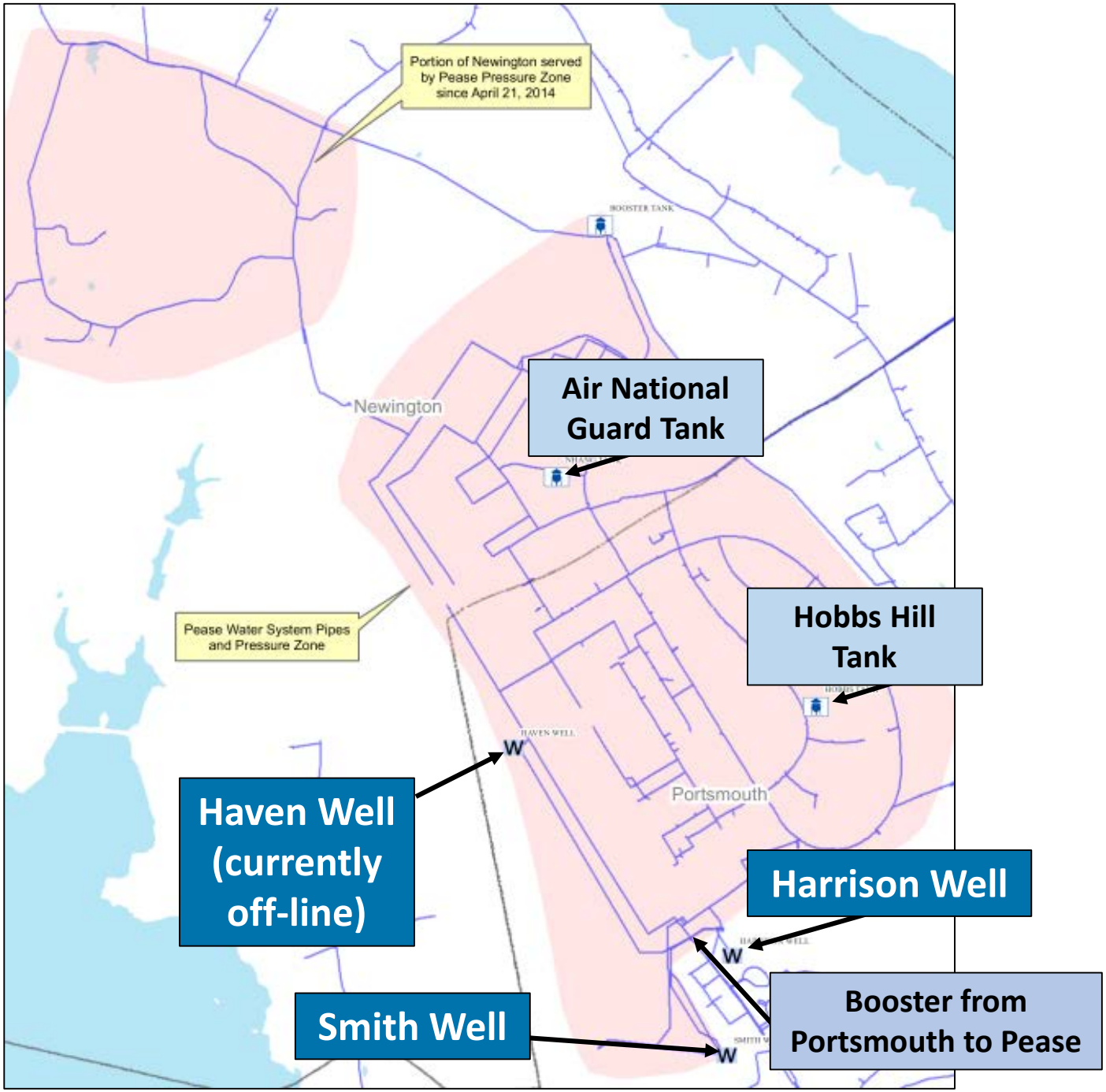
Pease Tradeport Water System: Drinking Water Treatment System Update

Weston & Sampson with the City of Portsmouth

Pease RAB
March 22, 2017

Pease Tradeport Water System

- 3 Wells
- 2 Storage Tanks
- Booster from Portsmouth to Pease
- 30 Miles of water main
- 0.4 to 1.0 Million Gallons per Day Usage



Well Treatment – Progress

- **Preliminary Design** – Complete (Feb. 2016)
- **Piloting** – Complete (Sept. 2016)
  - Pilot Report on City Website
- **Demonstration filters for Harrison and Smith Wells** – Current (Online Sept. 2016)
- **Additional preliminary design and assessment of other municipal treatment systems** – Current
- **ECT_2 performing a pilot study on resins** – Current
- **Design of treatment system upgrades for all three wells (8 to 12 months)** – Pending next agreement with Air Force
- **Construction start** - Anticipated in late 2017

Harrison/Smith Well Filters

Filter Performance

- Sampling for PFASs utilizing the same method and laboratory as the Air Force's sampling (Maxxam Analytics)
- 11 rounds of sampling since September 22, 2016
  - PFOS – ND (Non Detect is < 0.0033 µg/L)
  - PFOA – ND (Non Detect is <0.0053 µg/L)
- Over 8,000 Bed Volumes tested (roughly 42,000,000 gallons)
- Recent retesting of the Haven Well for water quality considerations

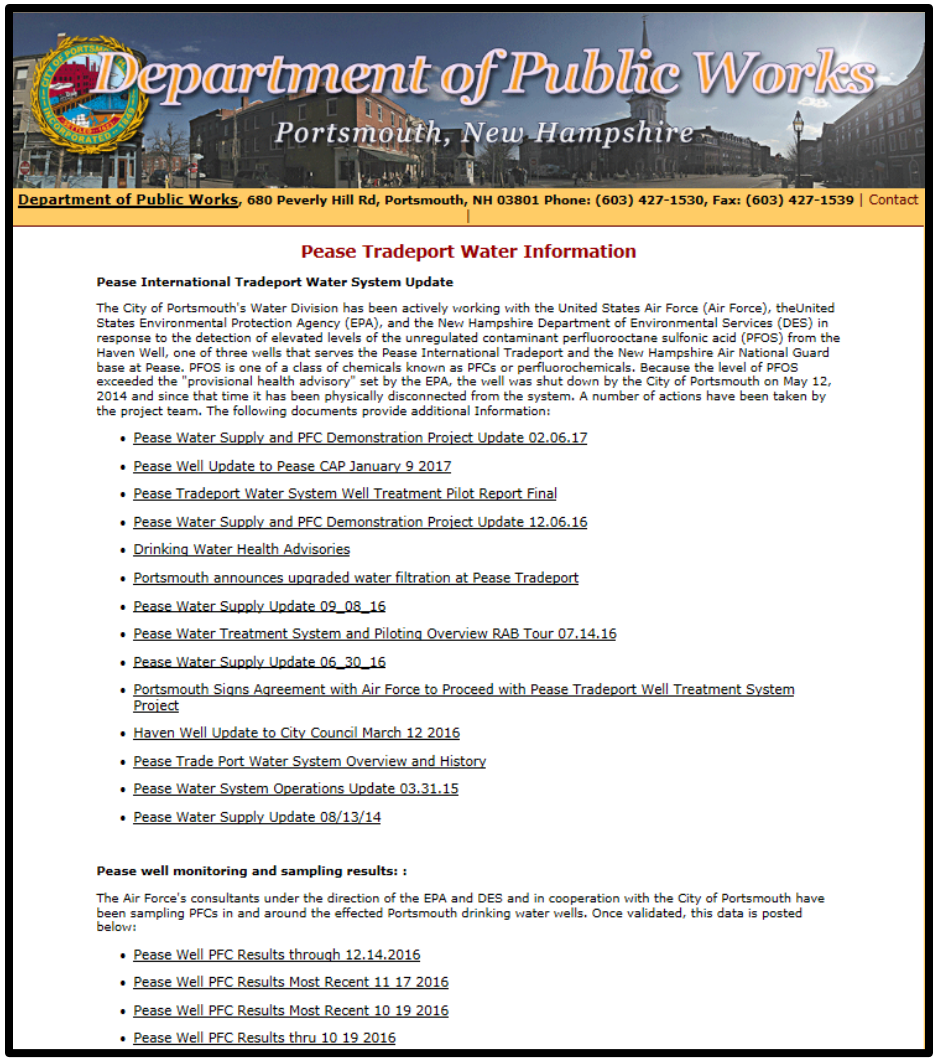
Filter Performance Summary

Sample	PFOA (ppb)	PFOS (ppb)	Combined (ppb)
Harrison (average – since Sept. 2016)	0.003 (ND)	0.0235	0.027
Smith (average)	0.0015 (ND)	0.011	0.013
Carbon Filters (11 sample rounds)	ND	ND	ND

ppb = parts per billion = µg/L

City Website (http://www.cityofportsmouth.com/publicworks/phwn.html)

Well sample results and information



Department of Public Works
Portsmouth, New Hampshire

Department of Public Works, 680 Peverly Hill Rd, Portsmouth, NH 03801 Phone: (603) 427-1530, Fax: (603) 427-1539 | Contact

Pease Tradeport Water Information

Pease International Tradeport Water System Update

The City of Portsmouth's Water Division has been actively working with the United States Air Force (Air Force), theUnited States Environmental Protection Agency (EPA), and the New Hampshire Department of Environmental Services (DES) in response to the detection of elevated levels of the unregulated contaminant perfluorooctane sulfonic acid (PFOS) from the Haven Well, one of three wells that serves the Pease International Tradeport and the New Hampshire Air National Guard base at Pease. PFOS is one of a class of chemicals known as PFCs or perfluorochemicals. Because the level of PFOS exceeded the "provisional health advisory" set by the EPA, the well was shut down by the City of Portsmouth on May 12, 2014 and since that time it has been physically disconnected from the system. A number of actions have been taken by the project team. The following documents provide additional Information:

- Pease Water Supply and PFC Demonstration Project Update 02.06.17
- Pease Well Update to Pease CAP January 9 2017
- Pease Tradeport Water System Well Treatment Pilot Report Final
- Pease Water Supply and PFC Demonstration Project Update 12.06.16
- Drinking Water Health Advisories
- Portsmouth announces upgraded water filtration at Pease Tradeport
- Pease Water Supply Update 09_08_16
- Pease Water Treatment System and Piloting Overview RAB Tour 07.14.16
- Pease Water Supply Update 06_30_16
- Portsmouth Signs Agreement with Air Force to Proceed with Pease Tradeport Well Treatment System Project
- Haven Well Update to City Council March 12 2016
- Pease Trade Port Water System Overview and History
- Pease Water System Operations Update 03.31.15
- Pease Water Supply Update 08/13/14

Pease well monitoring and sampling results: :

The Air Force's consultants under the direction of the EPA and DES and in cooperation with the City of Portsmouth have been sampling PFCs in and around the effected Portsmouth drinking water wells. Once validated, this data is posted below:

- Pease Well PFC Results through 12.14.2016
- Pease Well PFC Results Most Recent 11 17 2016
- Pease Well PFC Results Most Recent 10 19 2016
- Pease Well PFC Results thru 10 19 2016

Looking Ahead

- Continued sampling and assessment of Harrison/Smith filter performance
- Evaluation of available system data throughout the U.S.
- Explore other potential treatment technologies
- Basis of Design to be submitted in May
- Continued monitoring of PFCs in wells (Air Force)
- Aquifer mitigation work (Air Force project)

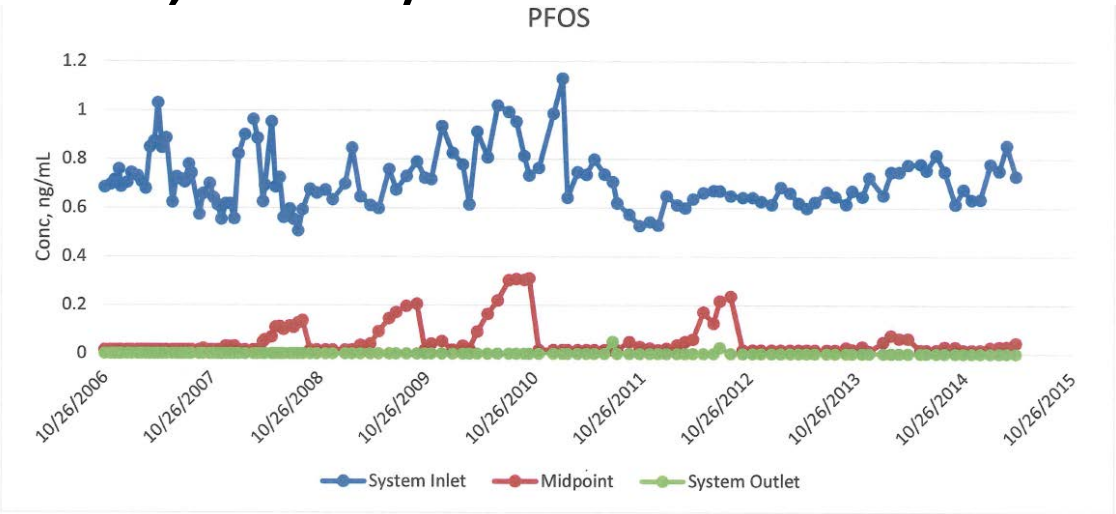
Similar systems around the U.S.

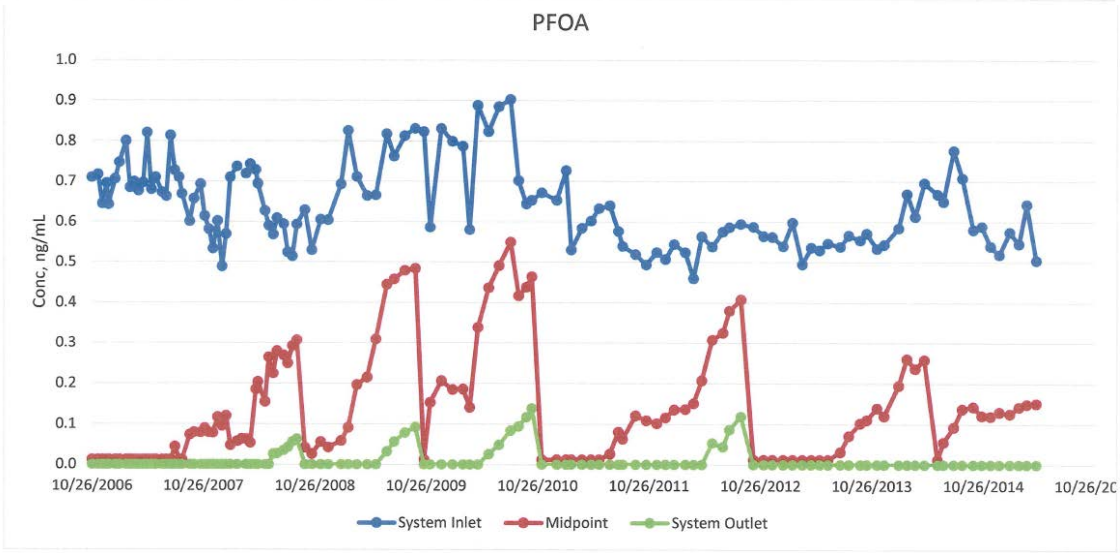
- Research on municipal drinking water systems with the same general groundwater quality indicates GAC as the preferred treatment alternative
  - GAC only – 9/13 utilities
  - GAC and resin – 1/13 utilities
  - Point of use (carbon) – 1/13 utilities
  - No treatment – 1/13 utilities
  - No information – 1/13 utilities
- No readily available data on the long term effectiveness of alternative media
- Preliminary performance data on some resin media

Similar systems around the U.S.

- **Aqua America System (PA)** – All PFAS<0.07 µg/L – No treatment
- **Barnstable (MA)** – PFOA: 0.18 µg/L, PFOS: 0.11 µg/L – Carbon Filters, In Design
- **Bennington (VT)** – PFOA: 1.0 µg/L – Point of Use, 2016
- **Hoosick Falls (NY)** – PFOA: 0.45 µg/L – Carbon Filters, 2016
- **Horsham (PA)** – PFOS:1.0 µg/L – Carbon and Resin Filters, 2016
- **Issaquah (WA)** – PFOS: 0.40 µg/L, PFHxS: 0.18 µg/L – Carbon Filters, 2016
- **Little Hocking (OH)** – PFOA:0.37-21 µg/L – Carbon Filters, 2007
- **Merrimack Valley District (NH)** – PFOA: 0.09 µg/L – Carbon Filters, In Design
- **New Castle (DE)** – PFOS:2.3 µg/L, PFOA:0.44 µg/L – Carbon Filters, 2016
- **Oakdale (MN)** – PFBA:1.7 µg/L, PFOS:0.71 µg/L, PFOA:0.64 µg/L – Carbon Filters, 2006
- **Oatman (AZ)** – PFOS:0.30 µg/L, PFOA:0.032 µg/L – No information
- **Suffolk County Water Authority (NY)** – PFOS:1.7 µg/L, PFOA:0.33 µg/L – Carbon Filters, 2016
- **West Morgan-East Lawrence (AL)** – PFOA: 0.15 µg/L, PFOS: 0.12 µg/L – Carbon Filters, 2016

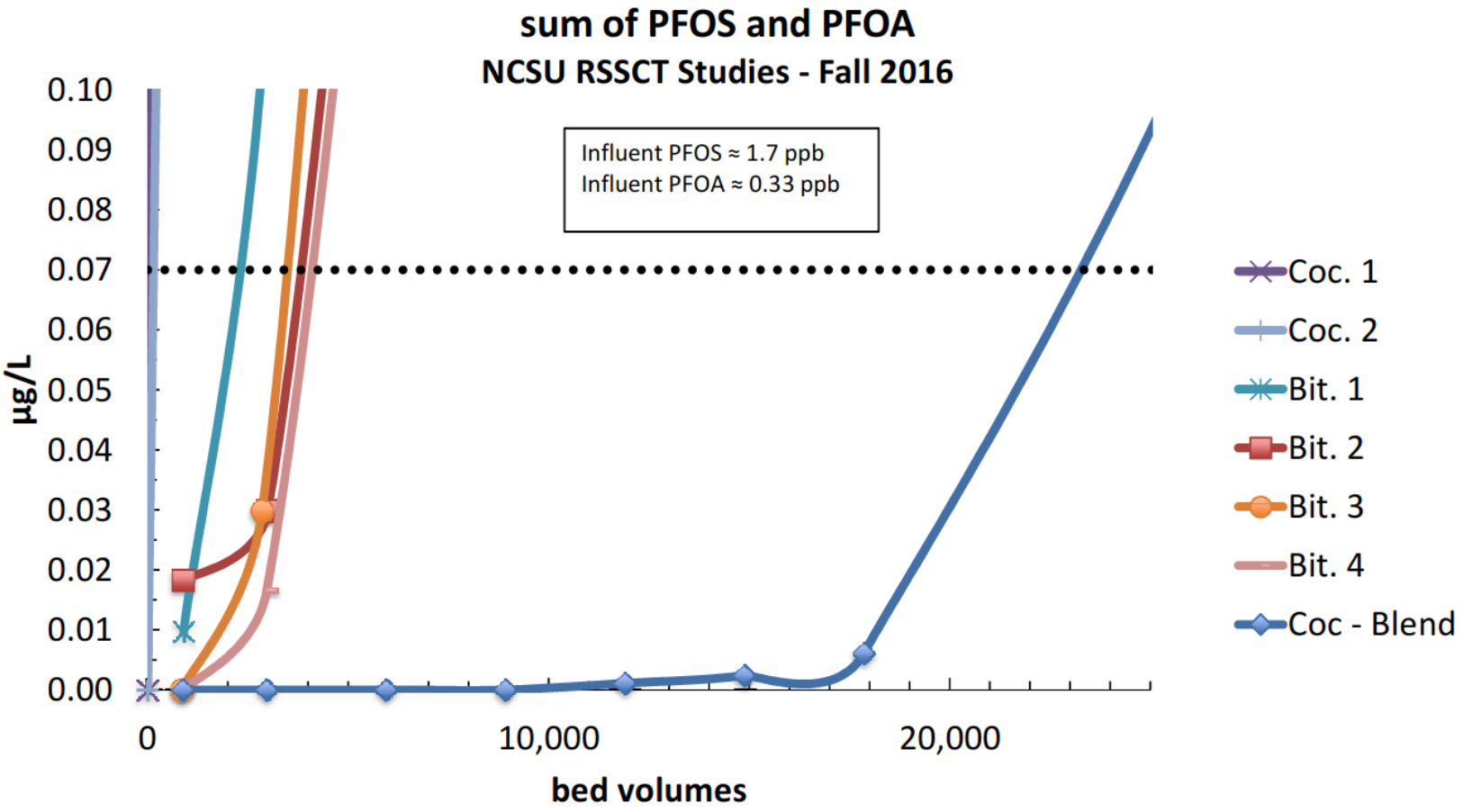
Full Scale GAC Treatment (Oakdale, MN)



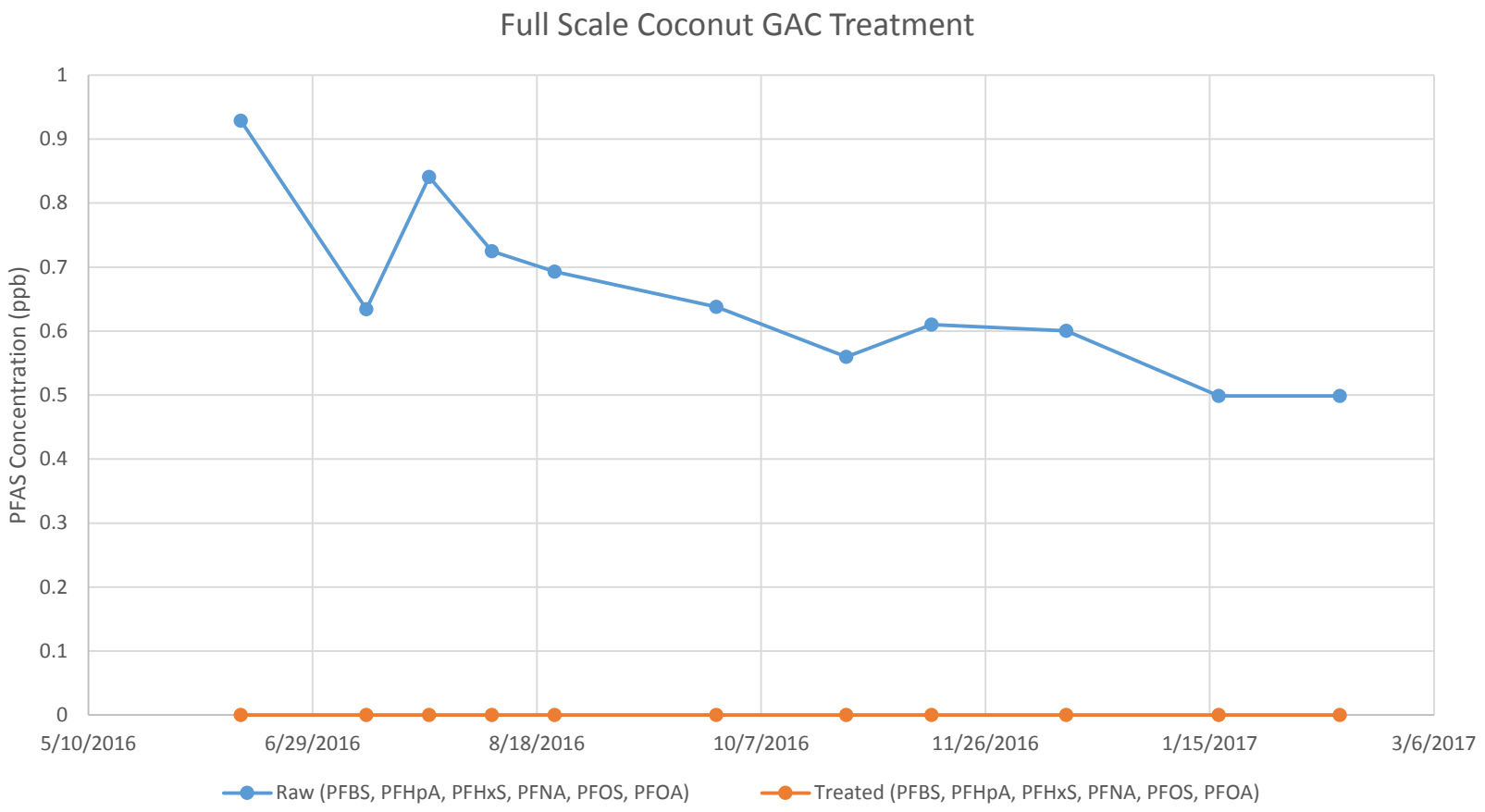


Note:
ng/mL=µg/L=ppb

Carbon Comparison Pilot Study (SCWA, NY)

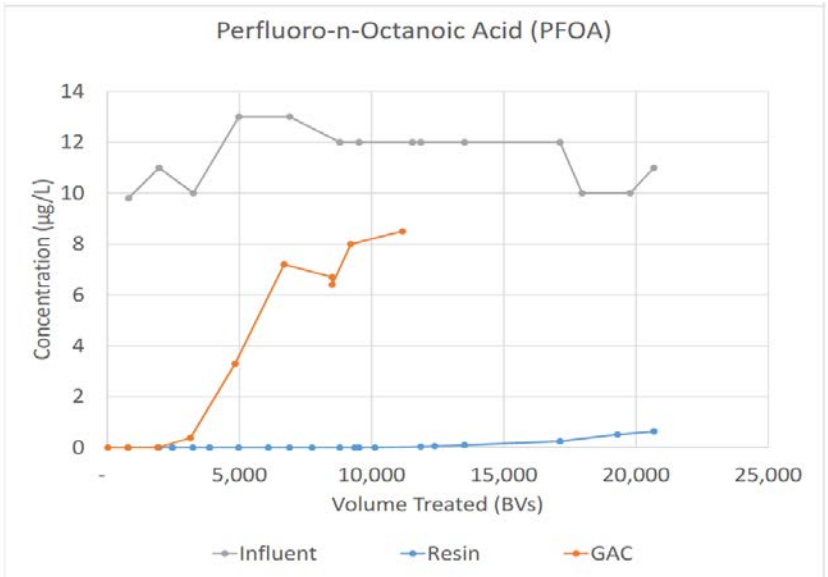


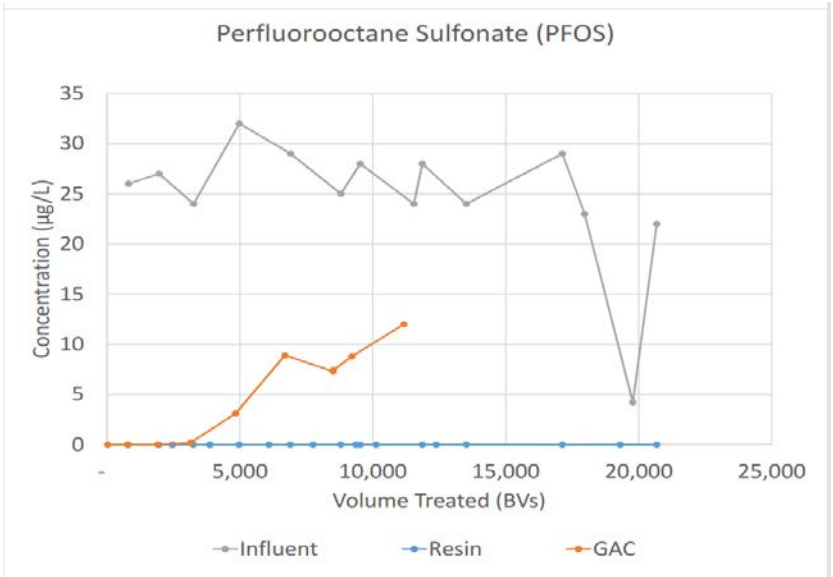
Coconut GAC Treatment (Western State)

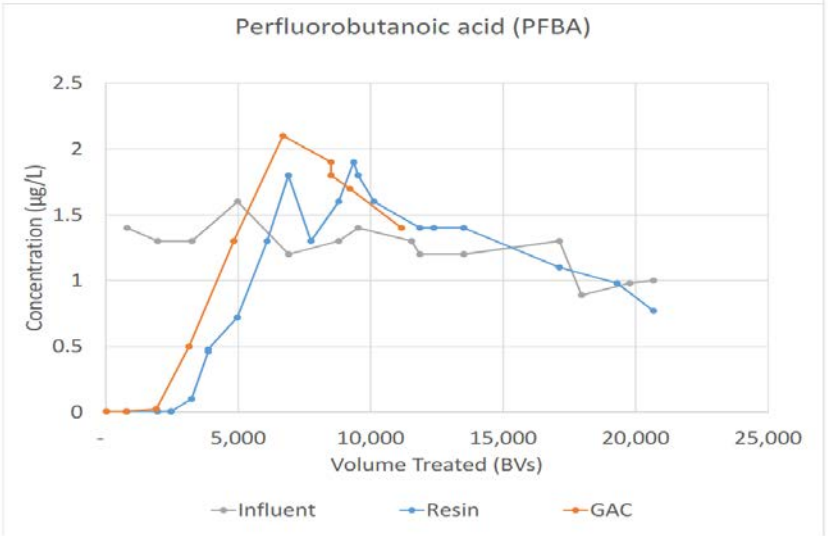


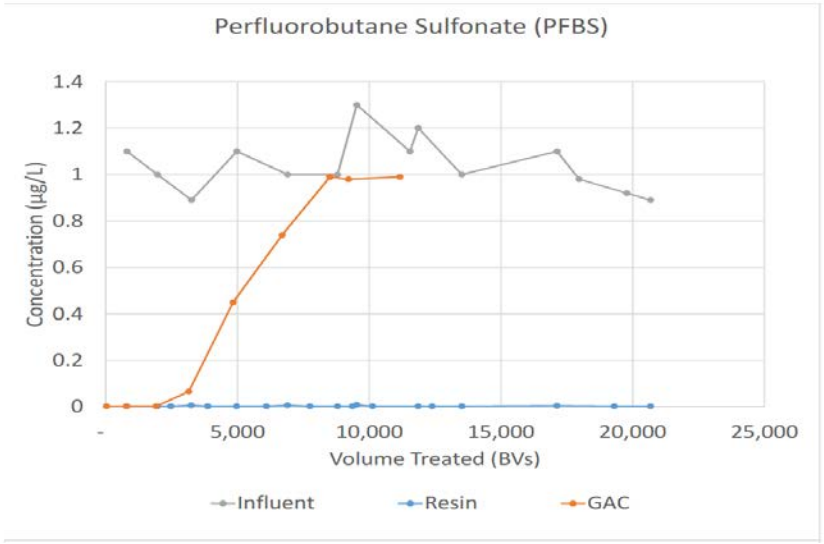
Approximately 15,000 BV treated

Site 8 Resin Pilot (Preliminary Results)









Questions Submitted to the City Prior to Meeting

- **Q**: What is the influent and effluent data for ALL PFCS in the Smith & Harrison wells since the GAC filters were installed? This detailed info should be provided in a clear and concise way, all on the same document/chart. And this info should be posted on the city's website moving forward in the same spreadsheet with influent data on one line and effluent data on the line underneath for people to see how effective the filters are working. The community should not have to look in two different places to see pre and post treatment data.

- **A**: The following slides provide a summary.

Pease PFC Demonstration Project Data

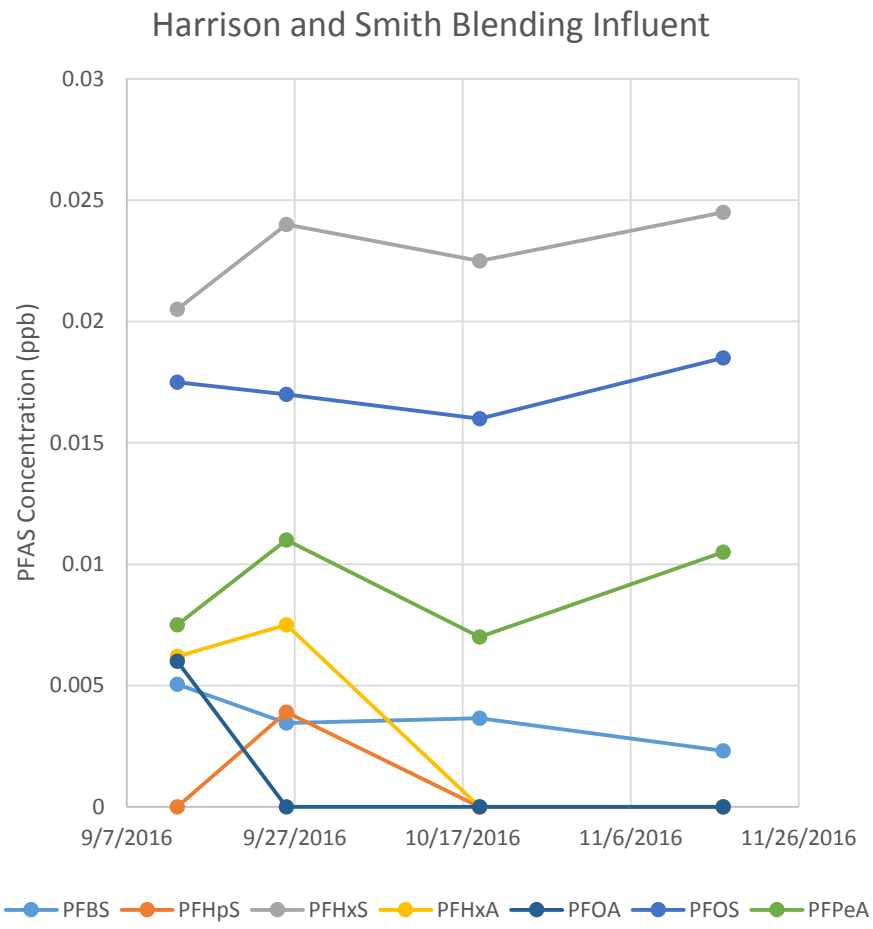
Sample Location	Sample ID	Collection Date	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl Perfluorooctane Sulfonamide (MEFOSA)	N-Methyl Perfluorooctane Sulfonamidoethanol (MEFOSE)	Perfluorobutanesulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecane sulfonate (PFDS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptane sulfonate (PFHpS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)	PFOS+PFOA
USEPA Health Advisory (HA):			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	-	-	0.07	-	-	-	-	0.07
Method Detection Limit (MDL)			0.0065	0.0055	0.0053	0.0049	0.0040	0.0061	0.0019	0.0066	0.0043	0.0066	0.0057	0.0036	0.0047	0.0040	0.0046	0.0053	0.0046	0.0058	0.0033	0.0036	0.0052	0.0032	0.0037	
Reported Detection Limit (RDL)			0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	
Harrison Well		13-Sep-16	ND	ND	NA	NA	NA	NA	0.0029 B	ND	NA	NA	NA	ND	ND	0.0260 B	0.0071 J	0.006 J	ND	ND	0.022 B	0.008 B	NA	NA	NA	0.028
Smith Well		19-Sep-16	ND	ND	NA	NA	NA	NA	0.0072 J	0.0067 J	NA	NA	NA	ND	ND	0.0150 J	0.0053 J	0.006 J	ND	ND	0.013 J	0.007 J	NA	NA	NA	0.019 J
Harrison Well		26-Sep-16	ND	ND	NA	NA	NA	NA	0.0040 J	ND	NA	NA	NA	0.0042 J	ND	0.0340	0.0100 J	ND	ND	ND	0.024	0.014 J	NA	NA	NA	0.024
Smith Well		26-Sep-16	ND	ND	NA	NA	NA	NA	0.0029 J	ND	NA	NA	NA	0.0036 J	ND	0.0140 J	0.0050 J	ND	ND	ND	0.010 J	0.008 J	NA	NA	NA	0.010 J
Harrison Well		19-Oct-16	ND	ND	NA	NA	NA	NA	0.0038 J	0.0069 J	NA	NA	NA	ND	0.0057 J	0.0320	0.0059 J	ND	ND	ND	0.022	0.009 J	NA	NA	NA	0.022
Smith Well		19-Oct-16	ND	ND	NA	NA	NA	NA	0.0035 J	ND	NA	NA	NA	ND	ND	0.0130 J	ND	ND	ND	ND	0.010 J	0.005 J	NA	NA	NA	0.010 J
Harrison Well		17-Nov-16	ND	ND	NA	NA	NA	NA	0.0026 J	0.0072 J	NA	NA	NA	ND	0.0059 J	0.0350	0.0085 J	0.006 J	ND	ND	0.026	0.013 J	NA	NA	NA	0.032
Smith Well		17-Nov-16	ND	ND	NA	NA	NA	NA	0.0020 J	ND	NA	NA	NA	ND	ND	0.0140 J	ND	ND	ND	ND	0.011 J	0.008 J	NA	NA	NA	0.011 J
Harrison Well		14-Dec-16	ND	ND	NA	NA	NA	NA	0.0062 J	0.0068 J	NA	NA	NA	ND	ND	0.0350	0.0120 J	0.0078 J	ND	ND	0.026	0.012 J	NA	NA	NA	0.034
Smith Well		14-Dec-16	ND	ND	NA	NA	NA	NA	ND	ND	NA	NA	NA	ND	ND	0.0150 J	0.0065 J	ND	ND	ND	0.012 J	0.0059 J	NA	NA	NA	0.012 J
Smith Well (Dup)		14-Dec-16	ND	ND	NA	NA	NA	NA	0.0055 J	ND	NA	NA	NA	ND	ND	0.0150 J	0.0057 J	ND	ND	ND	0.012 J	0.006 J	NA	NA	NA	0.012 J
Filter 2 Effluent	S1	22-Sep-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	06-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 2 Effluent	PV2-100	06-Oct-16	ND	ND	ND	ND	0.0065 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	14-Oct-16	ND	ND	ND	ND	ND	ND	0.0022 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	14-Oct-16	ND	ND	ND	ND	ND	ND	0.0021 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 2 Effluent	PV2-100	14-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0053 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	20-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	20-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 2 Effluent	PV2-100	20-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	28-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0082 J	ND	ND	ND	0.0062 J	ND	0.0052 J	ND	ND	ND	ND	0.0082 J	0.0084 J	ND
Filter 1 Effluent	PV1-100	28-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0049 J	ND	ND	ND	ND	0.0078 J	0.0081 J	ND
Filter 2 Effluent	PV2-100	28-Oct-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0040 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	10-Nov-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	10-Nov-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	28-Nov-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	28-Nov-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	27-Dec-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	27-Dec-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	16-Jan-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	16-Jan-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	10-Feb-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	10-Feb-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	07-Mar-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	07-Mar-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

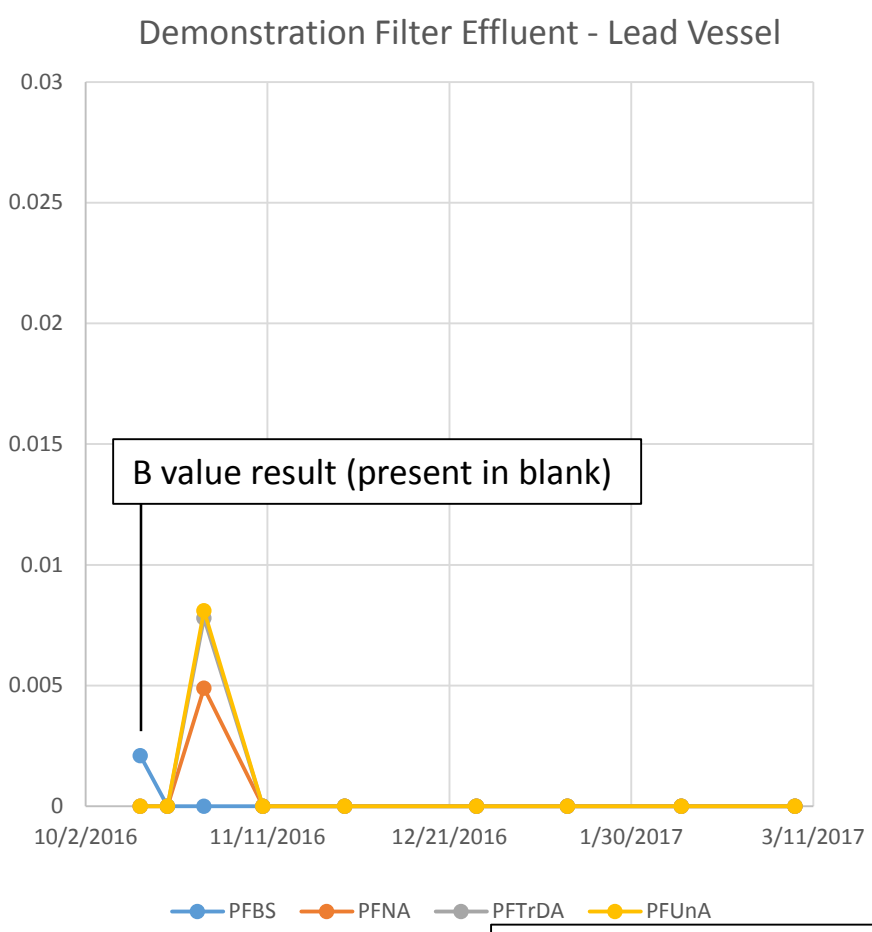
Notes:
Grey text indicates the parameter was not analyzed or not detected.
All concentrations in µg/L - micrograms per liter (ppb)
J - The result is an estimated value.
B - Detected in Blank.

USEPA - Environmental Protection Agency
NA - Not Analysed or Not Applicable
ND - Not detected
— - No Health Advisory available

- Denotes 'B' value, detected in blank
- Denotes raw water influent sample
- Denotes short chain compound

Influent and Effluent Charts





PFNA, PFTrDA, PFUnA not found in raw water

All other PFAS compounds not detectable

New Hampshire Health Advisory of 0.07 ppb combined PFOS+PFOA

- **Q**: Will the Haven well also be using GAC? Or are there plans for another treatment alternative? And when can the community anticipate the Haven well will be back online?

- **A**: Recently obtained two more sets of samples on Haven
  - Results are shown in the previous graph and table
  - Additional data on the UCMR constituents is provided in a handout
  - WSE is evaluating any modifications or additions to GAC filtration system, however, GAC will be an integral component of the final treatment process.
  - Haven Well will not be turned on until the full treatment plant is constructed, mid- to late-2018 at the earliest.

- **Q**: If the standards for PFOS, PFOA, and other PFCs lower in the future (and they may given current pending state legislation and ongoing science), how will the city and Air Force respond to the new standards? How will that impact the current treatment systems?

- **A**: The basis of the current treatment design would not be impacted by reasonable changes or lowering of the water quality standards
  - Lower standards would result in more frequent carbon changeouts.
  - The City will continue to work with the State and the EPA in holding the Air Force to their commitment to providing aquifer restoration and returning the 3 wells to their usable capacity.

- **Q**: Are the GAC filters filtering out short chain PFCs? Concerns were raised this summer that GAC was not effective on short chain PFCs. Although the short chain PFCs do not have PHAs associated with them (yet), the community is concerned that they are possibly being exposed to PFCs that aren't being filtered through their drinking water on Pease. Keep in mind the Pease population already has high levels of PFCs in their blood and want to prevent any additional exposure to ALL PFCs in their drinking water regardless of PHAs.

- **A**: The current GAC media in the filters is removing all PFAS (long- and short-chain) to non-detect levels.
  - A variety of GAC media are being tested and reviewed to optimize PFAS removals and carbon bed life. The final design and operating criteria (i.e. filter media changeout frequency) will intend to treat and remove PFAS in the most effective and efficient manner.
  - The intent of the final design is to assure that all water will meet EPA and NHDES drinking water standards.

- **Q**: What are the levels of ALL PFCs being detected at the tap samples since the GAC filters were installed?

- **A**: We are only measuring water after treatment, not at the tap. The Air Force has discontinued that sampling program since the GAC filters went online.
  - All water samples leaving the filters are at non-detect levels.

- **Q**: Given all the contaminants found in the ground water outside site 39/Building 227 (PCE, TCE, DCE, 1,4 dioxane), how could those possibly impact the drinking water wells? And how far away is site 39 to the Smith, Harrison, and Haven wells?

and

- **Q**: Is it too risky to turn the Haven well back on post treatment given the significant contamination and history of contamination?

- **A**: The Haven Well water quality, absent the PFAS concentrations, meets all current standards.
- The Haven Well and the treatment system will be a very closely monitored source, not only at the well but through a surrounding sentry well monitoring network.
- Continued cleanup efforts are being designed for a continual water quality improvement. This approach has been successfully applied to a multiple plume restoration issue at Otis AFB on Cape Cod.
- Approximate distance between site 39 and wells:
  - Haven: 0.25 miles
  - Harrison: 1.0 miles
  - Smith: 1.3 miles

- **Q**: Have other potential well sites/water source alternatives been explored instead of re-opening the Haven well?

- **A**: The City's 2012 Water System Master Plan addressed long-range water supply need through:

  1 – **Integrated management of surface and groundwater supplies** to optimize water sustainability

  2 – **Water efficiency efforts** – outreach, water efficiency rebates, rate structures to promote efficiency

  3 – **Upgrades to existing Madbury well field** - including the replacement of Well 4 and current permitting of Well 5

  4 – **Additional groundwater supply** - The next phase of this work will be to test wells after this summer at a location that has been identified as a potential large groundwater withdrawal site. If this water is found to be adequate both in quality and quantity then the City will proceed with the next phase of the project – a Large Groundwater Withdrawal Permit.

Thank You

Weston & Sampson