2022 BLACK HILLS DEFENSE & INDUSTRY SYMPOSIUM:

LEADING THE NATIONAL DEFENSE DISCUSSION

MARCH 14-16, 2022

RAPID CITY, SD

CO-HOSTED BY:

ELEVATE RAPID CITY

SOUTH DAKOTA MINES
An engineering, science and technology university

STEVE GRAGERT

Mr. Gragert has 17 years of experience in environmental remediation as a chemist, project manager, and Section Chief. His past experience includes analytical chemist for polymer production, environmental chemist for a large DoD contractor, project manager at the Omaha District, and physical scientist at the Omaha District. Mr. Gragert currently serves as the Chief of the Military Munitions and Environmental Sciences Section, overseeing 12 chemists, risk assessors, and industrial health and hygiene staff who support the Environmental Remediation Branch in executing an annual program of >$250M.

JAY ERICKSON

Jay Erickson is a Principal Hydrogeologist with more than 32 years of experience in the design, installation and operation of contaminant remediation systems. Mr. Erickson is the technical lead for injection well design and well fouling for the Remediation Hydraulics Practice Area for Arcadis North America as well as the field lead for PFAS investigations and demonstration projects at Ellsworth AFB. Additionally, Mr. Erickson oversees operation and maintenance of large scale, complex groundwater remediation systems with the emphasis on a proactive approach to mitigating well fouling.

DEMONSTRATION PROJECT FOR PFOS/PFOA RESPONSE ACTION FOR SURFACE WATER

Ellsworth Air Force Base
February 2022

U.S.ARMY

US Army Corps of Engineers®

ONEIDA Total Integrated Enterprises

ARCADIS

DoD CUSTOMERS

Contracting Options
- 772nd
- USACE - Contracted through Area of Responsibility

Contracting Options
- U.S. Army Mission and Installation Contracting Command (MICC)
- USACE - Contracted and Managed through 7 Lead CE Districts

Contracting Options
- NGB/AQE (GSA-Oasis)
- USACE - Contracted through Area of Responsibility

Contracting Options
- NGB/AQE (GSA-Oasis)
- USACE - Contracted and Managed through Baltimore District

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OMAHA DISTRICT
TREATABILITY STUDIES

OTIE/Arcadis:

- **Horizontal Reactive Media Treatment Well (HRX well®) for in-situ removal of PFAS in a high-velocity paleochannel.**

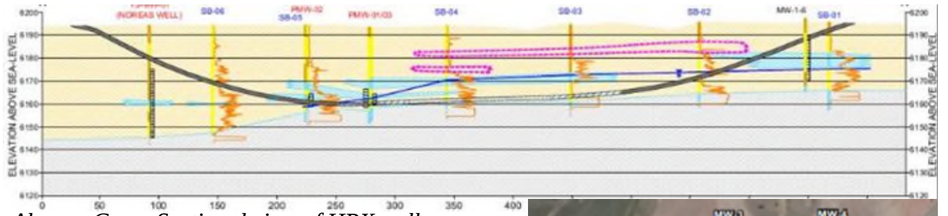
- **Flocculation of PFAS in ponded surface water and stabilizing PFAS in pond sediments to mitigate sediment-surface water interaction.**

- **Stabilization of PFAS in soil to mitigate leaching to groundwater.**

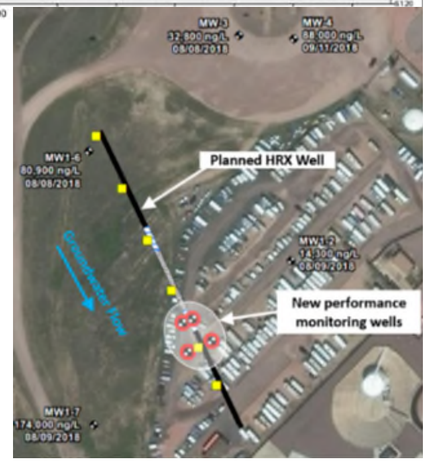
NOREAS:

- **Pump-Treat-Reinject (PTR)**
  - **Evaluate plume capture in paleo channel and use of Organic Clay Media as primary treatment with GAC as second-stage**

- **Permeable Reactive Barrier (PRB)**
  - **Evaluate PlumeStop® (liquid activate carbon [Regenesis]) as a reactive barrier**

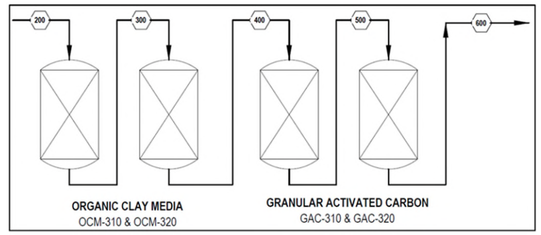


Above: Cross-Sectional view of HRX well



Above: HRX well alignment.

Example of in situ mixing using an excavator and conventional bucket/soil mixing attachment.



Above: PTR treatment media and configuration

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OMAHA DISTRICT
TREATABILITY STUDIES

Tanaq:

- **Evaluate use of GAC and IX to remove PFAS from stormwater surface runoff in pond to mitigate off-base release.**

NorthWind CDM:

- **Soil washing of impacted soil beneath a pond liner followed by foam fractionation of wash water.**

NuGlobal:

- **Potentially Responsible Party (PRP) study with PFAS forensic analysis for fingerprinting source release areas.**

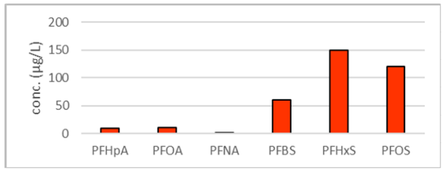
Brice:

- **Soil segregation and washing of impacted soils and sediments in stormwater retention pond.**

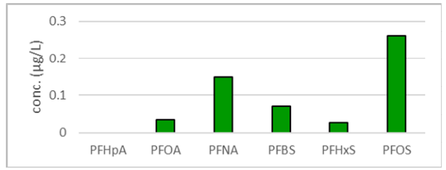
OTIE/Arcadis:

- **Reactive Core Mat to mitigate PFAS in groundwater from seeping into surface water runoff.**

Above: GAC/IX treatment system for pond water



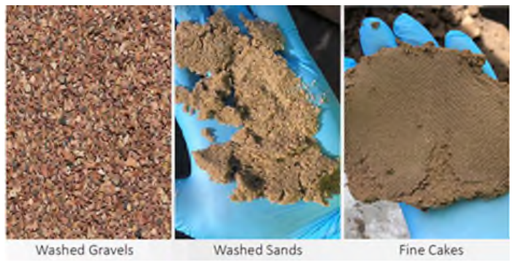
Above: On-base PFAS signature



Above: Off-base PFAS signature

Above: PTR treatment media and configuration

Above: Soil washing system setup



Above: Segregated and washed soil by grain size

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PROJECT OBJECTIVES AND TASK ITEMS

Objective:

- Evaluate the effectiveness of adsorbtive mats in reducing the concentration of PFOS/PFOA discharging from groundwater to surface water

Project Tasks:

- Baseline evaluation
  - identify installation location of 400 ft of mat
  - completed in summer 2021
- Field installation of 400 ft of mat
  - completed in fall 2021
- Quarterly performance sampling
  - first quarter event planned for April 2022
- Removal, disposal, and site restoration
- Technical report
- Technology transfer and training

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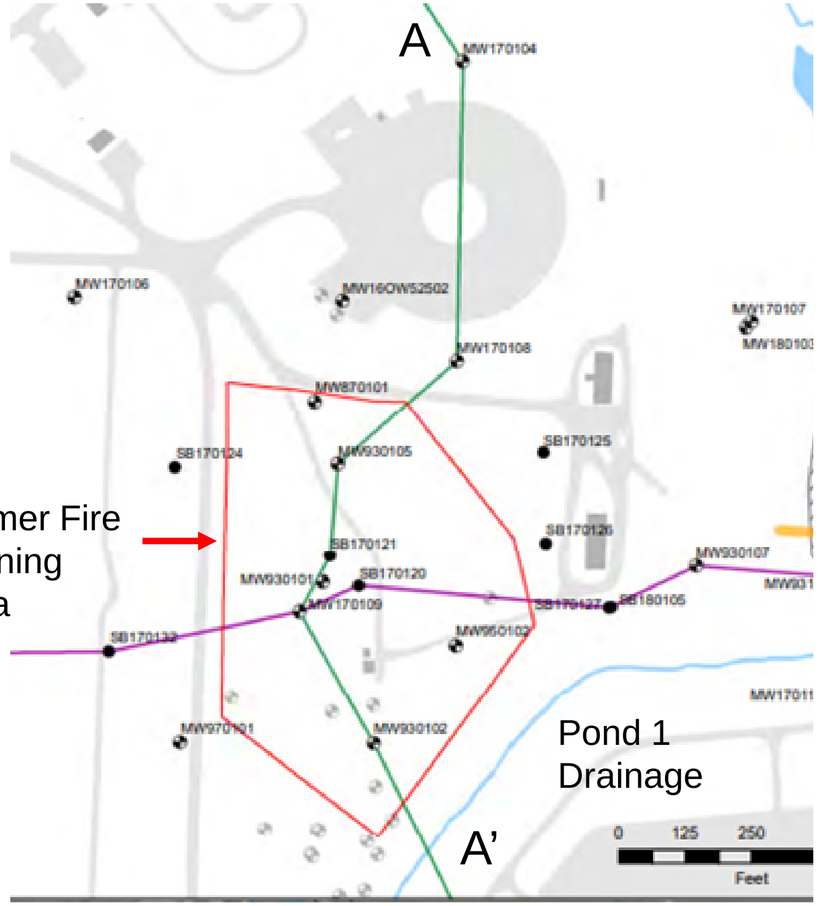
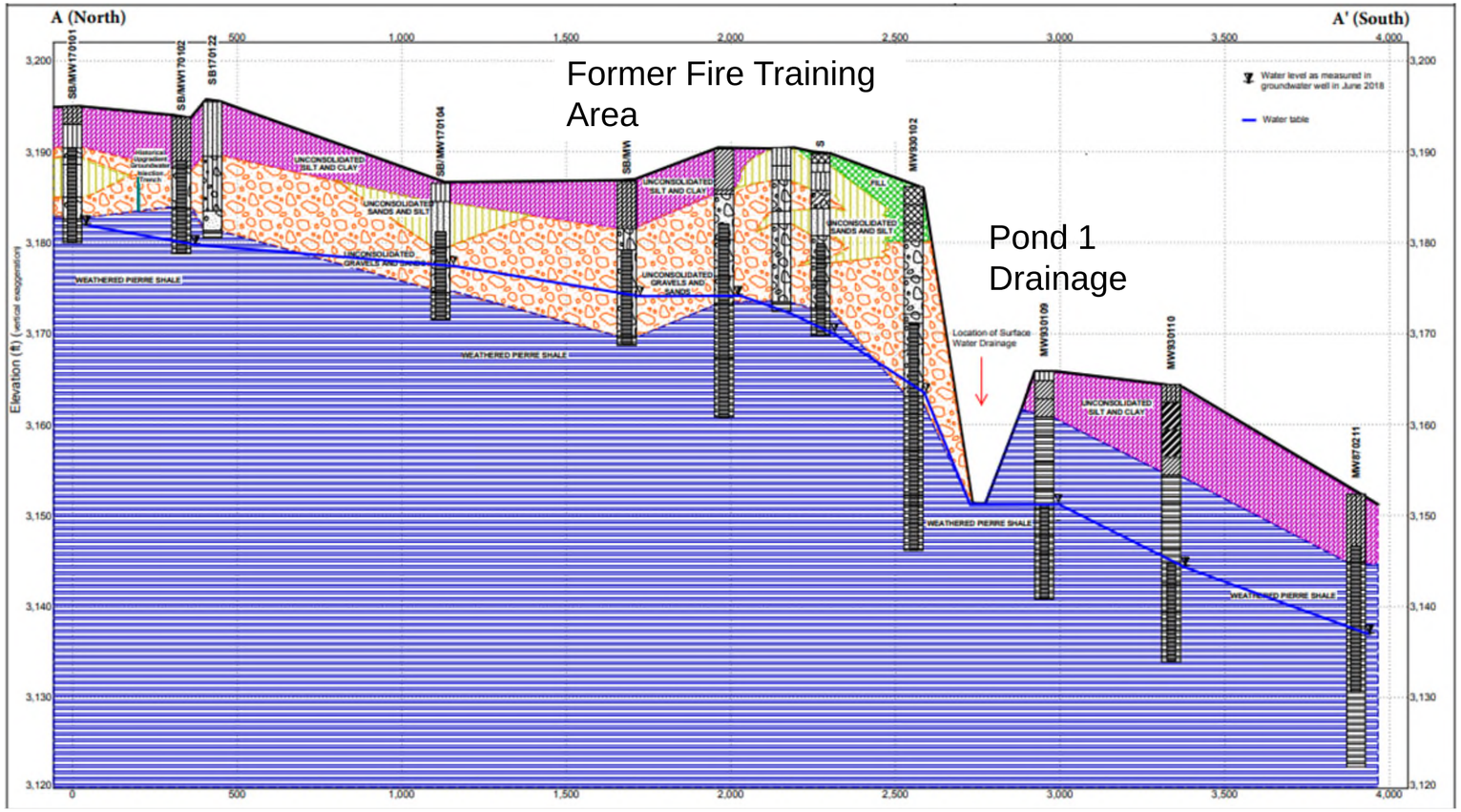
SITE LOCATION AND BASELINE CHARACTERIZATION





Draft Remedial Investigation Report: Per- and Polyfluoroalkyl Substances Area of Concern Perfluorinated Compound-1 Ellsworth AFB, SD November 2018

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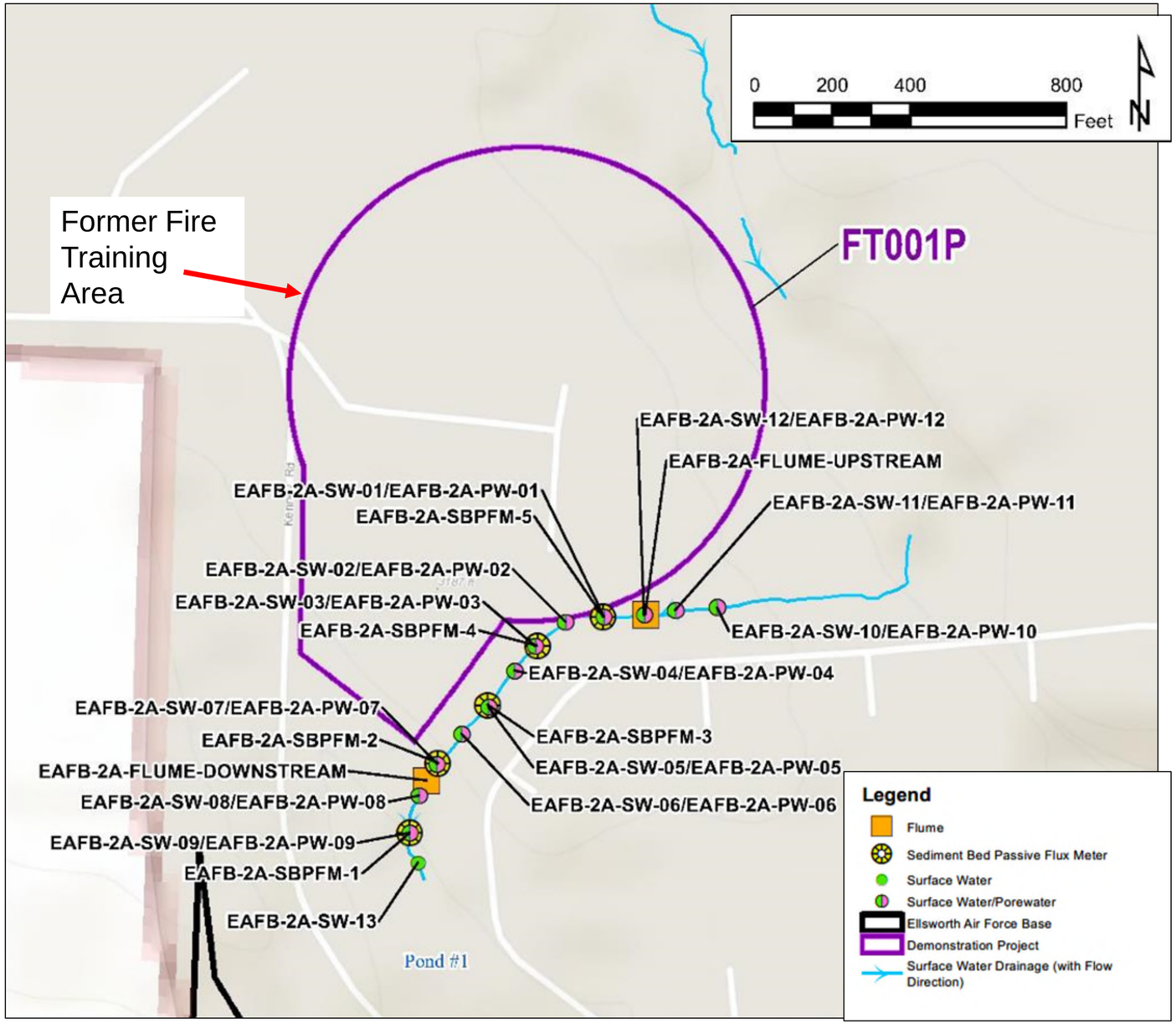
SITE LOCATION AND BASELINE CHARACTERIZATION

Baseline characterization activities included:

- 13 surface water sampling locations
- 12 porewater sampling locations
- 5 sediment bed passive flux meters (SBPFMs)
- 2 flumes with stilling wells
- 2 pressure transducers in stilling wells
- 1 stream tracer study



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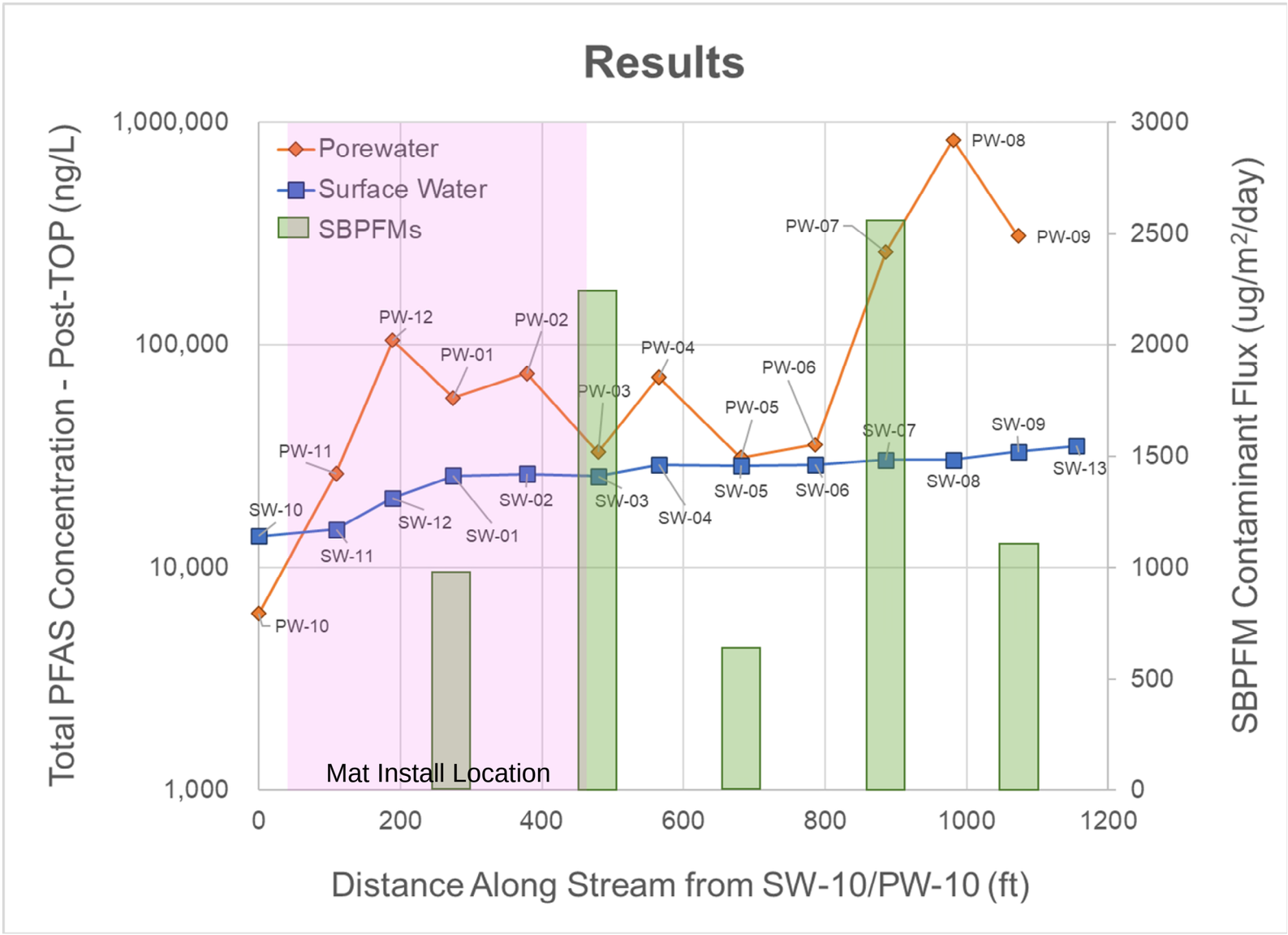
BASELINE RESULTS

- Surface Water:
  - Concentrations increase with distance downstream
  - Largest increase upstream between SW-11 and SW-01
- Porewater:
  - Highest concentrations downstream at PW-07, PW-08 and PW-09 but concentrations are elevated upstream as well
- SBPFMs:
  - Highest flux from groundwater at SW-03 and SW-07

Porewater Sampler

SBPFM

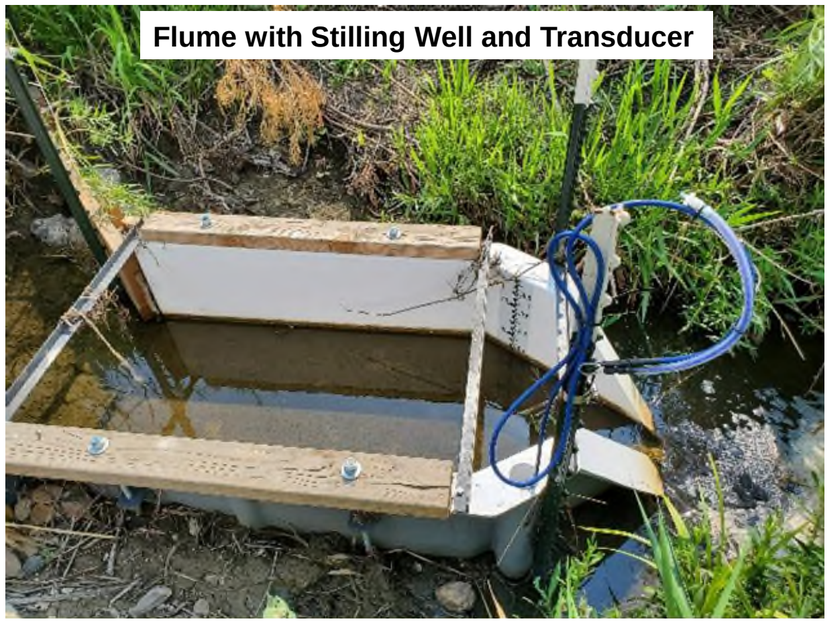


BASELINE RESULTS CONT.

- Stream flow:
  - August 2021 – flow fluctuated by ~60 gpm on a daily basis, excluding rain events, due to plant uptake
  - Daily peaks in early morning, lows in late afternoon
- Stream tracer test:
  - Groundwater discharge is 11 to 12 gpm along the entire stream reach,
  - Highest discharge along the lower reach of the stream

Mixed Tanks for Stream Tracer Test

Flume Installed

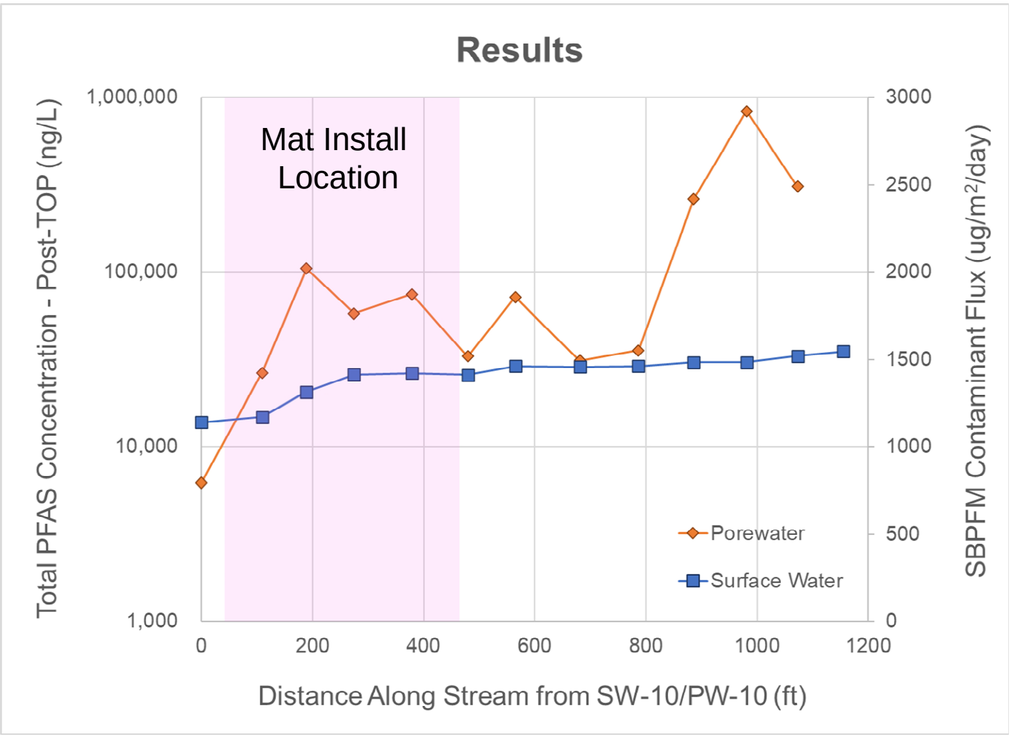

Flume with Stilling Well and Transducer

Tracer Addition Location

Stream Tracer Test

MAT INSTALLATION

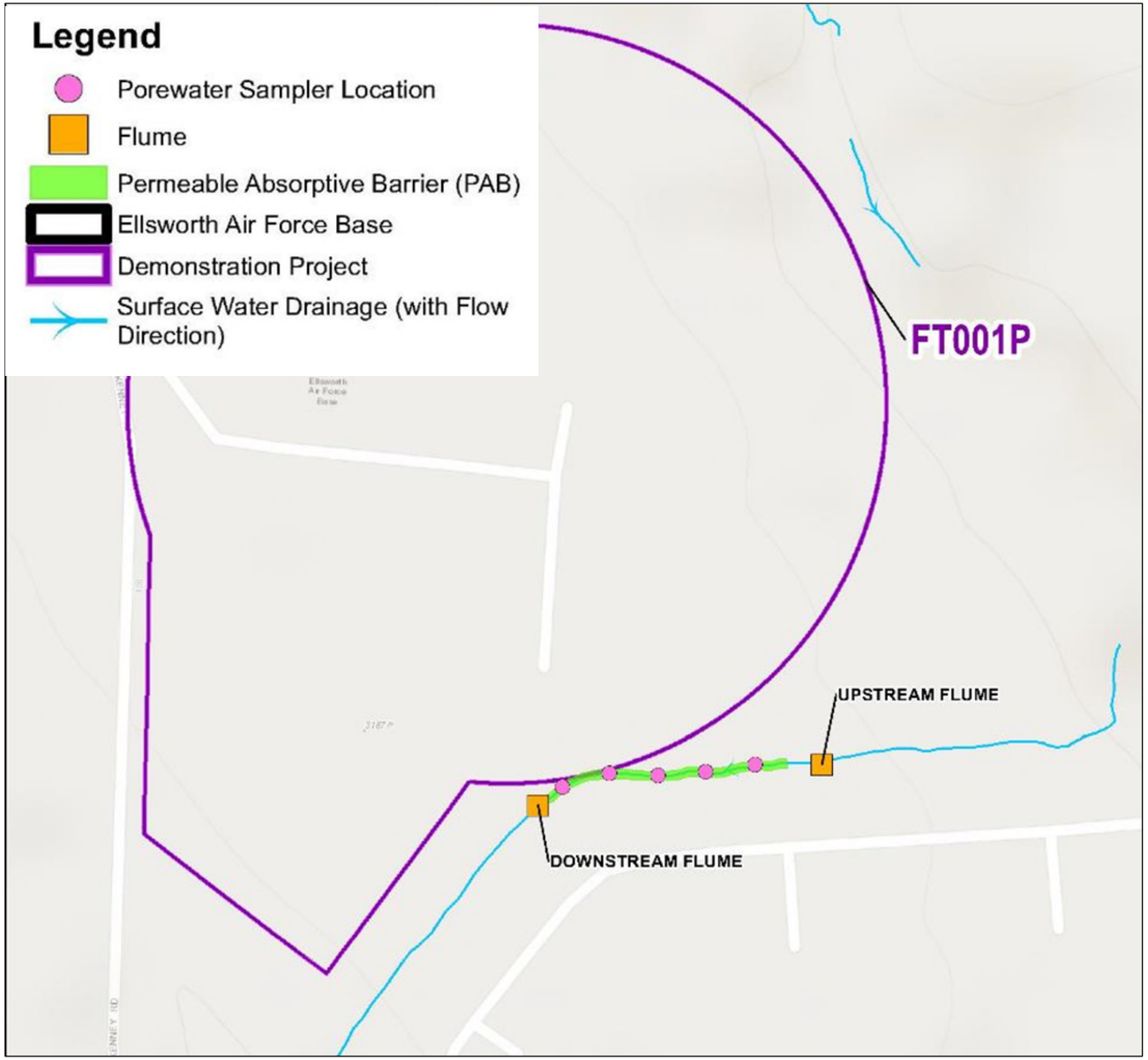
- Reactive core mat is 15-feet wide (variable length) with an adsorptive media needle punch woven between two layers of geo-fabric
- Groundwater passes freely through the mat
- Dissolved-phase contaminants sorb to the media within the mat
- 400 ft of mat installed where surface water concentrations increase most significantly and porewater concentrations are elevated



MAT INSTALLATION

QUARTERLY PERFORMANCE MONITORING

- 2 years of quarterly monitoring planned
- Begins in April 2022
- Includes:
  - Co-located surface water and porewater sampling along the length of the mat
    - Porewater sample ports were installed below the mat
  - Piezometer installation and gauging
  - Staff gauge installation and measurement
  - Transducer monitoring



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QUESTIONS

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