LANDFILL LEACHATE TREATMENT SYSTEM DESIGN AND OPERATION

MWEA Annual Conference 2022

Fleis & VandenBrink Engineering:
Jonathan Sowder, CGWP | Mike Vander Ploeg, PE

Kent County DPW: Molly Sherwood

KENT COUNTY DEPARTMENT OF PUBLIC WORKS

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

AGENDA

- Introduction
- Background
- Design
- Construction
- System Operation and Performance
- Next Steps
- Questions

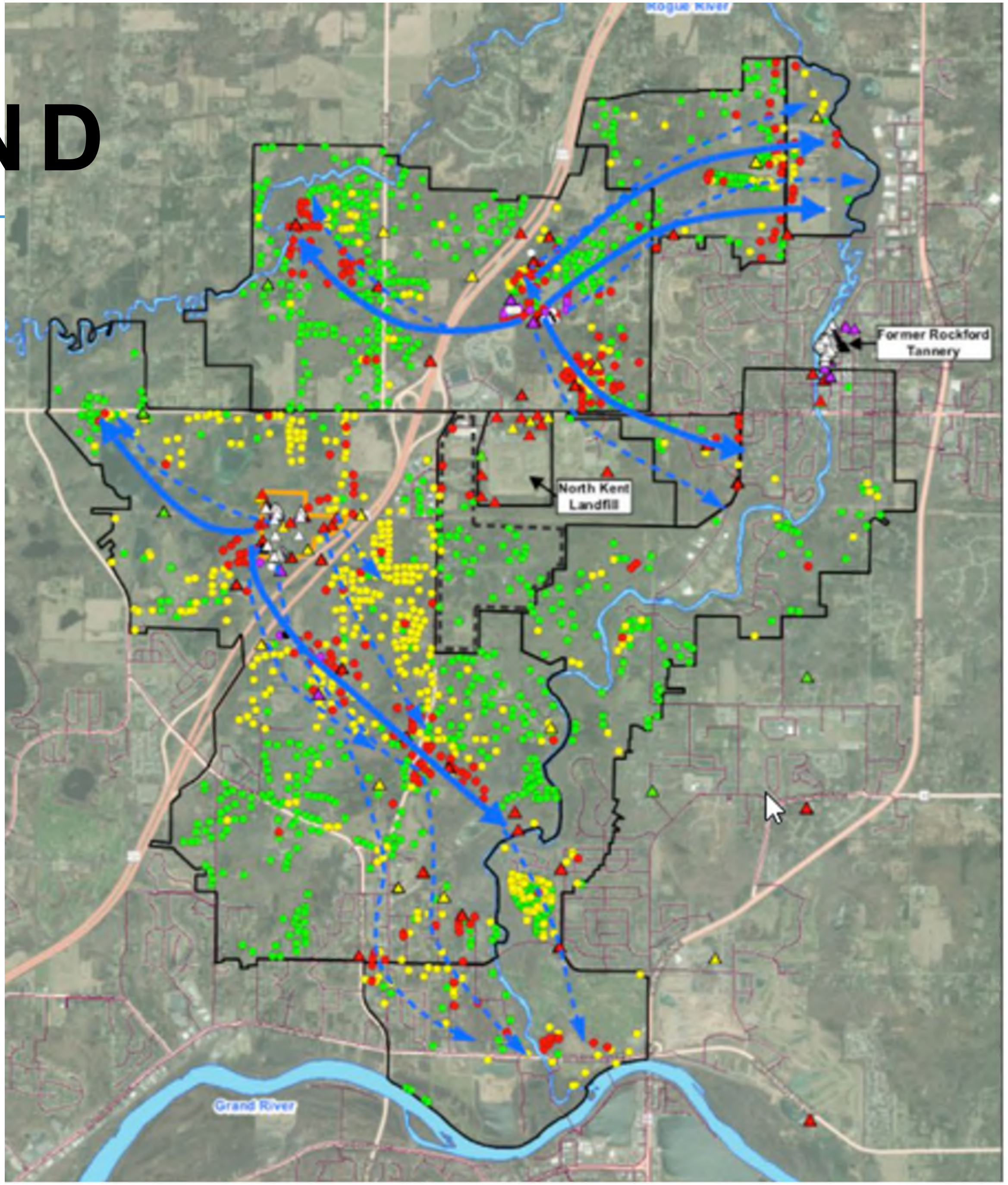
NKL BACKGROUND

About North Kent Landfill (NKL):

- Kent County-owned solid waste management facility
- Located near Rockford, Michigan
- 120-acre property with a 54-acre closed, Municipal Type II, synthetic lined landfill
- Part 201 site of environmental contamination
- Operated between 1977 and 1986
- Currently Site is used as North Kent Waste & Recycling Center

PFAS BACKGROUND

- 2017 – EGLE begins investigation of Wolverine's disposal of PFAS-contaminated tannery waste
  - Kent county records confirm that Wolverine's waste was disposed at NKL
- 2018 – Discussions with NKSA to add PFAS limits to discharge permit
  - Treatment of leachate necessary to meet proposed new limits
- November 2021 – Treatment system implemented as a full-scale pilot study.



mwea

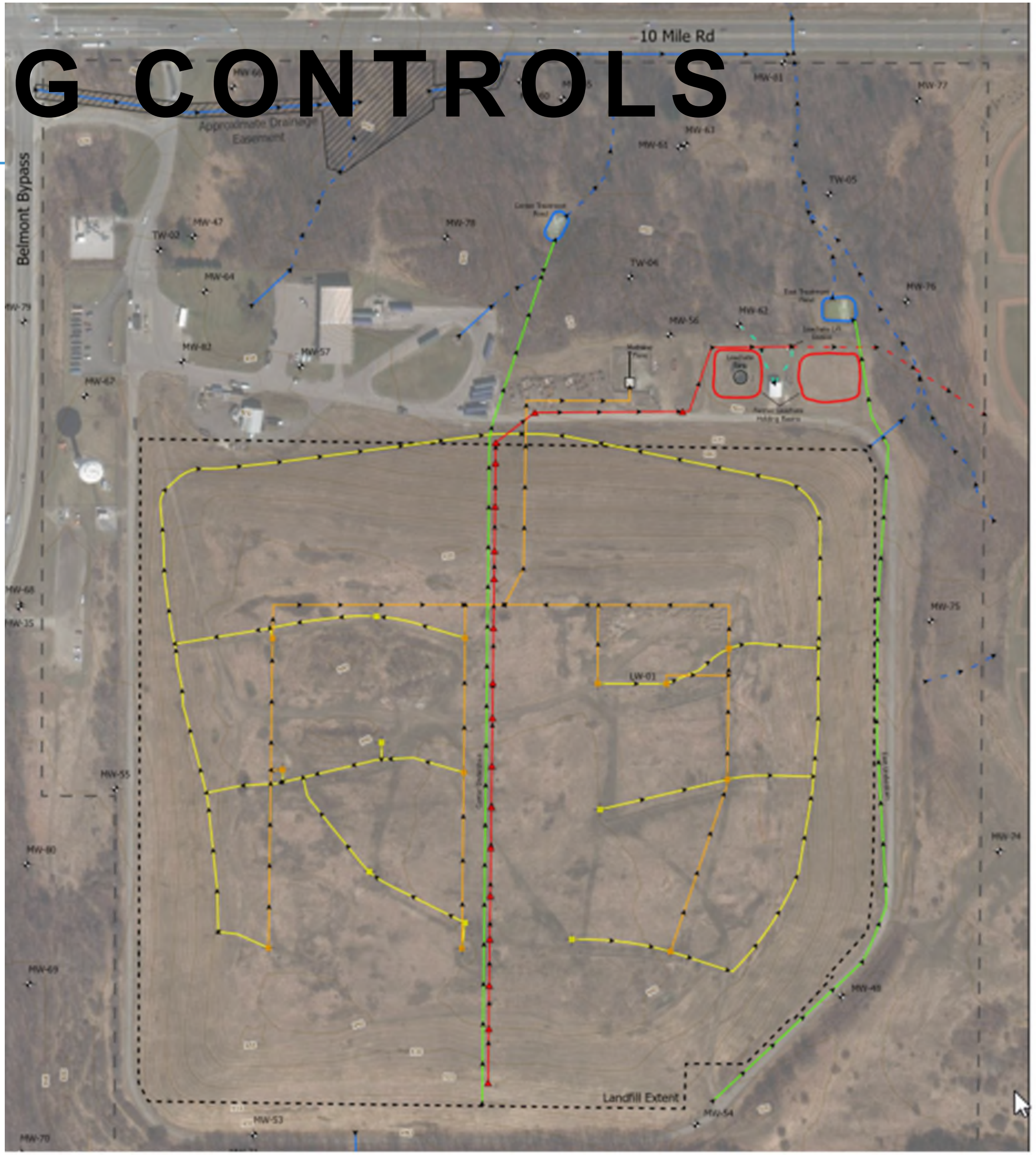
NKL ENGINEERING CONTROLS

Landfill Construction

- Landfill underdrains and pond outfalls
  - Center and East Underdrain
- Landfill Liner and Leachate Collection System
- Gas collection system and flare
- Landfill cap
- Ground water extraction wells

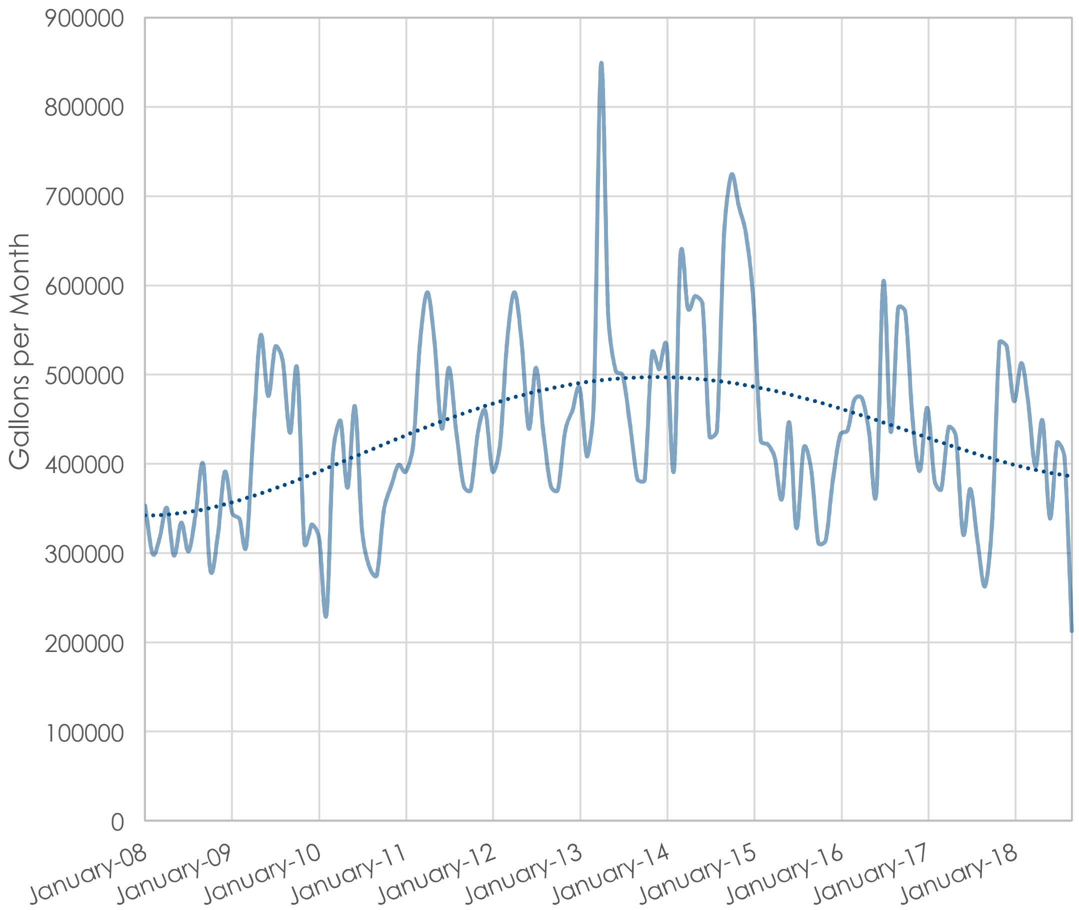
Past Leachate Handling

- Landfill collected and stored in a lagoon
  - Leachate hauled offsite for Treatment
  - Reinjected into landfill
- Leachate lagoon taken out of service
- Current discharge to North Kent Sewer Authority



LEACHATE DESIGN DATA

- Inputs
  - Landfill leachate collection system
  - Groundwater extraction well MW-62
  - Landfill gas flare condensation
  - Stormwater runoff from storage tank containment area
  - Transfer Station drains
- 2008-2018 monthly average flow was 435,180 gallons
- Concentrations
  - Total PFAS: 4,100 – 8,800 ppt
  - PFOA: 1,350 – 2,500 ppt
  - PFOS: 426 – 790 ppt
  - TOC: 165 mg/L



DESIGN CONSIDERATIONS

- Potential Treatment Technologies
  - Granular Activated Carbon (GAC)
  - Ion Exchange
  - Reverse Osmosis
  - Emerging Technologies
- Complex waste stream
  - Competing Contaminants
  - Solids
  - Geochemical parameters
  - TOC
- Don’t make it someone else's problem
  - Incineration of PFAS
- Reuse existing infrastructure
  - Pump Station Rehab
  - Control Building
  - Storage Tank
- Anticipated permit limits:
  - PFOA: 12,000 ppt
  - PFOS: 12 ppt

SYSTEM DESIGN

- Full scale pilot study
  - Competing containments
  - Variable loading due to wet weather impacts
  - Flexibility of testing GAC and ion exchange resin
  - Rental of equipment prior to purchase
- Equipment Selected
  - Bag Filters (Solids Removal)
  - GAC
  - Ion Exchange polishing
- Building sized for future treatment system expansion and underdrain treatment

CONSTRUCTION

OPERATION

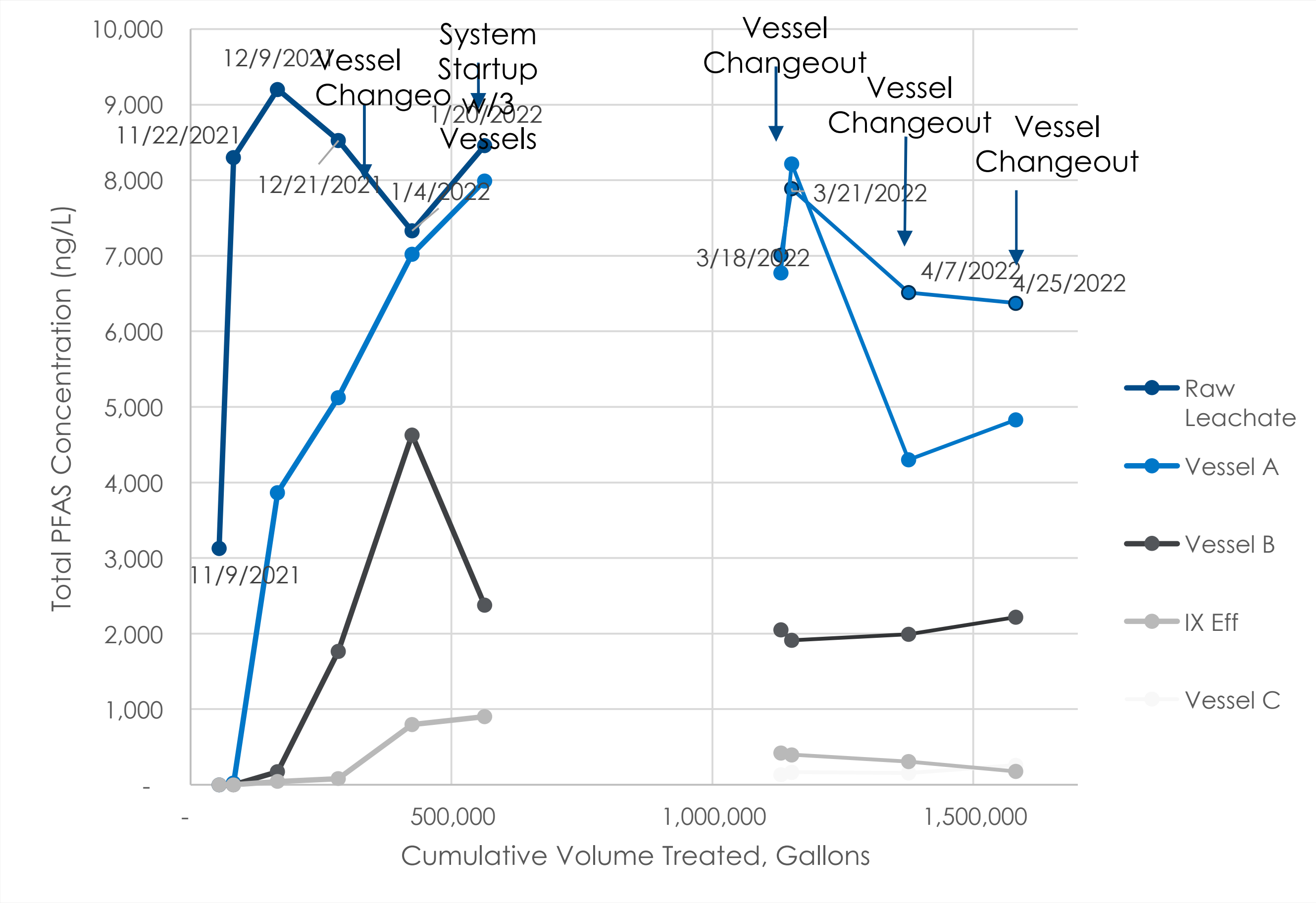
- Operation started in November 2021
- Certified Operator assisting Kent County Personnel
- PFAS and geochemical samples used to monitor system performance and guide system operation
- Flows monitored
  - Nov. 2021-Jan. 2022: 8,350 gpd average
  - Feb 2022-April 2022: 14,000 gpd average
    - Dry weather flows of 11,600 gpd
    - Storm flows up to 50,000 gpd
- MW-62 out of service until end of April

SYSTEM IMPROVEMENTS

- Additional bag filter housings
  - 100, 50, 25, 5-micron sizes
- Added 3rd GAC vessel
- Switch pump impeller to increase pump flow rate

SYSTEM PERFORMANCE

- PFAS Concentrations (March – April 2022)
  - Average Influent
    - Total PFAS: 6,946 ppt
    - PFOS: 807 ppt
    - PFOA: 2,275 ppt
  - Average Effluent
    - Total PFAS: 252 ppt
    - PFOS: ND
    - PFOA: ND
- 97% Removal of Total PFAS
- Meeting anticipated future permit limits



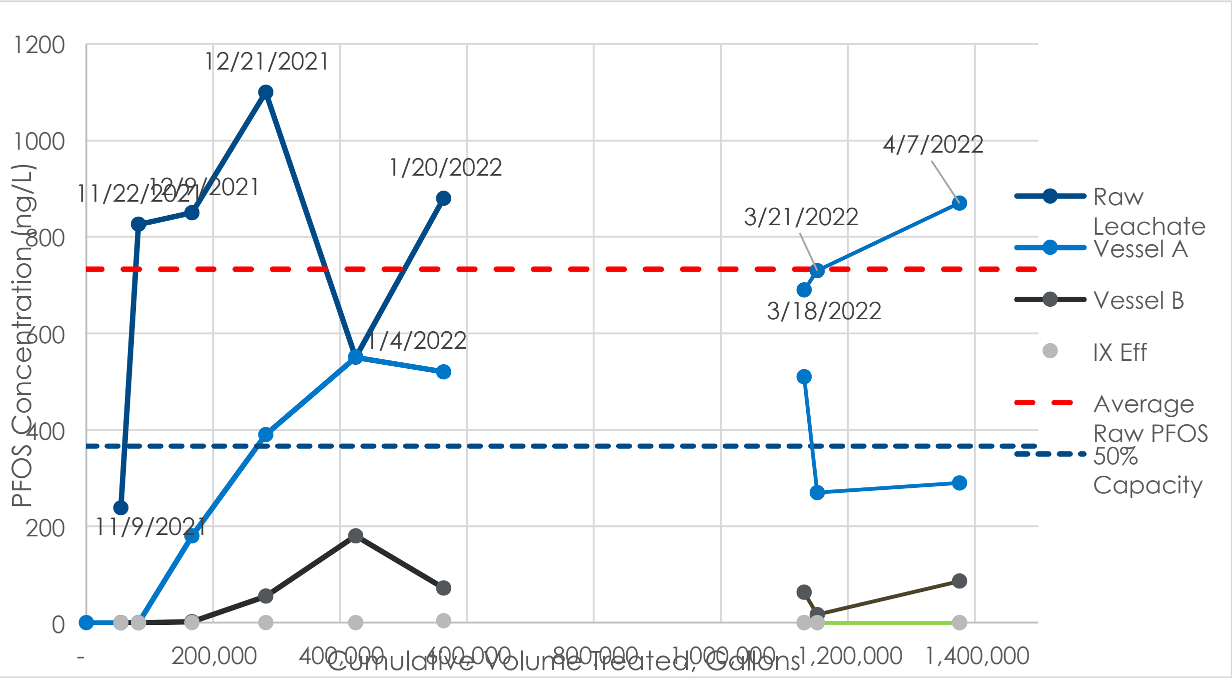
F&V

SYSTEM OPERATION AND COSTS

- Change out frequency
  - Bag filters: as needed based on pressure differential
  - GAC: effluent PFOS = 50% of influent
  - Ion exchange: PFAS breakthrough
- GAC backflush frequency
  - Backflush vs backwash
  - As needed to reduce pressure differential
  - Reduce changeout frequency
- GAC replacement costs

Table 1. Carbon Usage Rate Summary (50% Capacity)

Compound	Initial Bed Life (thousand gallons)	Steady-State Bed Life (thousand gallons)	Initial Bed CUR (lb/1000 gallons)	Steady State CUR (lb/1000 gallons)
PFOA	215	172	9.3	11.6
PFOS	264	215	7.6	9.3



NEXT STEPS

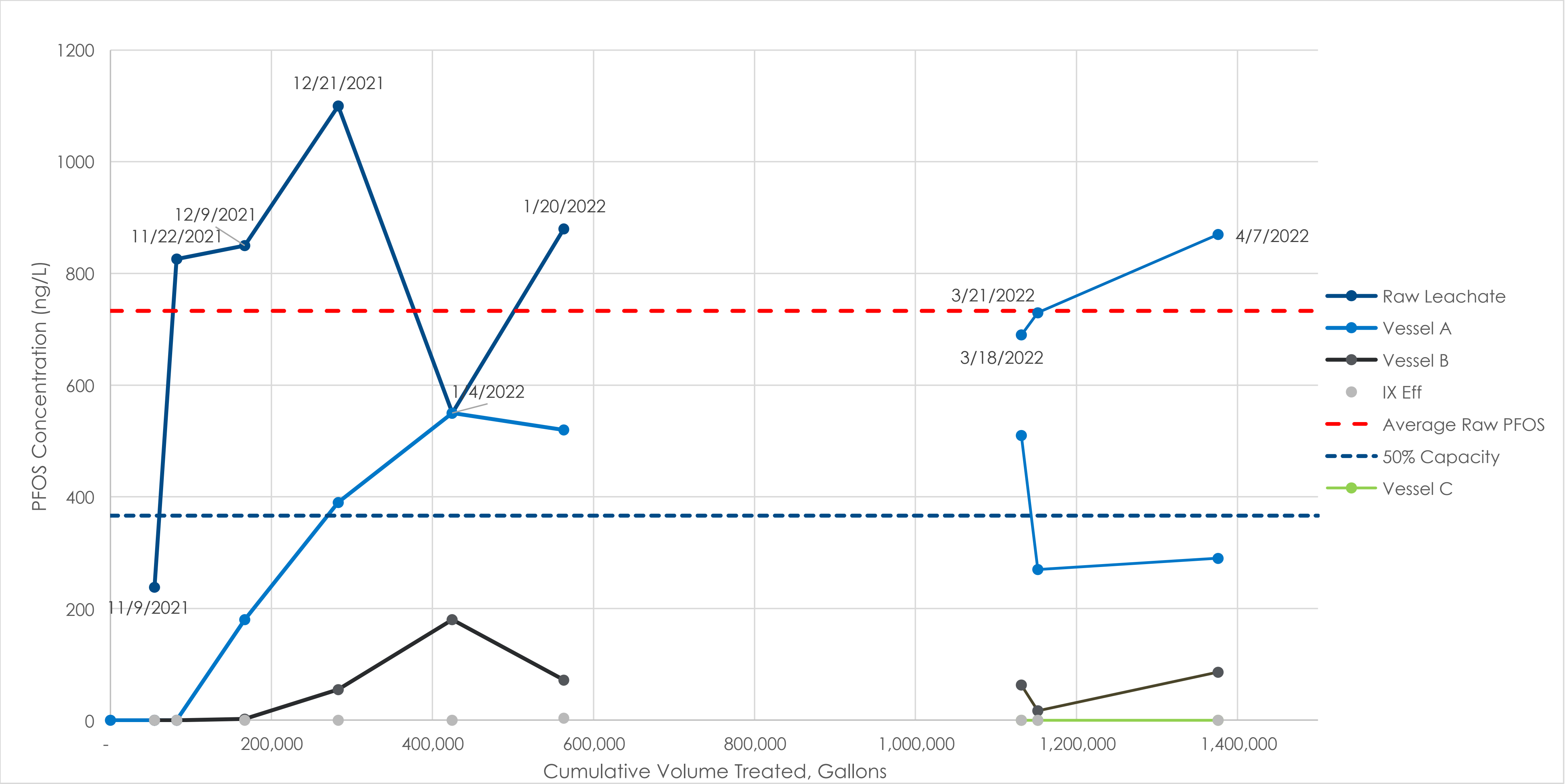
- Continue to operate the treatment system
- Complete pilot study end of 2022
- Recommendations for system operation
  - Larger GAC vessels to reduce change out frequency?
  - Install booster pump if needed to keep up with storm flows and increased pressures
  - Other?
- Purchase equipment
- Construct underdrain treatment system

QUESTIONS?

FLEIS&VANDENBRINK

DESIGN. BUILD. OPERATE.

SYSTEM PERFORMANCE



SYSTEM PERFORMANCE