



P4 INFRASTRUCTURE

Technology for Increasing Efficiency and Monitoring of Stormwater BMPs and Graphical Method for Management of Stormwater BMPs

A Discussion with the Wisconsin DNR
July 10, 2020

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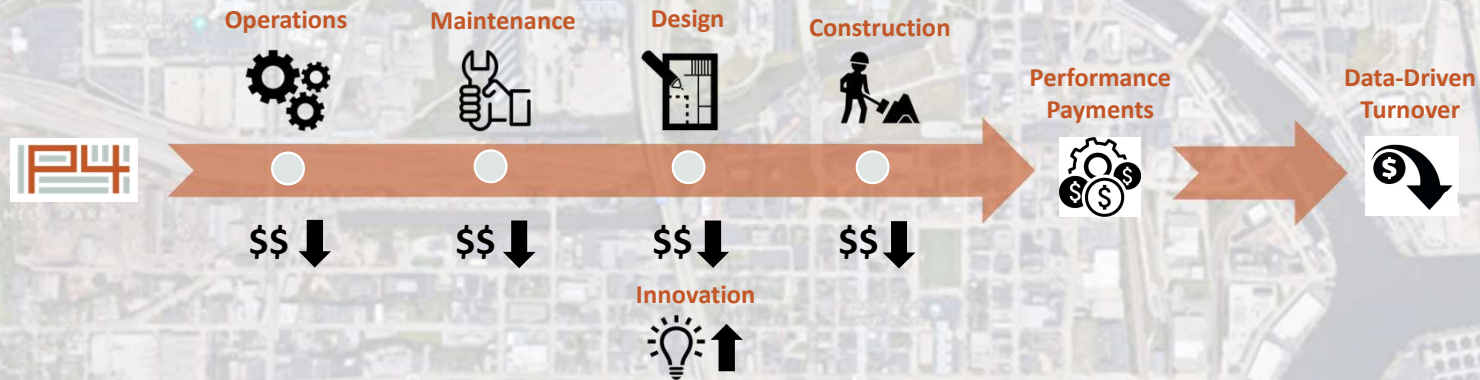
P4 Infrastructure, Inc.
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P4 → Products for Public Private Partnerships

P4 lives at the intersection of innovation and technology



P4 creates products that reduce risk and document performance



P4 is building products that connect people with infrastructure.

P4 is building the Internet of Infrastructure to make civil infrastructure as a service a reality.

How fast does my storage
gallery discharge?



Do I have excess pollutant removal
to allow Water Quality Trading?

Wet Ponds



Permeable
Pavement



Does my subgrade
infiltration rate change
over time?

Detention
Cisterns



Can I increase the efficiency of
my existing and new BMPs
using technology?

How much stormwater
am I capturing?

Biofiltration



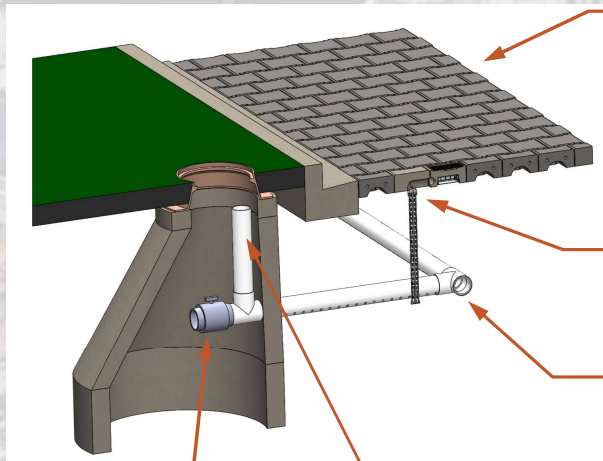
How many BMPs do I need to
build to meet EPA regulations?

When should I perform
maintenance?

How effective is my BMP
in removing pollutants?

Which type of BMP
do I build?

INFIL-Tracker & Flow-RTC



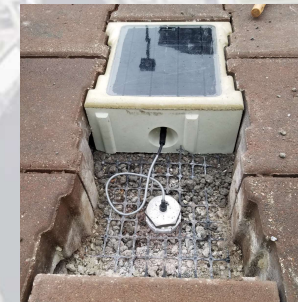
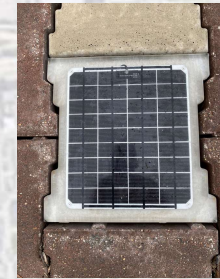
Permeable Pavement
(Stormwater BMP)

INFIL-Tracker Device

Underdrain
(typical)

Vertical Overflow
Standpipe (optional)

Real-Time Control (valve)
Flow-RTC



Tech Standards/Guidance
(WI DNR)

**Pollutant
Removal
Efficiency**

Underdrain Present
65% TSS
35% TP

No Underdrain
100% TSS
100% TP

Filter/Drain
65% TSS
35% TP

May/May Not Infiltrate
100% TSS
100% TP

Infiltrate for Drawdown Period
100% TSS
100% TP

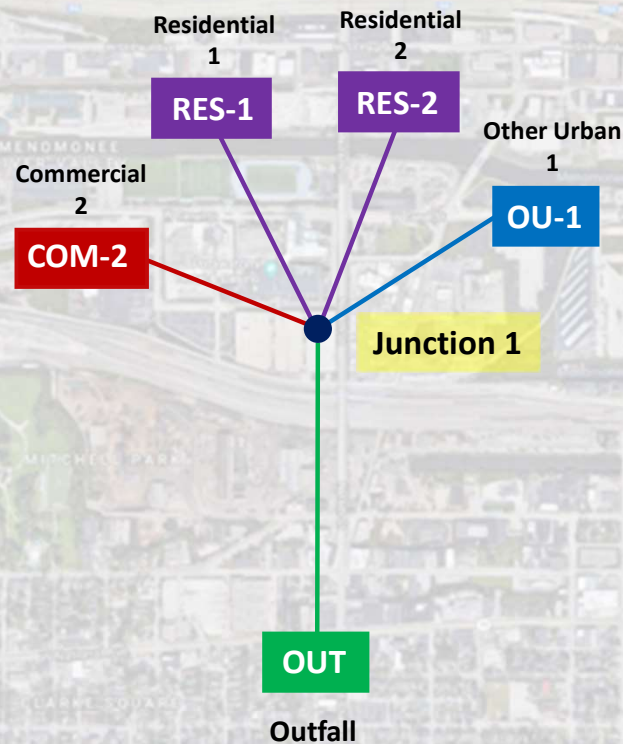
P4 Products and Systems

- **DOCUMENT FULL VALUE** of BMPs
- **Data for BMP Modeling**
- **Maximize Pollutant Capture** per Dollar
- **Drive Maintenance** Intervention
- **Data for Water Quality Trading**

Drain Only when Required

65% TSS (100% TSS when infiltrating)
35% TP (100% TP when infiltrating)

Source Load and Management Model



Land Use

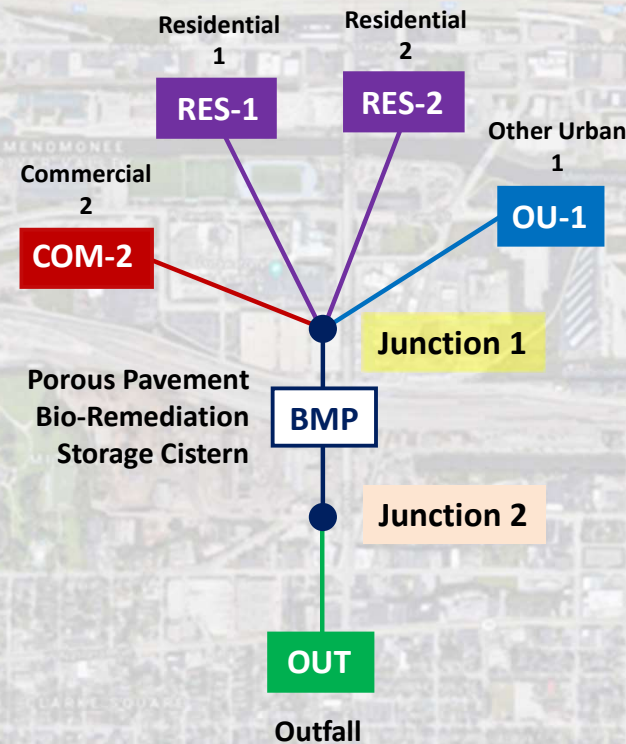
- Pollutant Source
- Pollutant Load (lbs/cf)

Stormwater and Pollutant Quantity

- Rainfall Volume
- Runoff Coefficient
- **Stormwater Runoff Volume (cf)**
- Pollutant Load (lbs)

**Baseline
Pollutant
Concentration
(lbs/cf)**

Source Load and Management Model



Land Use

- Pollutant Source
- Pollutant Load (lbs/cf)

Stormwater and Pollutant Quantity

- Rainfall Volume
- Runoff Coefficient
- **Stormwater Runoff Volume (cf)**
- Pollutant Load (lbs)

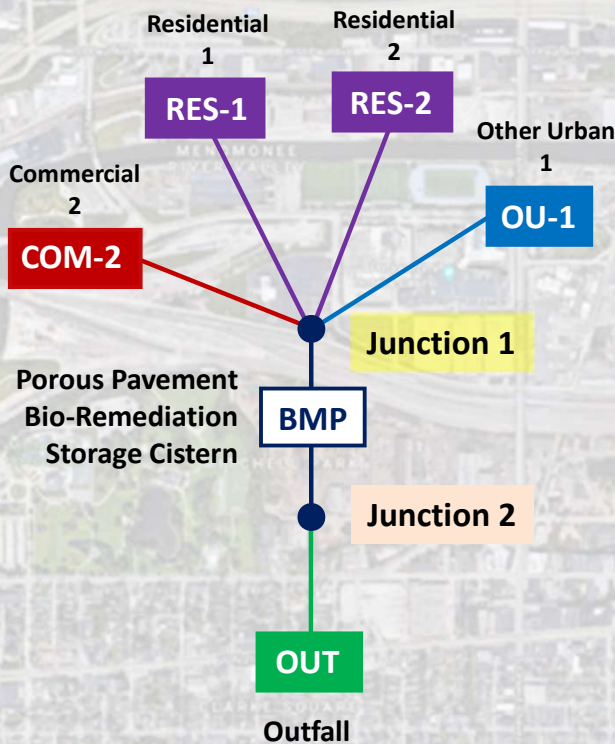
Baseline
Pollutant
Concentration
(lbs/cf)

Pollutant Treatment

- Gallery Media
- Underdrain
- Infiltration (cf)
- **Stormwater Pass-Through Volume (cf)**
- Pollutant Load (lbs) at Outfall

Source Load and Management Model

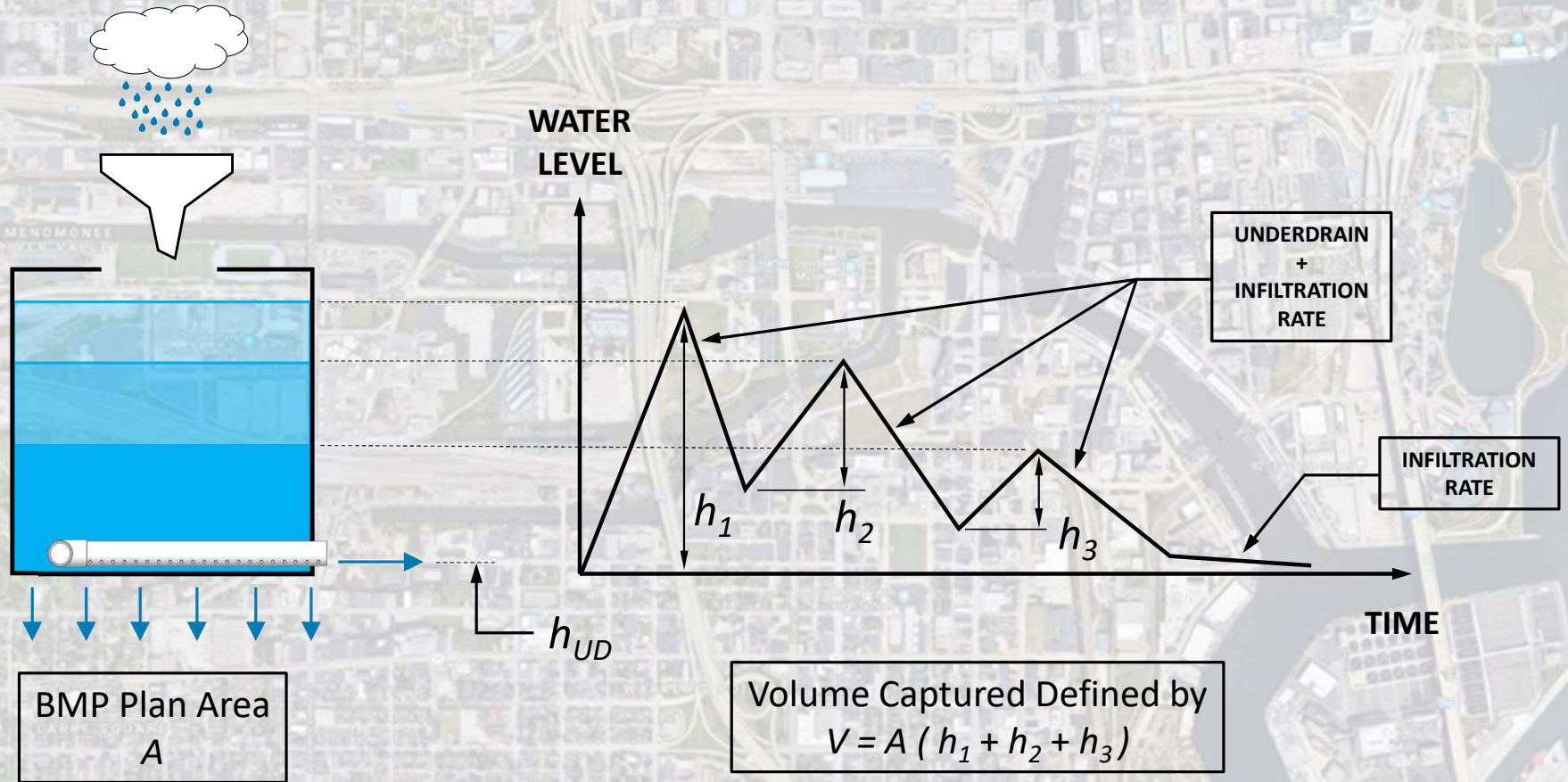
Permeable Pavement | UD@Bottom | Subgrade Seepage = 0.04 in/hr

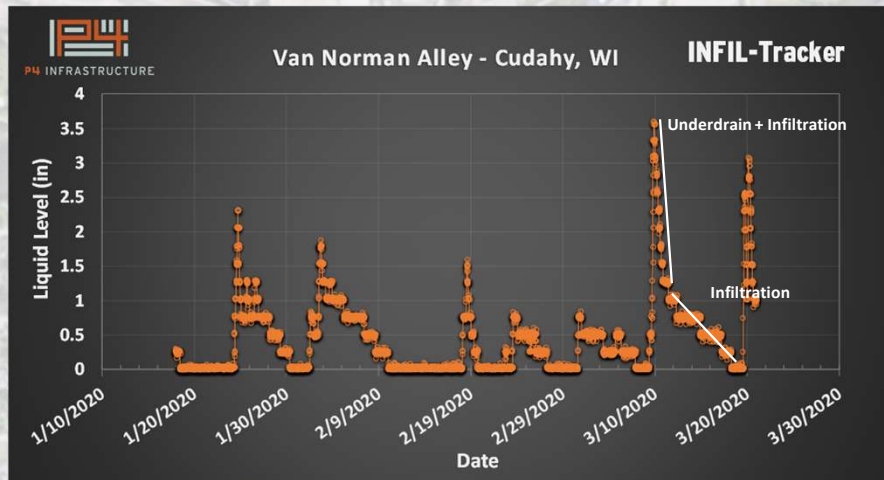
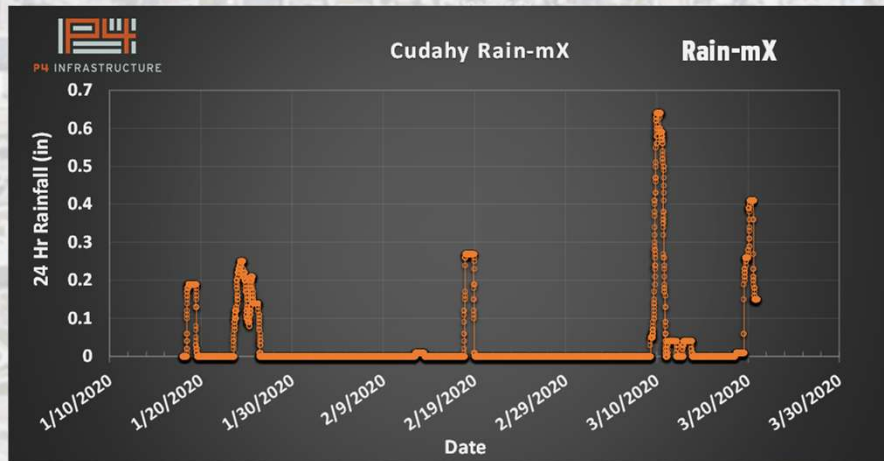


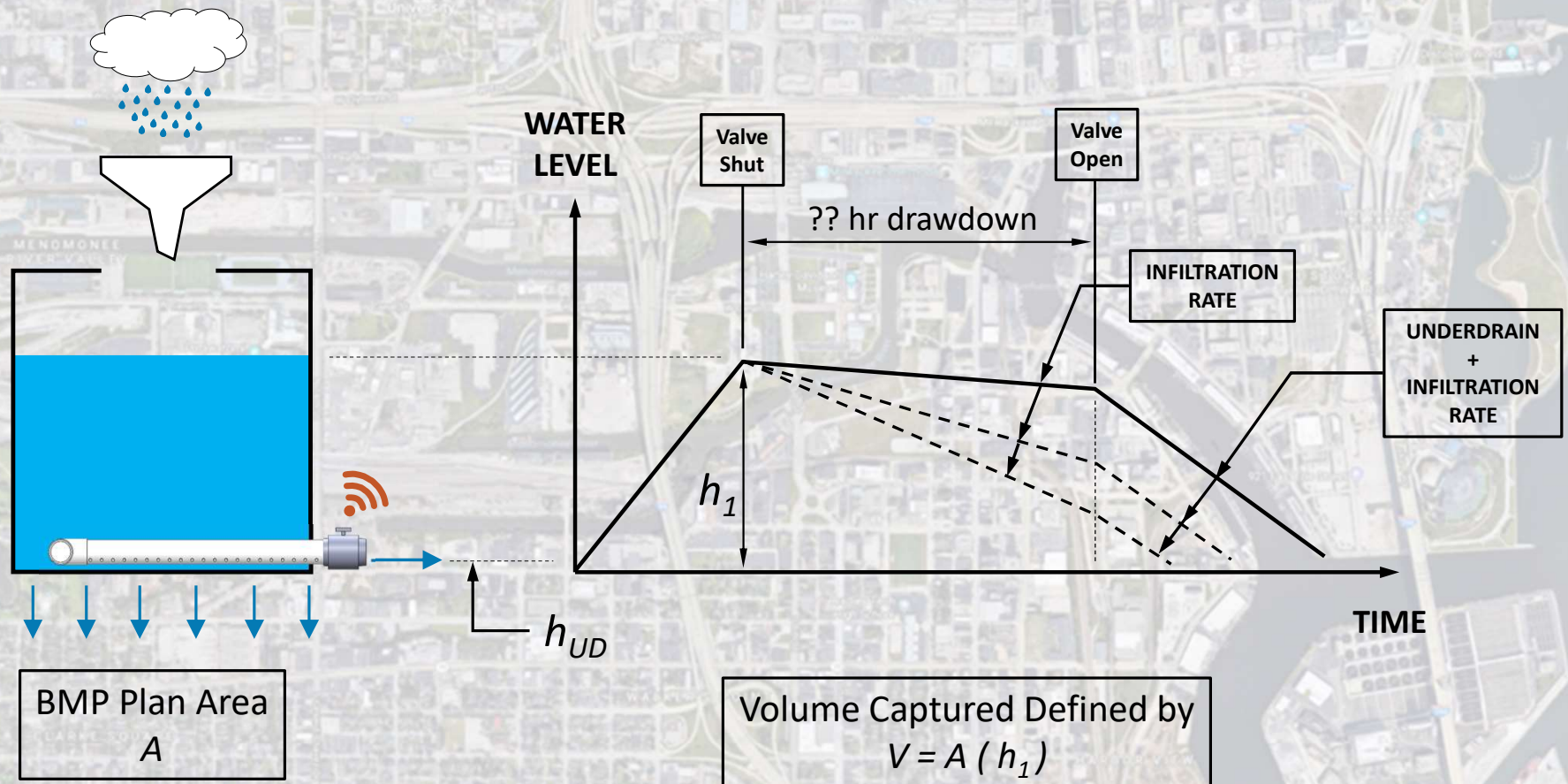
WinSLAMM Output Summary		Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction	
Total of all Land Uses without Controls:		113630	-	106.4	754.8	-	
Outfall Total with Controls:		107304	5.57%	31.44	210.6	72.10%	
Annualized Total After Outfall Controls:		110952			217.8		
Pollutant	Concentration - No Controls	Concentration - With Controls	Conc. Units	Pollutant Yield No Controls	Pollutant Yield With Controls	Pol. Y Units	Yield Percent Reduction
Particulate Solids	106.4	31.44	mg/L	754.8	210.6	lbs	72.10 %
Filterable Solids	64.24	64.24	mg/L	455.7	430.3	lbs	5.57 %
Total Solids	170.6	95.68	mg/L	1210	640.9	lbs	47.05 %
Particulate Phosphorus	0.3019	0.09285	mg/L	2.141	0.6220	lbs	70.95 %
Filterable Phosphorus	0.1219	0.1219	mg/L	0.8650	0.8163	lbs	5.63 %
Total Phosphorus	0.4238	0.2147	mg/L	3.006	1.438	lbs	52.16 %

Permeable Pavement | UD@Bottom | Subgrade Seepage = 2.5 in/hr

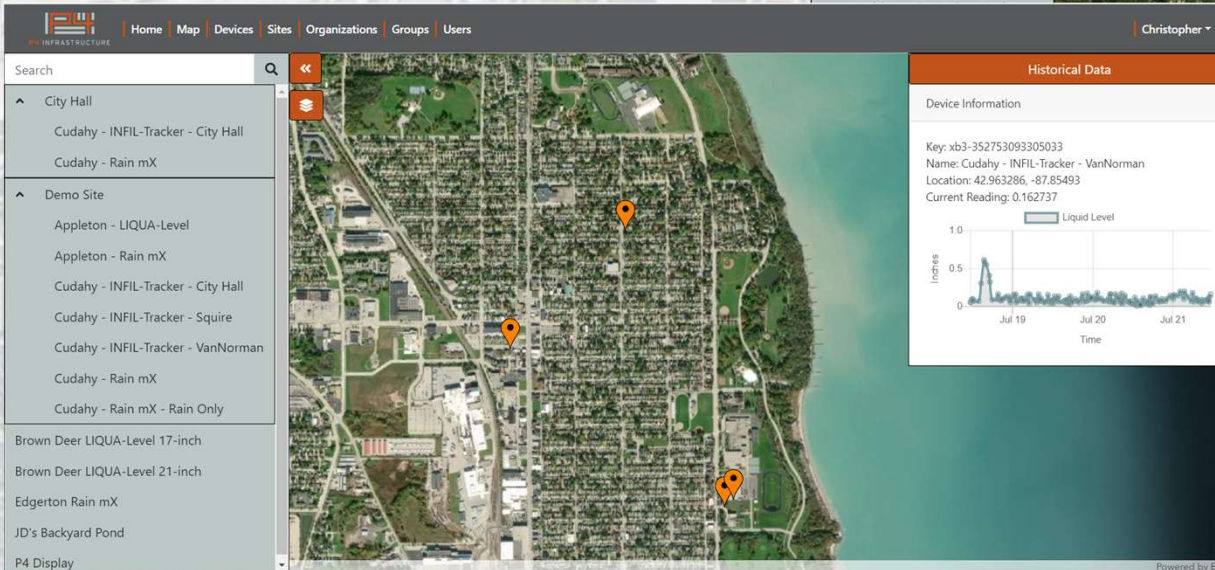
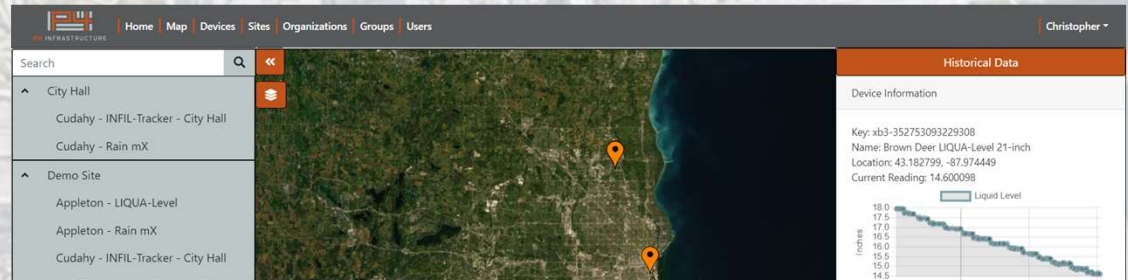
WinSLAMM Output Summary		Runoff Volume (cu ft)	Percent Runoff Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction		
Total of all Land Uses without Controls:		113630	-	106.4	754.8	-		
Outfall Total with Controls:		27878	75.47%	32.26	56.14	92.56%		
Annualized Total After Outfall Controls:		28825			58.05			
Pollutant	Concentration - No Controls	Concentration - With Controls	Conc. Units	Pollutant Yield No Controls	Pollutant Yield With Controls	Pol. Unit	Yield	Percent Reduction
Particulate Solids	106.4	32.26	mg/L	754.8	56.14	lbs	92.56	%
Filterable Solids	64.24	65.07	mg/L	455.7	113.3	lbs	75.15	%
Total Solids	170.6	97.33	mg/L	1210	169.4	lbs	86.01	%
Particulate Phosphorus	0.3019	0.09589	mg/L	2.141	0.1669	lbs	92.21	%
Filterable Phosphorus	0.1219	0.1256	mg/L	0.8650	0.2185	lbs	74.74	%
Total Phosphorus	0.4238	0.2214	mg/L	3.006	0.3854	lbs	87.18	%





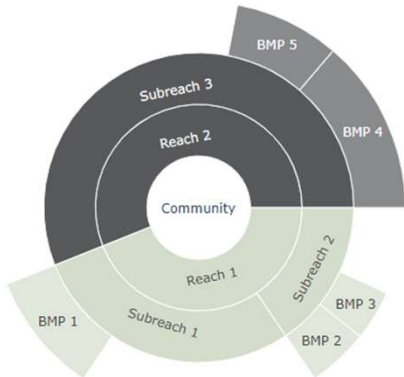


P4 Dashboard ERSI/ArcGIS

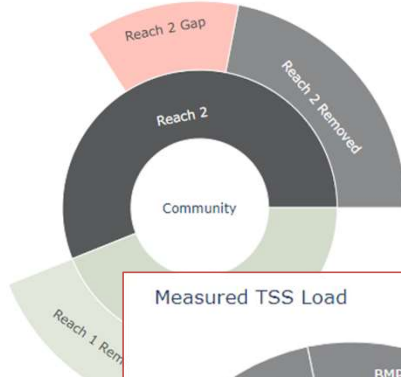


P4 Sunburst Technology – BMP Management

Measured TSS Load



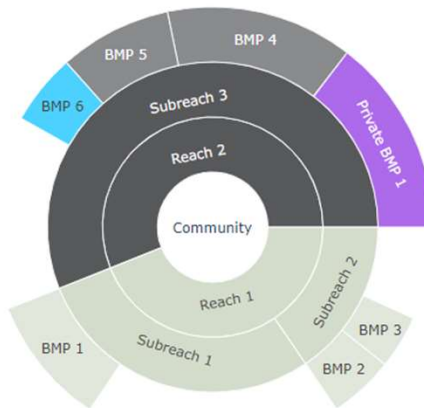
Measured TSS Gap



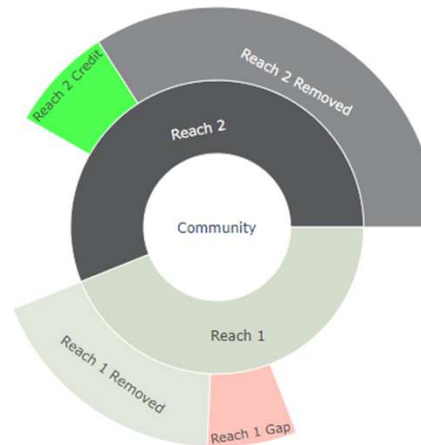
Measured TSS Cost Summary

TOGGLE COLUMNS			
Label	Type		Effective Cost
Reach 1 Gap	Gap		\$8,788
Reach 1 Removed	Value		\$24,220
Reach 2 Gap	Gap		\$16,087
Reach 2 Removed	Value		\$29,229

Measured TSS Load



Measured TSS Gap



Measured TSS Cost Summary

TOGGLE COLUMNS			
Label	Type		Effective Cost
Reach 1 Gap	Gap		\$8,788
Reach 1 Removed	Value		\$24,220
Reach 2 Credit	Credit		\$10,218
Reach 2 Removed	Value		\$45,316



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*Revolutionizing
the way we address
civil infrastructure*