RETHINKING TRADITIONAL TREATEMENT SYSTEMS for PFAS REMEDIATION

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Rethinking Traditional Treatment Systems for PFAS Remediation

Speaker:

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  Weston Solutions, Inc.

Two Case Studies Rethinking PFAS Remediation

Soil Washing at Shaw AFB

Biologically Active Pre-Filtration and Upflow Gravity Systems at Wright-Patterson AFB

Soil Washing at Shaw Air Force Base, South Carolina

Overview of Shaw Air Force Base

PFAS in Soil and Sediment: A Challenging Problem

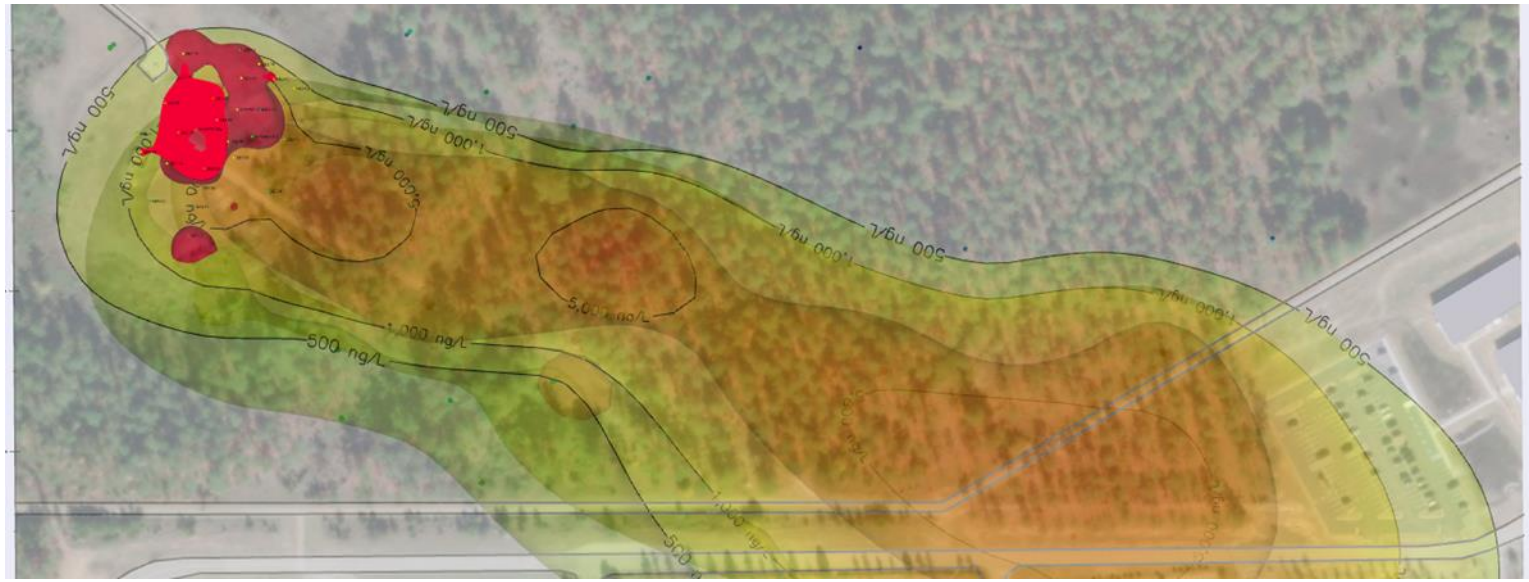
- Higher retardation factor for longer chain perfluoroalkyl acids (PFAAs)
- Vadose zone can act as long-term storage
- Fine material and organic fraction have shown to adsorb certain PFAS
- Demonstrated soil remediation technologies are limited
  - Excavation and landfilling
  - Thermal desorption/oxidation
  - Incineration
  - Soil washing
- Most soil remediation technologies are costly and still at a demonstration phase
- Ability to achieve ultra-low levels is questionable
- No federal soil remediation cleanup levels

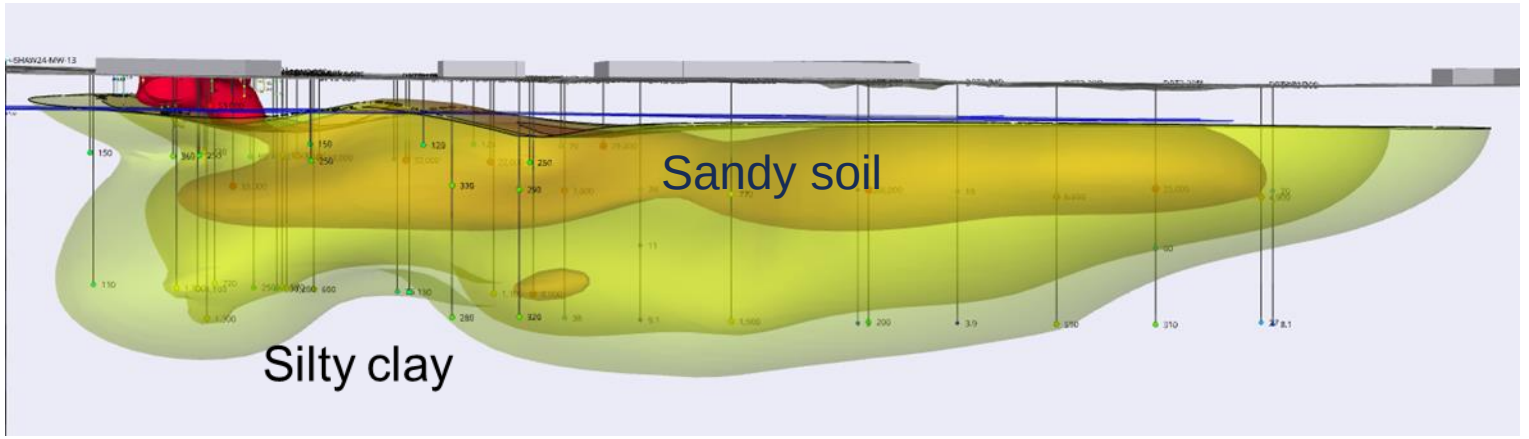
Detailed View – Area 3 PFOS Source Area

Area 3 PFOS Impacts

The groundwater plume is migrating outside of the site boundary, affecting downgradient drinking water wells

- High concentration soil impacts
- PFOS leaching from soil created groundwater plume that is migrating off-installation
- Depth to groundwater 6 ft to 15 ft
- Removal action objective is to reduce future leaching by source area mass removal
- Soil excavation will be limited to high concentration source area
- Groundwater plume mitigation will be addressed through separate Remedial Investigation/Feasibility Study/Remedial Action process





Source Removal Approach

- **Soil Washing Selected as the Remedy**

→ Air Force Civil Engineer Center (AFCEC) chose soil washing system as a soil source removal approach

→ Interim Removal Action Proposed Plan and Interim Record of Decision signed by AFCEC

→ Risk evaluation determined PFOS concentrations in groundwater and soil exceeded EPA Regional Screening Levels (RSLs) and Lifetime Health Advisories (LHAs)

  → Highest PFOS concentration in groundwater >48 times the LHA

  → Highest PFOS concentration in soil >19 times the RSL

→ Results of risk evaluation justified removal actions to mitigate potential threats to public health and welfare

→ 65,000 cubic yards of PFAS-impacted soils are expected to be processed

Pilot Study Results

Pilot Study Showed Lower Fine Content

16.44 lb of soil processed

75% of the soil is made up of coarse and fine sand

25% of the soil is made up of fine particles

Soil Size Analysis

→Initial grain size analysis: 100% of soil material size is < ½ inch

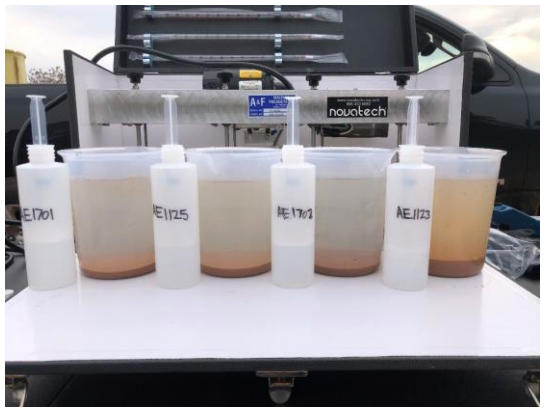
Pilot study results: substantial amount of gravel material size is > ½ inch (Area 3)

Sieve size for the full-scale separation units should be re-evaluated to optimize grain separation and subsequent washing

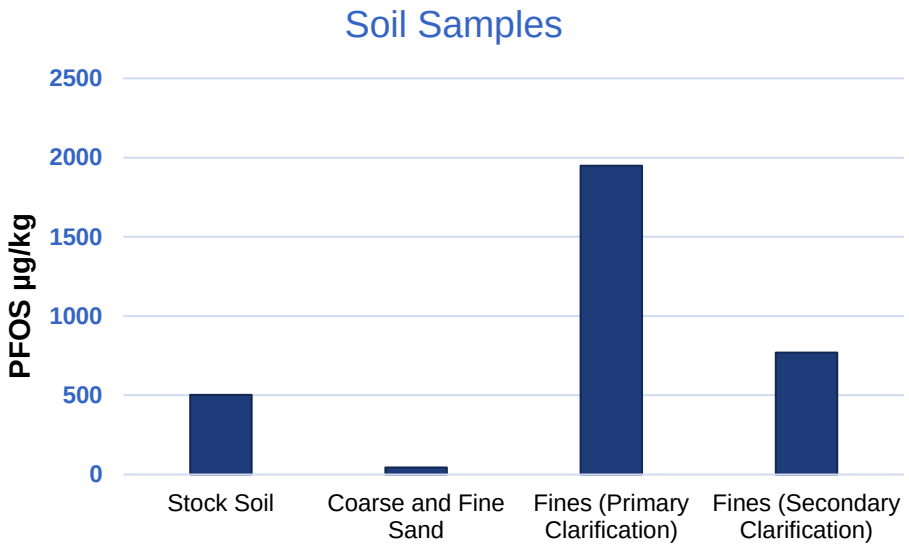
Polymer

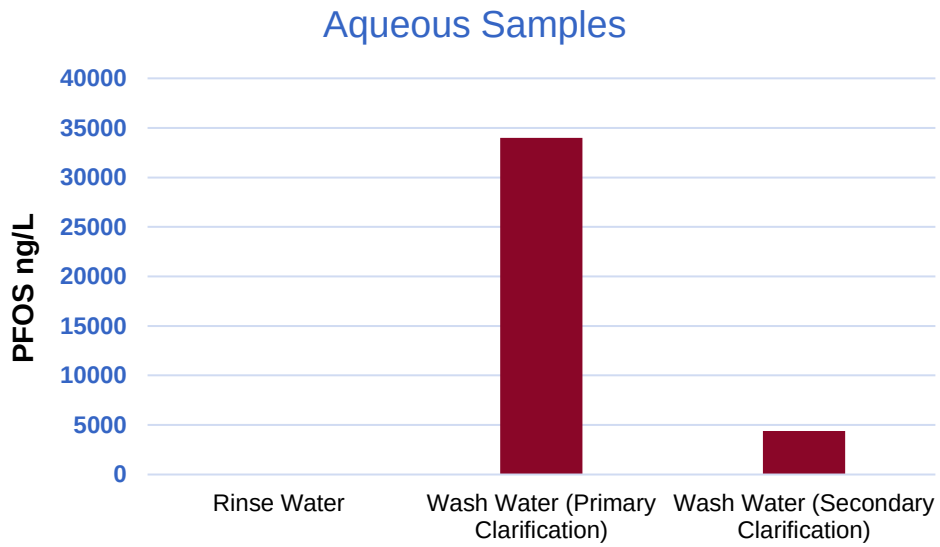
Three polymers were tested: Four different dosing rates (3 mL, 4 mL, 5 mL, and 6 mL)

6 mL of 0.1% Polyfloc AE1702 resulted in higher enhancement of the settling process



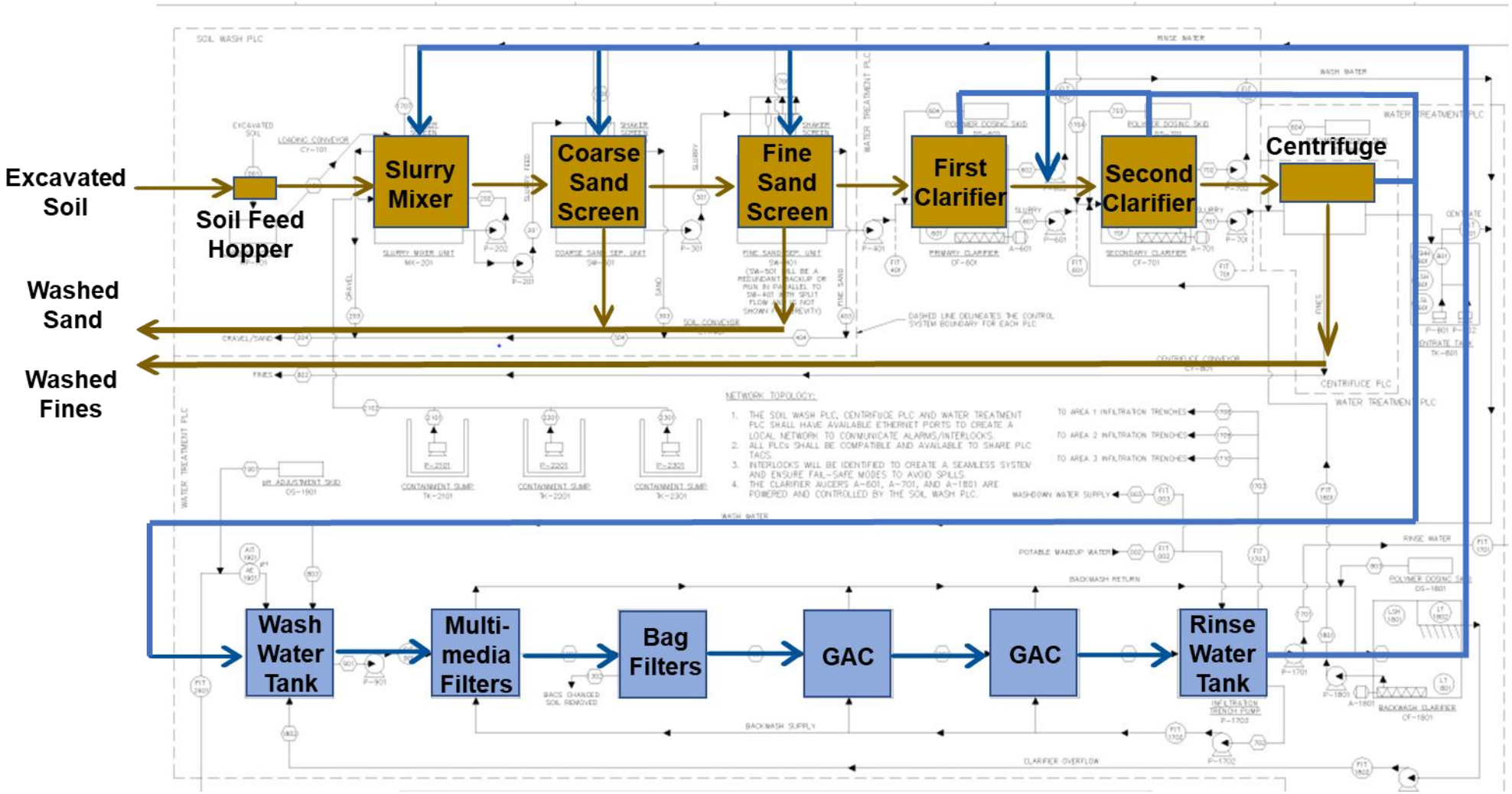
PFOS Absorption on Fine Grained Sediments





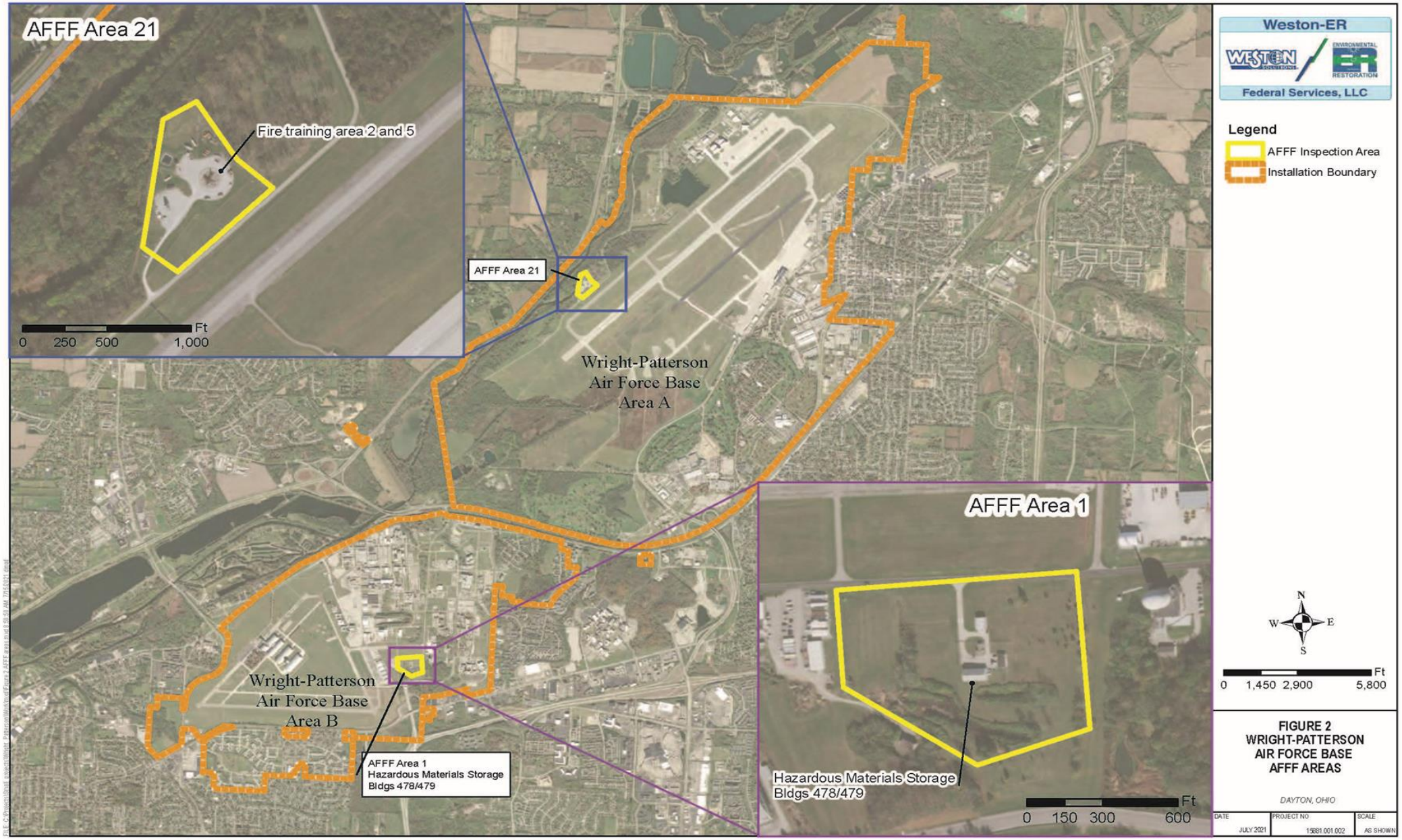
Most water flow to the treatment system is from the wash water from primary clarification units
Successful transfer of PFOS from stock soil into water

Simplified Soil Washing Unit Processes

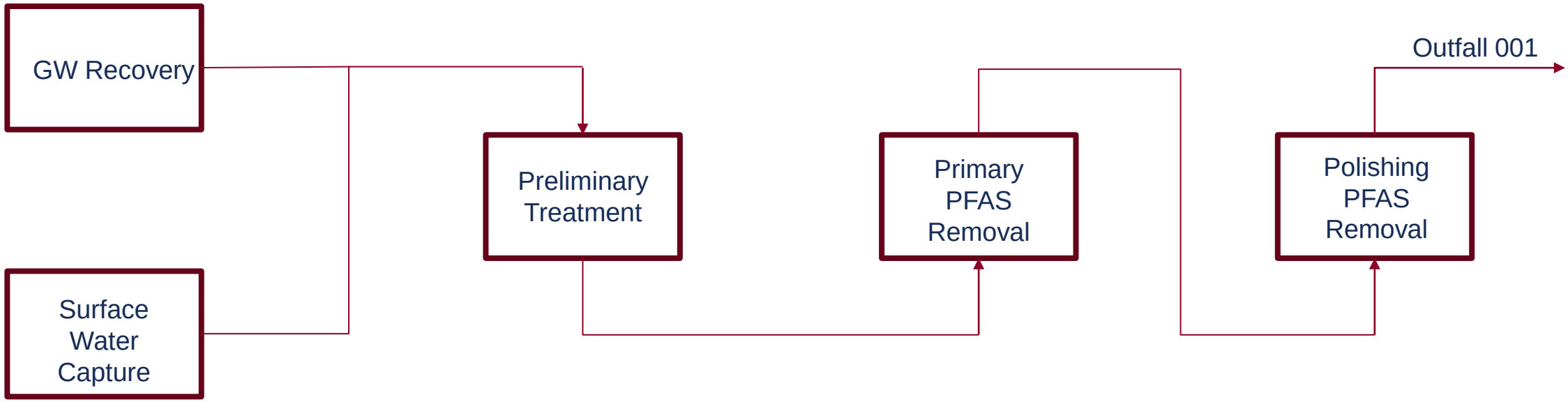


Biologically Active Pre-Filtration and Upflow Gravity Systems

Wright-Patterson Air Force Base


AFFF Area 21
Fire training area 2 and 5
0 250 500 1,000 Ft
AFFF Area 21
Wright-Patterson
Air Force Base
Area A
Wright-Patterson
Air Force Base
Area B
AFFF Area 1
Hazardous Materials Storage
Bldgs 478/479
AFFF Area 1
Hazardous Materials Storage
Bldgs 478/479
0 150 300 600 Ft
Weston-ER
Federal Services, LLC
Legend
AFFF Inspection Area
Installation Boundary
N
W
E
S
0 1,450 2,900 5,800 Ft
FIGURE 2
WRIGHT-PATTERSON
AIR FORCE BASE
AFFF AREAS
DAYTON, OHIO
DATE
JULY 2021
PROJECT NO
15881.001.002
SCALE
AS SHOWN

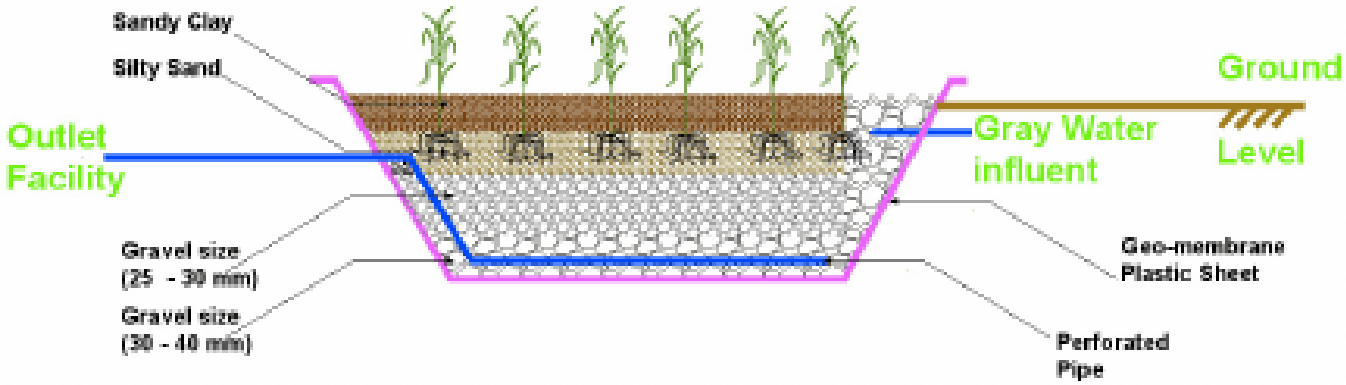
Process Flow Diagram



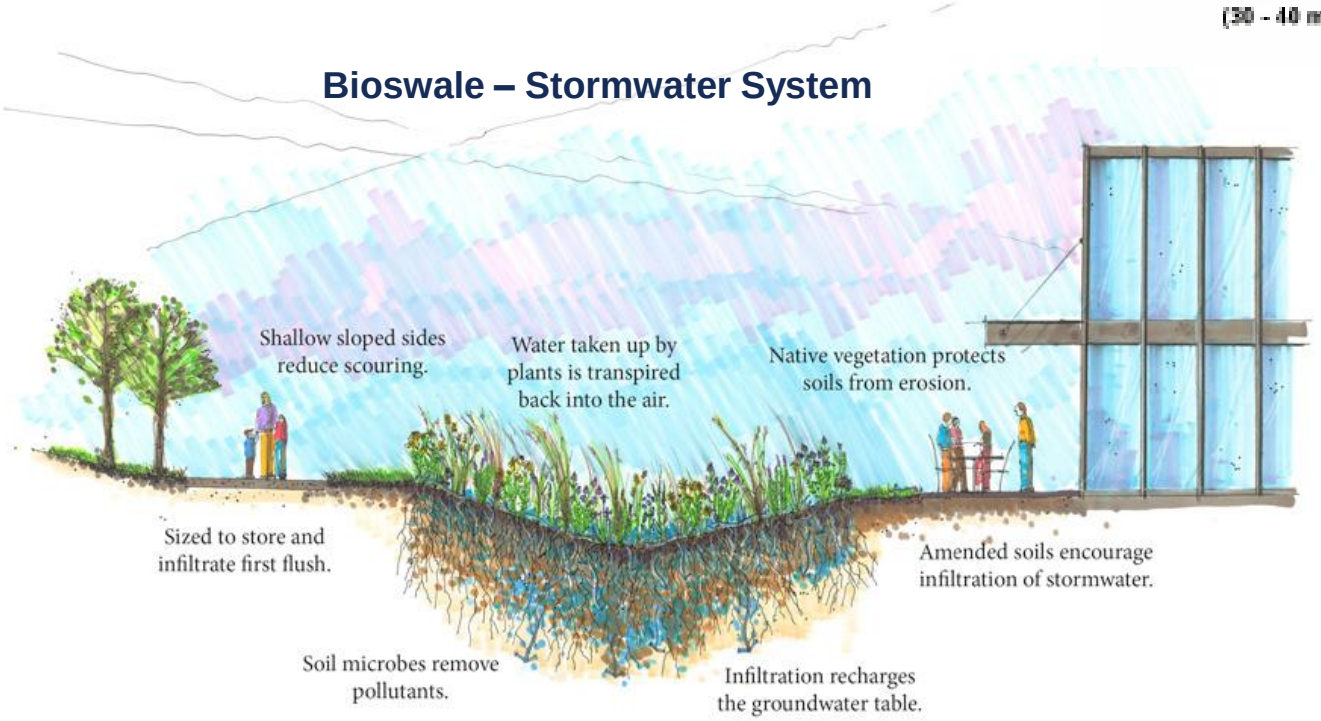
- Treatment Processes
  - Preliminary Treatment – Filtration
  - Primary PFAS Removal – Fluoro-Sorb 400 Organoclay
  - Polishing PFAS Removal – Fluoro-Sorb 400 Organoclay

Biologically Active Filter

Reed Bed – Wastewater System



Bioswale – Stormwater System



- Proposed biologically active treatment cell combines existing stormwater and groundwater
- Controlled biological growth provides nutrient pretreatment to reduce bio-fouling in downstream treatment cells

PRE-ENGINEERED LIFT STATION WITH DUPLEX FLYGT CONCERTOR-N SUBMERSIBLE PUMPS OR APPROVED EQUAL. (1 / M-103)

PRE CAST VALVE VAULT. SEE SCHEDULE ON SHEET C -110 (1 / C-307) (1 / C-308)

10" DIA. HDPE DISTRIBUTION PIPE. TYPICAL FOR EACH BASIN.

4" PERFORATED LATERAL COLLECTION PIPE WITH A MINIMUM INLET AREA OF 0.5 SQUARE INCHES PER LINEAR FOOT. TYPICAL FOR EACH BASIN. PRE-ENGINEERED FILTER UNDERDRAINS OPTIONAL (ASHTONTUCKER OR EQUAL)..

10"X10"X10" TEE. TYPICAL FOR EACH BASIN.

10" DIA. PERFORATED COLLECTION PIPE WITH A MINIMUM INLET AREA OF 0.5 SQUARE INCHES PER LINEAR FOOT. PLACE BACKWASH OVERFLOW/ CLEANOUT WYES' 10' OC. TYPICAL FOR EACH BASIN.

10" DIA. PIPE INFLUENT DISTRIBUTION

10" TEES WITH RISER PIPE 3' OC FOR OVERFLOW COLLECTION. EXTEND RISER ABOVE DRAINAGE STONE

AIR BLOWER (KAESER KOMPRESSOR OR APPROVED EQUAL) WITH MANUFACTURE'S OUTDOOR INSTALLATION KIT INCLUDING WEATHER HOOD, CONTROLLER COVER, AND HEATERS.

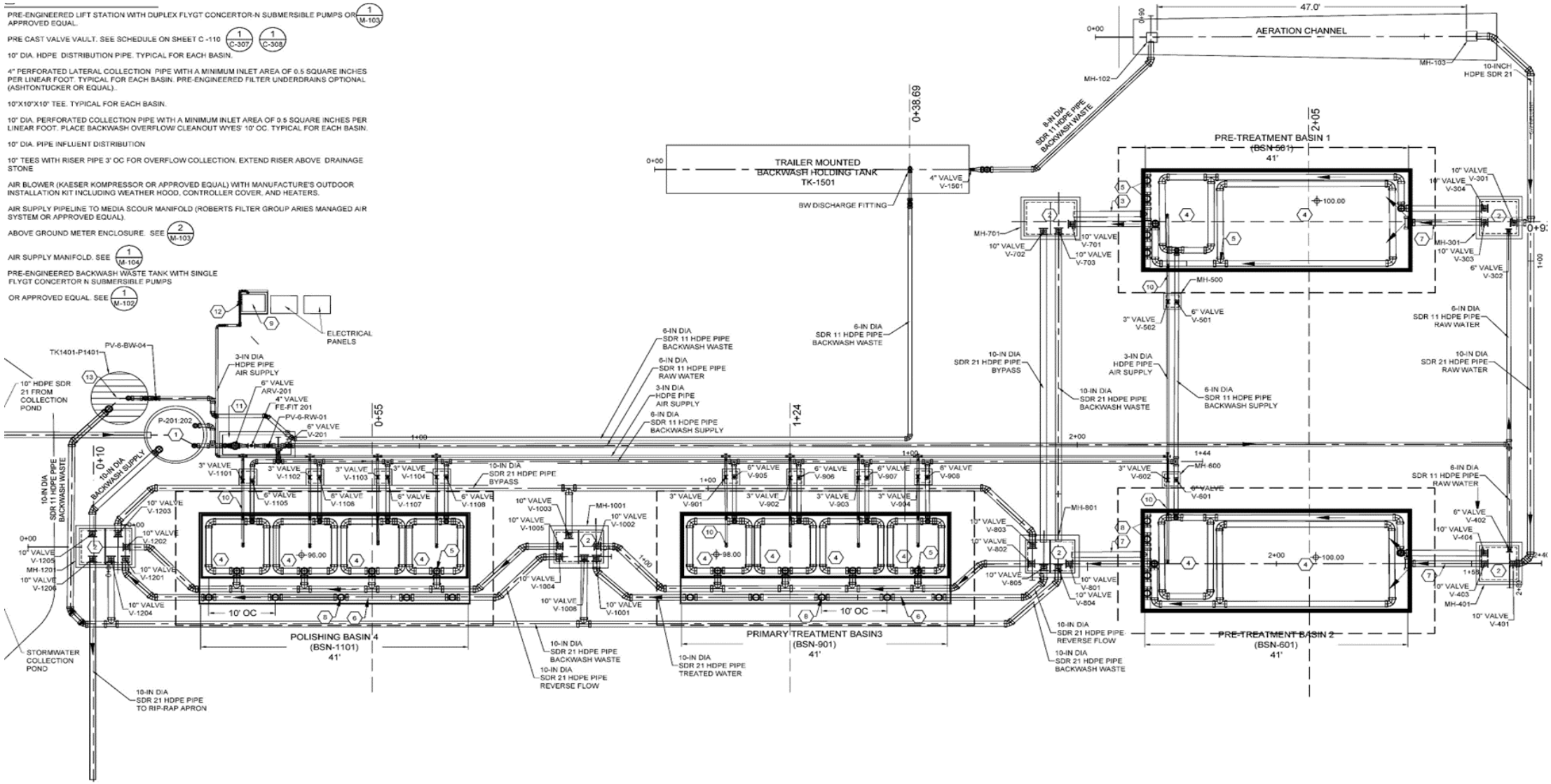
AIR SUPPLY PIPELINE TO MEDIA SCOUR MANIFOLD (ROBERTS FILTER GROUP ARIES MANAGED AIR SYSTEM OR APPROVED EQUAL).

ABOVE GROUND METER ENCLOSURE. SEE (2 / M-103)

AIR SUPPLY MANIFOLD. SEE (1 / M-104)

PRE-ENGINEERED BACKWASH WASTE TANK WITH SINGLE FLYGT CONCERTOR N SUBMERSIBLE PUMPS

OR APPROVED EQUAL. SEE (1 / M-102)



CONSTRUCTION NOTES

ALL ELEVATIONS SHOWN ON THE PIPING AND EQUIPMENT PLANS AND PROFILES REFERENCE THE FINISHED BOTTOM OF BASIN 1 AND BASIN 2 OR 100 FT.

HORIZONTAL

THANK YOU

Visit Weston at Booth 508

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