



P4 INFRASTRUCTURE



Real-time Monitoring and Active Controls for Urban Stormwater Systems

24th Annual Watershed Conference
Fox-Wolf Watershed Alliance
Oshkosh Convention Center
Oshkosh, WI
Feb. 28 – Mar. 1, 2023

Joseph A. Diekfuss, PhD, PE
Vice President – Engineered Systems

Christopher M. Foley, PhD, PE, FASCE
President

Nicholas J. Hornyak, PhD, PE
Vice President – Sensor Technology

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622 N. Water Street, Suite 406
Milwaukee, WI 53202
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P4 Devices

Rain-mX



LIQUA-Level



INFIL-Tracker PavDrain
INFIL-Tracker Paver



Flow-RTC



DEPTH



Device Costs:

- \$3,500 to \$17,000
- Some mounting fixtures require additional cost
- Shipping not included

Curated Data:

- Wireless Transmission (cellular or Wi-Fi)
- Common Storage
- Browser-Based Access
- Downloadable
- Dashboard Viewing

Power & Maintenance

- Battery Powered (solar re-charged) or Line Power
- Plug-and-Play Components
- Long-Term Battery Life
- Minimal Maintenance Interventions

CamVIEW



SoilSENSE



AVFM



LIQUA-Level EPC

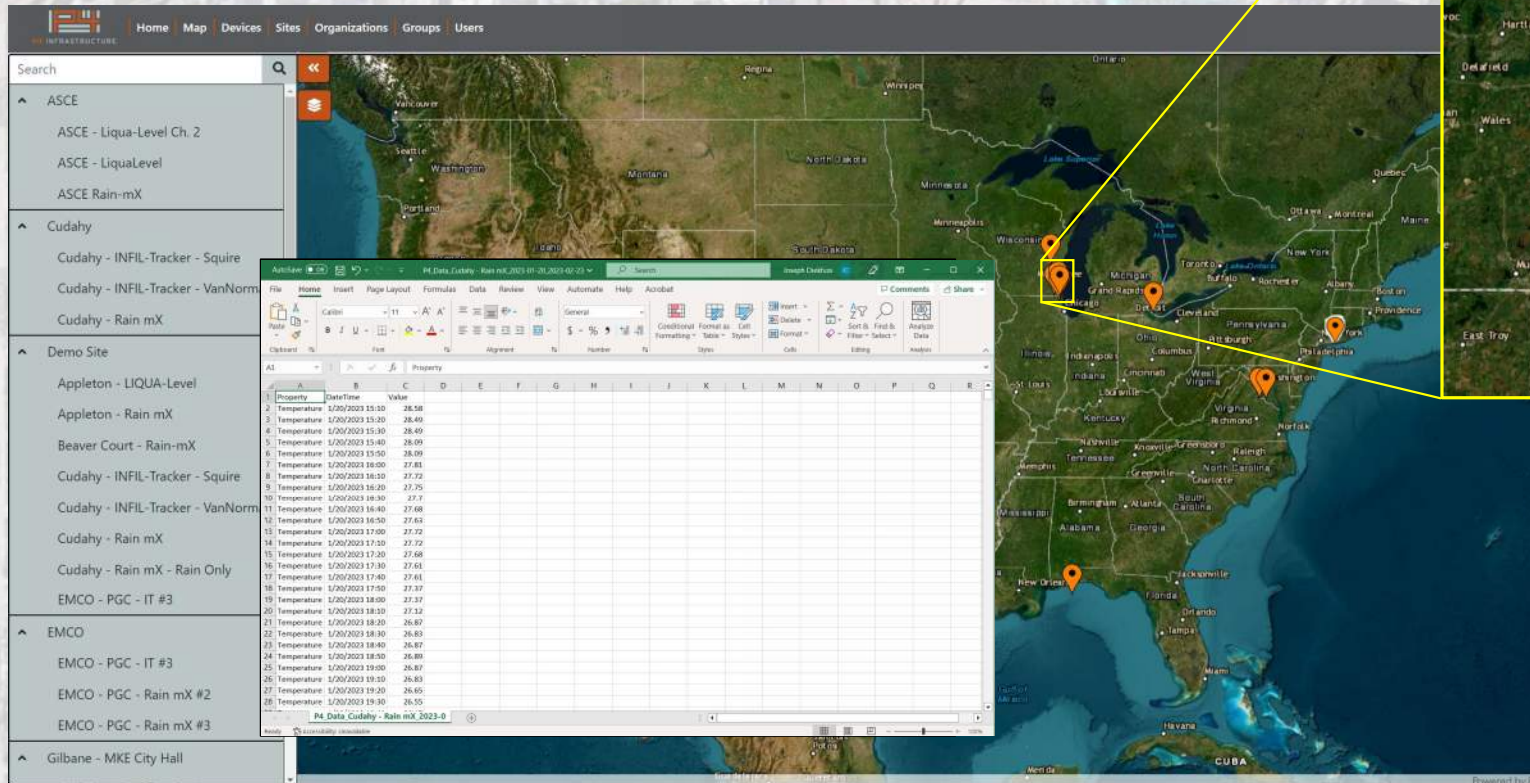


VELO



P4 Dashboard

Basic viewing and downloading of data is available as soon as device is turned on.

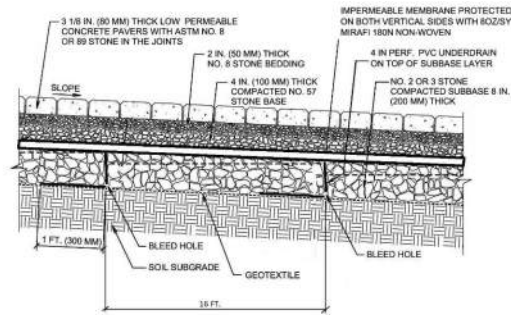
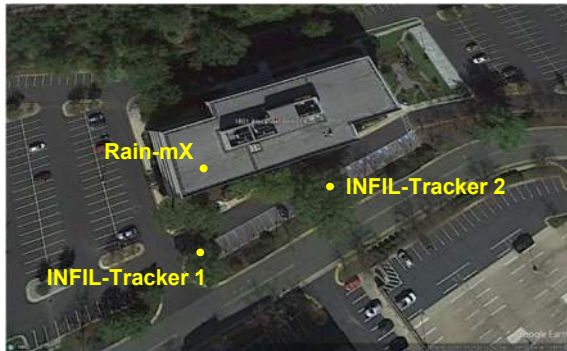


Data Access – Annual

- \$675/dev/year
- “Family Plan” Pricing

An aerial photograph of a city, likely Chicago, showing a complex highway interchange (I-55/I-90) and the Menomonee River. The text "Permeable Pavement Systems" is overlaid in a white box with a red border.

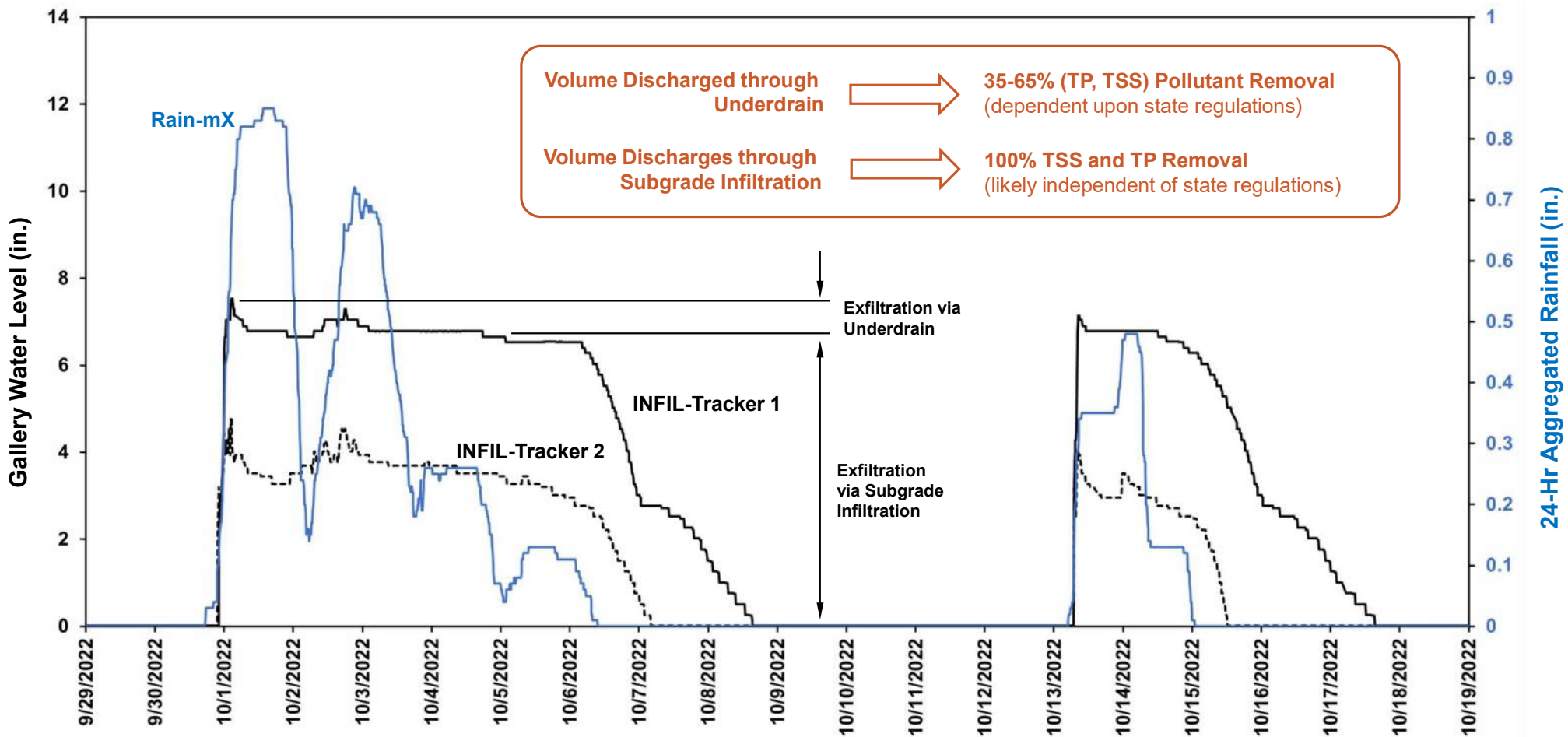
Permeable Pavement Systems

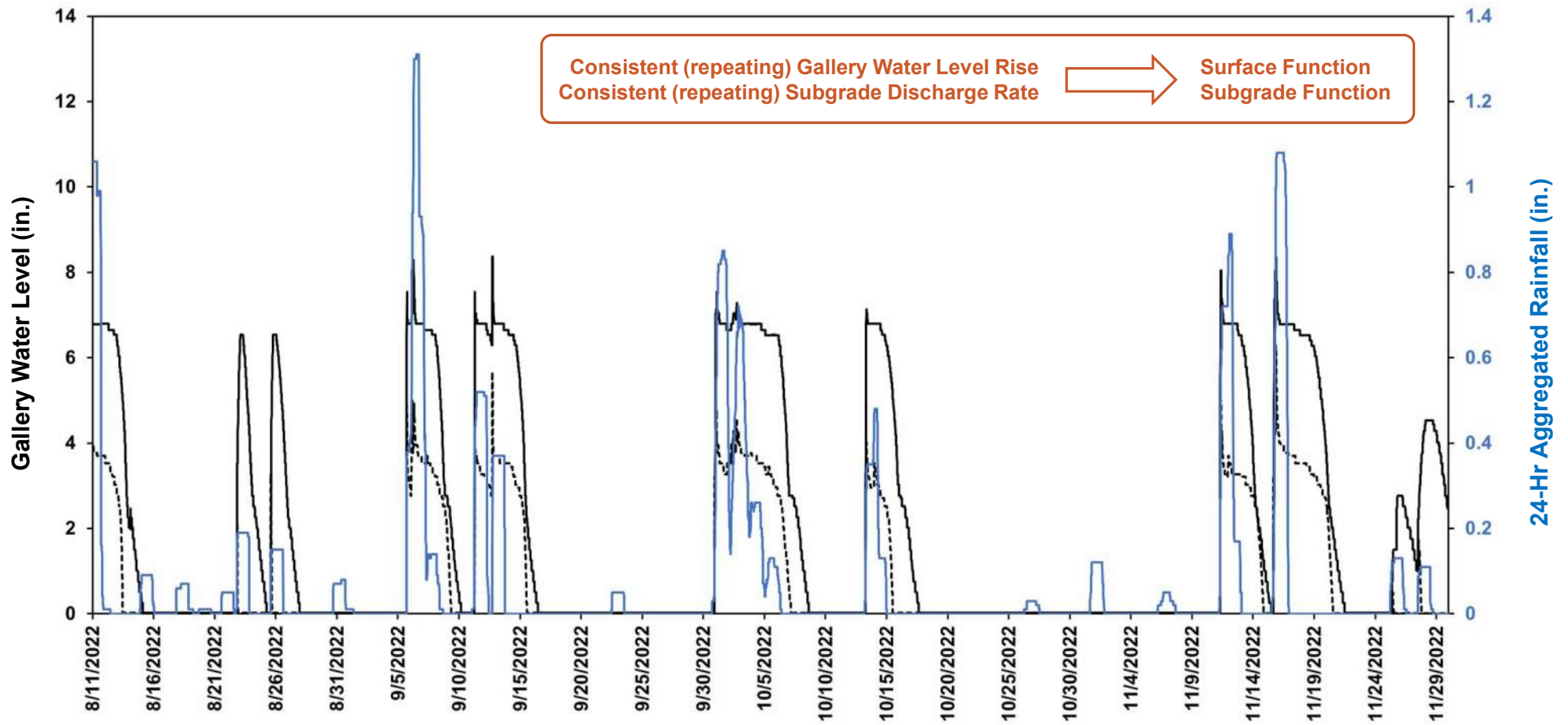


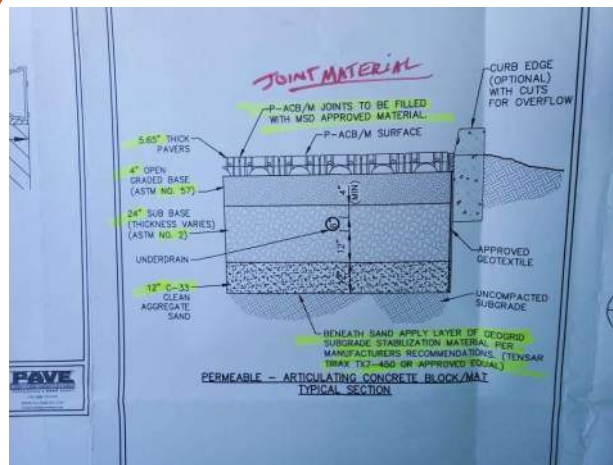
Installation Details:

- One Rain-mX
- Two INFIL-Trackers (Paver) – E.P. Henry pavers
- Pole Mounted INFIL-Tracker Computer, Battery Powered, Solar Recharging
- 12" long Sensors (installed post-construction)
- Infiltration-based galleries (underdrain at "top" of sub-base layer)
- Grade Change (impermeable membrane "check dams")
- Public Awareness Kiosk



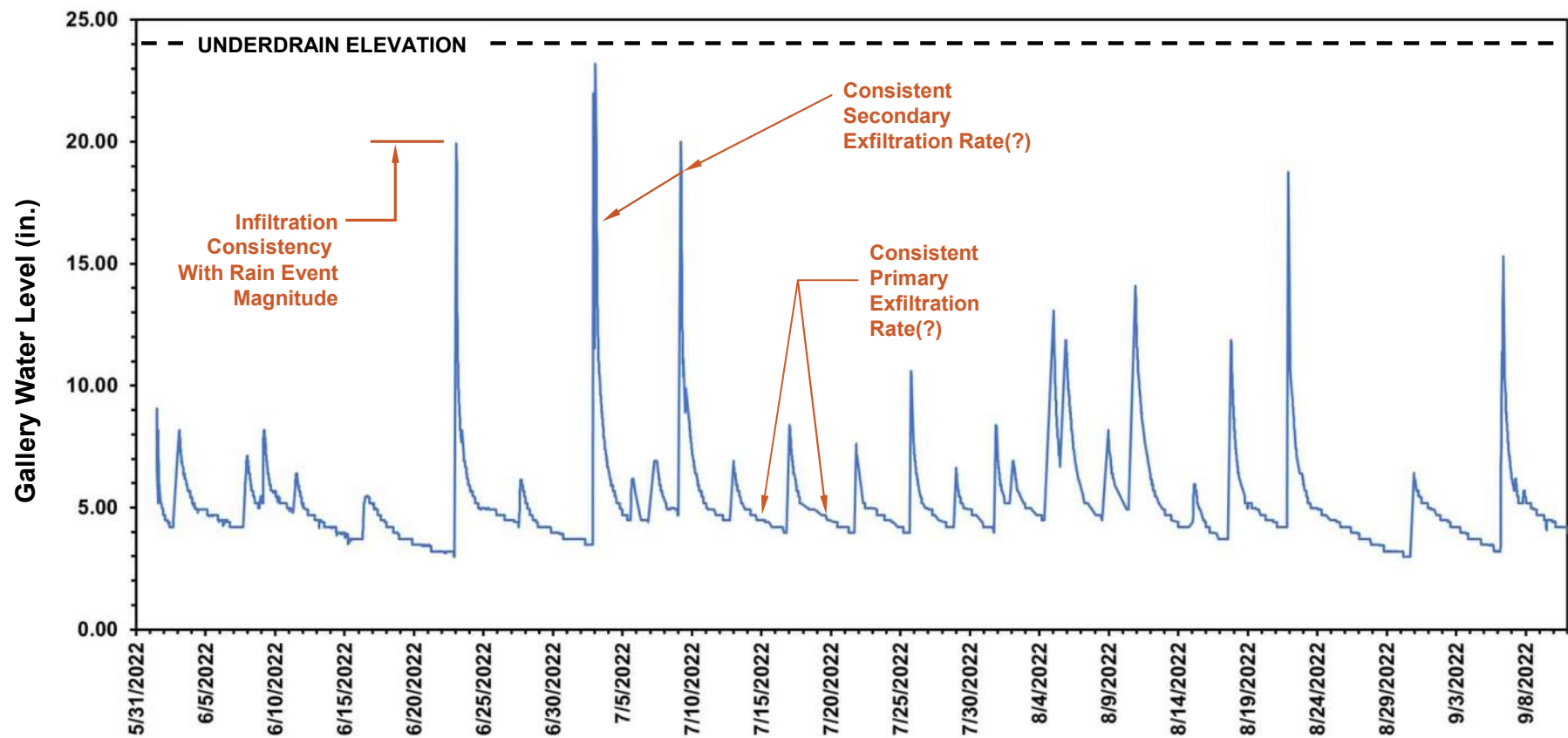


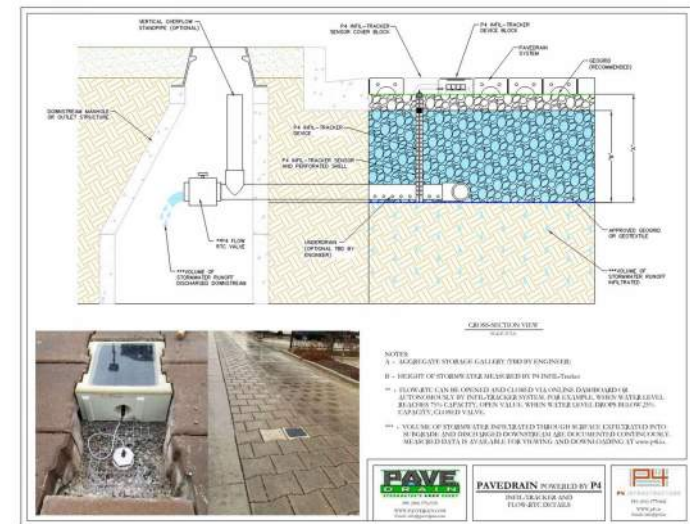
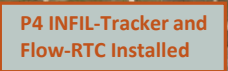


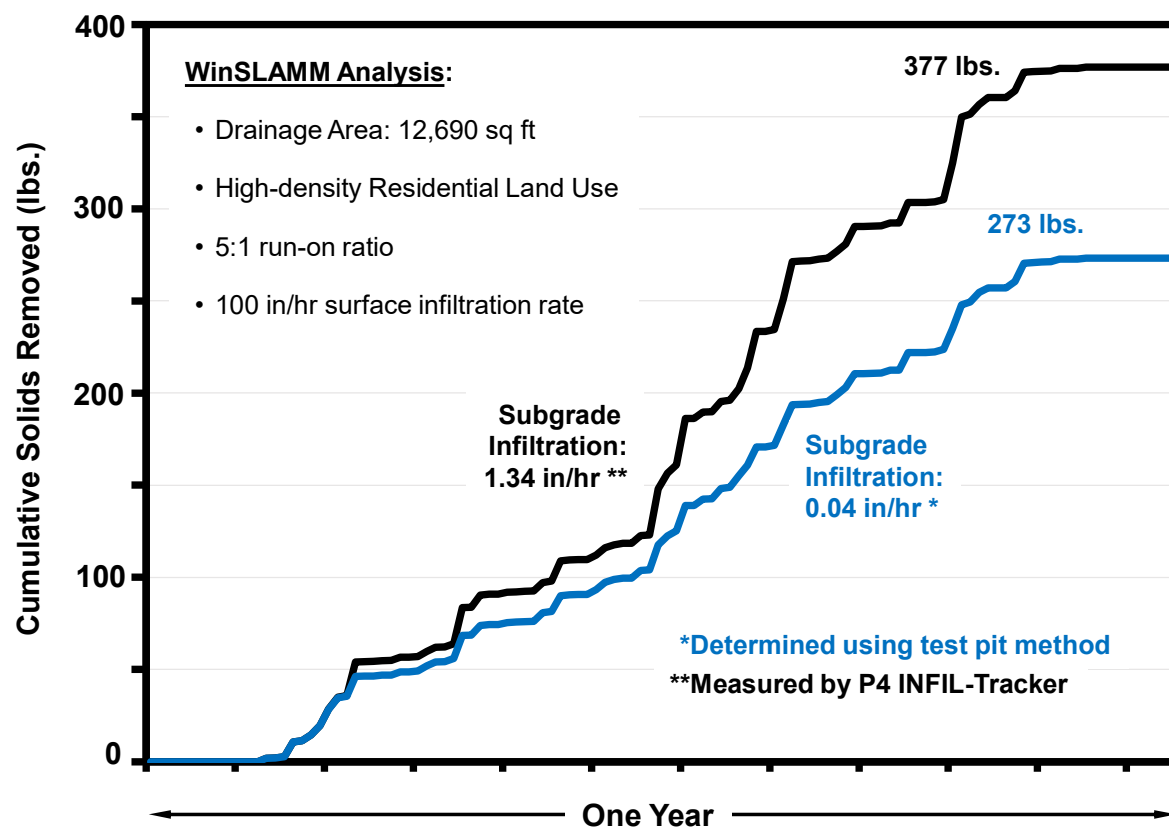


Installation Details:

- One Rain-mX
- One INFIL-Tracker – PaveDrain ACB System
- 34" long Sensors (installed post-construction)
- MDE Questioned Infiltration Capability of Subgrade







38% Increase in Solids Removed

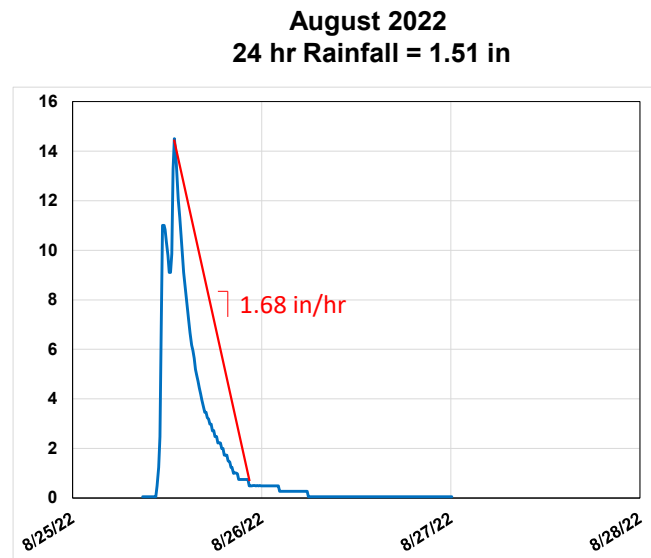
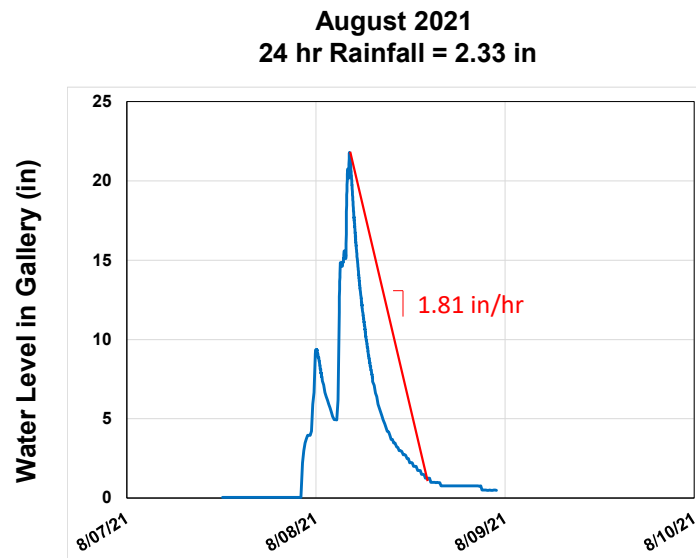
If surface infiltration rate unchanged.

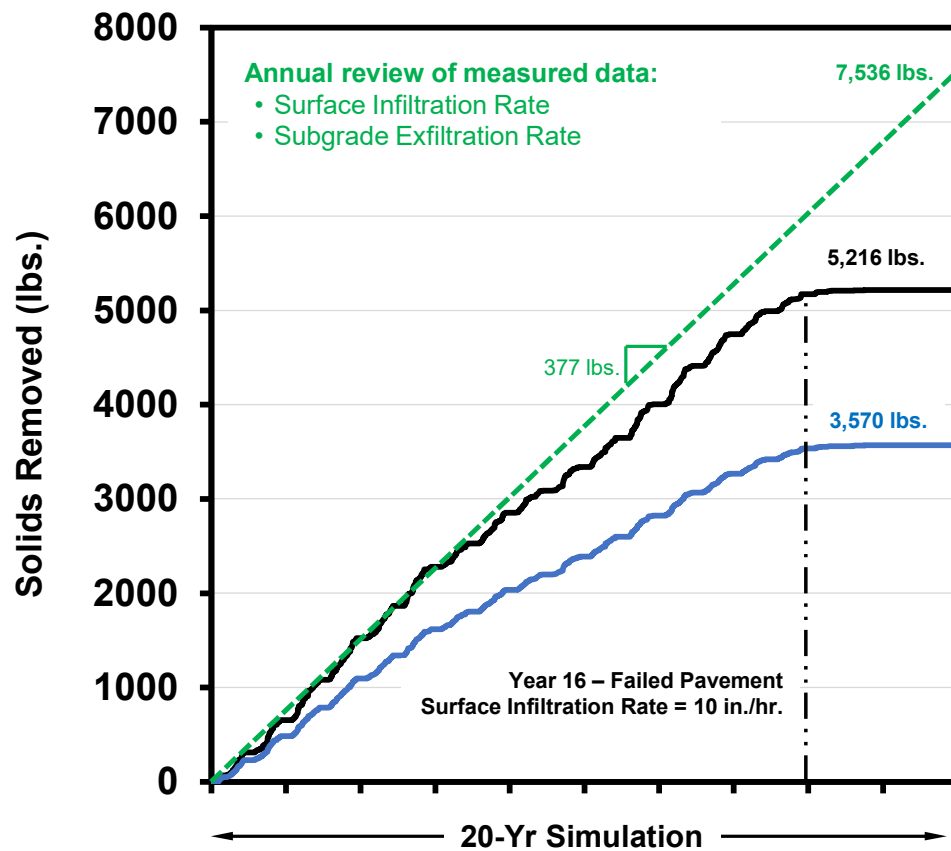
If subgrade exfiltration rate unchanged.

Next year can use **same model**.

**Van Norman Alley Water Level and
Subgrade Infiltration Records**

Subgrade infiltration degradation rate **DOES NOT**
follow WinSLAMM Modeling assumptions.





P4 systems approved for pollutant removal collection and documentation

State of Wisconsin
DEPT OF NATURAL RESOURCES
Wisconsin Department of Natural Resources
100 W. Washington Avenue, 4th Floor
Madison, WI 53703

September 9, 2020

Joseph A. Dickel, P.E., P.S.
Vice President, Engineering Services
P4 Infrastructure
427 N. Water Street, Suite 400
Milwaukee, WI 53202

Dear Mr. Dickel:

The Department supports the use of site-specific monitoring data and real-time control technology to enhance pollutant reductions. The Department appreciates that the use of monitoring technology, such as the P4 PVI II, Trucker system, will assist in improved management of NPS systems and optimization of pollutant removal. This is especially important in highly developed urban areas with large pollutant reduction goals where availability of land to add additional runoff controls is limited.

The Department does not approve specific proprietary products or devices that are used to address runoff water quality. The exception is water quality treatment additive products, which are given a water quality use endorsement to protect against aquatic toxicity. As a result, upon review of the information you provided related to the P4 PVI II, Trucker System, the Department does not consider this system as an additive product, and therefore, does not require formal review prior to use. As with other products, the Department does not limit its use in appropriate settings as long as it is done in accordance with applicable rules, regulations, and technical standards.

The white paper provided by P4 on July 14, 2020 outlined methodologies for calculating additional pollutant removal from BMP devices after data is collected using the PVI II, Trucker System. In general, the Department will allow real-time control BMPs to improve treatment and infiltration under the following design conditions:

- BMPs are designed, installed, and maintained in accordance with applicable technical standards.
- Each BMP is evaluated individually using site-specific data collection from and BMP.
- Monitoring will occur over the life of the BMP device.
- For infiltration devices, the 12-hour rainfall and 72-hour rainfall events shall be maintained.

Please let me know if you have any other questions.

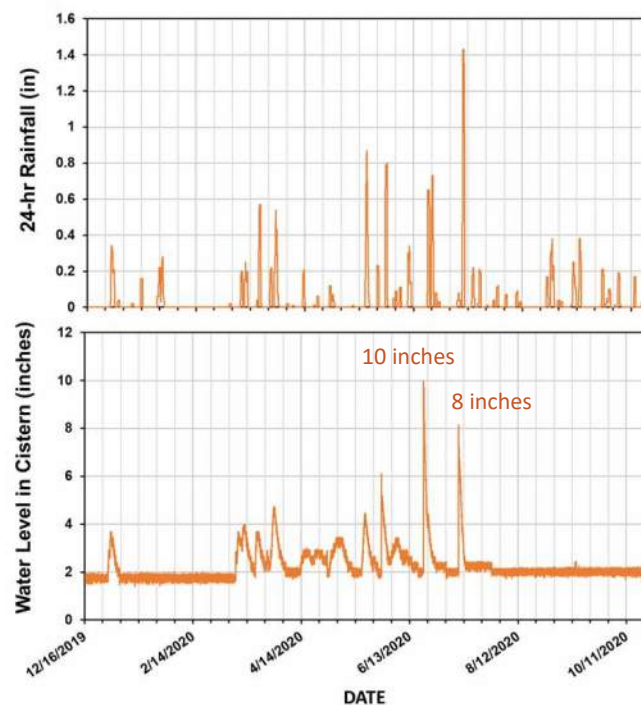
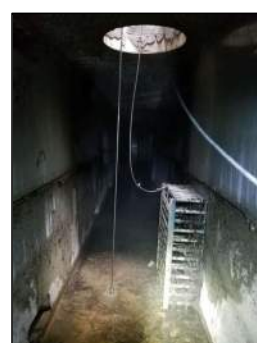
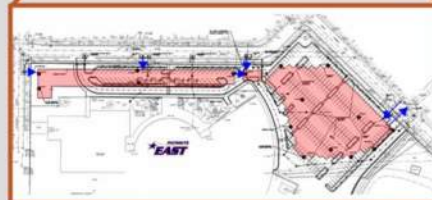
Sincerely,
Scott Zimmerman, PE
Technical Engineer

CC: Christopher Foley, PhD, PE, FASCE - P4 Infrastructure
Todd Wolk, P.E., FASCE - CWC Engineering and Associates, Ltd.
Brynne Hennigshoff - WI DNR
Erik Kottick, PE - WI DNR

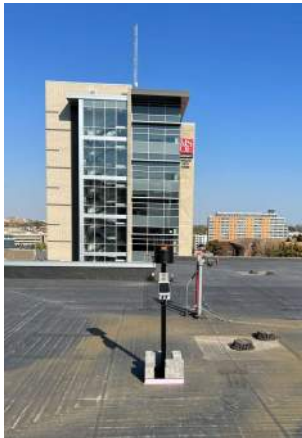
WISCONSIN
Naturally WISCONSIN

An aerial photograph of a city, likely Milwaukee, showing a complex highway interchange (I-430/I-94) and the Menomonee River. The text "Below-Ground and Biofiltration Systems" is overlaid in a white box with a brown border. Labels on the map include "MENOMONEE RIVER VALLEY", "MENOMONEE PARK", and "MILWAUKEE".

Below-Ground and Biofiltration Systems









Surface Systems



POND 1

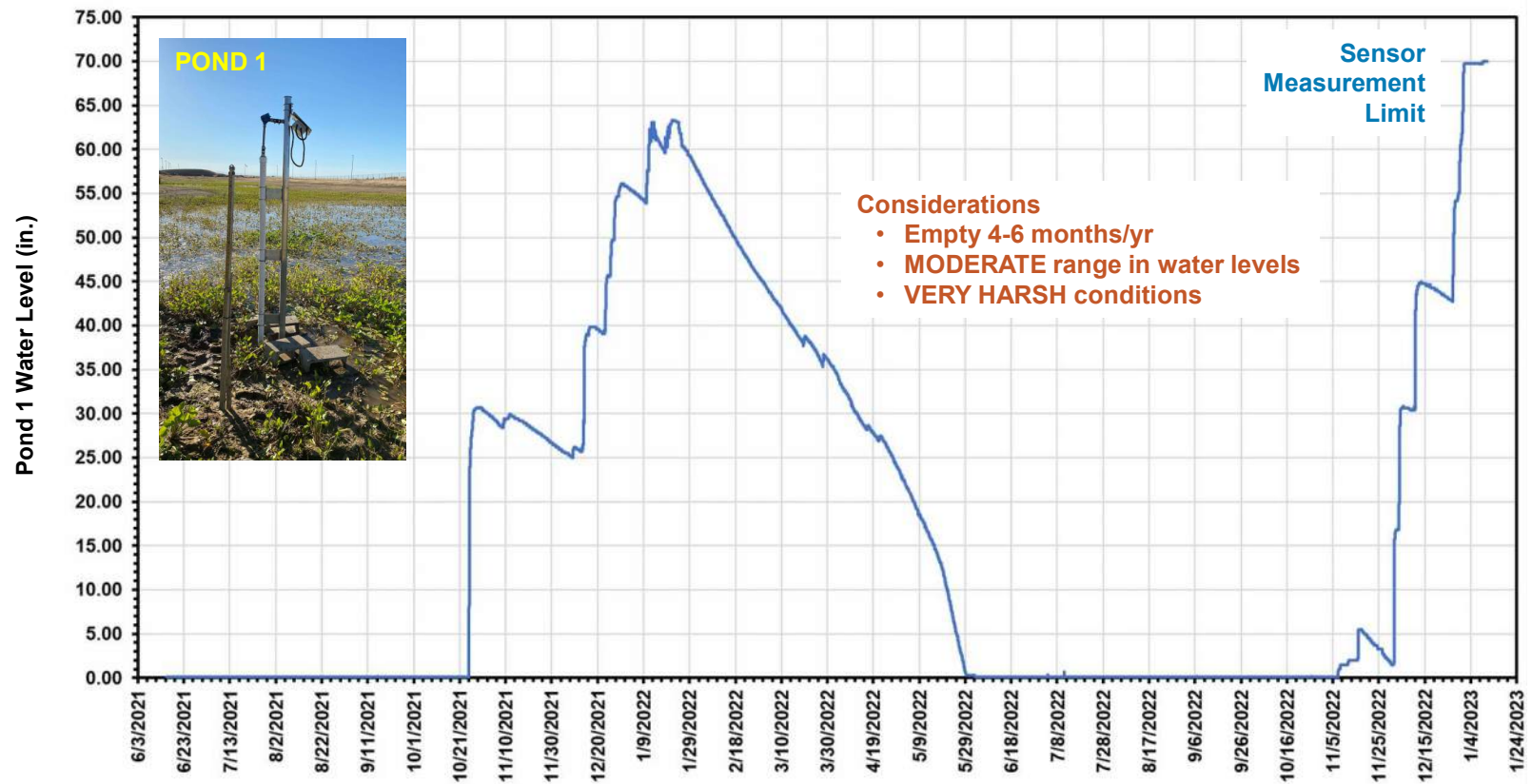


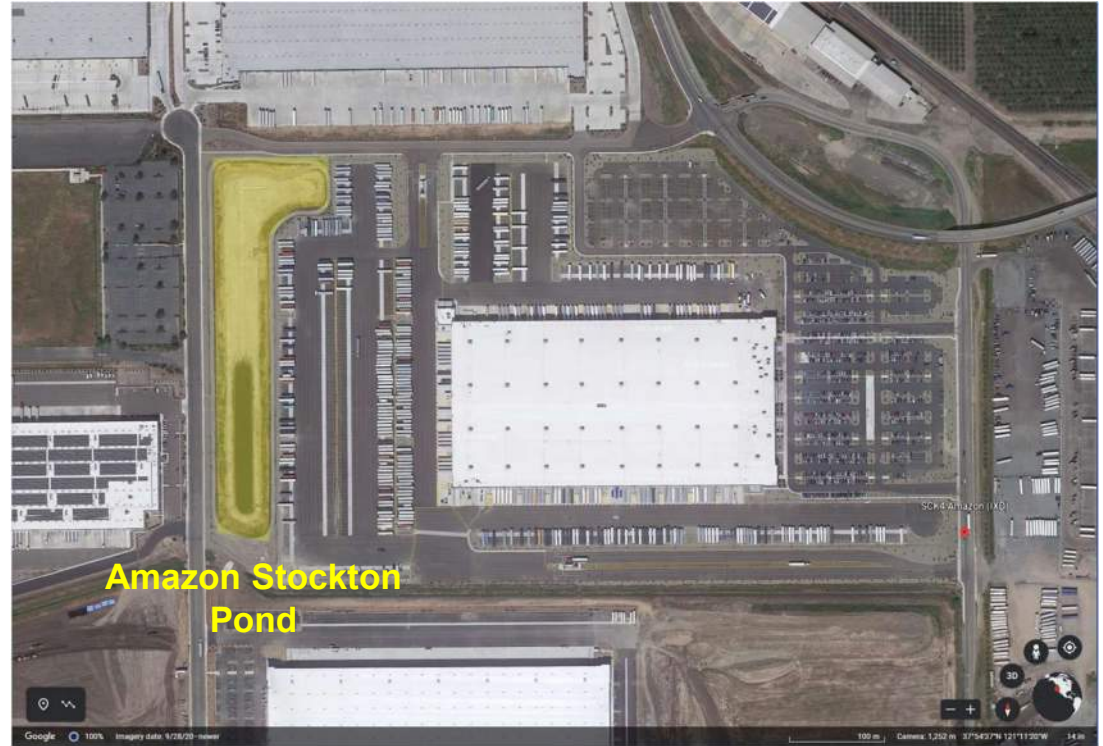
POND 2



POND 3









LIQUA-Level EPC



Rain-mX

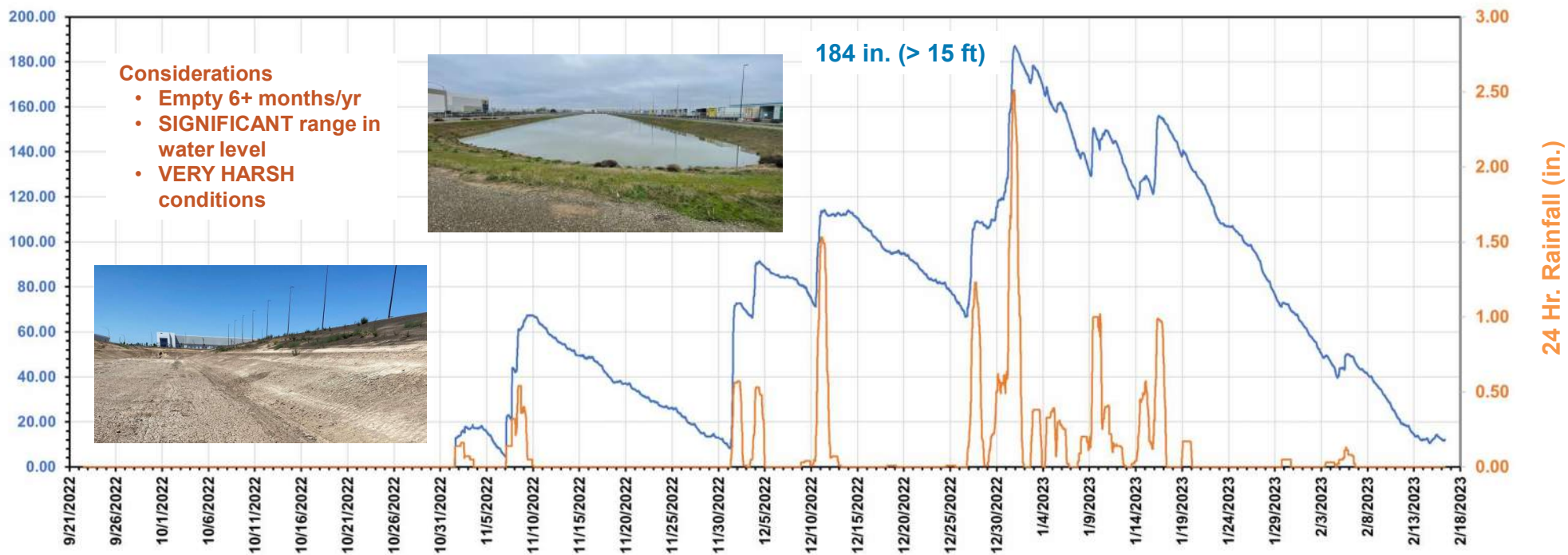
LIQUA-Level EPC

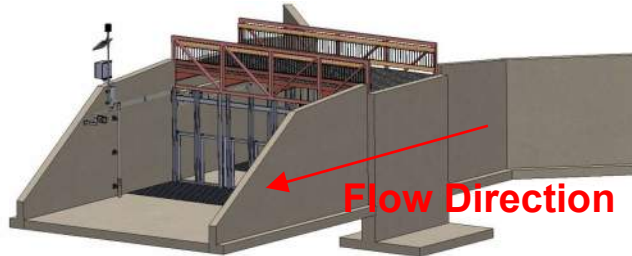
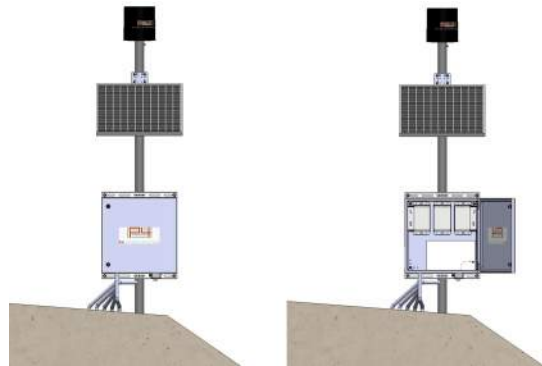
Considerations

- Empty 6+ months/yr
- **SIGNIFICANT** range in water level
- **VERY HARSH** conditions



184 in. (> 15 ft)





Feb. 9, 2023 @ 8:15 AM



Feb. 10, 2023 @ 8:15 AM



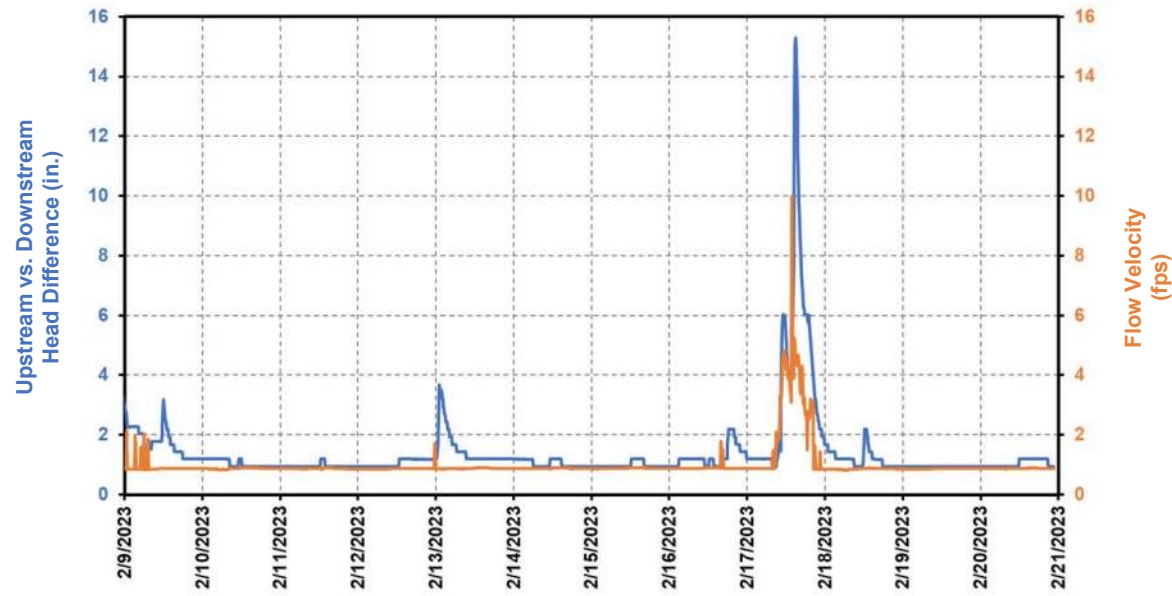
Feb. 18, 2023 @ 8:15 AM

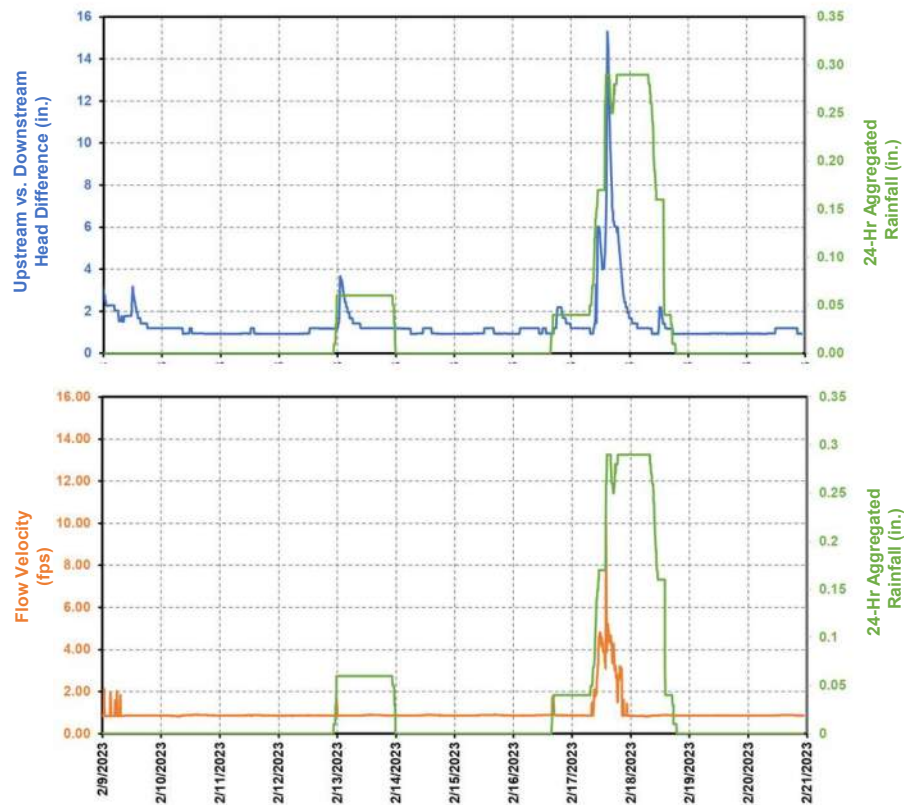


Feb. 21, 2023 @ 8:15 AM



Feb. 28, 2023 @ 9:00 AM





Upstream Bags

Feb. 17, 2023 @ 8:15 AM



Feb. 18, 2023 @ 8:15 AM



Downstream Bags

Feb. 17, 2023 @ 8:15 AM



Feb. 18, 2023 @ 8:45 AM





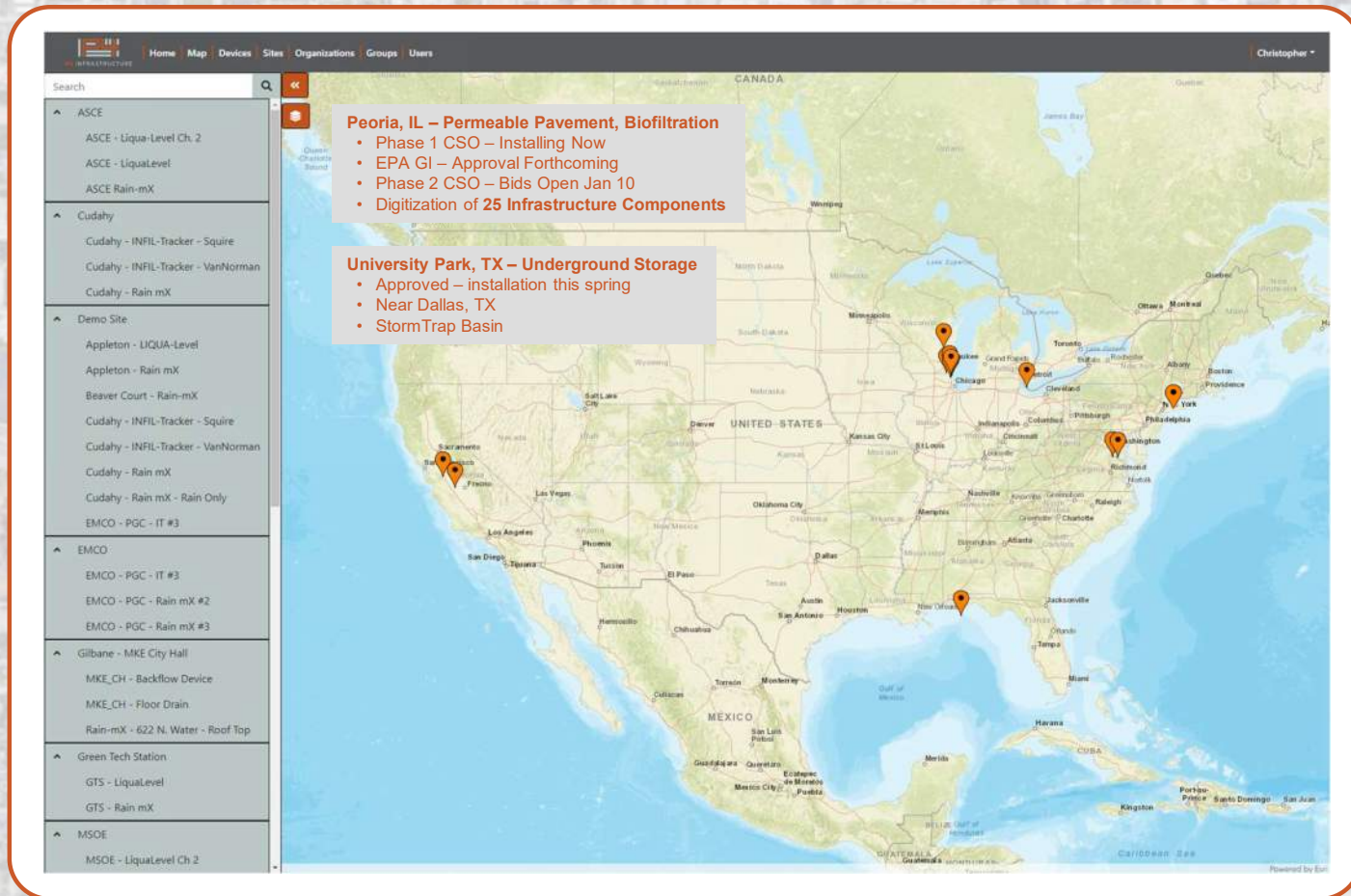
On-Structure Systems



- One Option To Meet Urban Stormwater Regulations
- Does Not Require Additional Structural Requirements
- Has Integral Constant Monitoring Leak Detection Automatically Drains The Roof If A Breach Were To Occur
- Meets Roofing Manufacturer Warranty Requirements
- Simple Installation (one per roof drain – flashed in)



Nationwide Digitization





P4 INFRASTRUCTURE

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*Revolutionizing
the way we address
civil infrastructure*