

Evaluation of Filter Strips and Vegetated Swales at Reducing Highway Runoff and Concentrations

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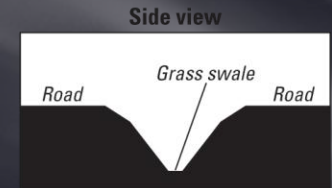
Overview of Today's Talk

- Sampling Location
- Runoff from Filter Strips
- Runoff from Swales
- Concentrations from Filter Strips
- Concentrations from Swale

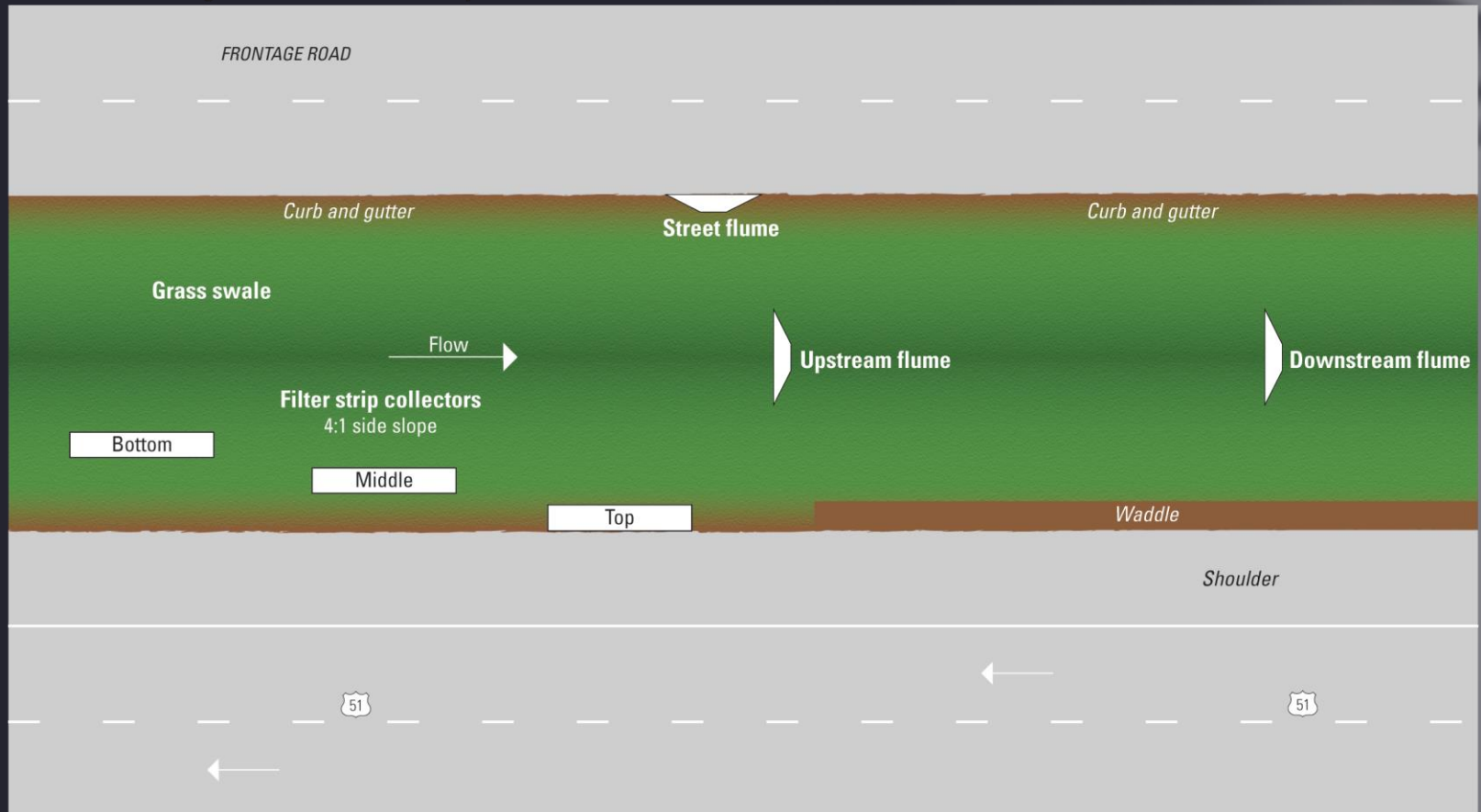


Sampling Locations

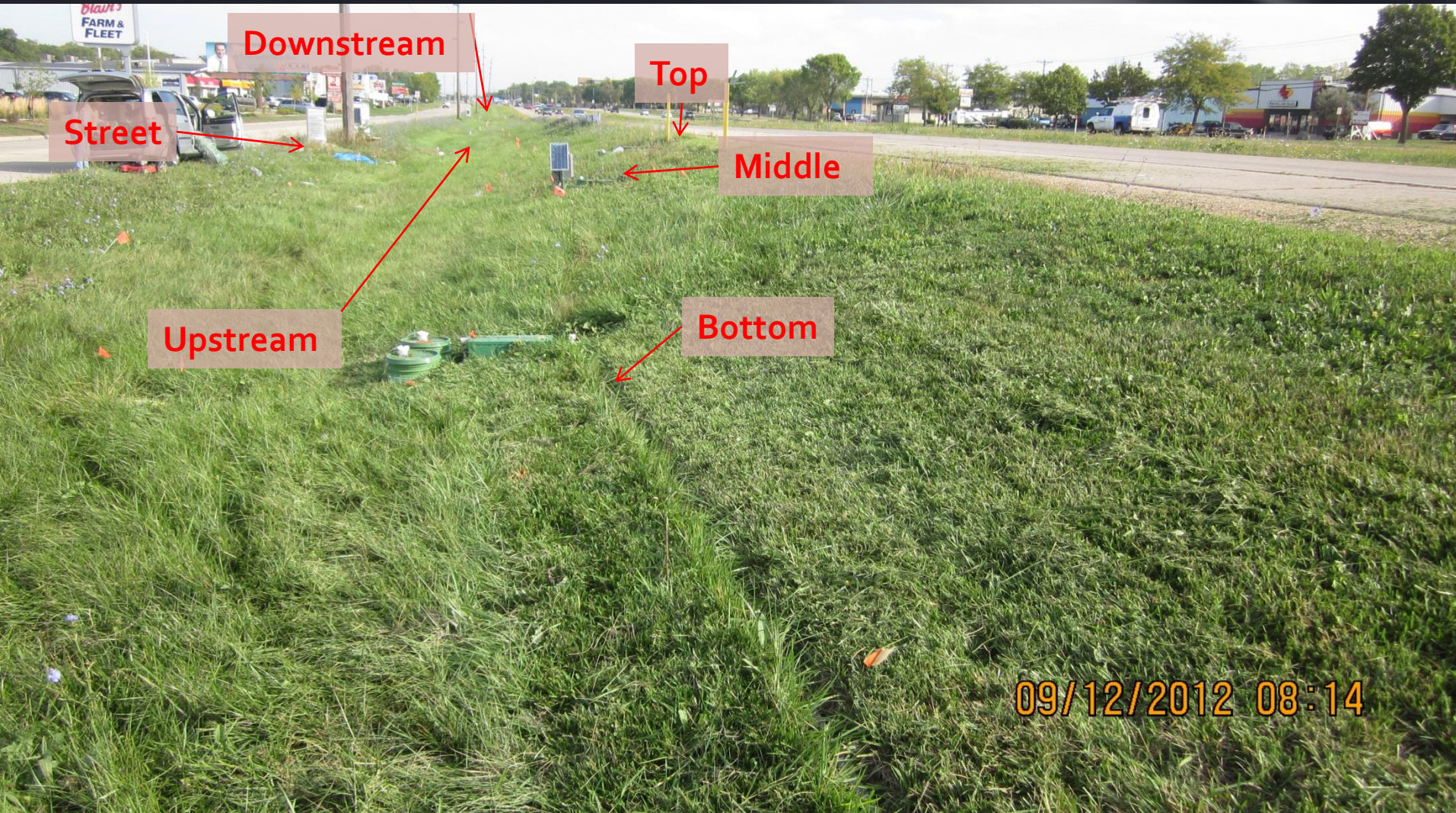
Monitored from August 2011-Present



Schematic drawing of the Grass Swale Project



Location of Monitoring Site



Monitoring Filter Strip Complexities

- **Highway Safety Restriction**
- **Develop a Technique to Measure Volume**
- **Develop a Sampling Method**
- **Overfilling of Bucket Samples During Large Events**

Filter Strip Monitoring



Filter Strip Percent Runoff

	Percent Runoff		
Rainfall (in)	Upper	Middle	Lower
<0.5	0.2	0.3	0.1
0.5 - 1.5	0.8	0.8	0.6
>1.5	5	7	1

Grass Swale Monitoring

Street



Upstream



Downstream



Install a Waddle to Isolate Flow in the Downstream Channel



16 Double Ring Tests

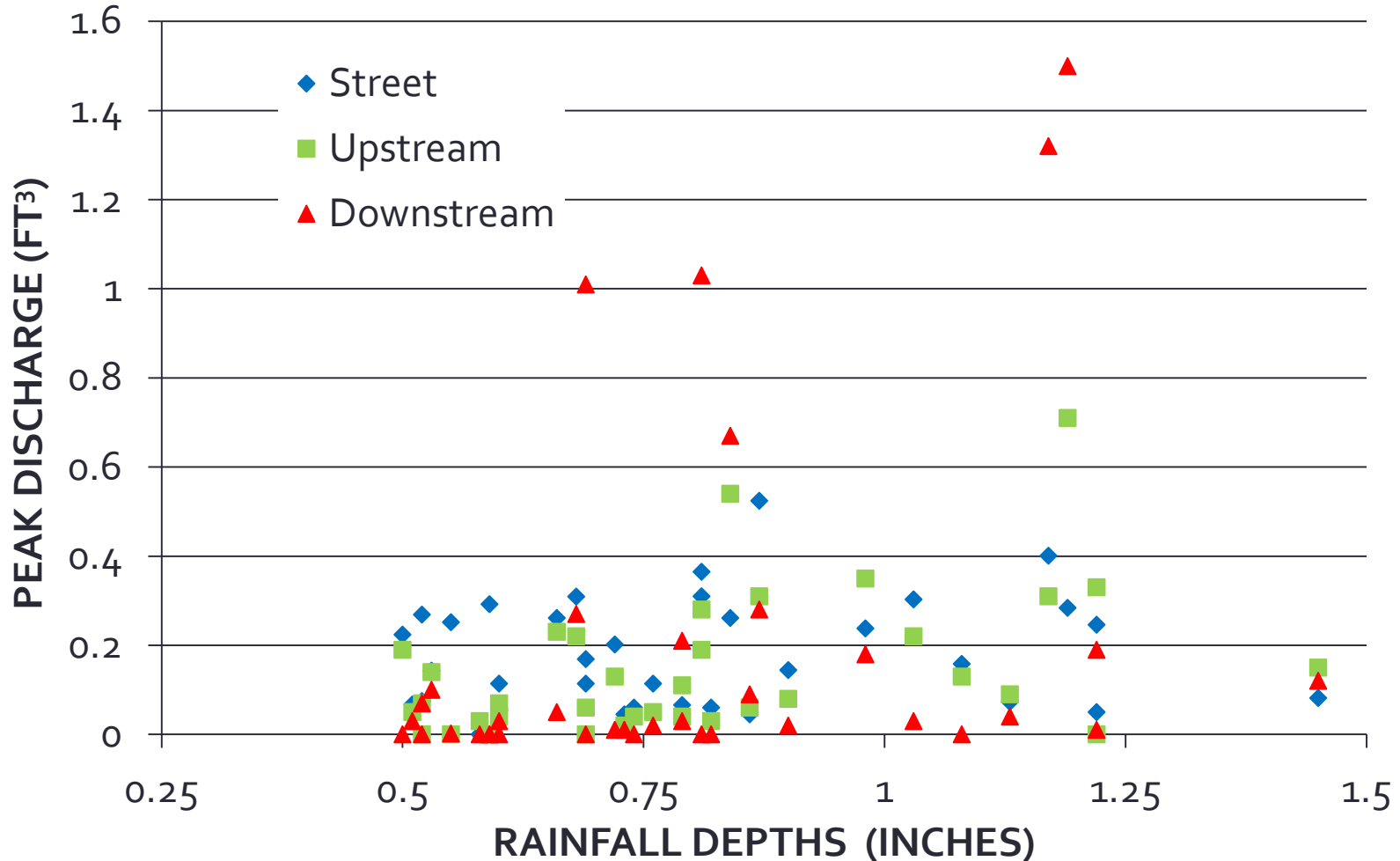
Infiltration Ranged from 0.07 to 3 in/hr



Swale Percent Runoff

	Percent Runoff		
Rainfall (in)	Street	Upstream	Downstream
<0.5	75	3	0
0.5 - 1.5	90	13	5
>1.5	100	22	14

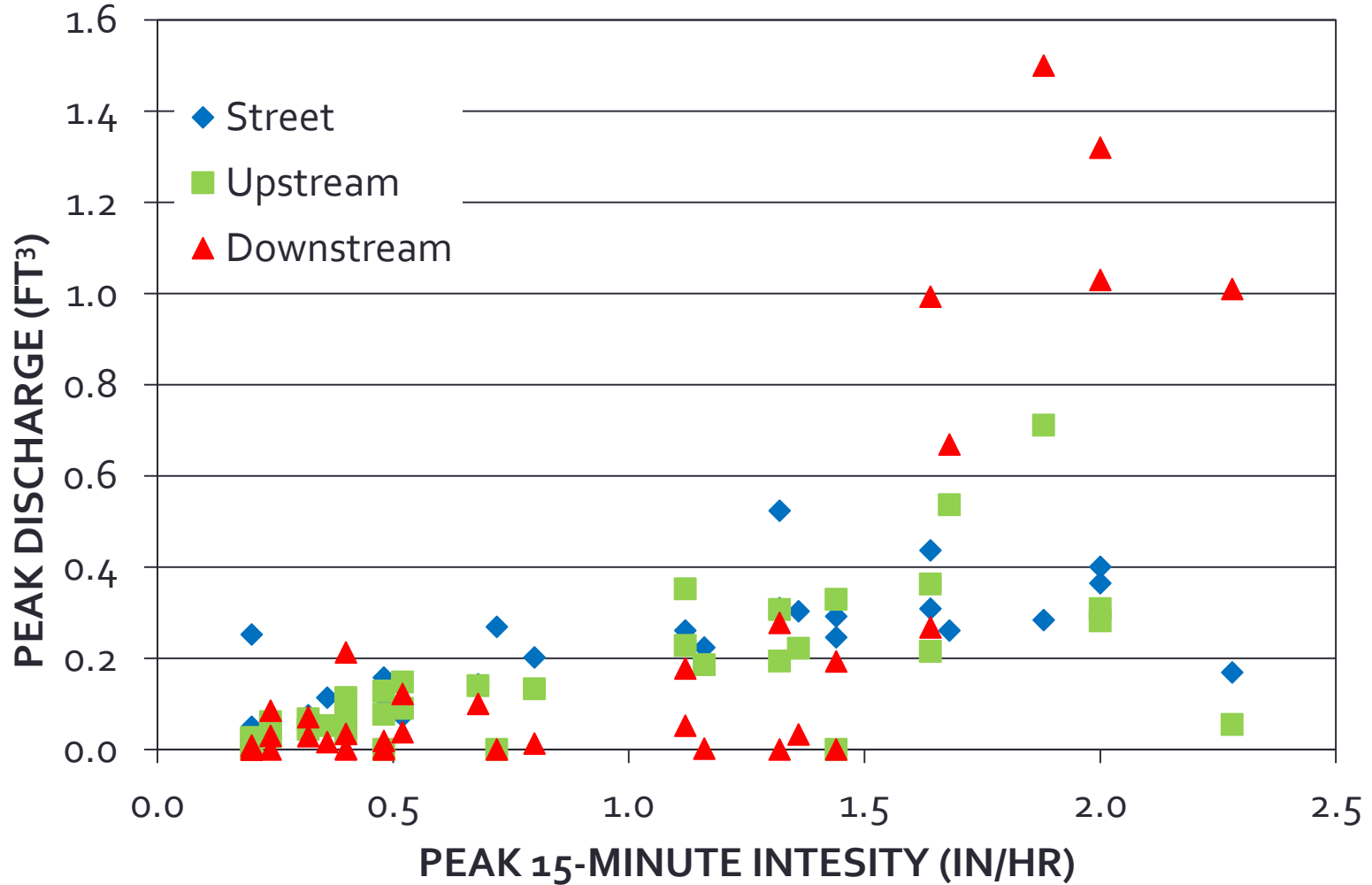
Rainfall Depths Compared to Peak Discharge in 2011-13



Peak 15 Minute Intensity Compared to Peak Discharge

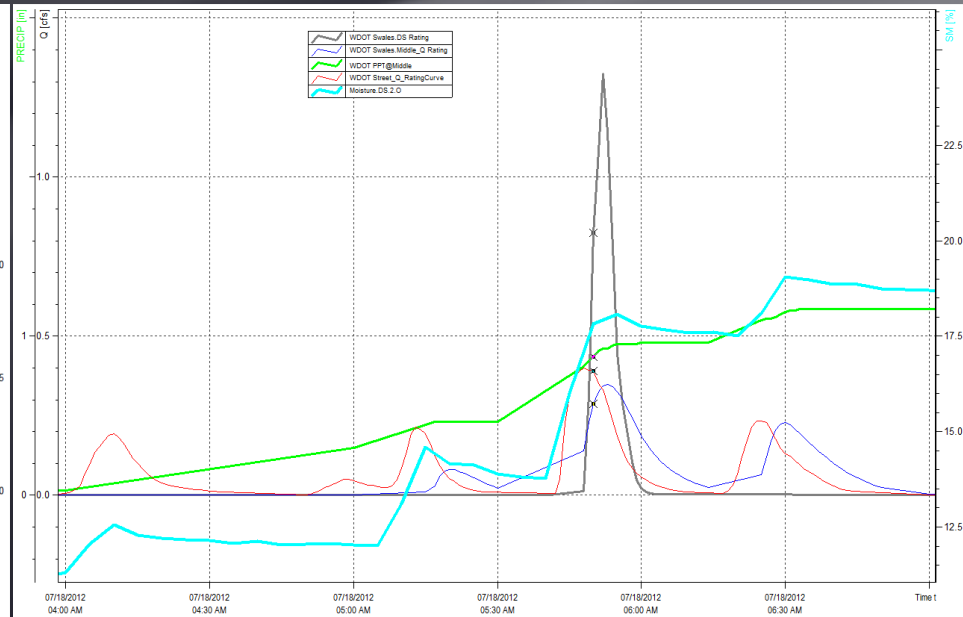
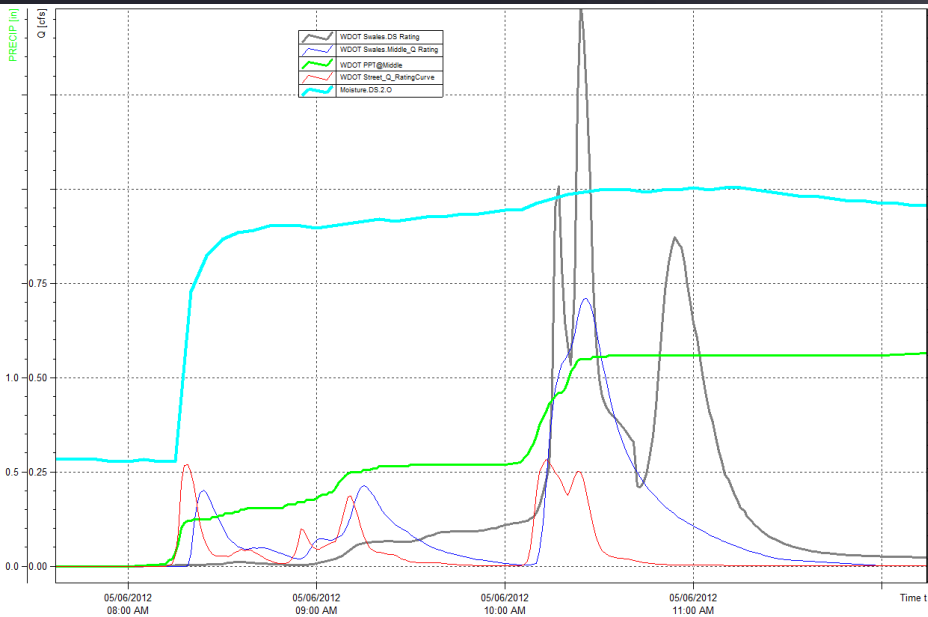
Between 2011-13

Rainfall Depth 0.5-1.5



Soil Moisture and Rainfall Intensity

	Rainfall Characteristics			Volume (ft ³) and Percent Runoff		
Storm	Rainfall (in)	Soil Moisture (%)	Intensity (in/hr)	Street	Upstream	Downstream
5/06/12	1.19	45	0.28	650 (74%)	1642 (37%)	1572 (16%)
7/18/12	1.17	11	0.45	735 (85%)	518 (12%)	397 (4%)



Filter Strip Samples From 4/18/2013

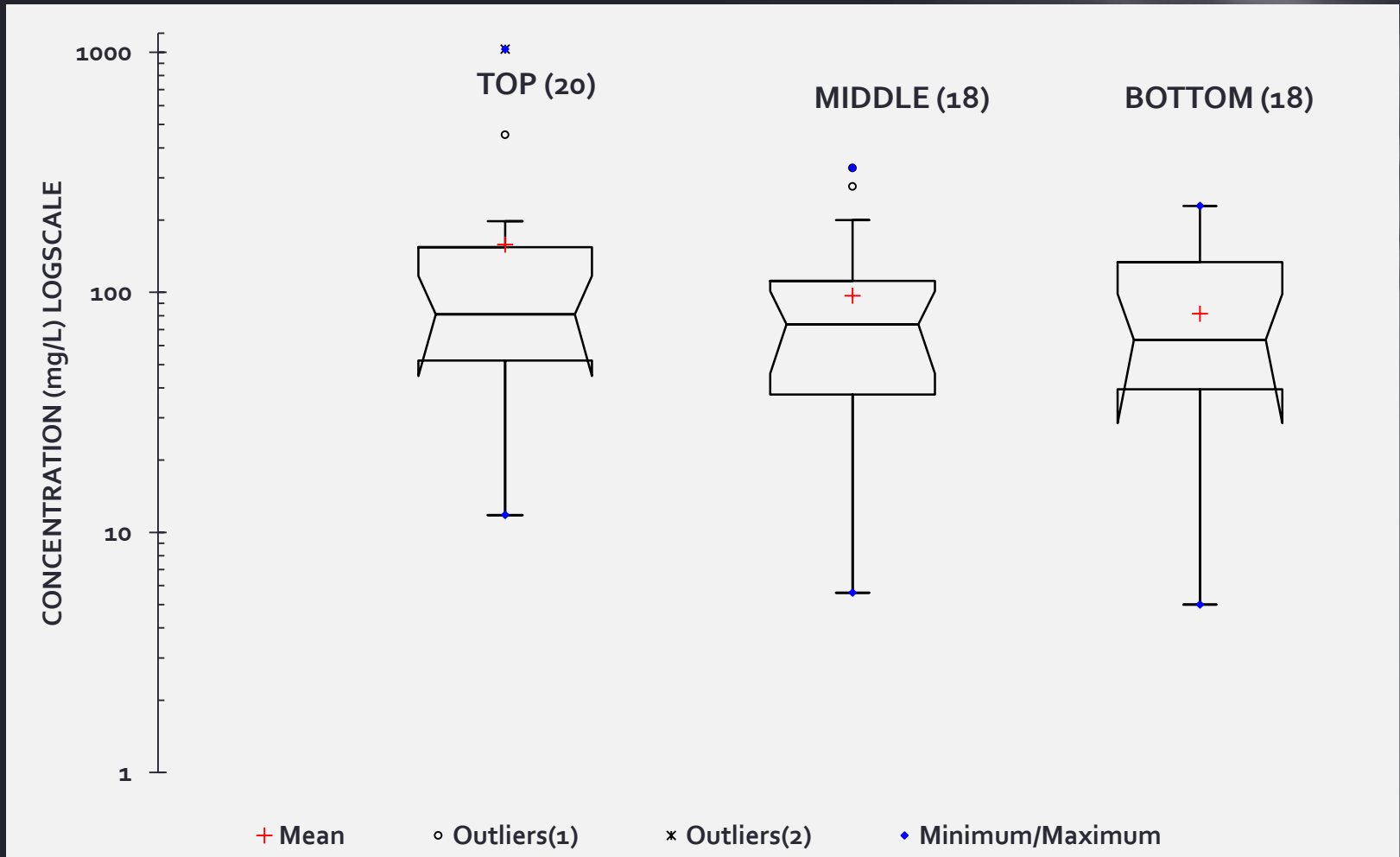


Top

Middle

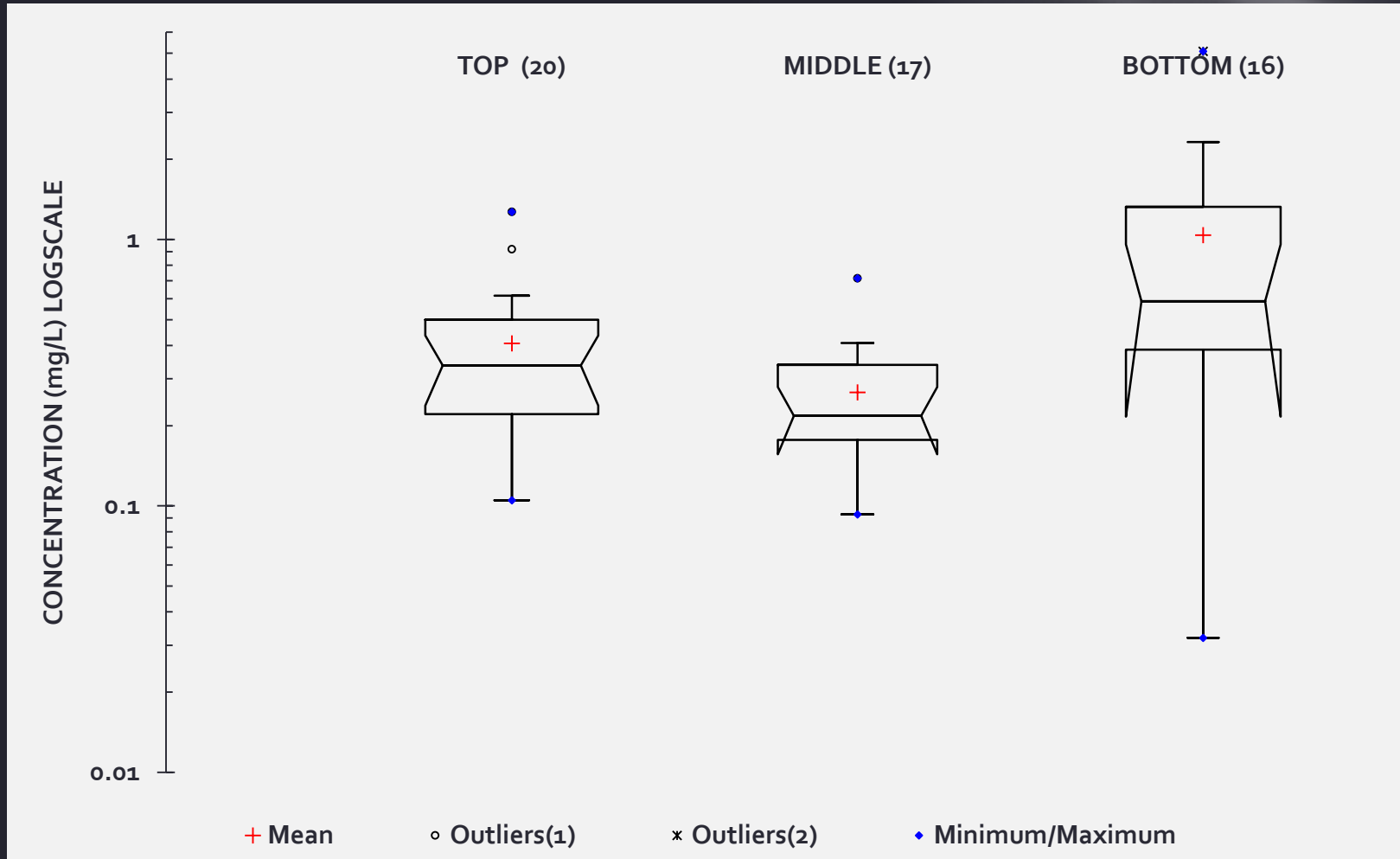
Bottom

Filter Strip Total Suspended Solids (21% Median Reduction from Top to Bottom)



Filter Strip Total Phosphorus

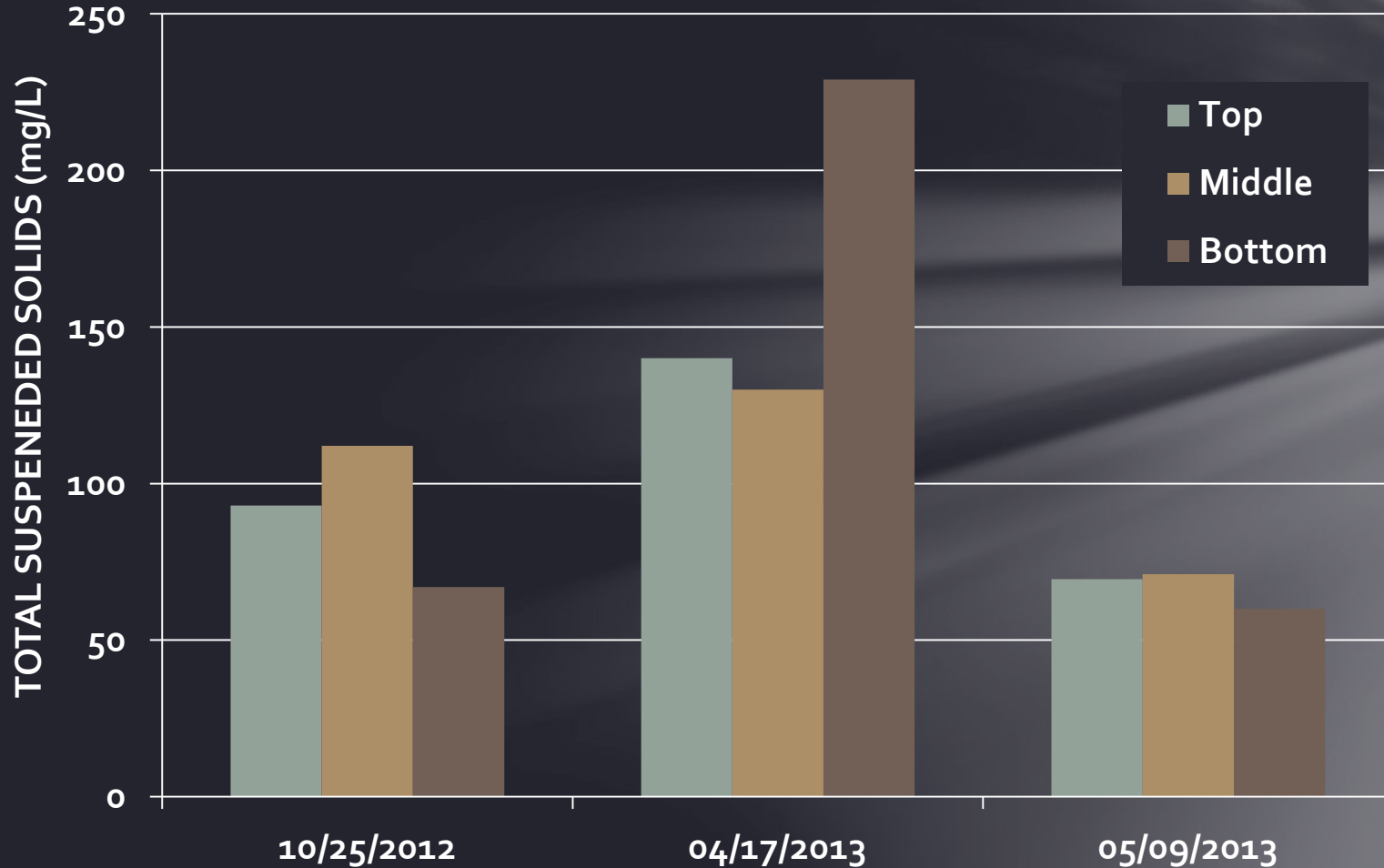
(-170% Median Reduction from Top to Bottom)



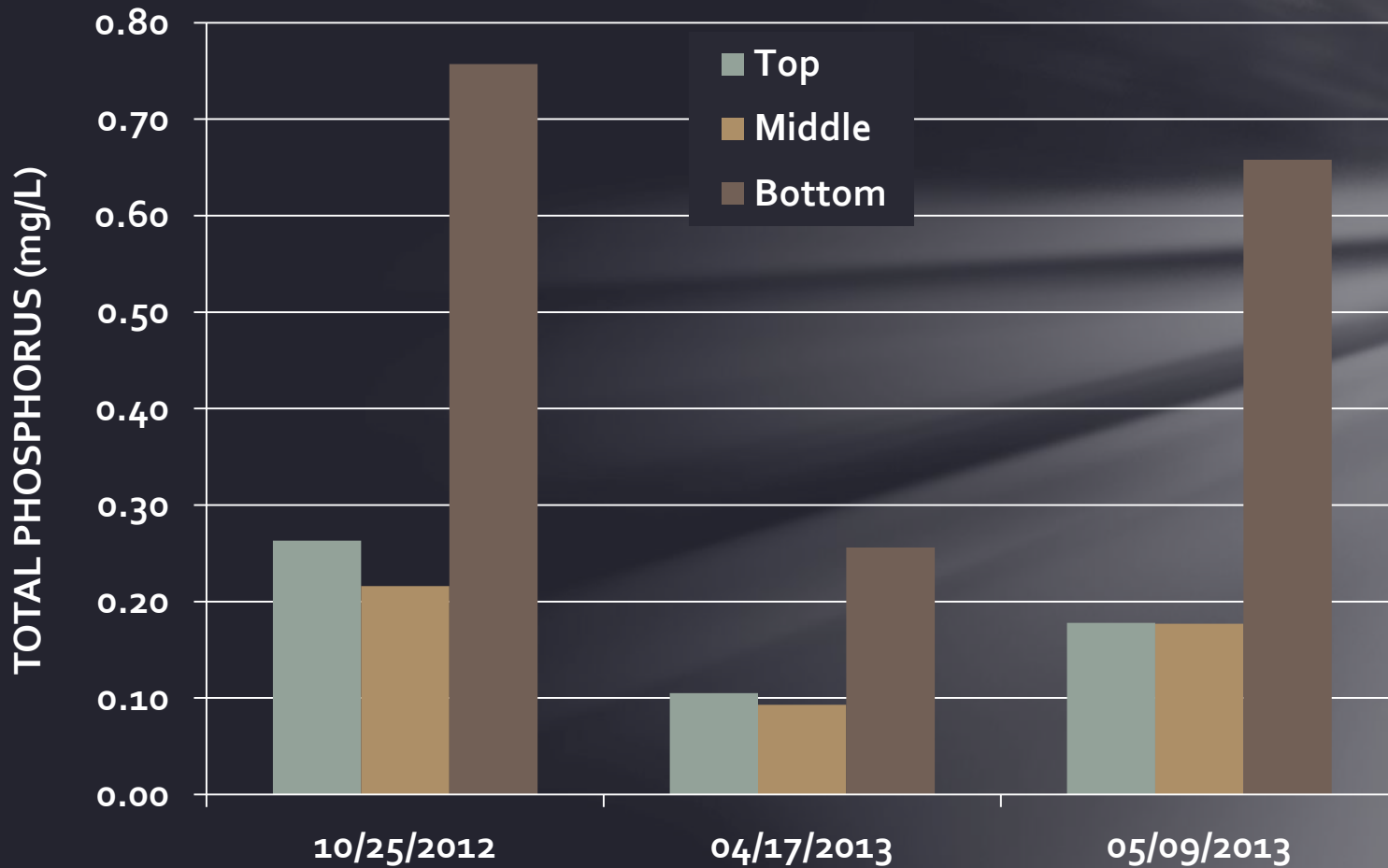
Filter Strip Individual Event on 05/09/2013 Rainfall Depth 1.58 inches

Concentrations (mg/L)	Filter Strip		
	Top	Middle	Bottom
Suspended Solids	70	71	60
Total Phosphorus	0.18	0.18	0.66
Dissolved Phosphorus	0.04	0.06	0.45

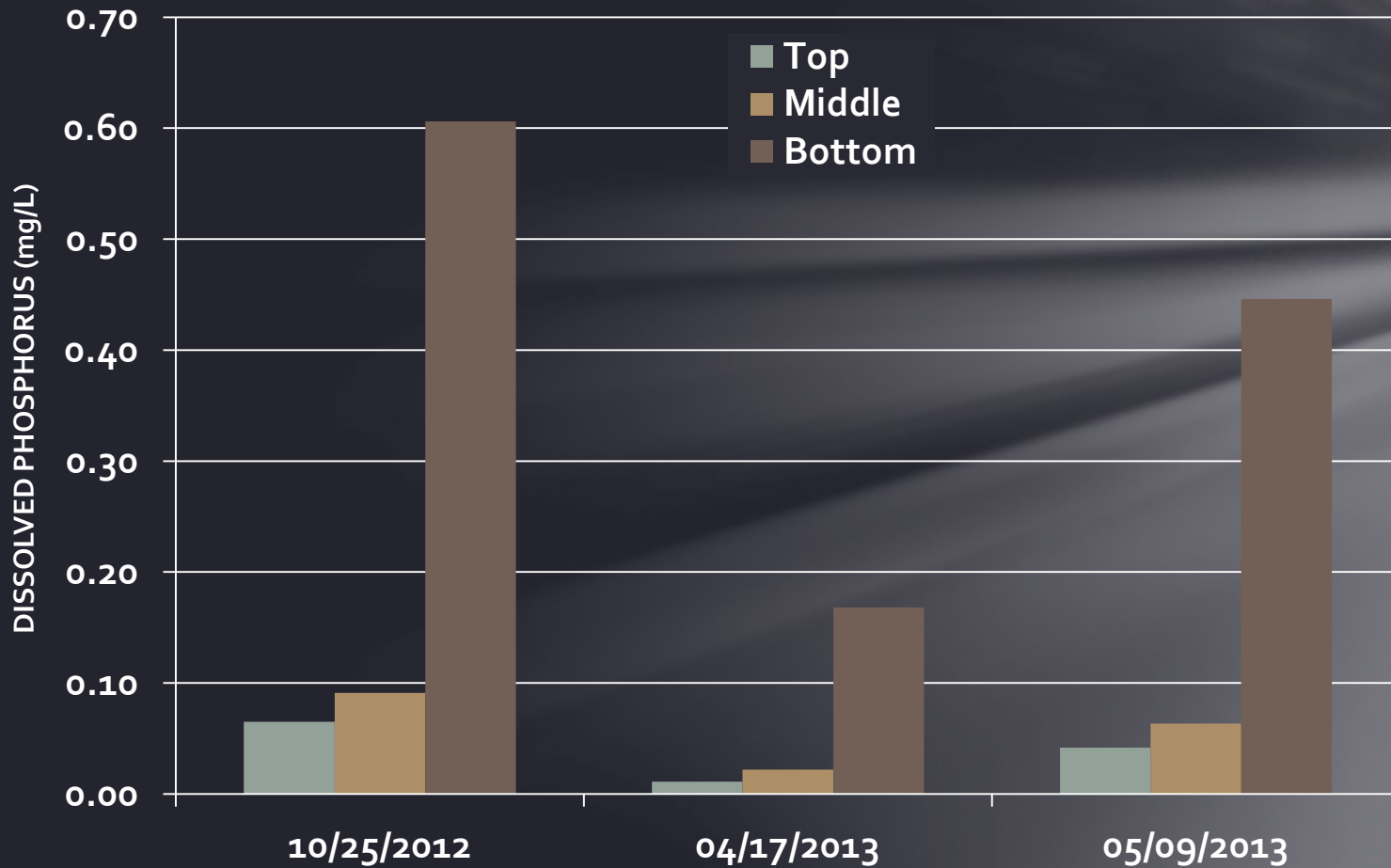
Filter Strip Total Suspended Solids for Selected Runoff Events



Filter Strip Total Phosphorus for Selected Runoff Events



Filter Strip Dissolved Phosphorus for Selected Runoff Events



Grass Swale

Samples From 4/18/2013

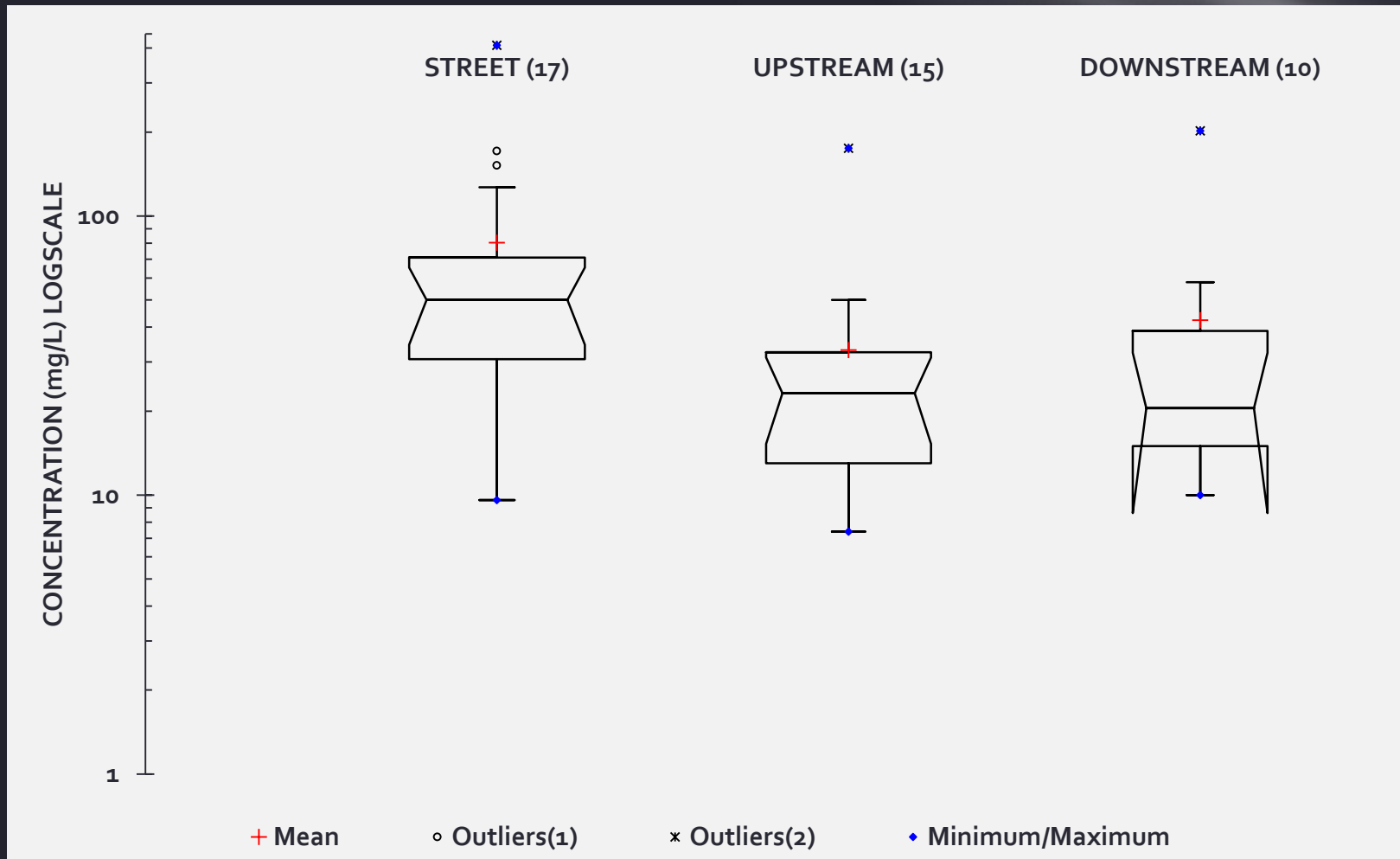


Street

Upstream

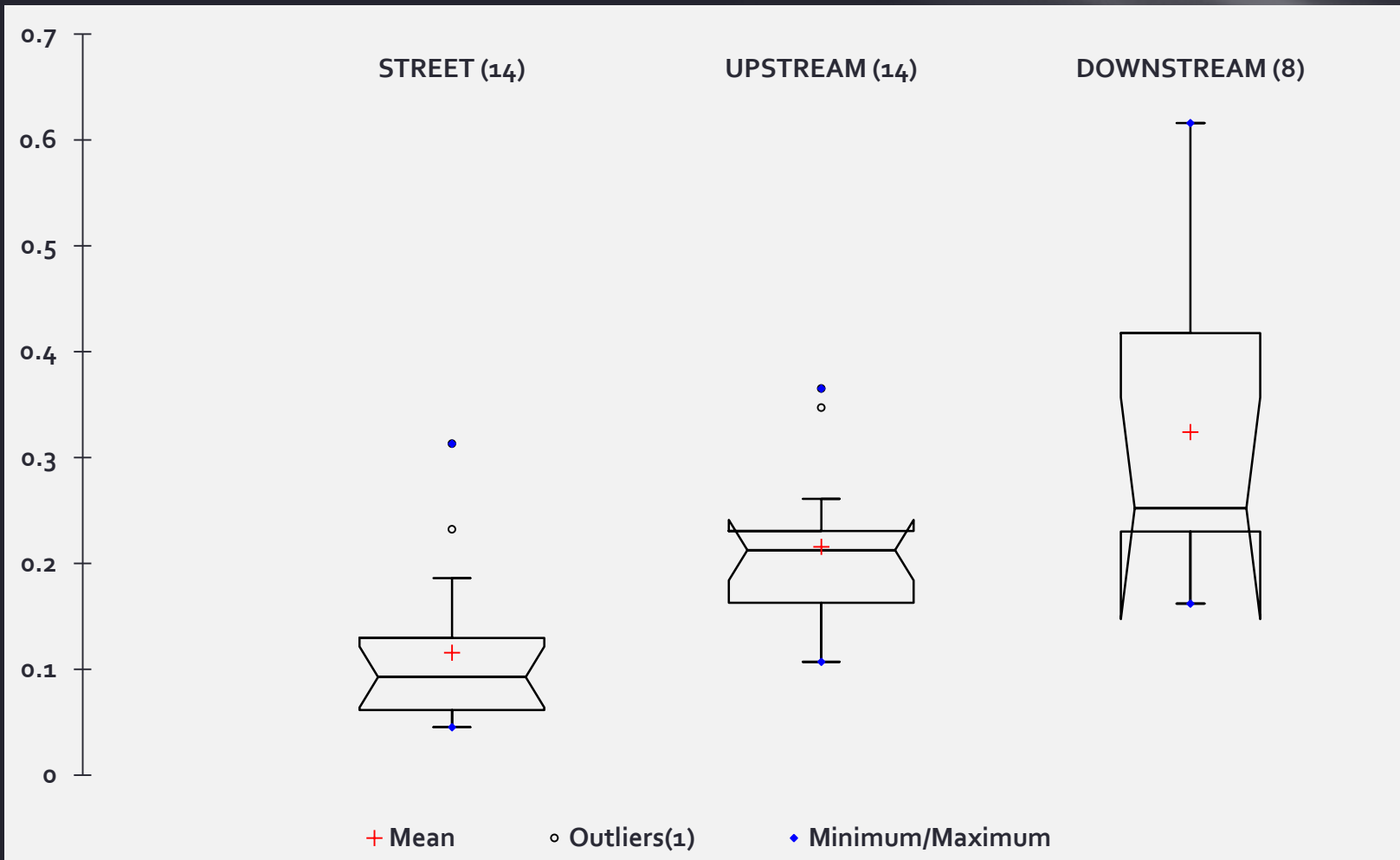
Downstream

Street and Swale Total Suspended Solids (11% Median Reduction from Up to Down)



Street and Swale Total Phosphorus

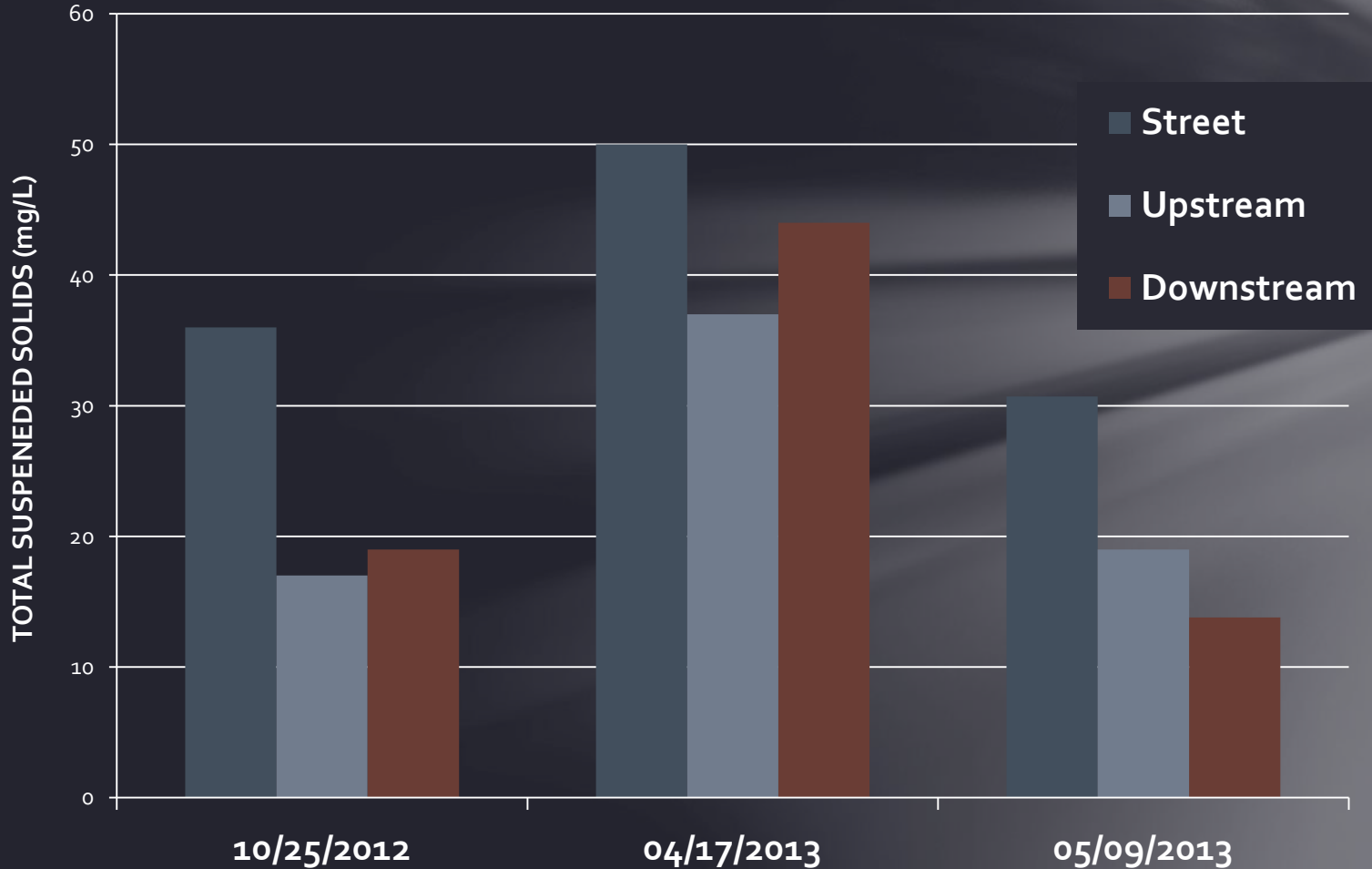
(-18% Median Reduction from Up to Downstream)



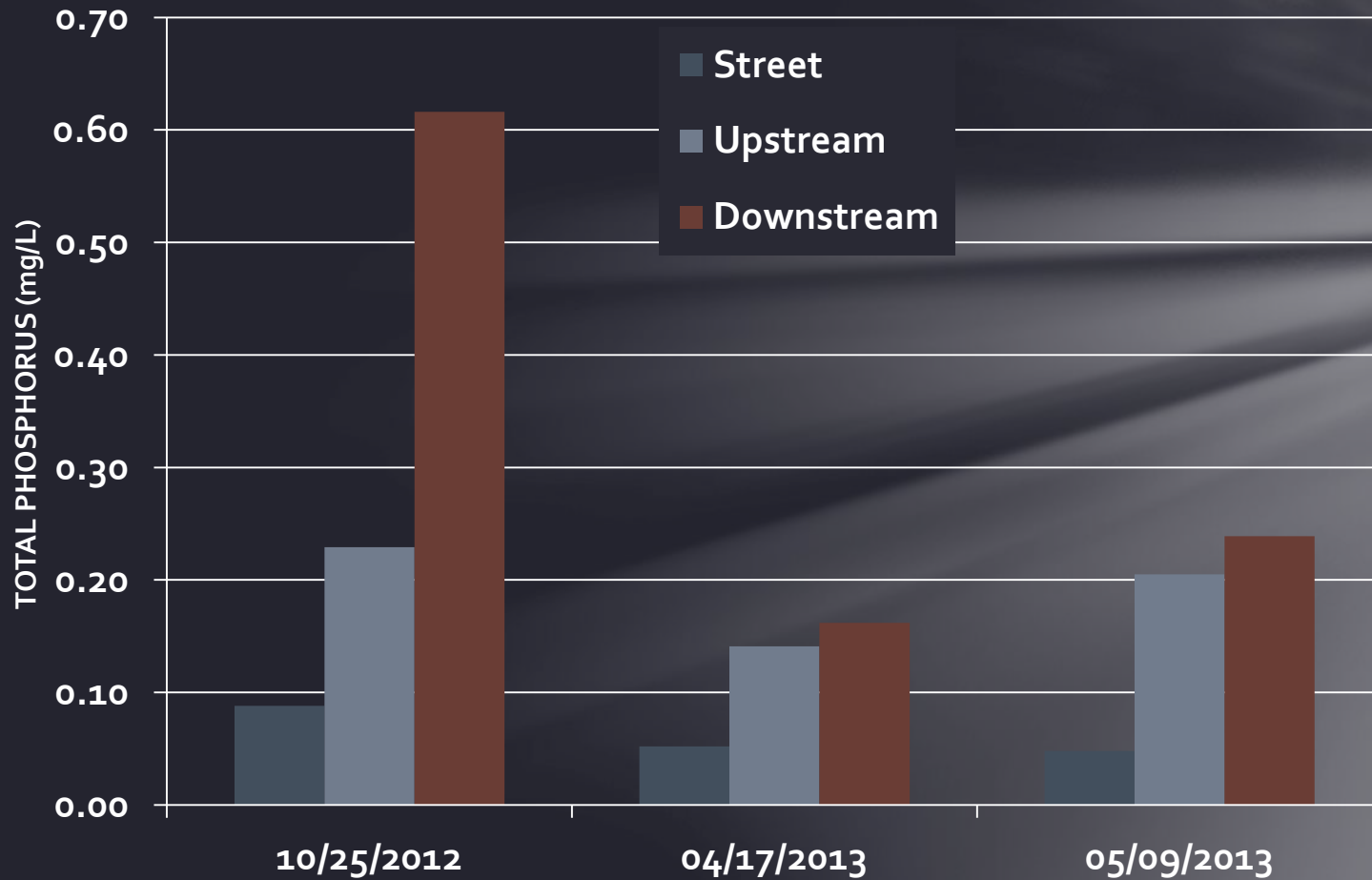
Street and Swale Individual Event on 05/09/2013 Rainfall Depth 1.58 inches

Concentrations (mg/L)	Grass Swale		
	Street	Upstream	Downstream
Suspended Solids	31	19	14
Total Phosphorus	0.05	0.21	0.24
Dissolved Phosphorus	0.02	0.15	0.18

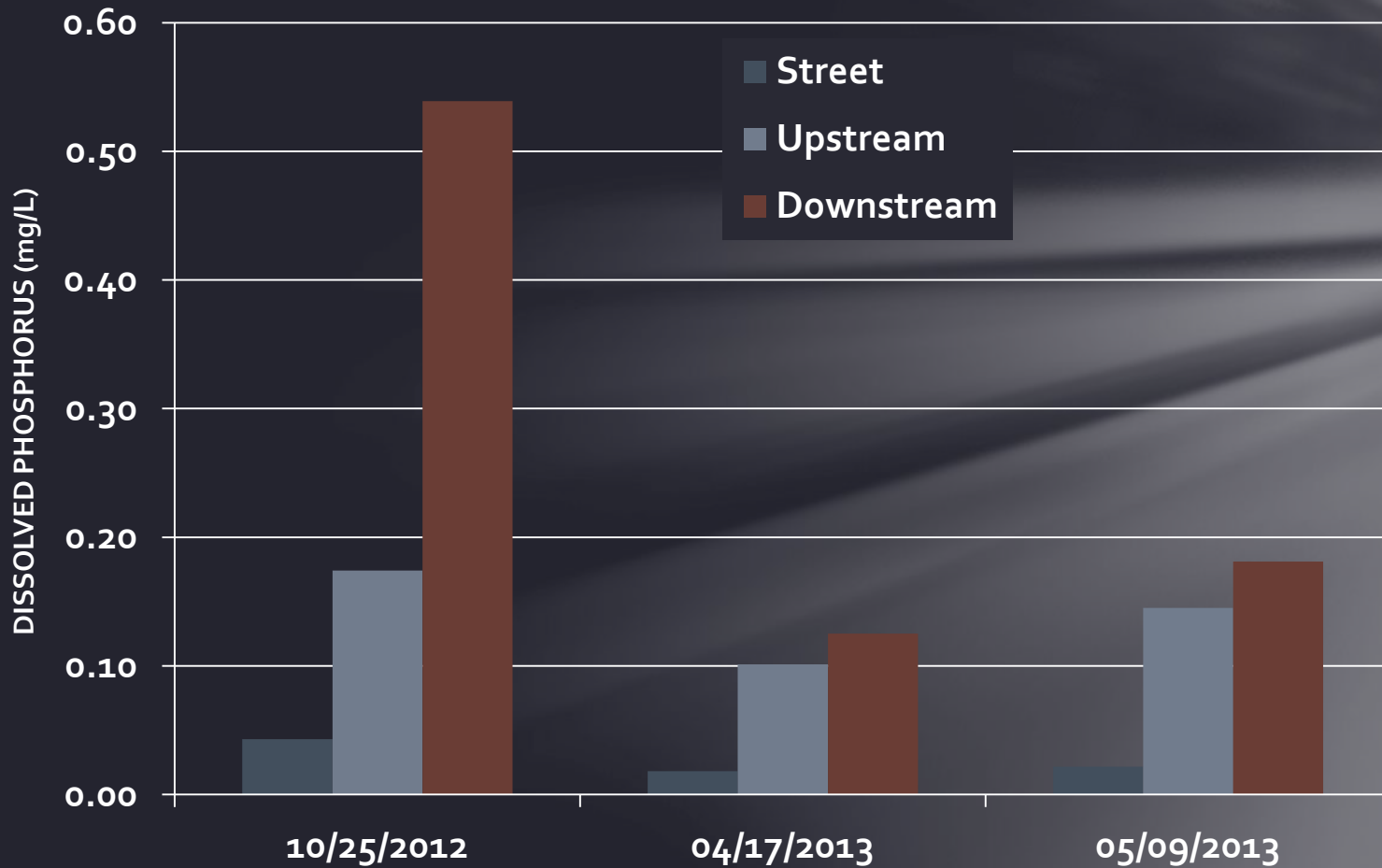
Street and Swale Total Suspended Solids for Selected Runoff Events



Street and Swale Total Phosphorus for Selected Runoff Events



Street and Swale Dissolved Phosphorus for Selected Runoff Events



QUESTIONS ?

