ACHIEVING ULTRA-LOW PHOSPHORUS AND METALS REMOVAL AT BURRILLVILLE, RI

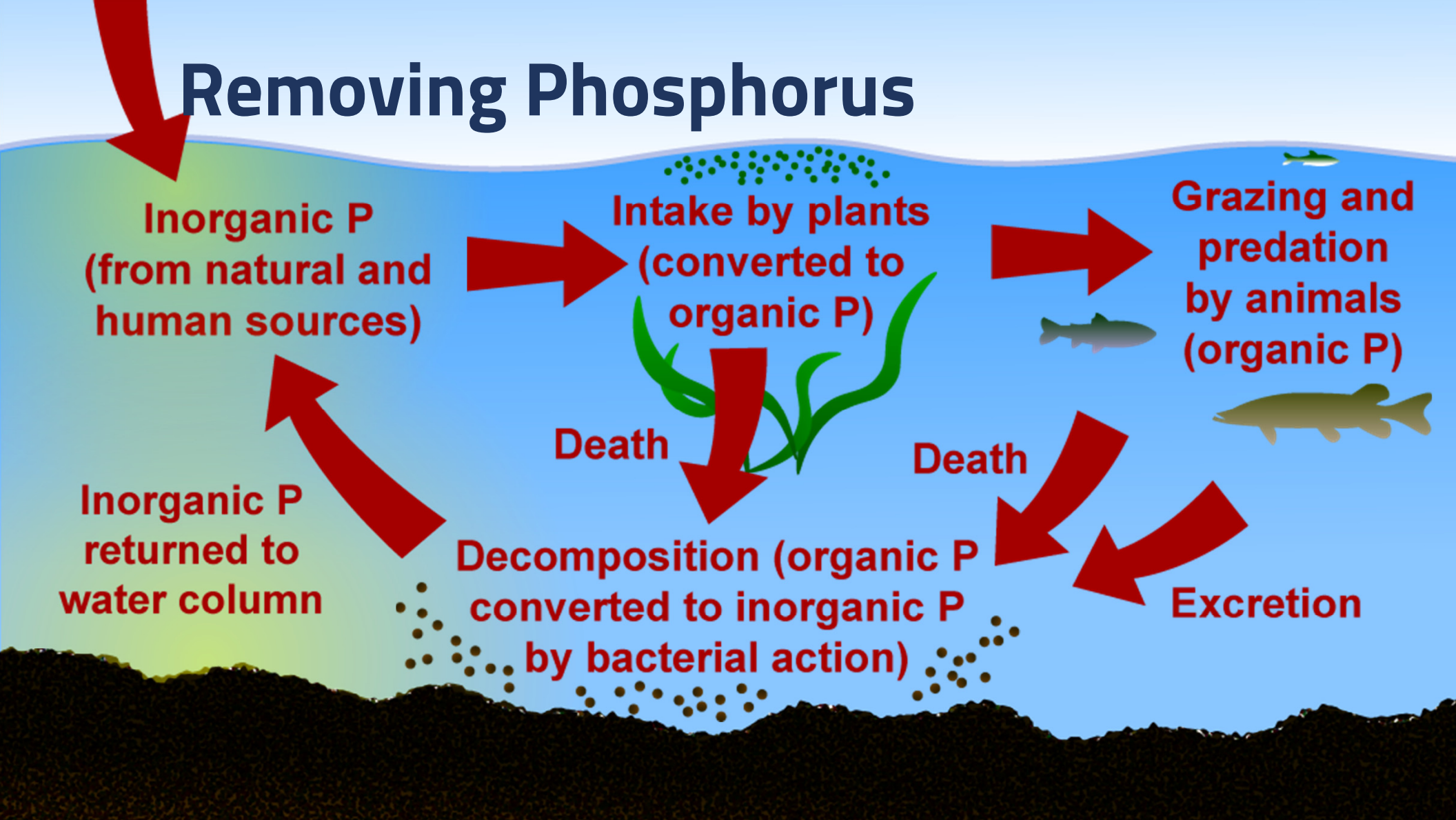
NEWEA Annual Conference
Session 3: Sustainability

January 27, 2021

Challenges to Burrillville

- Need flexibility for future requirements:
  - Ultra low phosphorus
  - Trace metals polishing
- Need TSS reduction for disinfection and discharge

Removing Phosphorus



Burrillville, RI

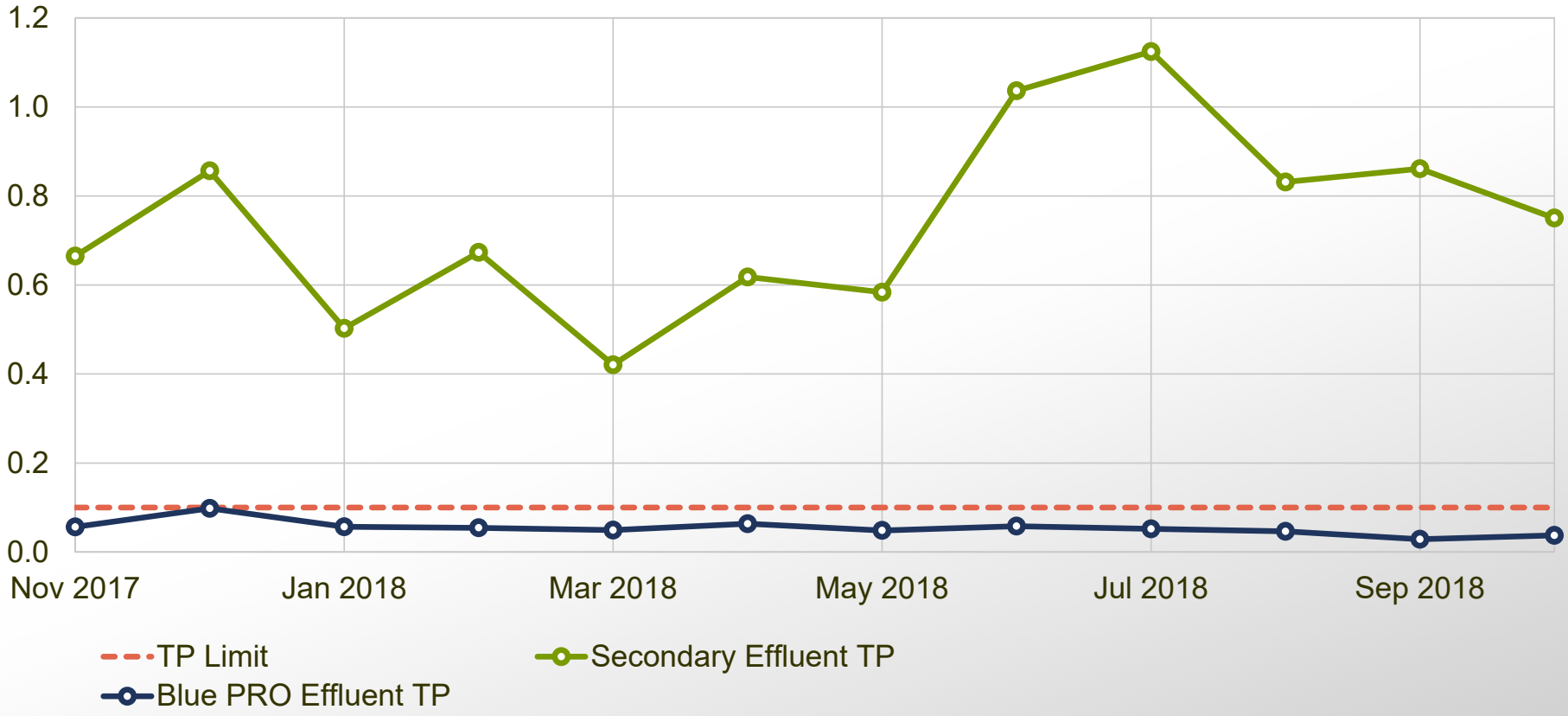
Project Type:
Municipal Wastewater

Design Flow:
1.5 MGD average
4.5 MGD peak

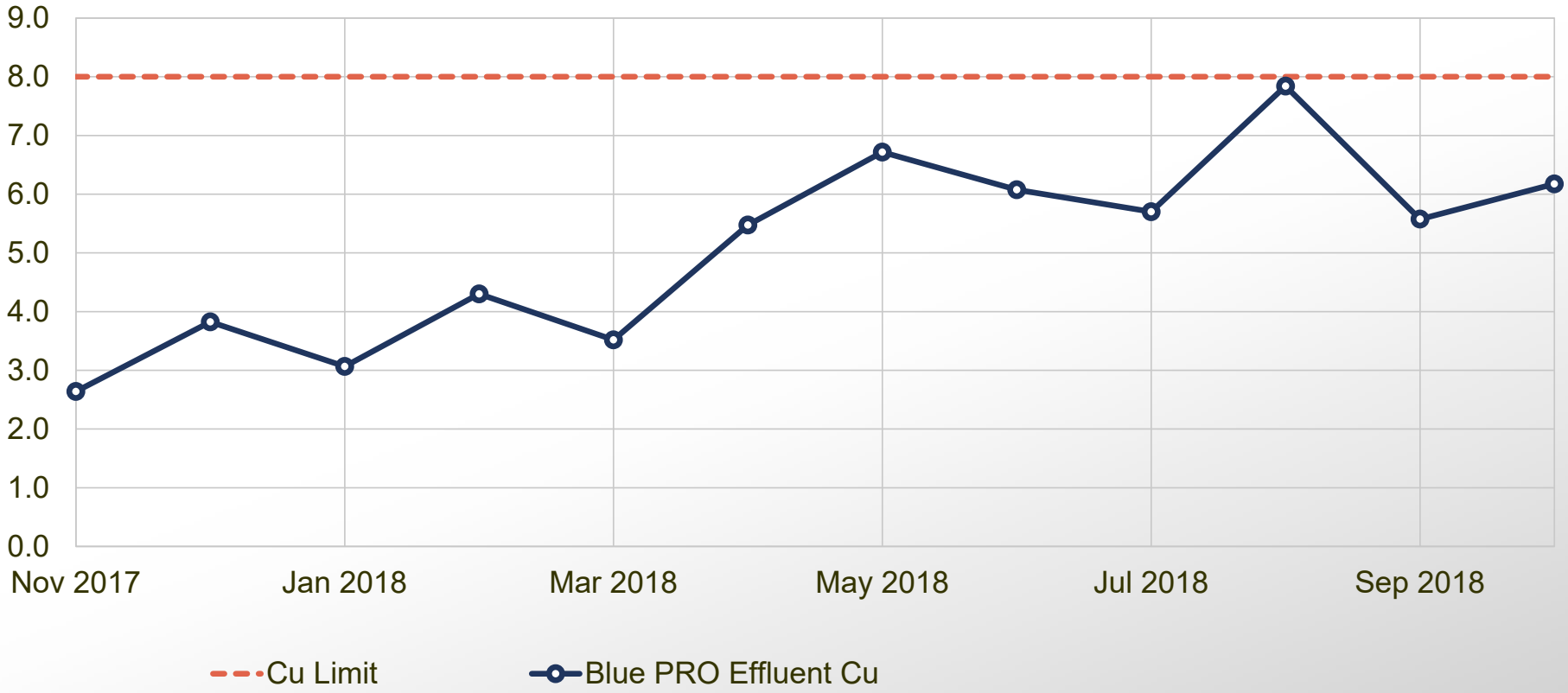
Effluent Limits:
- **TP:** 0.1 mg/L
- **Cu:** 8 µg/L

Single-Pass

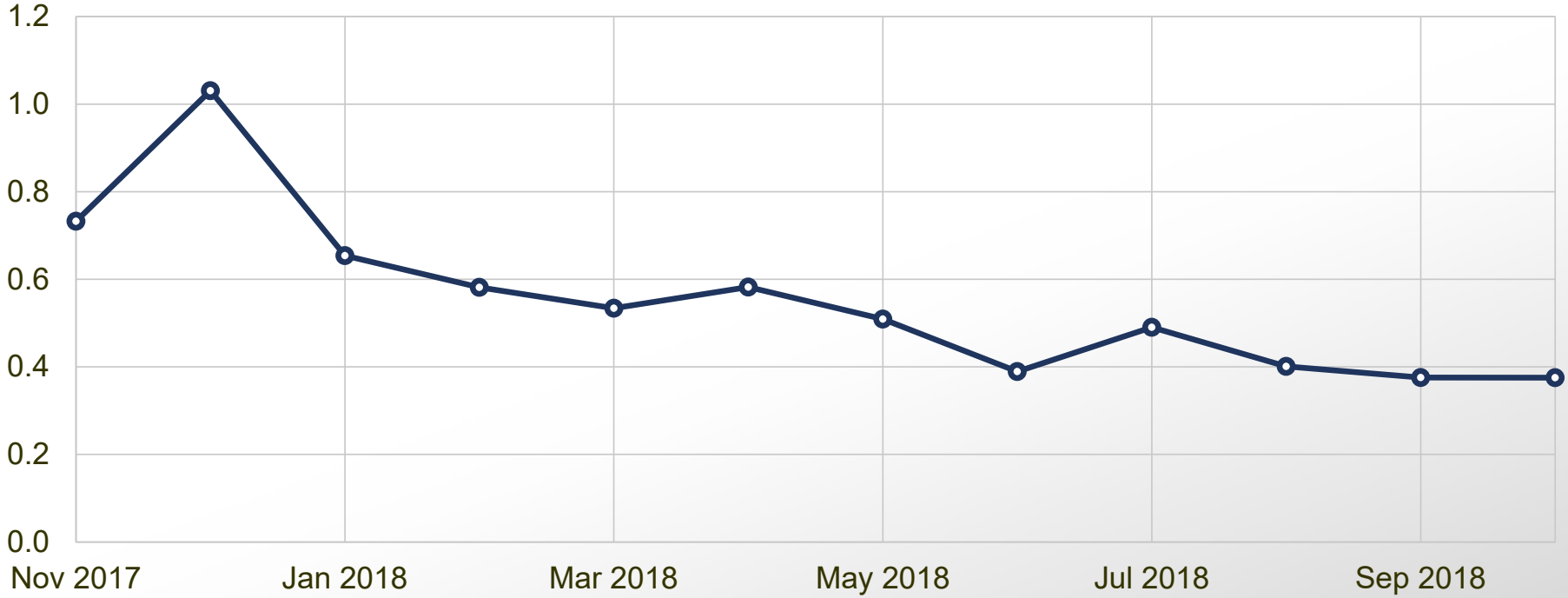
Burrillville, RI Total Phosphorus (mg/L)



Burrillville, RI Total Copper (µg/L)



Burrillville, RI BluePRO®
Effluent Turbidity (µg/L)



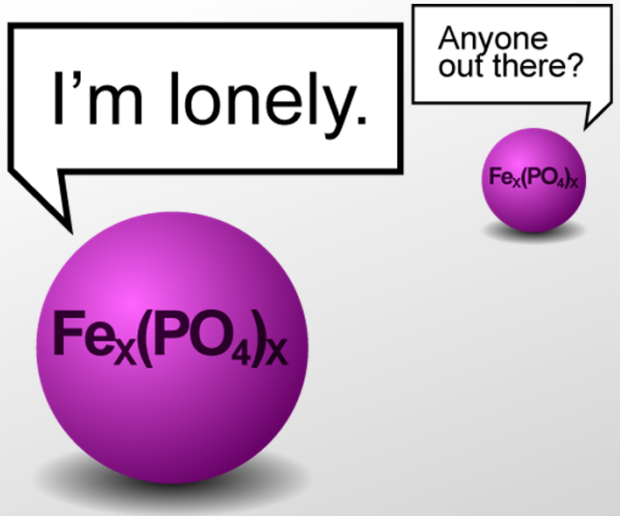
BluePRO®

Reactive filtration features **continuous regeneration** of reactive filter media within a moving sand bed filter.

Why coagulation/filtration isn't best for low limits

At ultra-low concentrations of phosphorus,
it's inefficient to rely on diffusion to create contact between:

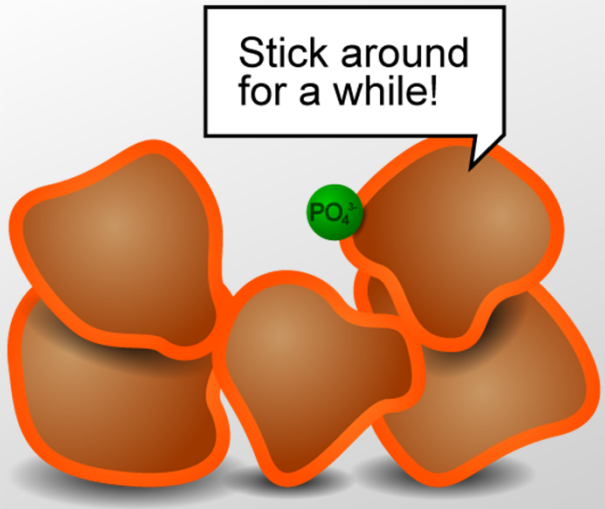
1. the phosphorus and reactant
2. the phosphates with each other so they can coagulate into a filterable floc.



Why reactive filtration is best for low limits

At ultra-low concentrations of phosphorus, **reactive filtration is more efficient** because it:

1. **Creates contact** by filtering phosphorus through reactant-coated sand
2. **Eliminates the need to flocculate** and filter by reacting phosphorus on the sand, then scrubbing it off



BluePRO®

Built on the Centra-flo® platform:

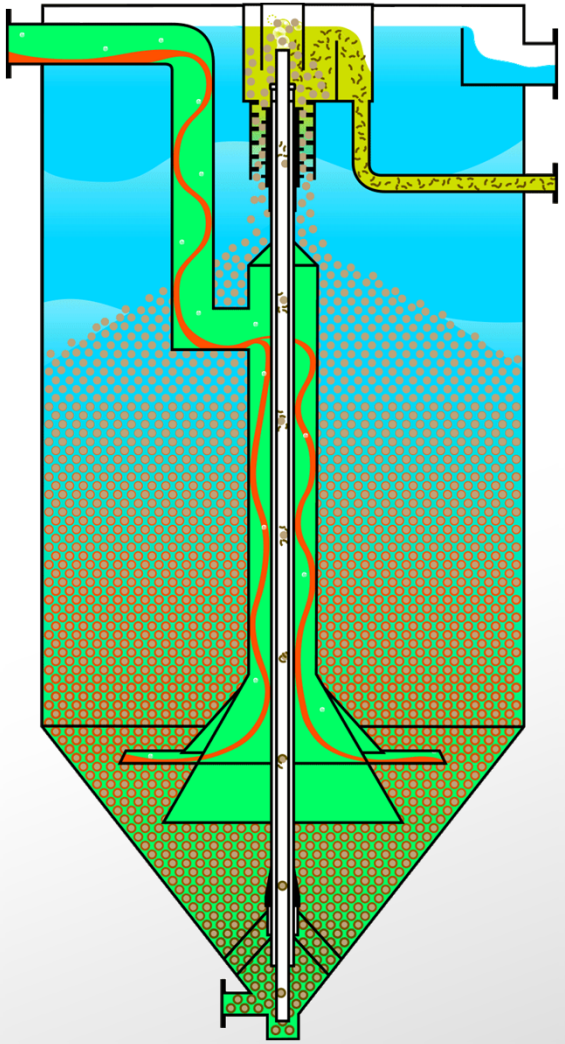
- CA Title 22 Approved

Featuring:

- Non-mechanical
- Gravity sand filter
- Continuous backwash
- Simple!

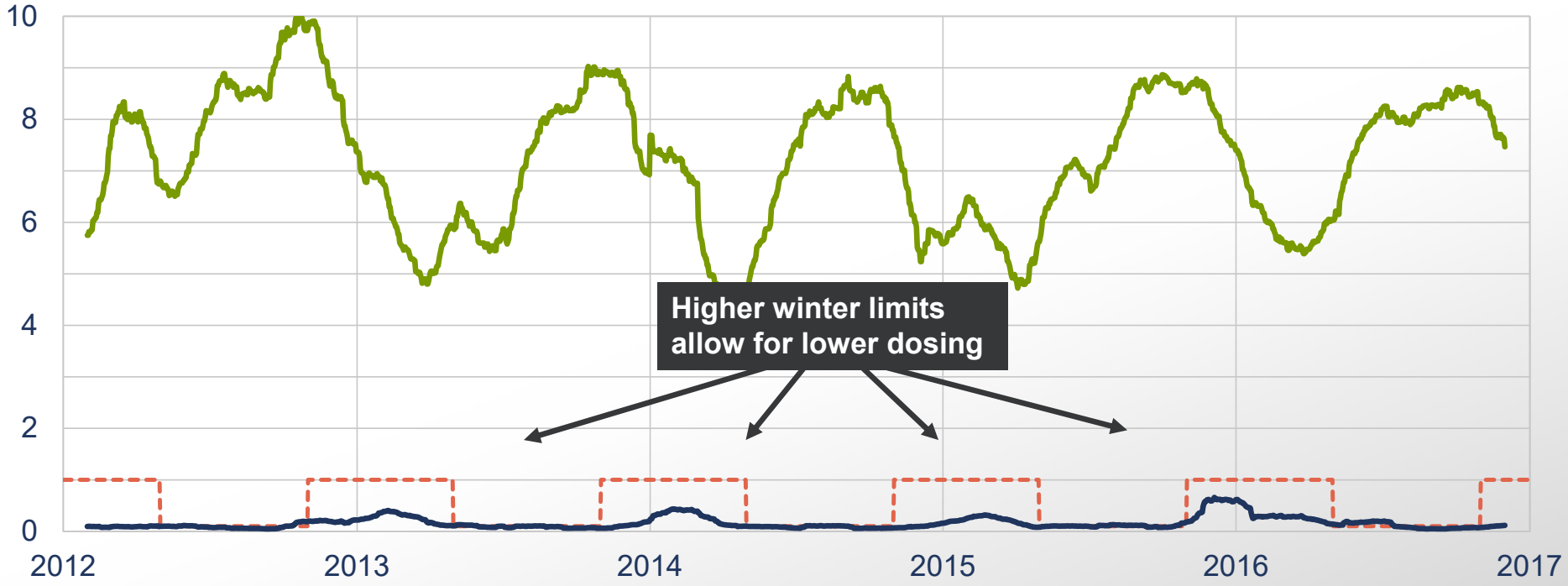
BluePRO®

Reactive filtration, built on the Centra-flo® continuous-backwash upflow sand filter platform.

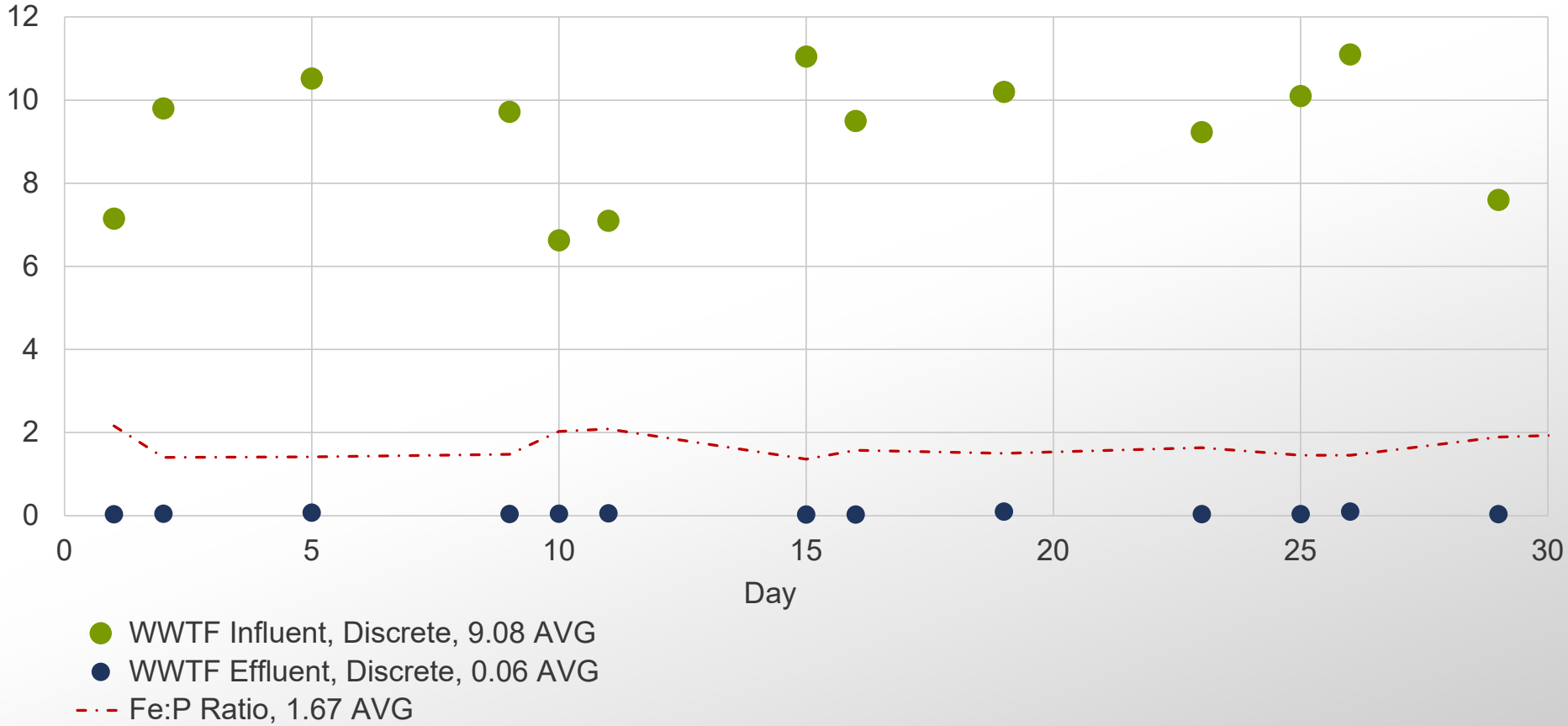


- Equipment
- Sand
- Flow
- Airlift
- Dosing
- Loading

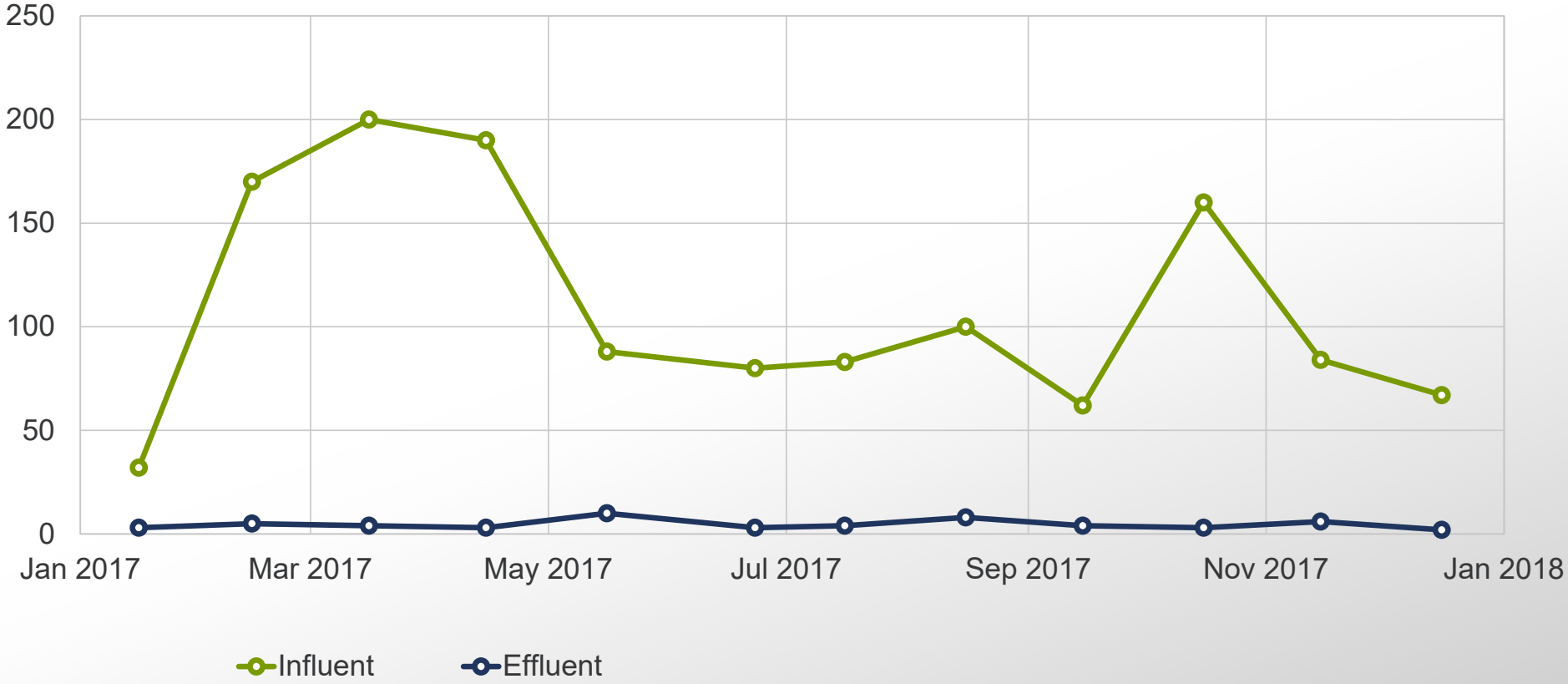
Marlborough, MA Total Phosphorus (mg/L)



Marlborough MA: DMR 07/12 Total Phosphorus (mg/L)



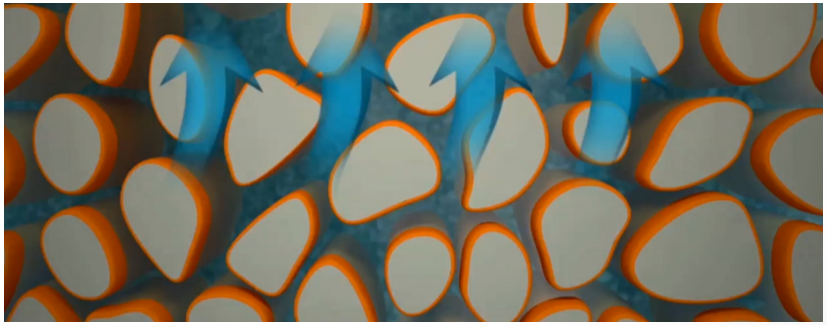
Marlborough, MA Copper (µg/L)



Reactive vs Conventional Filtration

BluePRO®

adsorption/
reaction kinetics



Particle
coagulation/
filtration

Design Benchmarks

Hydraulics

- Daily Design: < 4 gpm/sf
- Peak Hour: < 5 gpm/sf

Surface Solids Loading

- Daily Design: < 2 lb/sf/d
- Peak Hour: < 2.5 lb/sf/d

Headloss

- Average 1-3 feet driving head
- Design maximum of ~4 feet

Constituent Loading

- Plan for a nominal 90% efficiency

How did Burrillville validate reactive filtration during technology selection?

Burrillville, RI

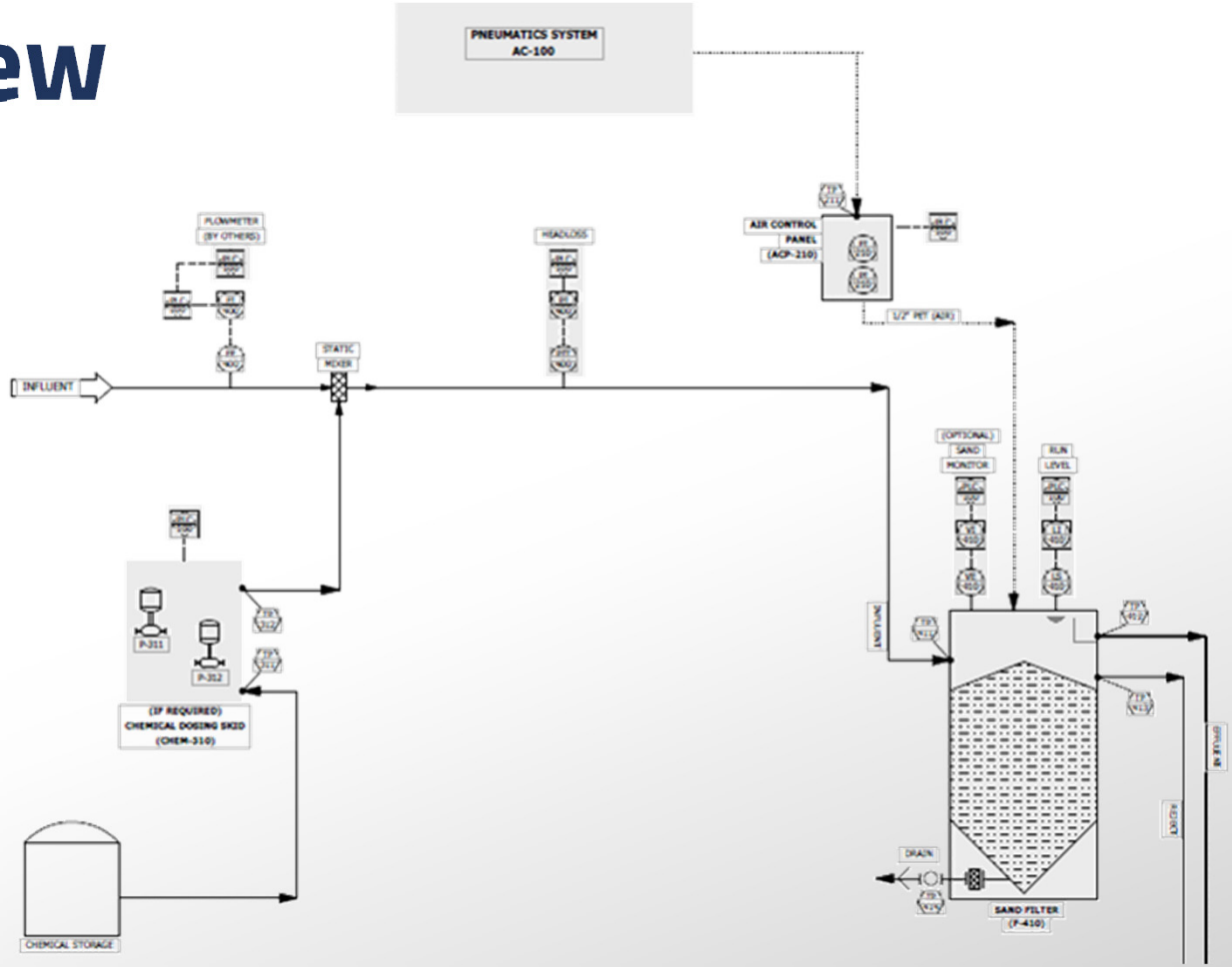
2013 Pilot Study

2013 BluePRO® Pilot Results

Dates	Configuration	Average Results
September 16-20	Loading variations. Optimization for phosphorus removal.	0.061 mg/L P 10.7 µg/L Cu
September 23-25	Influent P stress test.	0.046 mg/L P 8.93 µg/L Cu
September 26-27	Optimization for copper removal.	0.023 mg/L P 3.65 µg/L Cu
October 7-10	Chemical optimization continued for design OPEX.	0.057 mg/L P 5.87 µg/L Cu

What does this look like in the real world?

Process Overview

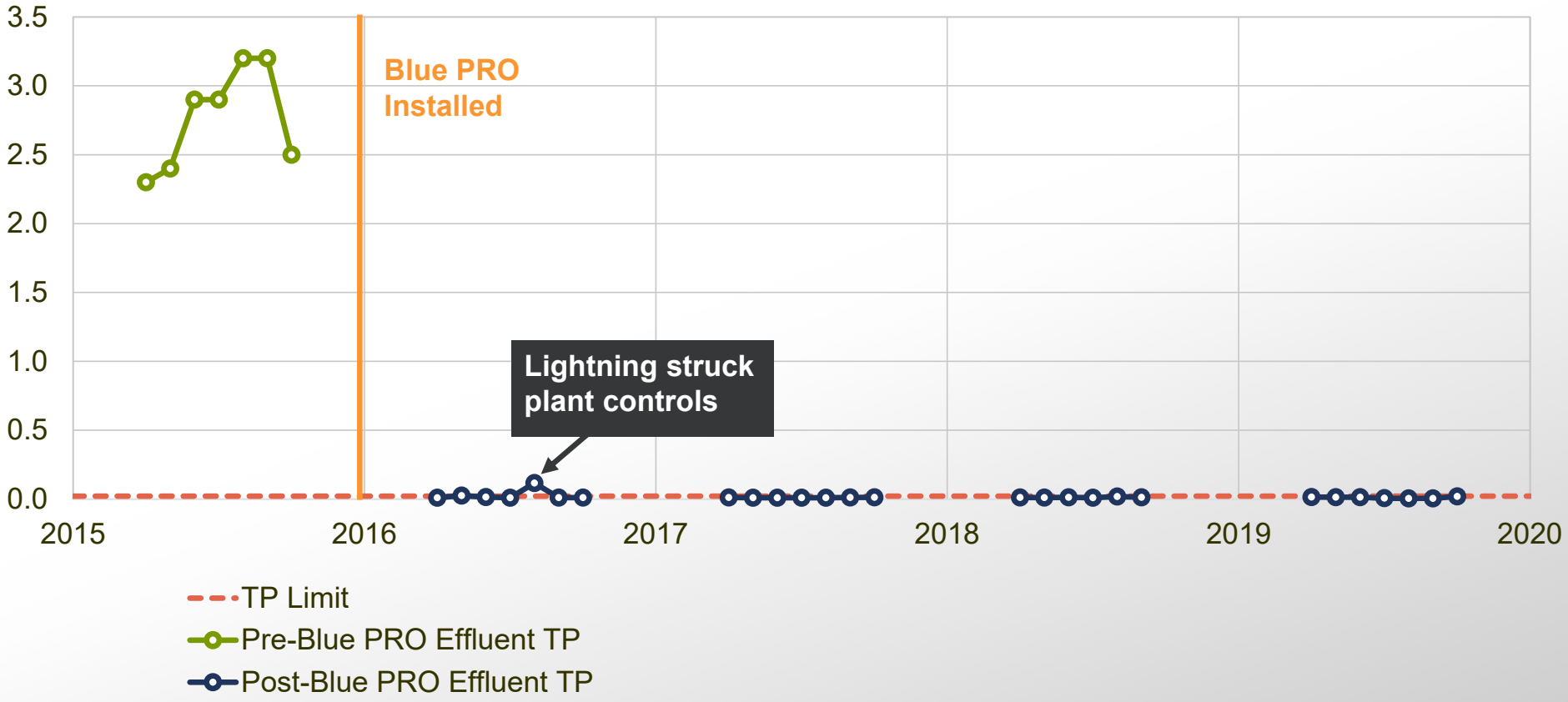


BluePRO Media

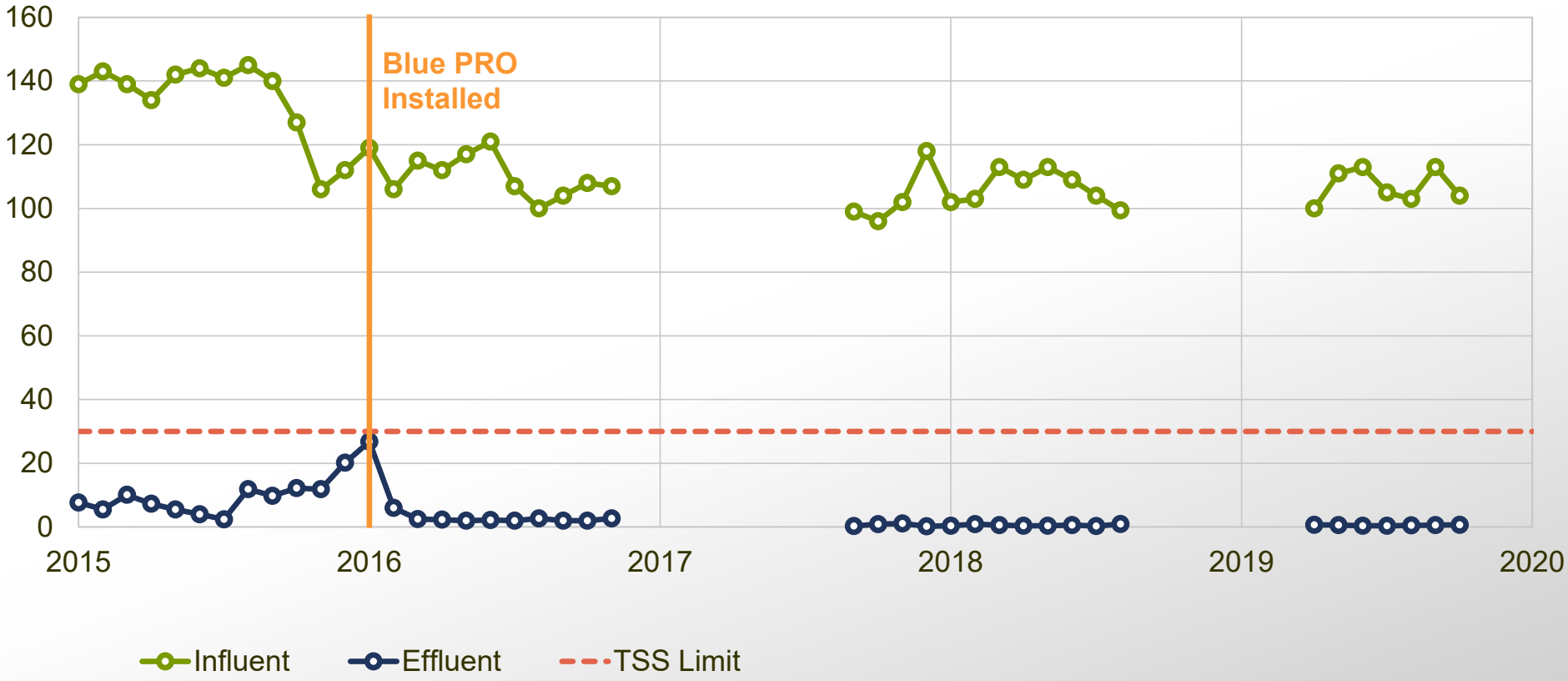
Modular Construction


BluePRO projects
Completed
Under Construction
NT
NU
NL
BC
AB
SK
ON
QC
NB
NS
ME
WA
MT
ND
OR
ID
SD
MI
WY
NE
IA
IL
IN
NV
UT
CO
KS
WV
VA
CA
NC
AZ
NM
OK
AR
SC
MS
AL
GA
TX
LA
FL

Citronelle, AL Blue PRO®
Total Phosphorus (mg/L)



Citronelle, AL TSS (mg/L)

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