

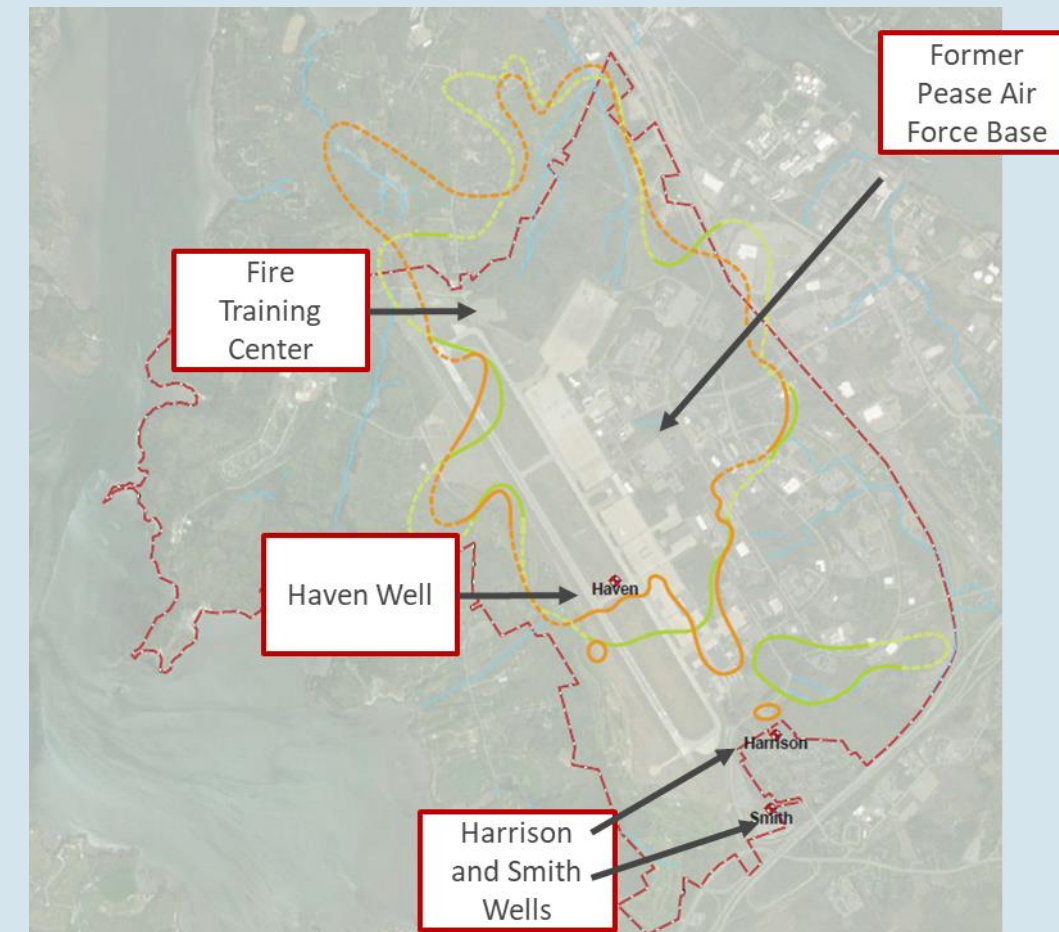
Case Study – Moving Beyond Carbon for More Effective Removal of PFAS



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Background

- May 2014 - PFOS was first detected in the Portsmouth, New Hampshire public water supply
- The level in the Haven water supply well was above the Provisional Health Advisory level of 0.2 ug/l set by the U.S. EPA
- The City of Portsmouth immediately shut down the well, and the contamination was also traced to two other water supply wells, the Smith and Harrison wells
- Eleven additional PFAS compounds were detected in the three wells
- The source of PFAS contamination was traced back to the historical use of firefighting foam at the nearby Pease Air Force Base



Aerial view of source contamination

Objectives

A side-by-side pilot test was conducted to compare the effectiveness of ECT2's SORBIX™ ion exchange (IX) resin to a typical carbon system.

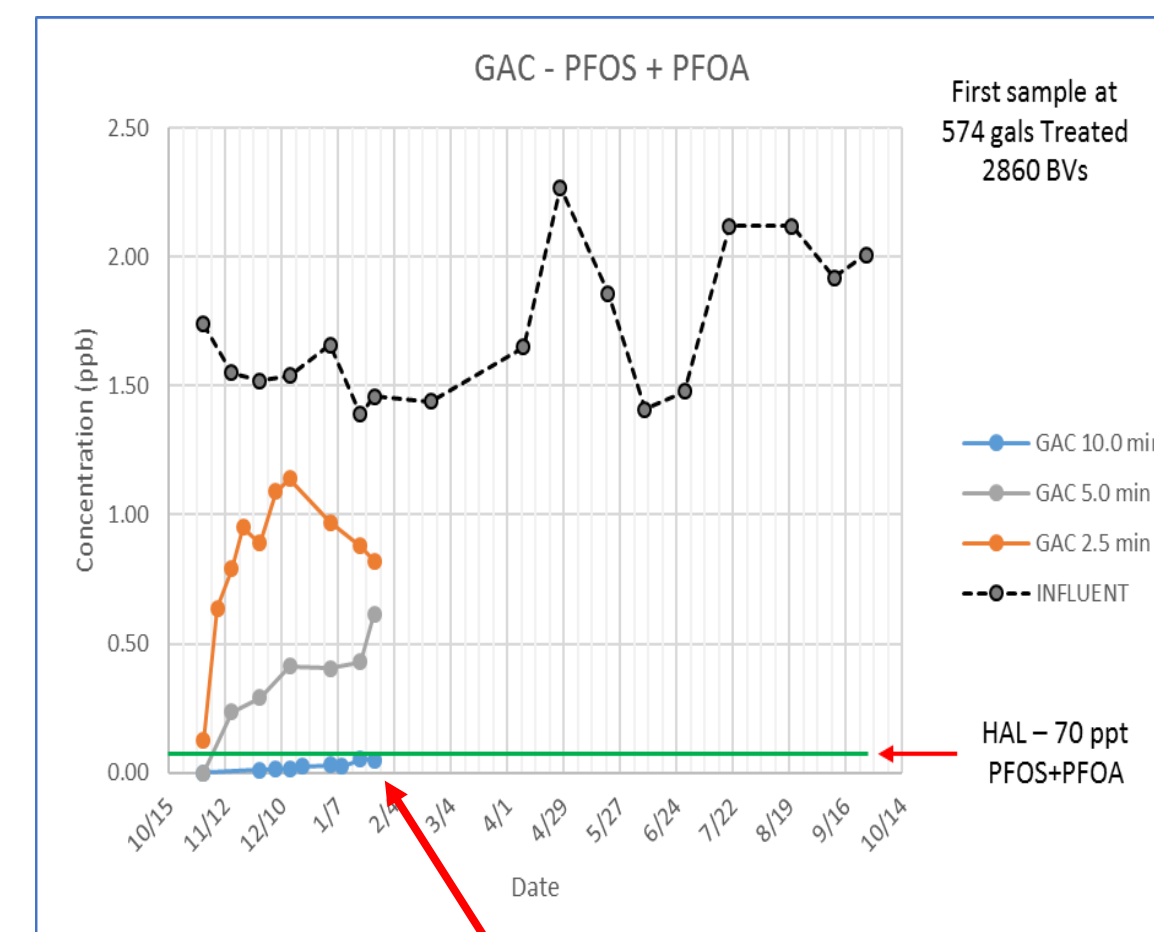
The objectives of the test were to:

1. Compare the ability of the IX resin and GAC to remove PFAS from the Haven well water
2. Determine system sizing and design parameters to be used in the preparation of the full-scale treatment system technology evaluation
3. Select the best PFAS-removal technology for full-scale implementation based on lifecycle cost comparison

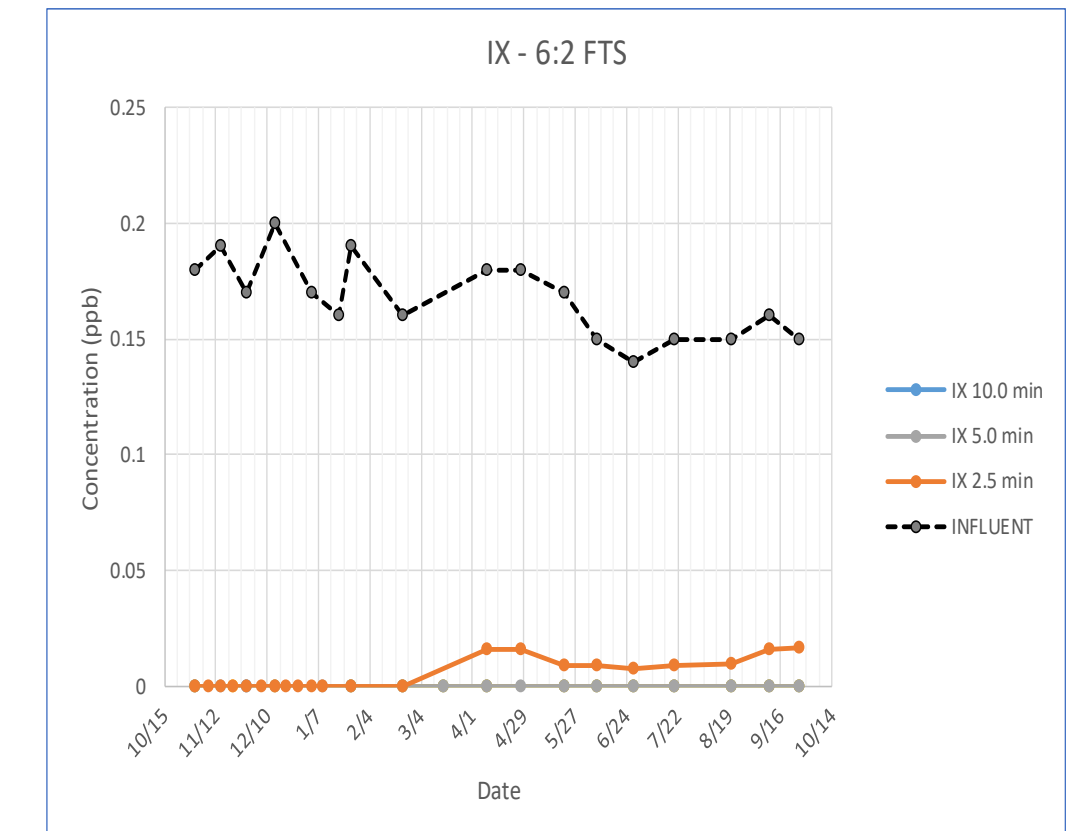
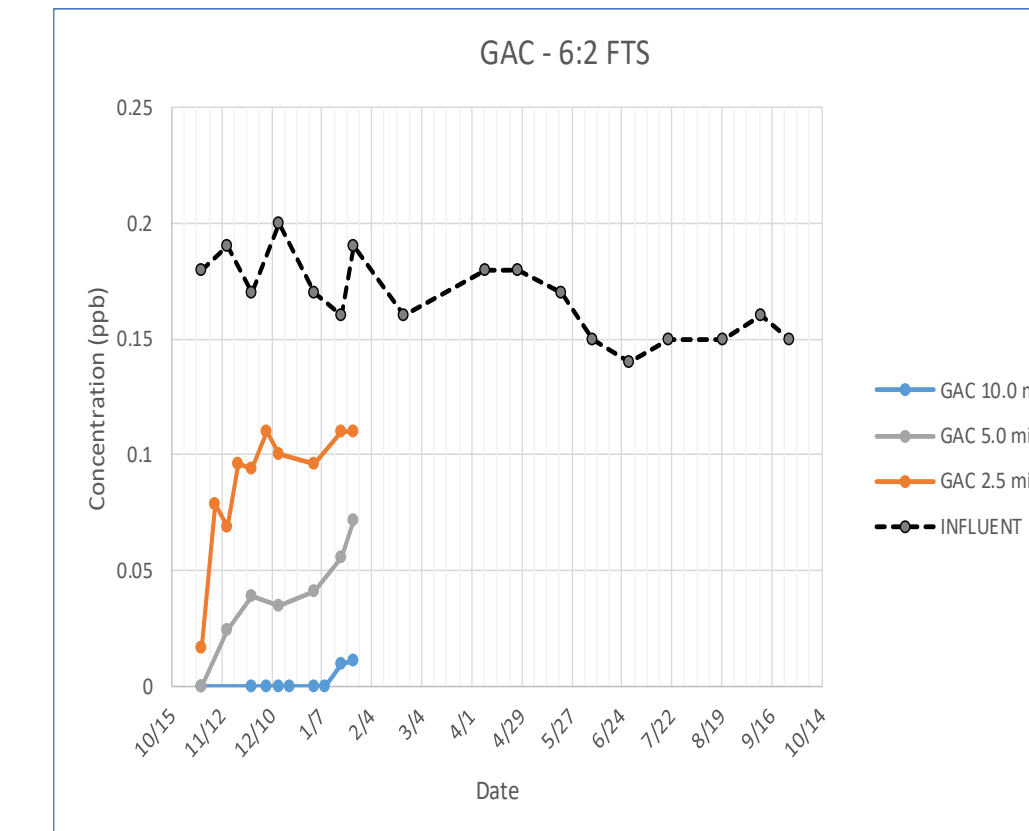
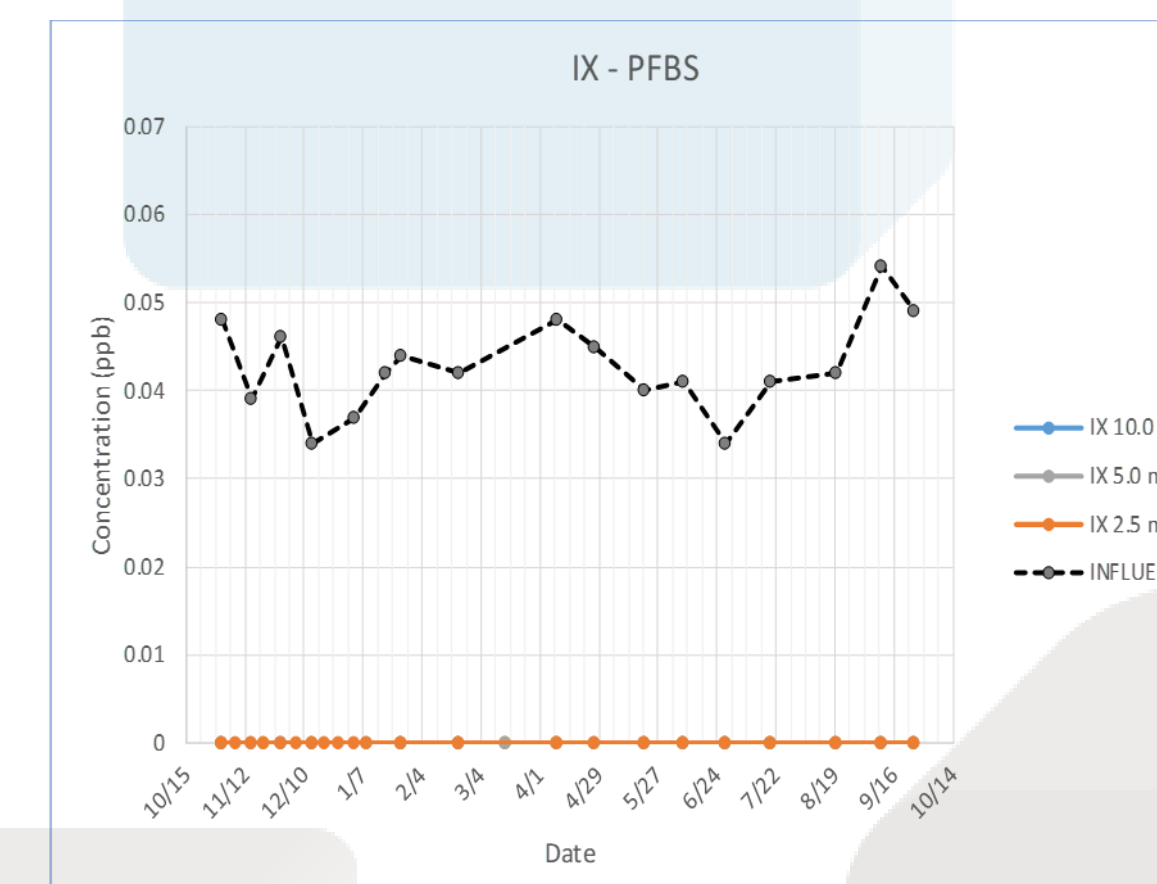
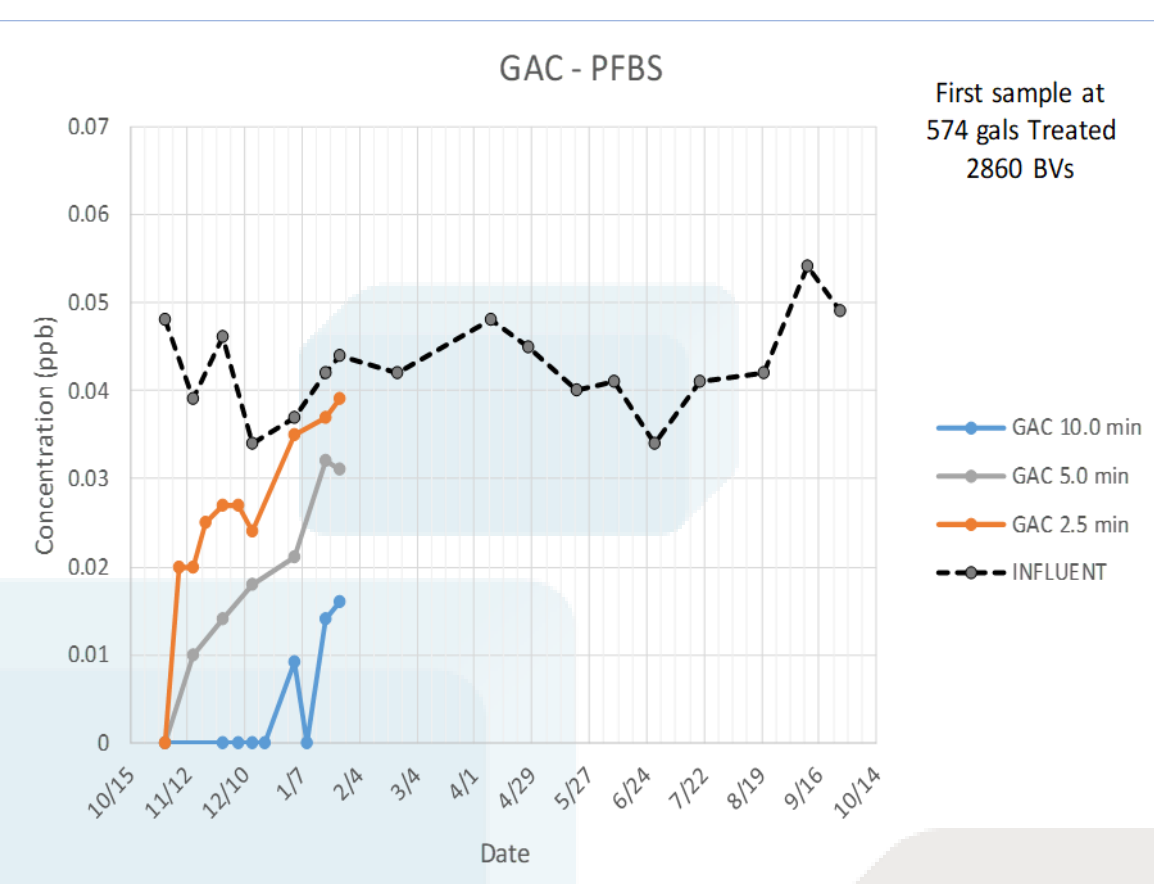
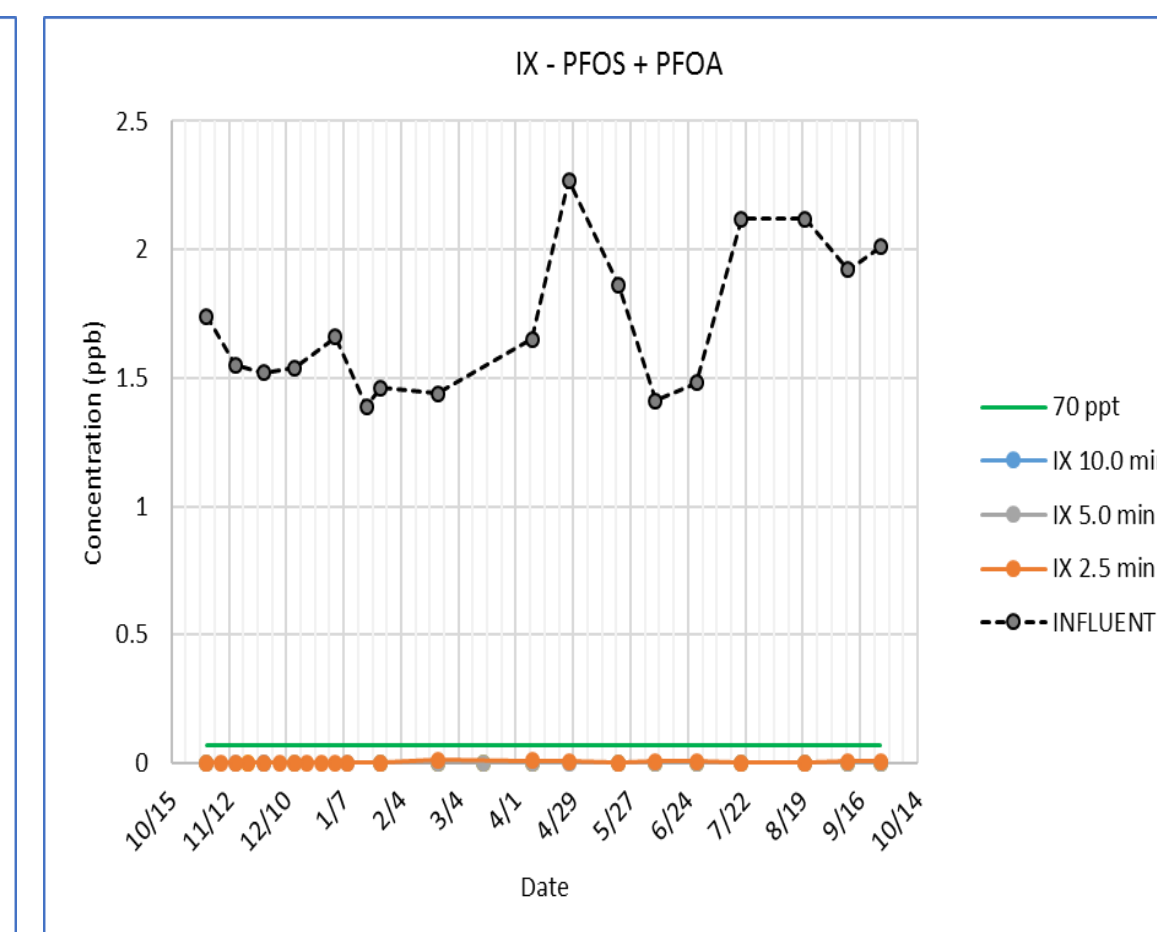
Approach and Results

Utilized dual-sided skid for side-by-side testing: IX resin vs. GAC

- Design flowrate: 112 gallons/day
- 4 columns in series: 2.5, 5, 7.5 and 10 min EBCT
- Column diameter: 1 1/4 in
- Media bed height: 42 in



City Stopped GAC at 10,400 gal Treated



Twenty-Year Present Worth Analysis (USD)

Treatment Option	Capital Cost	Annual Operating Cost	Present Worth Cost
GAC	\$2,140,000	\$304,000	\$6,271,000
Resin	\$1,090,500	\$99,300	\$3,173,000

Summary and Conclusions

- The influent total PFAS concentration averaged 3.5 ug/l over the course of the year-long pilot test
- The IX resin substantially out-performed the GAC on all 12 PFAS compounds that were present at detectable levels
- The results demonstrate noticeably higher treatment capacity and faster kinetics associated with ECT2's SORBIX resin, compared to the carbon system
- The City has moved forward with a contract to upgrade the existing water treatment plant using ECT2's resin system for PFAS removal
- The resin system will treat water from three wells; Haven, Smith and Harrison
- The project was put out to bid in late 2018 and awarded to Kinsmen Corporation in early 2019
- Construction is anticipated to take two years to fully retrofit the existing facility with this upgraded treatment system
- Full-scale design includes two stages of IX resin, operating in lead-lag configuration, each vessel having a 5-minute EBCT