



**Massachusetts Water Resources Authority**

## **Joint WAC and WSCAC meeting on PFAS**

**What do we know about PFAS in MWRA  
water, wastewater and biosolids?**

**October 15, 2019**



*“PFAS have been detected in almost every wildlife sample measured, ubiquitously in humans throughout the world, and in most environmental compartments, including pristine locations.”* – Coggan et al *Heliyon* 5 (2019) e02316



# DEP Reporting Detail

- MDL – typically ~3 SD above noise, MRL typically lowest standard level, expect 50% - 150% recovery
- Current ORSG is 70 ng/L (ppt) for sum of PFOA, PFOS, PFHxS, PFHpA, PFNA
- Proposed MCP is 20 ng/L for sum of above plus PFDA

CAS#	REGULATED AND UNREGULATED PFAS CONTAMINANTS	Labs must Report One of the Following			ORSG+ µg/L	MRL µg/L
		Results µg/L	< MRL	< 1/3MRL		
1763-23-1	Perfluorooctane Sulfonic Acid (PFOS)	0.020	<input type="checkbox"/>	<input type="checkbox"/>	0.070	0.004
335-67-1	Perfluorooctanoic Acid (PFOA)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.070	0.004
355-46-4	Perfluorohexane Sulfonic Acid (PFHxS)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	0.070	0.004
375-95-1	Perfluorononanoic Acid (PFNA)	0.030	<input type="checkbox"/>	<input type="checkbox"/>	0.070	0.004
375-85-9	Perfluorohepatanoic Acid (PFHpA)	0.020	<input type="checkbox"/>	<input type="checkbox"/>	0.070	0.004
375-73-5	Perfluorobutane sulfonic acid (PFBS)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	-	0.004
335-76-2	Perfluorodecanoic acid (PFDA)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	-	0.004

< MRL (or < RL) is equivalent to a “J” value, but no estimated concentration is provided. The contaminant was detected but is not quantifiable.

< 1/3 MRL is equivalent to Non-detect

µg/L = micrograms per liter  
Always check the units shown in the report. In this case they are different than the Example in Table 2 above.



# What do we know about PFAS in MWRA water?

- UCMR3 (2014 – 2016) – 180 samples all ND
- 2019 voluntary sampling - DEP Totals
  - Quabbin ~1 ng/L
  - Wachusett ~3 ng/L

Not detected	<u>PFDA</u> , PFDoA, PFTeDA, PFTrDA, PFUnA, NEtFOSAA, NMeFOSAA, 11CI-PF3OUdS, 9CI-PF3ONS, ADONA, HFPO-DA
Quabbin	<u>PFOA<sup>TD</sup></u> , <u>PFOS<sup>U</sup></u> , <u>PFHpA<sup>U</sup></u> , <u>PFHxS<sup>U</sup></u> , <u>PFNA<sup>U</sup></u> , PFHxA <sup>U</sup>
Wachusett	<u>PFOA<sup>TD</sup></u> , <u>PFOS<sup>TD</sup></u> , <u>PFHpA<sup>TD</sup></u> , <u>PFHxS<sup>U</sup></u> , <u>PFNA<sup>U</sup></u> , PFHxA <sup>U</sup> , PFBS <sup>U</sup>
Detect > MRL	<u>PFOA</u> , PFHxA – <b><u>only at one community entry point</u></b>
TD = Trace Detect (1/3 MRL < result < MRL)	U = Ultra-Trace Detect (MDL < result < 1/3 MRL)



# Results as presented on MWRA.COM

<b>PFAS Analyte</b>	<b>Metro Boston Result</b>	<b>CVA Result</b>
Perfluorohexanesulfonic acid (PFHxS)	trace - less than 2.27 ppt	Not detected
Perfluoroheptanoic acid (PFHpA)	trace - less than 2.27 ppt	trace - less than 2.27 ppt
Perfluorooctanoic acid (PFOA)	trace - less than 2.27 ppt	trace - less than 2.27 ppt
Perfluorooctanesulfonic acid (PFOS)	trace - less than 2.27 ppt	trace - less than 2.27 ppt
Perfluorononanoic acid (PFNA)	trace - less than 2.27 ppt	trace - less than 2.27 ppt
Perfluorodecanoic acid (PFDA)	Not detected	Not detected
Compare to possible standard of 20 ppt for the sum of these six compounds*	3 ppt	1 ppt
PFBS	trace - less than 2.27 ppt	trace - less than 2.27 ppt
PFHxA	trace - less than 2.27 ppt	trace - less than 2.27 ppt
NEtFOSAA	Not detected	Not detected
NMeFOSAA	Not detected	Not detected
PFDoA	Not detected	Not detected
PFTeDA	Not detected	Not detected
PFTTrDA	Not detected	Not detected
PFUnA	Not detected	Not detected
11Cl-PF3OUdS	Not detected	Not detected
9Cl-PF3ONS	Not detected	Not detected
Adona	Not detected	Not detected
HFPO-DA	Not detected	Not detected

\* MassDEP is considering a possible drinking water standard of 20 ppt for the sum of these six compounds. The sum reported here is based on proposed MassDEP approach for handling trace results detected below laboratory reporting levels.



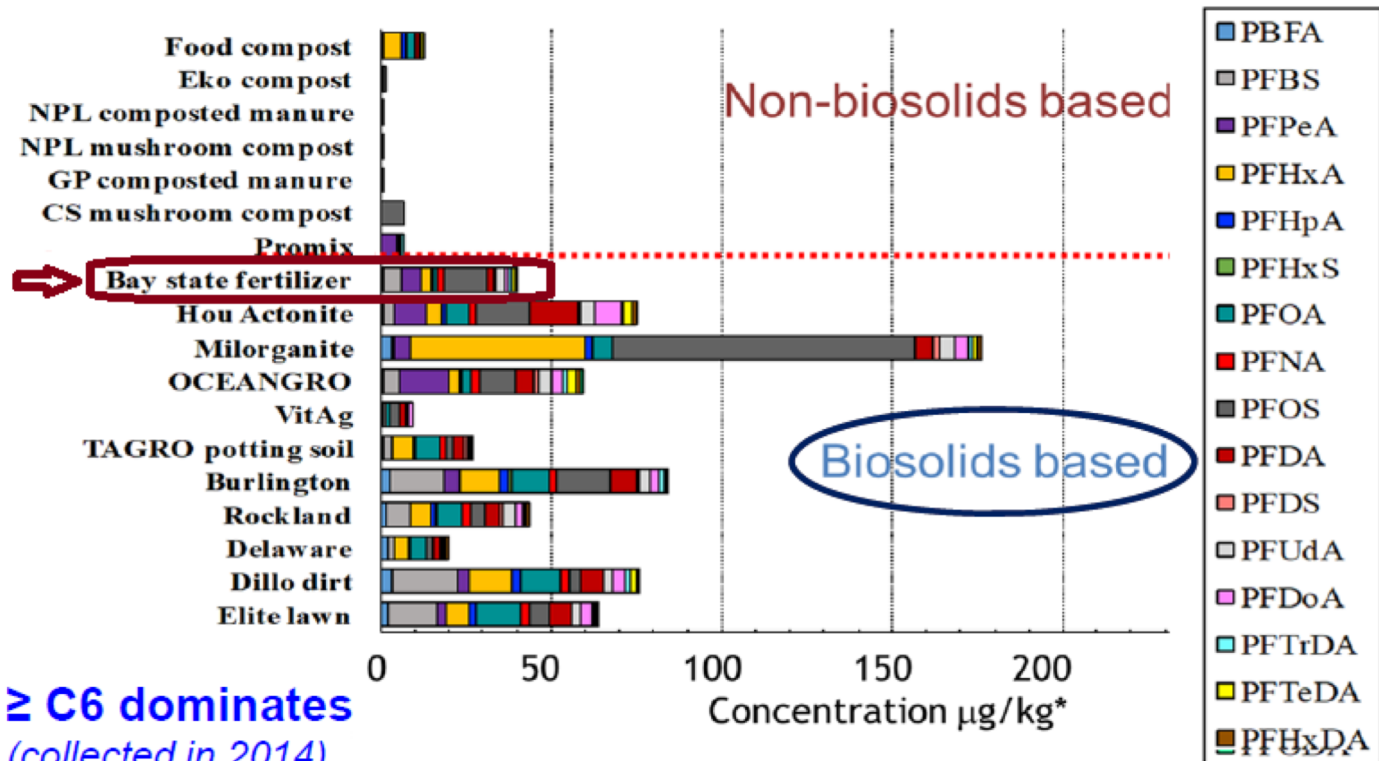
# What do we know about PFAS in MWRA biosolids?

Facility	Location	PFBS (ng/g)	PFOA (ng/g)	PFOS (ng/g)	PFOA + PFOS (ng/g)
Limestone	Limestone	2.3	5.4	120	125
Kennebec Sanitary Treatment District	Waterville	<2.9	5.6	77	83
Pat Jackson, Inc.	Belgrade	3	35	35	70
Bucksport	Bucksport	<0.723	9.95	57	67
Falmouth	Falmouth	0.833	15.1	27.4	43
South Portland South	Portland	<3.02	2.1	37.2	39
Madawaska Pollution Control	Madawaska	<0.485	12	23.5	36
Yarmouth WWTP	Yarmouth	<2.65	4.78	23.4	28
Village Green	Brunswick	<5.37	3.71	24	28
Synagro	North Andover, MA	<0.5	0.95	25.3	26
Portland Water District (Westbrook)	Westbrook	<0.682	1.24	22.9	24
Mechanic Falls Sanitary District	Mechanic Falls	<1.89	1.41	17.8	19
<b>NEFCO</b>	<b>Quincy, MA</b>	<b>&lt;0.893</b>	<b>1.16</b>	<b>17.3</b>	<b>18</b>
McCain Foods USA, Inc.	Easton	<18	<18	9.4	18
Richmond Utility District	Richmond	<1.68	4.33	12	16
LAWPCA	Lewiston	<2.99	<1.5	13.8	15
Boothbay Harbor Sewer District	Boothbay Harbor	<2.83	<2.83	12.4	14
Portland Water District (East End)	Portland	<0.61	0.903	10.9	12
<b>NEFCO</b>	<b>Quincy, MA</b>	<b>&lt;0.57</b>	<b>0.65</b>	<b>11</b>	<b>12</b>
Old Town Pollution Control	Old Town	<0.599	<0.599	9.84	10
Kennebunk Sewer District	Kennebunk	<1.98	<1.98	6.15	7
Brunswick Sewer District	Brunswick	<1.8	<1.8	6	7
Farmington WWTF	Farmington	<3.2	<3.2	4.7	6



# Older data - 2014 National Survey

## PFAAs in Biosolid & Non-biosolid Commercial Fertilizers



Kim Lazcano et al.,  
Manuscript in preparation

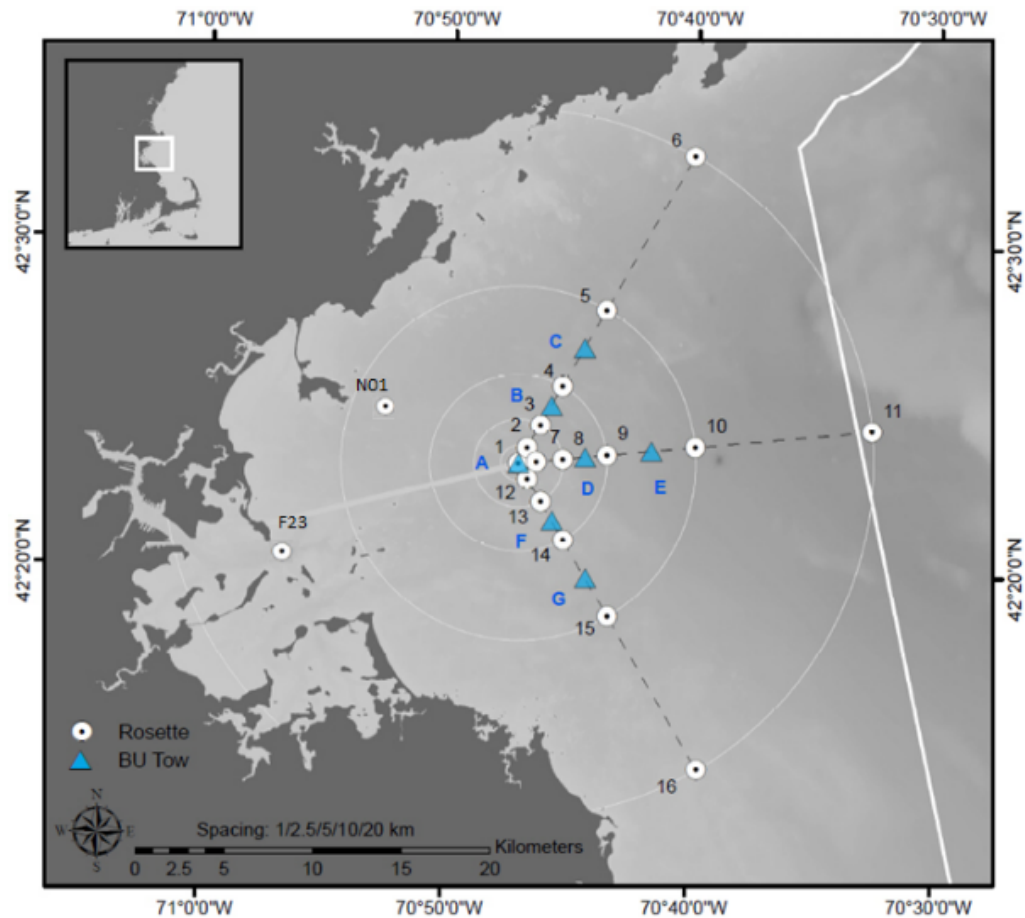
\*Assumes PFAAs negligible in the > 2 mm fraction  
PFAAs quantified in the < 2mm fraction (36-80%)





# What do we know about PFAS in MWRA wastewater?

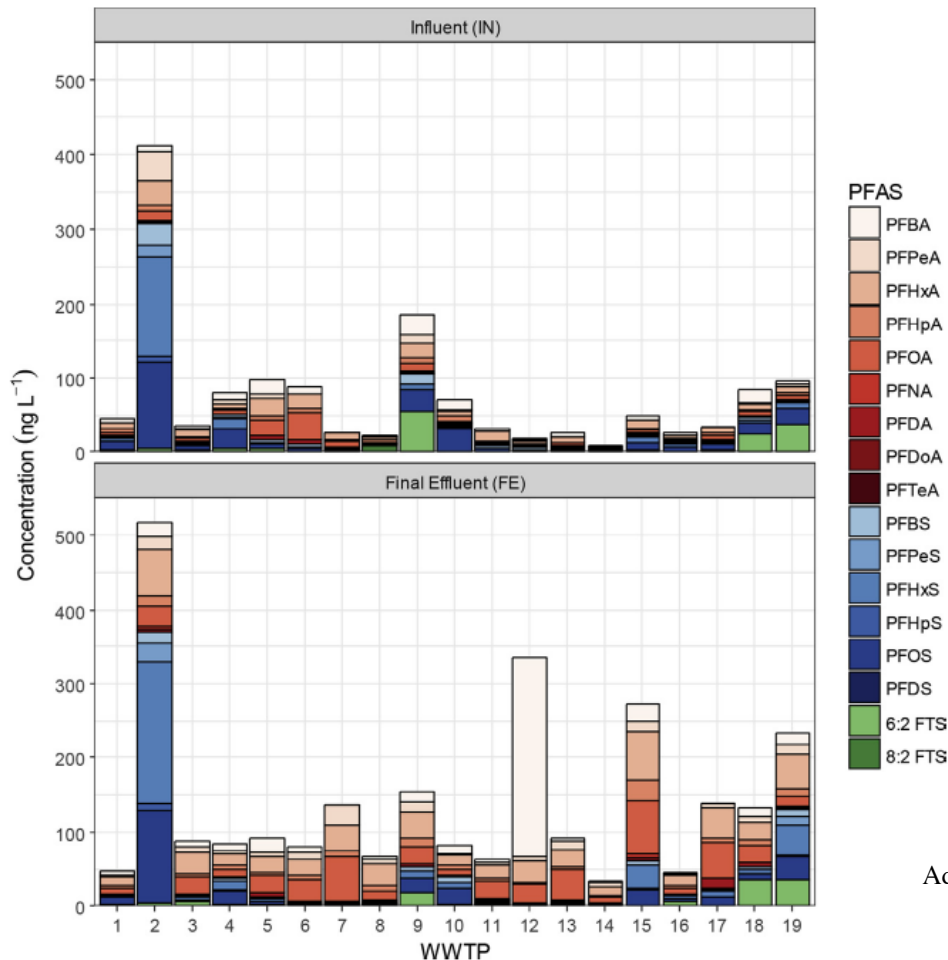
- Five days of effluent samples submitted to URI with additional sampling in MassBay, results expected mid-November?
- We **DO** expect to see PFAS







# What do we expect to see?



- Average of 19 WWTP sludge 34 ng/g (range 2 – 130)
- Average of 19 WWTP wastewater 110 ng/L (range 9 – 520)
- Increases from influent to effluent are common

Adapted from Coggan et al Heliyon 5 (2019) e02316



## Where do they come from?

- Polymer applications include textile stain and soil repellents and grease-proof, food-contact paper
- Surfactant applications include processing aids for fluoropolymer manufacture, coatings, and aqueous film-forming foams (AFFFs) used to extinguish fires involving highly flammable liquids
- Numerous additional applications





## Product Examples

# Commercial and Consumer Products containing PFAS

- paper and packaging
- clothing and carpets
- outdoor textiles and sporting equipment
- ski and snowboard waxes
- non-stick cookware
- cleaning agents and fabric softeners
- polishes and waxes, and latex paints
- pesticides and herbicides
- windshield wipers
- paints, varnishes, dyes, and inks
- adhesives
- medical products
- personal care products (for example, shampoo)



## How might PFAS get into MWRA wastewater?

- Cleaning products such as carpet spot cleaners, alkaline cleaners, denture cleaners, shampoos, floor polish, dishwashing liquids, car wash products, automobile waxes, windshield wiper fluid.
- PFAS are used as a surfactant, wetting agent, and mist suppressing agent for metal plating
- PFAS are used by the textile industry for their ability to repel oil, water, and stains. Jackets, shoes, umbrellas, carpets, upholstery, leather, tents and sails are treated.
- PFAS are used to produce greaseproof paper for plates, popcorn bags, pizza boxes, and wraps. Non-food contact applications include folding cartons, carbonless forms, and masking papers.
- PFAS are used in adhesives to assure a complete contact.
- PFAS can be used as an anti-mist film to prevent fogging of glass, metal, or plastic surfaces.



## References

- **MA DEP** - <https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas>
- **EPA** - <https://www.epa.gov/pfas>
- **AWWA** - <https://www.awwa.org/Resources-Tools/Resource-Topics/PFAS>
- **WRF** - <https://www.waterrf.org/research/topics/and-polyfluoroalkyl-substances-pfas>
- **CDC** - [https://www.cdc.gov/biomonitoring/PFAS\\_FactSheet.html](https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html)



## Questions ???

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