



MITIGATING PFAS LIABILITY

AFFF Transition from Firefighting Systems

Tom Li
November 28, 2025

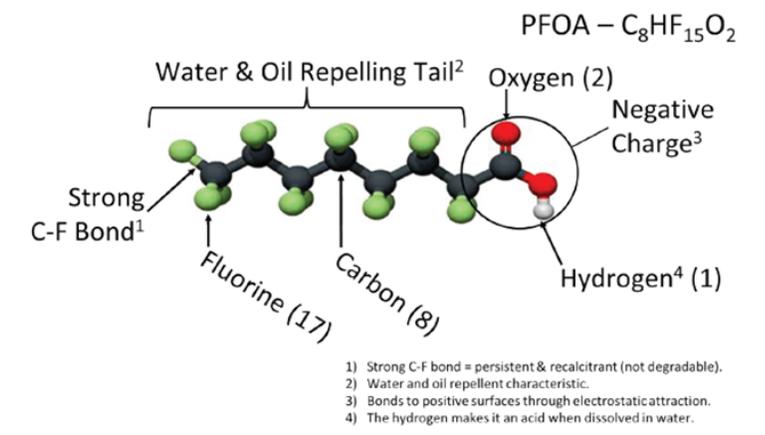
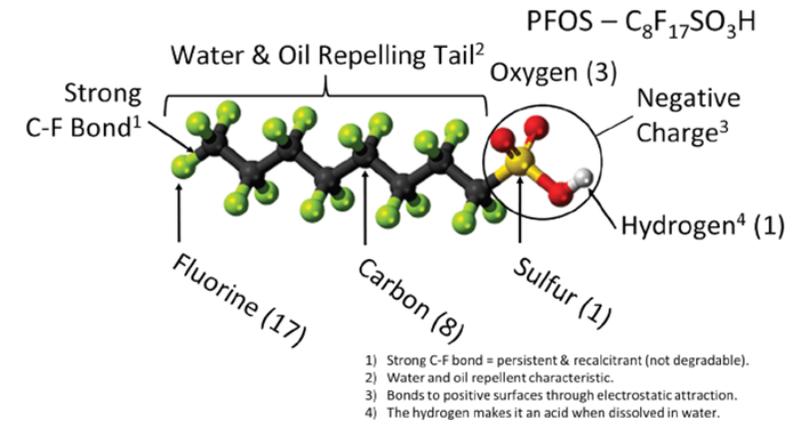


AGENDA

1. Intro to AFFF/PFAS Liability.
2. PerfluorAD™ Technology
3. Case Studies
4. Questions

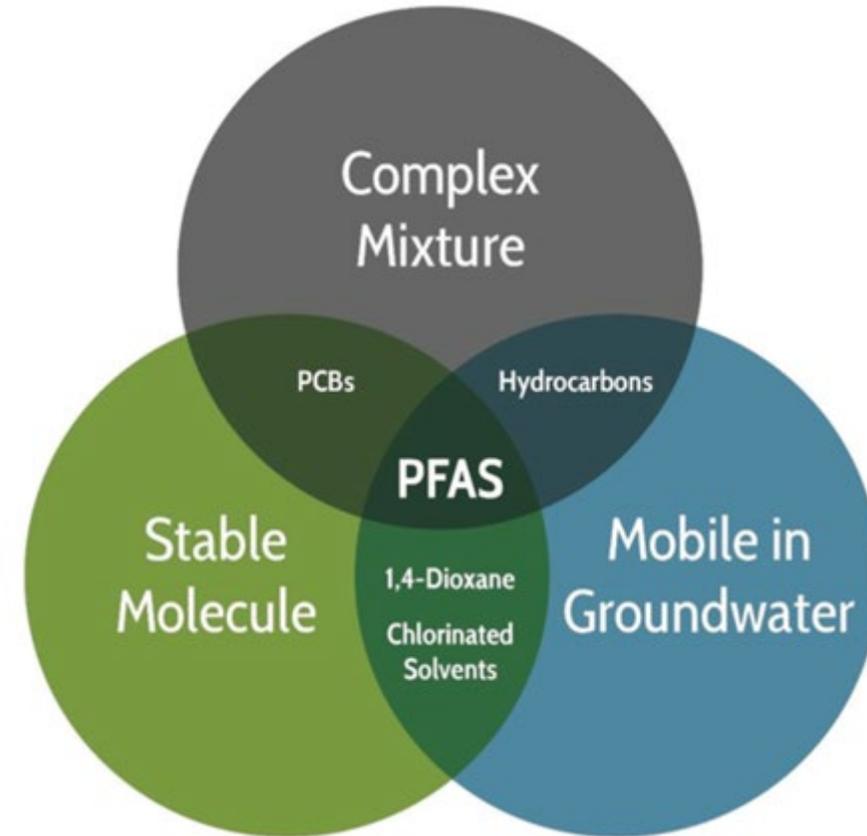
PFAS LIABILITY IN CANADA

- The risk of PFAS to human health and environment are known for over 2 decades
- Most PFAS are classed as a “toxic substance” in Canada under CEPA
- Health Canada has established a drinking water quality objective of 30 nanograms per litre (ng/L) for a sum of 25 specific PFAS
- Linked to cancer, weakening immune system, liver damage, obesity, reproduction and thyroid disease.



ENVIRONMENTAL CONCERNS

- Once discharged to the environment, PFAS are difficult to manage
- Toxic at low levels ng/L
- Mobile in Groundwater
- 10,000s of unknown compounds
- Increasing Regulations
- Recalcitrant, with not many remedial options currently in the market- place



WHAT IS FIREFIGHTING FOAM?

- Aqueous Fire Fighting Foam (AFFF)
- Fire suppression tool- for hydrocarbon fires
- Cooling effect
- Long-lasting barrier over fuel
- Essential for firefighters
- Widespread use in:
 - Airports
 - Oil refineries
 - Military bases
 - Chemical plants
 - Firefighting training areas, Fire Departements
 - Maritime Emergencies where fuel oil are handled



Image Source: International Fire and Safety Journal



Image Source: BioEX.com



WHY FIREFIGHTING FOAM TRANSITIONS?

- AFFF contains PFAS, when released results environmental impacts
- Firefighters have been linked to higher cancer and other health risk from exposure to PFAS (US Human Health Services, 2023, <https://pmc.ncbi.nlm.nih.gov/articles/PMC10698640/pdf/nihms-1926891.pdfz>)
- AFFF soon no longer manufactured in the US
- Regulation changes - Canada phasing out PFAS in AFFF, soil and groundwater standards evolving
- Liability management

The screenshot shows the Government of Canada website header with the Canadian flag, the text "Government of Canada" and "Gouvernement du Canada", and a search bar. Below the header is a breadcrumb trail: "Canada.ca > Environment and natural resources > Pollution and waste management > Canadian Environmental Protection Act Registry > Canadian Environmental Protection Act Registry: publications". The main title of the document is "Consultation Document on Phase 1 of the Risk Management of Per- and Polyfluoroalkyl Substances (PFAS), Excluding Fluoropolymers: Prohibition of the Use of PFAS, not Currently Regulated, in Firefighting Foams".

WHY AFFF CLEANOUT?

- Prepare for transition to fluorine free foam (F3)
- Better performance in firefighting apparatus
- Fraction of the cost compared to replacement



Fixed Fire Suppression System



Aircraft Rescue Firefighting Truck (ARFF)



TRS GROUP AND PARSONS

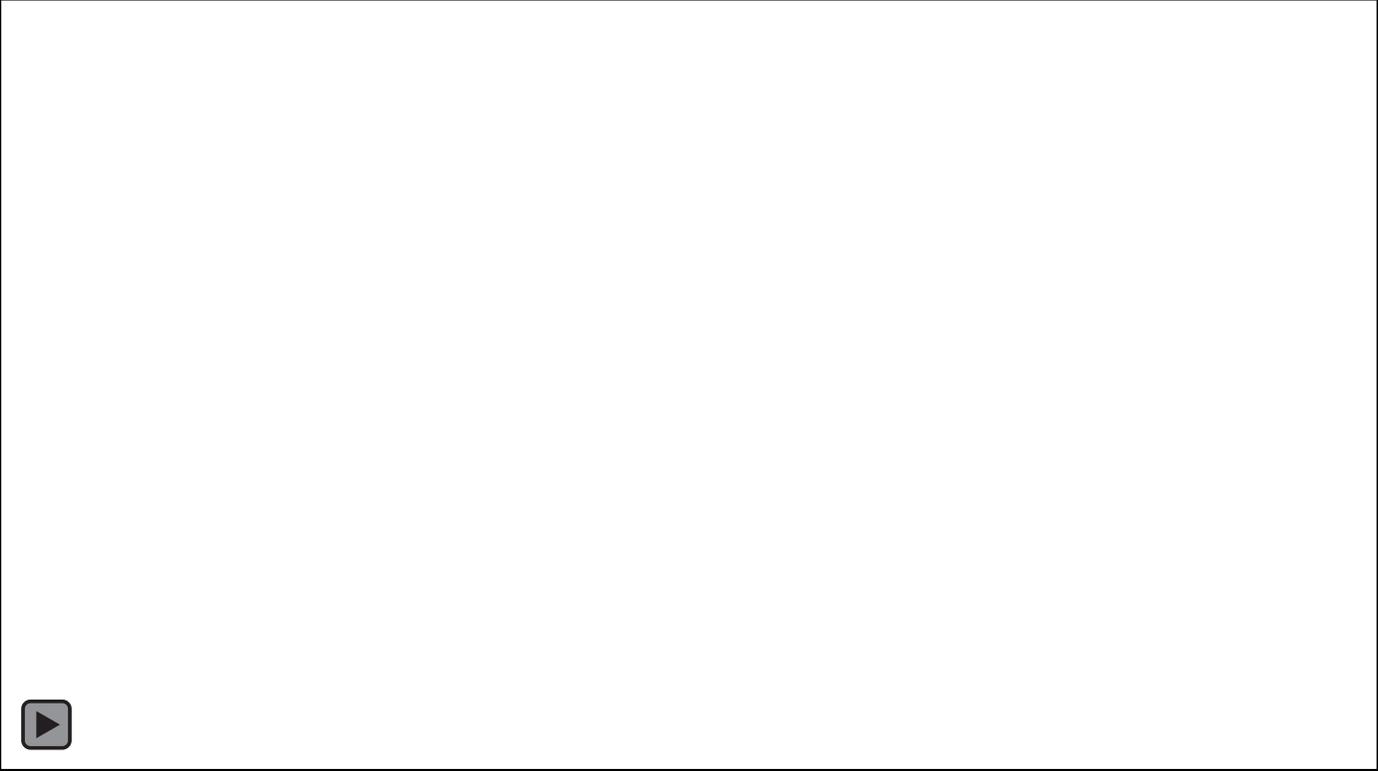


- Parsons acquired TRS Group in 2025
- Patented Thermal remediation process for VOCs, PHCs and PFAS
- Exclusive rights to use PerfluorAD™ for AFFF cleanouts in North America



PERFLUORAD™ TECHNOLOGY

Plant-based oleic acid



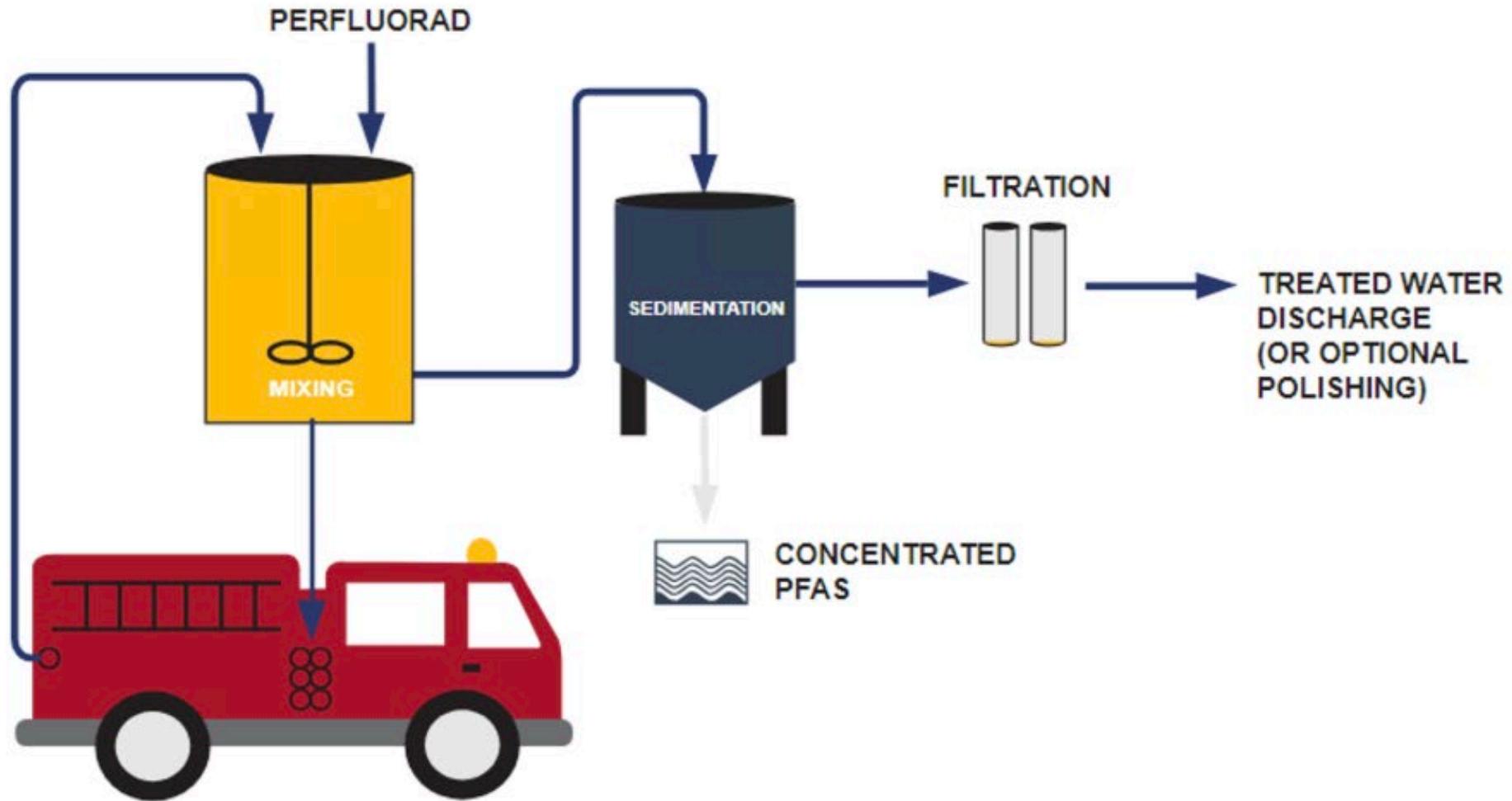
Filtered flocculant



Photos and Video courtesy of Cornelsen



PERFLUORAD™ MOBILE, BATCH TREATMENT SYSTEM



AFFF CLEANOUT OF FIRETRUCKS





AFFF CLEANOUT SYSTEM

Sedimentation tanks

Heated mixing tank

Granular activated vessels

Filters



INITIAL PERFLUORAD RINSE (AFTER WATER RINSE)



Connections to truck

Motorized mixer

Heated (60° C) water

PERFLUORAD™ PROJECTS

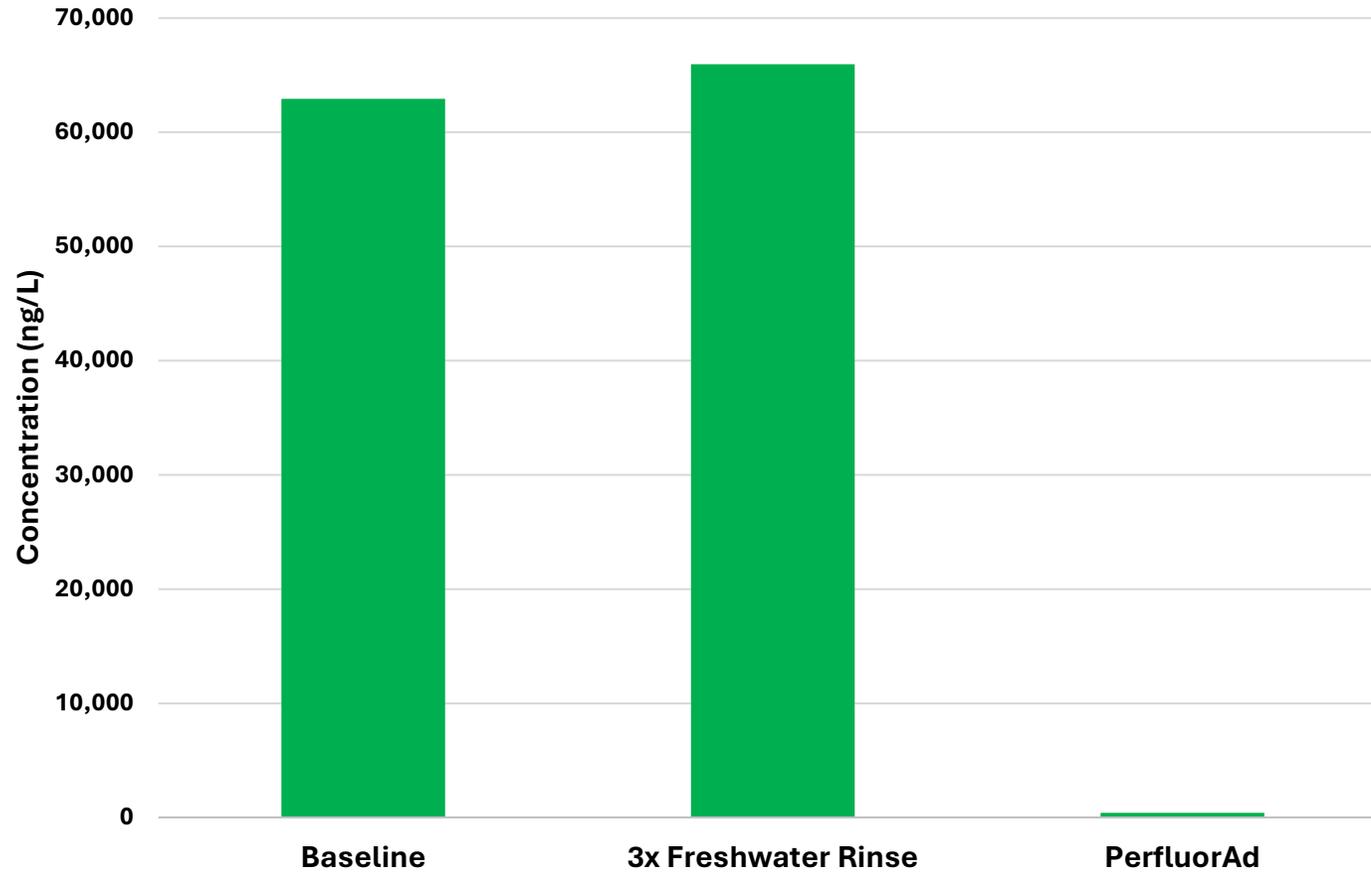
- 80 mobile and fixed system cleanouts completed
- 14 airports
- Increasing cleanout demand
- Expanding equipment fleet





MAJOR, WEST COAST INTERNATIONAL AIRPORT

Total PFAS Concentrations





SEATTLE TACOMA INTERNATIONAL AIRPORT (SEA)

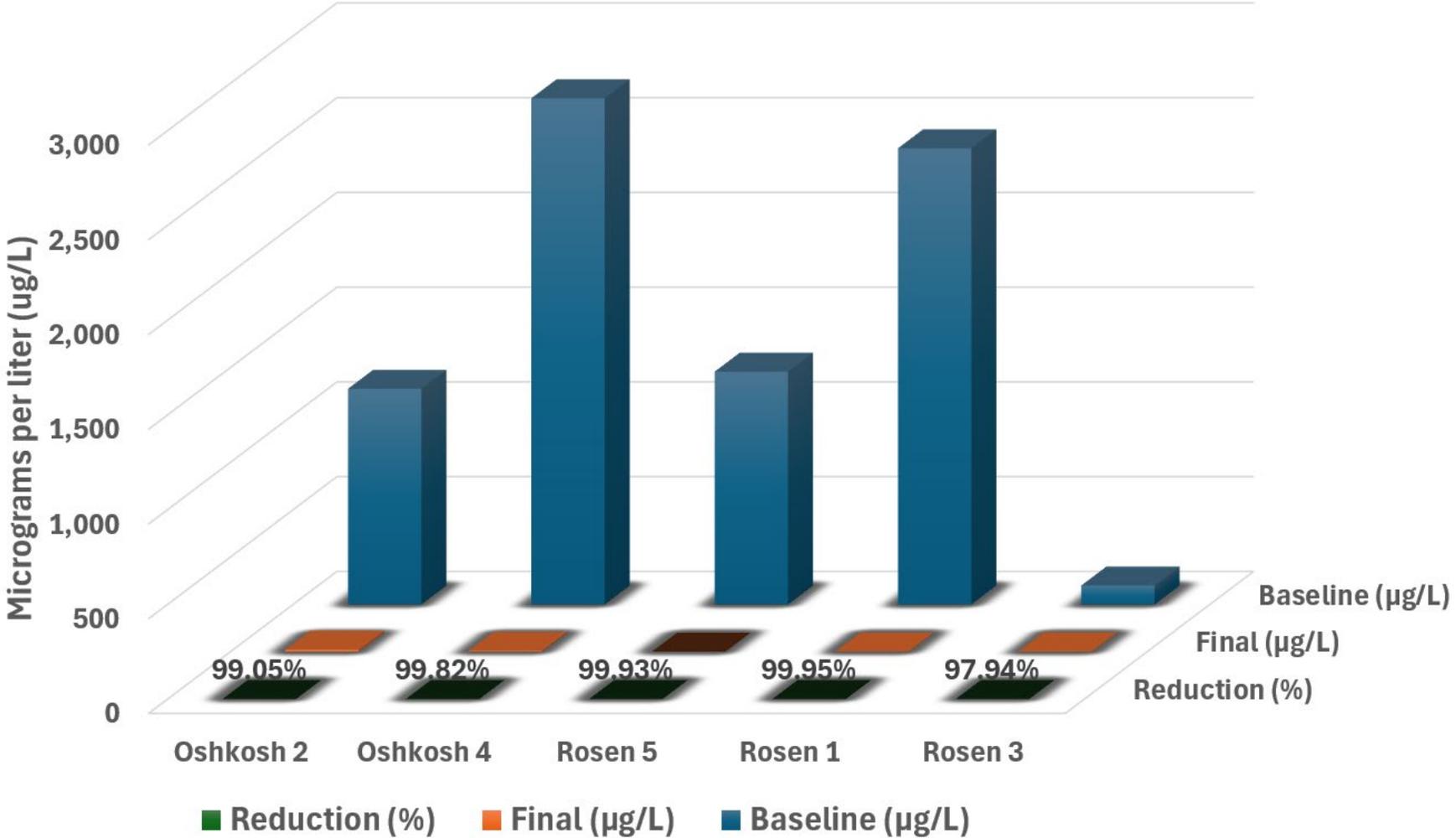
- AFFF cleanout of ARFF's
- Oshkosh, Rosenbauer, E-One
- Regional center – 10 ARFF's
- ~7 days per truck
- Waste minimization
- On-site rinsate discharge



AFFF Cleanout of a Rosenbauer ARFF
Courtesy of Port of Seattle and SEA Airport



SEA PFAS REDUCTION RESULTS

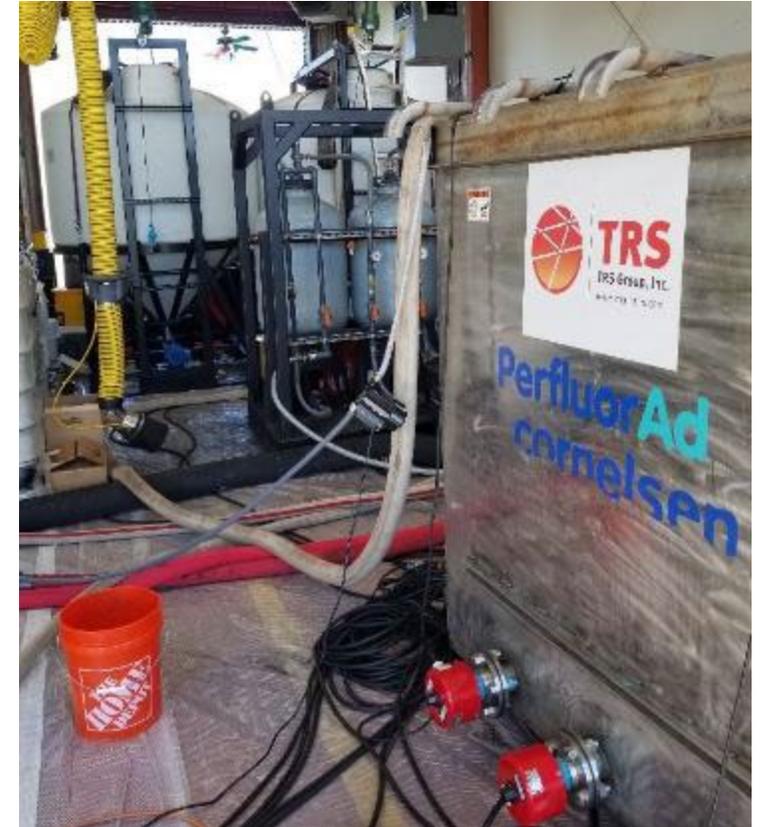


ESTIMATED WASTE DISPOSAL

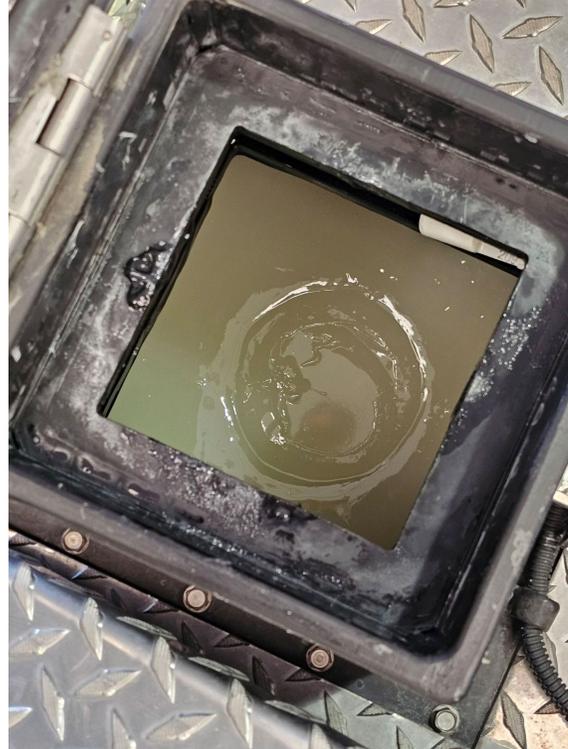
Rinsate Treatment Approach	Rinsate Volume (gallons)	Off-Site Rinsate Disposal	On-Site Treatment & Discharge
PerfluorAd	80,000		\$8,000
Triple Water Rinse	20,000	\$200,000 - \$1,000,000*	

* **Plus, additional fees:** recycle, treatment, and disposal charges and profiling fee. Transportation, stop fee, variable fuel surcharge; transportation shipment

Does not include waste disposal costs for AFFF concentrate, first water rinse, sludge, spent carbon, construction materials, PPE, municipal trash, etc.



Triple Water Rinse of Firefighting Vehicles

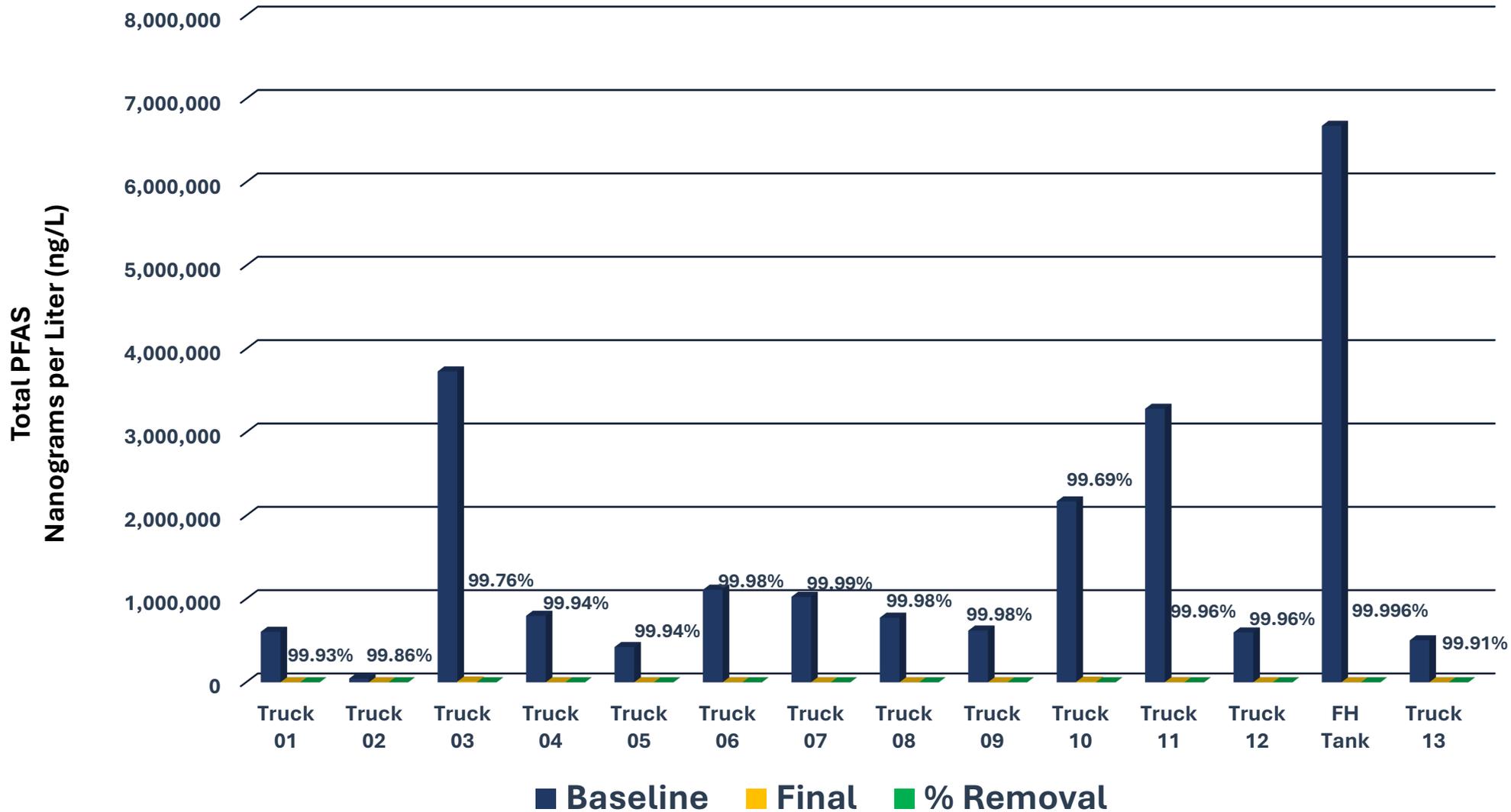


Photos taken at confidential airport

- Airport applied triple water rinse to remove AFFF
- Replacement F3 gelled
- Trucks were compromised
- Airport hired TRS to solve problem
- TRS cleaned out gelled sludge with PerfluorAd
- Trucks returned to full service



LAX and Van Nuys Airports - Results Summary

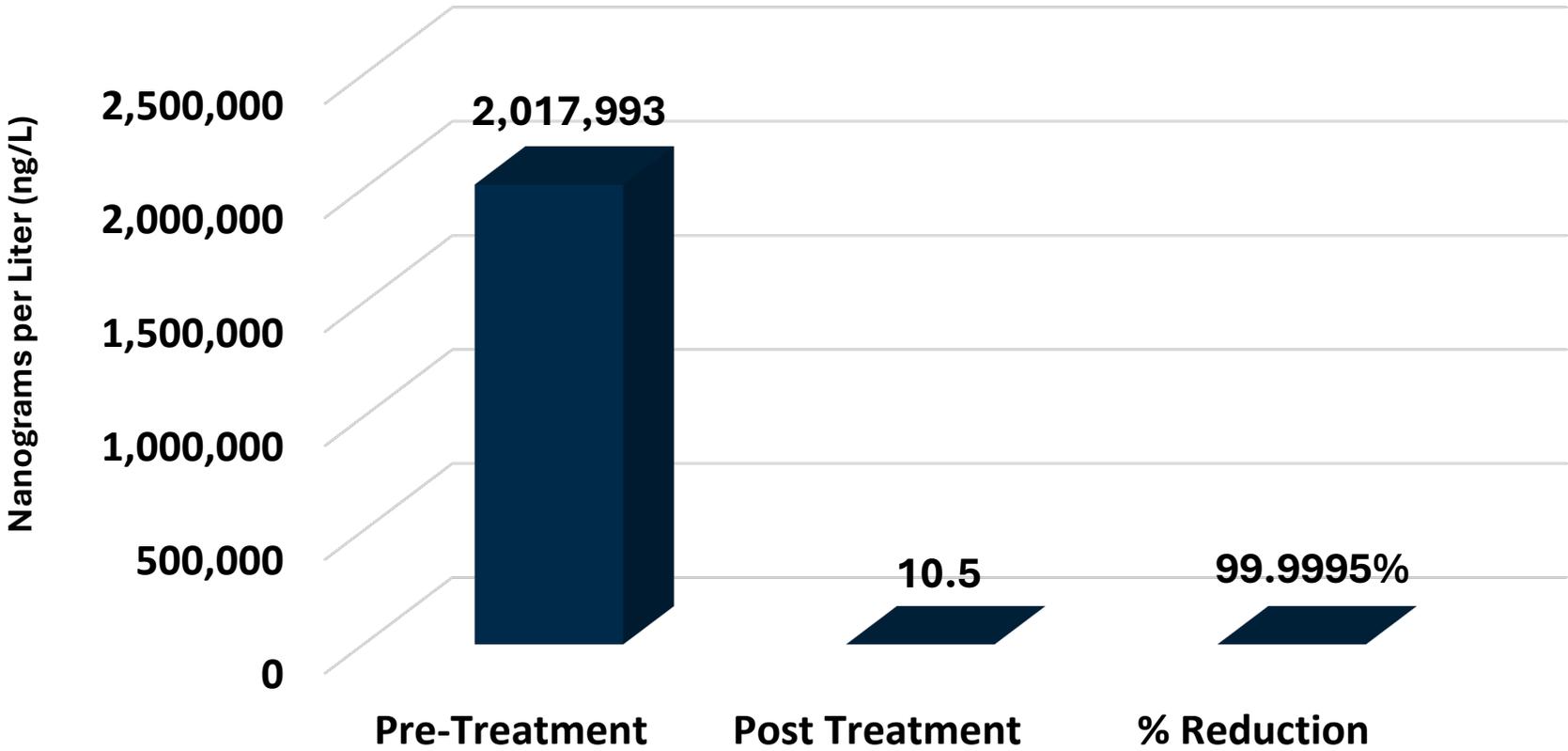


**99.92% Average
PFAS Removal**



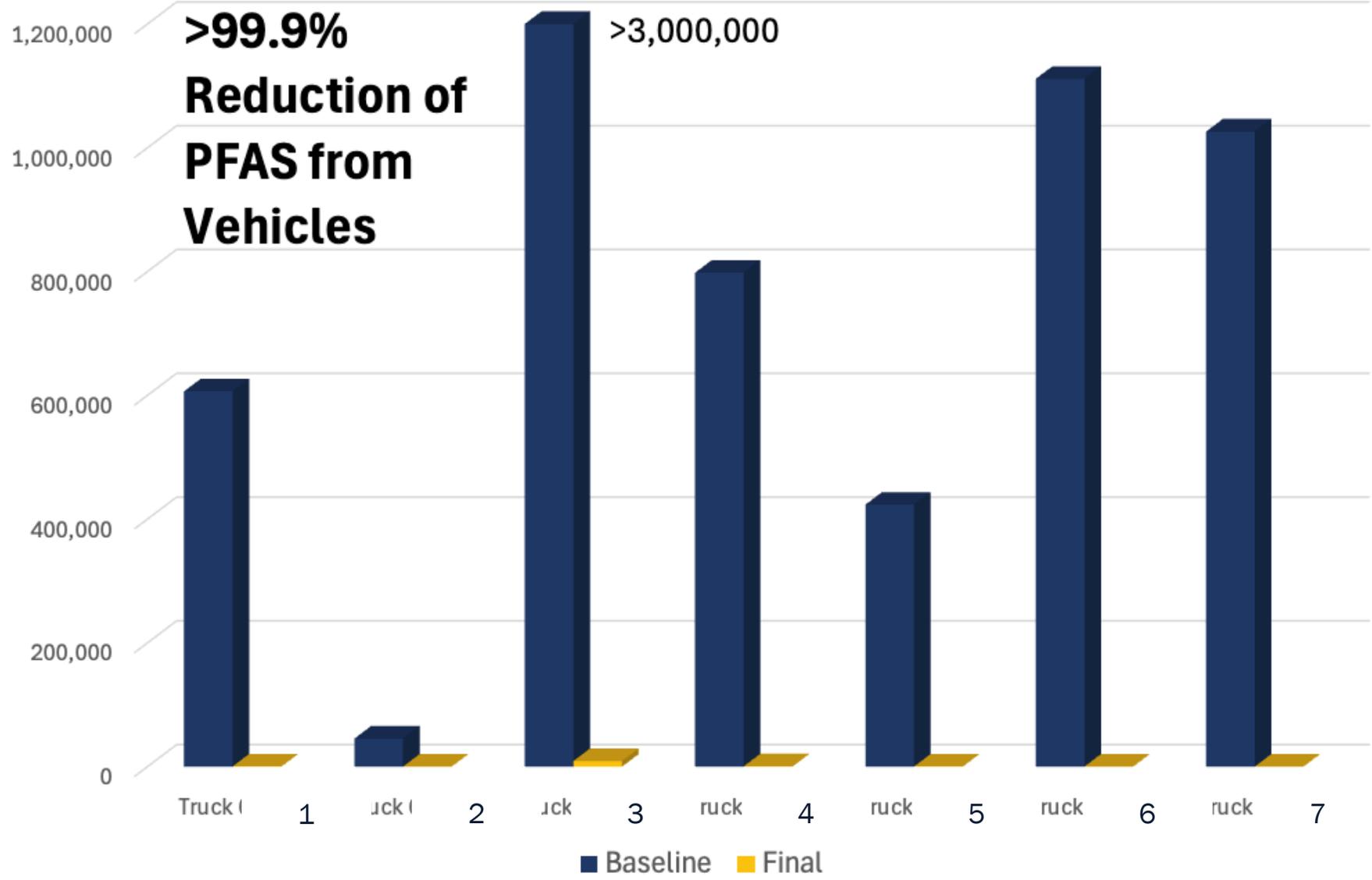
LAX and Van Nuys Airports

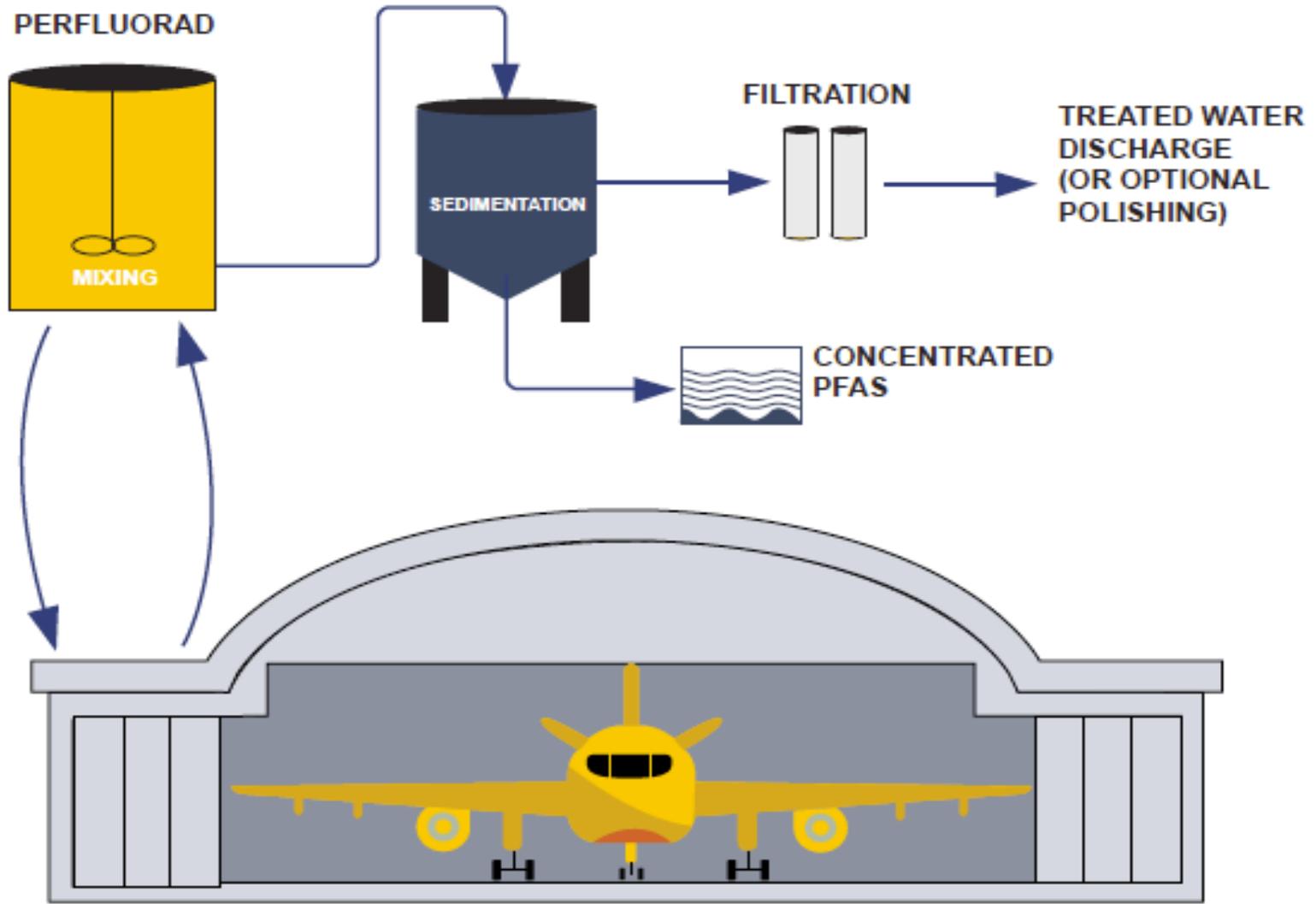
TA49 Second Fill Rinsate Discharge - Total PFAS





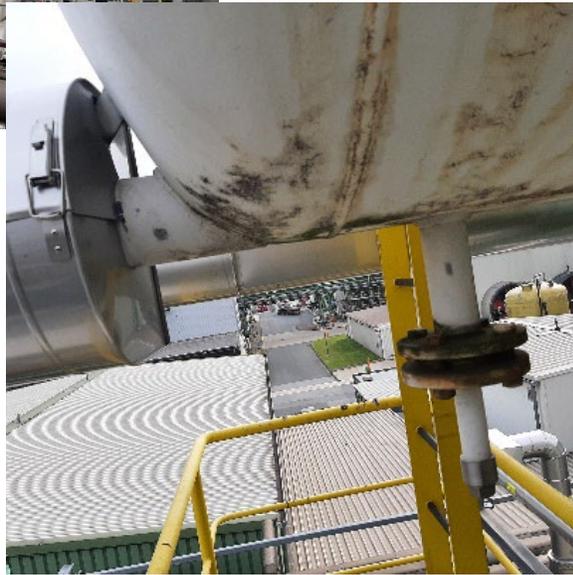
CALIFORNIA AIRPORT - PFAS RESULTS



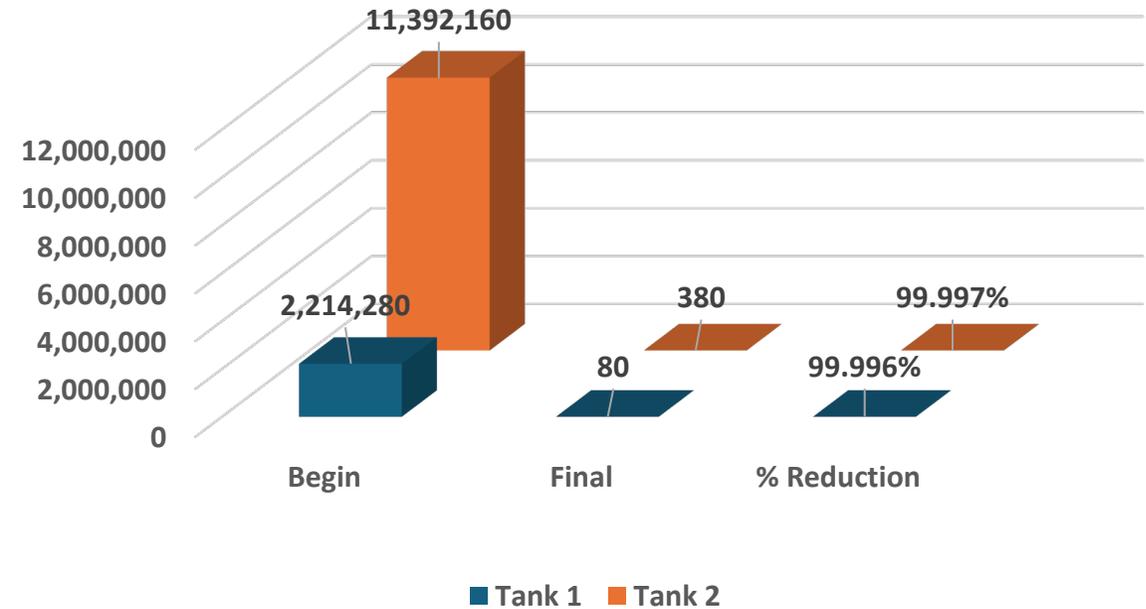


AFFF CLEANOUTS FIXED SYSTEMS

RESULTS IN FIXED SYSTEMS



Chemical Plant (ng/L)





KEY POINTS - AFFF CLEANOUT WITH PERFLUORAD™

- Applicable for mobile and fixed systems- Allows for reuse of mechanical infrastructure
- AFFF remaining with water rinsing alone
- TRS cleaned and transitioned more than 80 trucks
- Methods impact effectiveness
- Minimizes waste disposal
- Can achieve low PFAS objectives
- Lowers rebound risk



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Questions?