations Across System



The small volume of effluent from Obreak™ is then recycled to Olift™, allowing the remaining PFAS compounds to be further removed, concentrated, and reprocessed by the Obreak™ destruction solution within a closed-loop system.

Integrated Solution Summary

PFAS Compound	Raw Leachate	Foamate Pre-Destruction	Foamate Post-Destruction	System Effluent	Removal
	(ppt)	(ppt)	(ppt)	(ppt)	(%)
PFOA	**3,600**	**504,000**	**3,130**	**11**	**99.70**
PFOS	**260**	**29,600**	**80**	**5**	**96.20**
PFNA	**85**	**6,640**	**60**	**ND**	**88.20**
PFHxS	**940**	**82,200**	**2,250**	**ND**	**98.90**
PFBS	**6,700**	**72,100**	**59,900**	**21**	**99.70**
PFBA	**2,100**	**1,890**	**2,570**	**1,000**	**52.40**
PFDA	85	4,630	ND	ND	88.20
PFDoA	ND	142	ND	ND	ND
PFEESA	ND	33	ND	ND	ND
PFDoS	38	ND	ND	ND	73.70
PFHpS	ND	561	ND	ND	ND
PFOSA	ND	438	ND	ND	ND
PFHpA	820	71,900	1,110	ND	98.80
PFUnA	ND	300	ND	ND	ND
PFTrDA	ND	80	ND	ND	ND
PFHxA	2,300	55,800	1,350	41	98.20
PFPeA	1,100	3,000	994	580	47.30
PFPeS	92	2,550	719	4	95.90
3:3 FTCA	150	633	ND	ND	93.30
5:3 FTCA	3,800	741,000	2,280	ND	99.70
6:2FTS	410	64,000	1,040	ND	97.60
NEtFOSE	ND	939	ND	ND	ND
NEtFOSAA	140	4,640	ND	2	92.90
4:2 FTS	ND	175	ND	ND	ND
7:3 FTCA	ND	87,300	153	ND	ND
8:2 FTS	ND	2,320	ND	ND	ND
Gen X	ND	29	ND	ND	ND
NEtFOSA	ND	35	ND	ND	ND
FOUEA	ND	64	ND	ND	ND
FHUEA	ND	1,260	ND	ND	ND
NMeFOSA	ND	35	ND	ND	ND
NMeFOSE	ND	2,830	ND	ND	ND
NMeFOSAA	230	8,760	38	5	95.70
SUM OF PFAS	**22,850**	**1,749,884**	**75,674**	**1,669**	**93%**

Conclusions from the OnSite Pilot Demonstration Include the Following:

- E2METRIX's Olift™ and Obreak™ treatment systems achieved site-specific treatment targets for Total PFAS reduction and enabled onsite PFAS destruction.
- Combining Olift™ with tertiary foamate concentration with Obreak™ resulted in energy consumption less than 0.016 kWh/gallon for PFAS destruction.
- By incorporating a tertiary concentration stage with Olift™, the integrated solution CAPEX including Obreak™ is reduced by 20% and OPEX is reduced by 25% compared to only including a secondary concentration stage.
- Onsite destruction with Obreak™ reduces off-site disposal cost and liabilities associated with PFAS-concentrated waste streams.
- Combining Obreak™ and Olift™ into an advanced PFAS treatment system allows a closed-loop process for continual PFAS removal, concentration, and destruction at the highest energy efficiencies.
- Constructing and operating larger centralized PFAS pre-treatment plants at WWTPs offer lower OPEX and CAPEX and improved ROI compared to smaller individualized treatment systems located at each industrial wastewater generator where industrial waste streams are hauled.

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Ovivo, with 150 years of experience in water treatment and nearly 1,500 dedicated water professionals worldwide, is **the preferred partner** for those who value water as much as we do. E2METRIX's PFAS Solutions portfolio is leveraging expertise and innovation from across the company and through valued partnerships to allow our customers to affordably and effectively **BREAK FREE FROM PFAS™.**

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