Assessing Performance of Advanced Rainwater Harvesting Systems for Mitigation of CSOs and Continuous Monitoring of PFC Asphalt Overlay

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Outline

Background	• Pilot Sites • Advanced Rainwater Harvesting
Advanced RH Results	• Wet Weather Flow Reduction
Continuous PFC Monitoring	• Flow Rate • Temperature
Conclusions	• Next Steps

Background

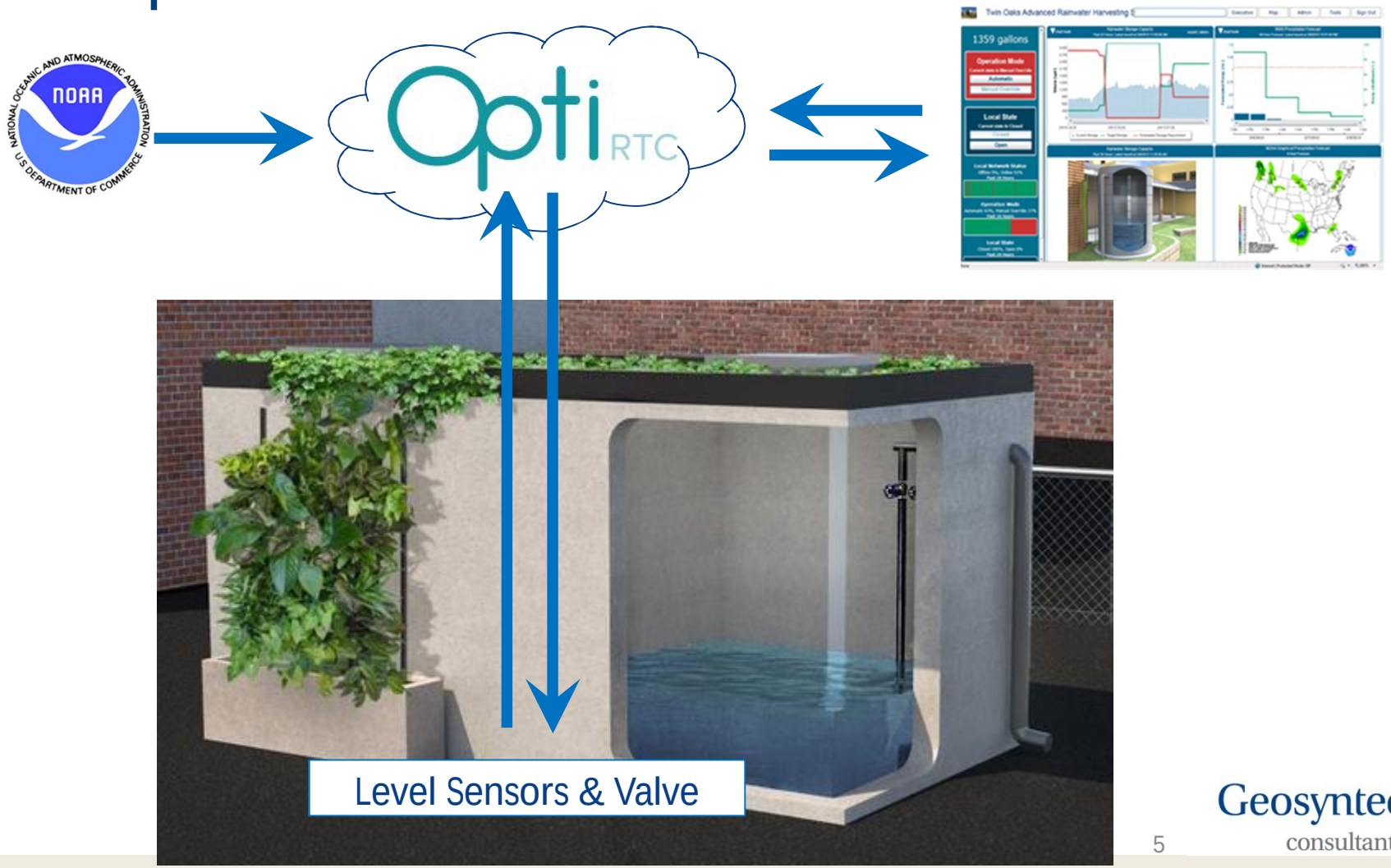
- D.C. conveys stormwater through two types of systems
  - Combined sewer systems (1/3 of D.C.)
  - MS4 (2/3 of D.C.)

- Problem:
  - Combined Sewer: Limited capacity of existing infrastructure
  - MS4: Discharge at highly erosive flows and elevated pollutant loads

Background

- Solution:
  - Advanced rainwater harvesting systems
  - Permeable friction course asphalt overlay
- Location:
  - Engine House #3: Combined Sewer
  - Engine House #25: MS4

Advanced Rainwater Harvesting: Active controls based on probability of precipitation



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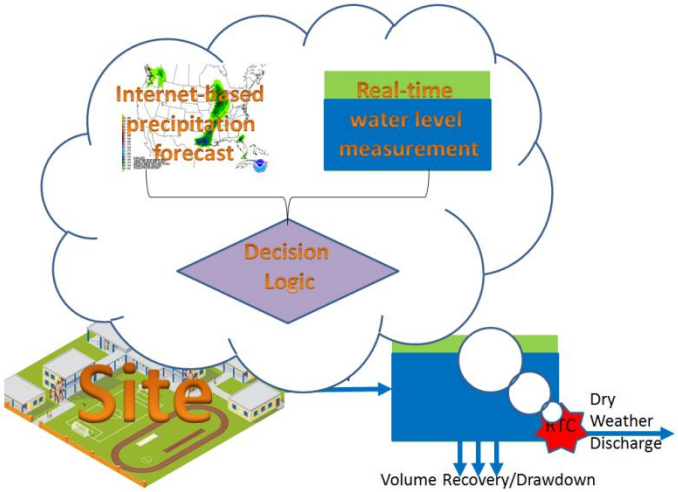
Real-time Monitoring and Control

- Primary Goals:
  - Reduce discharge to combined sewer/MS4 during rain events
  - Discharge stored water prior to forecast storm event
  - Continuous monitoring of cisterns (water level/turbidity)
  - Continuous monitoring of PFC and asphalt (flow rate/temp.)

- System Benefits:

Minimize Runoff	Reduce potable water usage
Minimal Maintenance	Remote Monitoring & Programming



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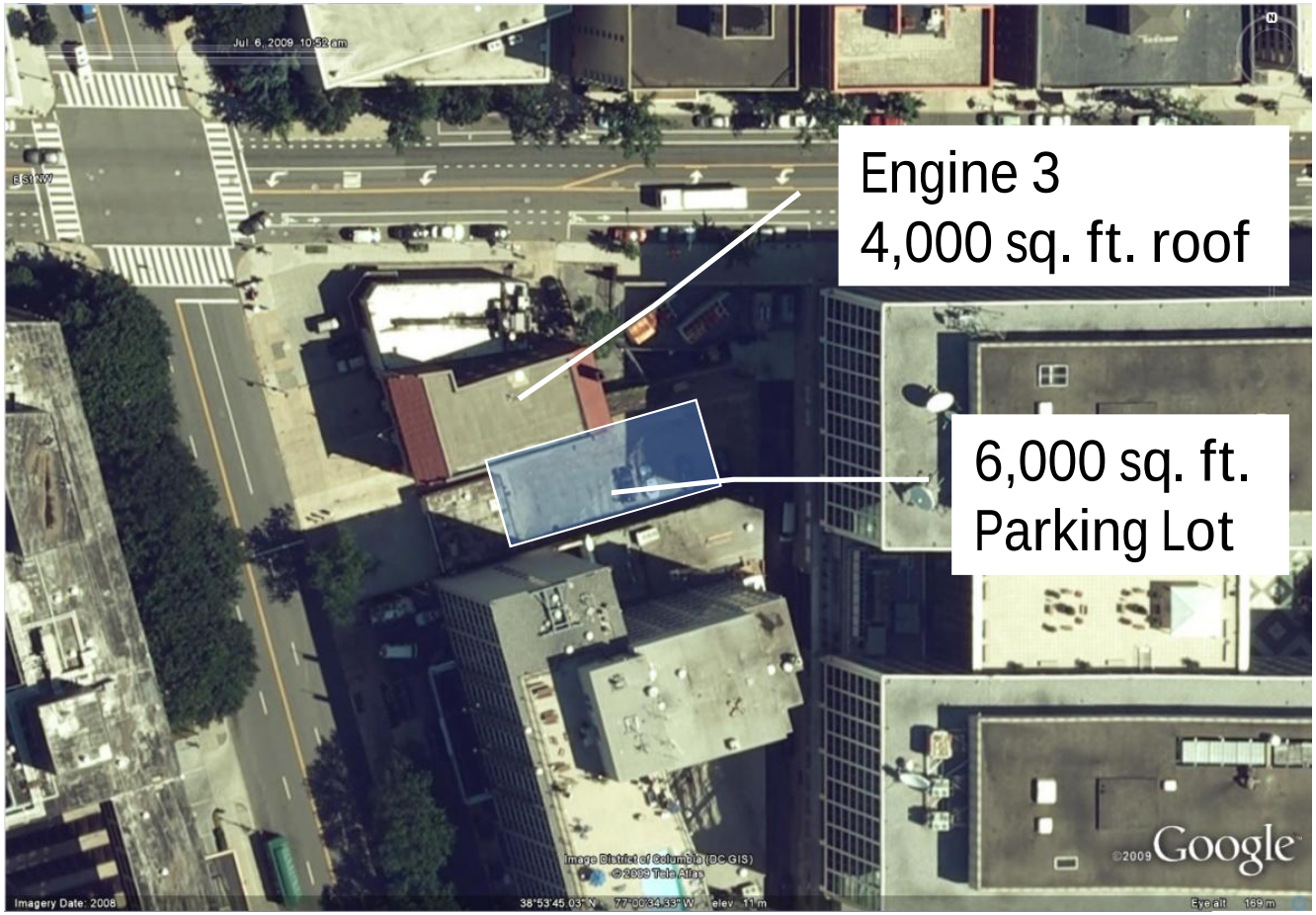
Real-time Monitoring and Control

- Cistern Logic
  - Predict storm volumes 48 hours in advance
  - Drain cisterns to accommodate predicted storm volume
    - Can drain to as low as the minimum level of 1.8” (79 gal)
  - Drain valve open if cistern level greater than maximum + 8” (87”; 3500 gal)

Background: Engine House #3



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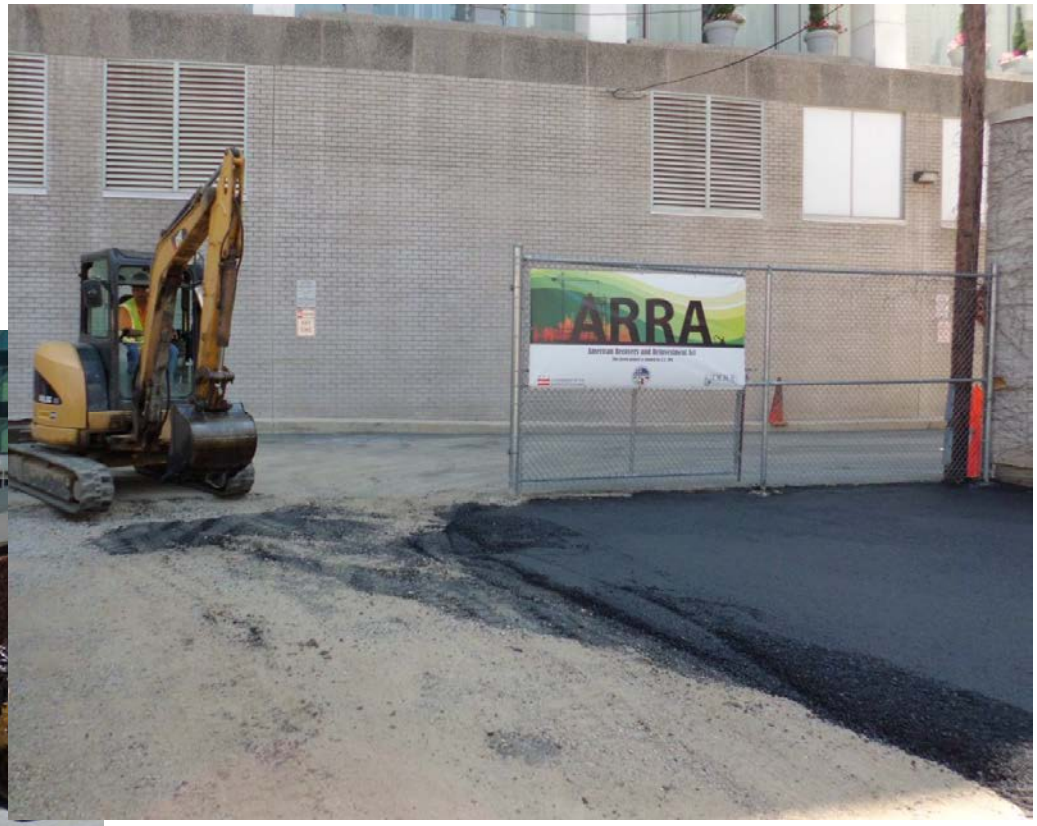
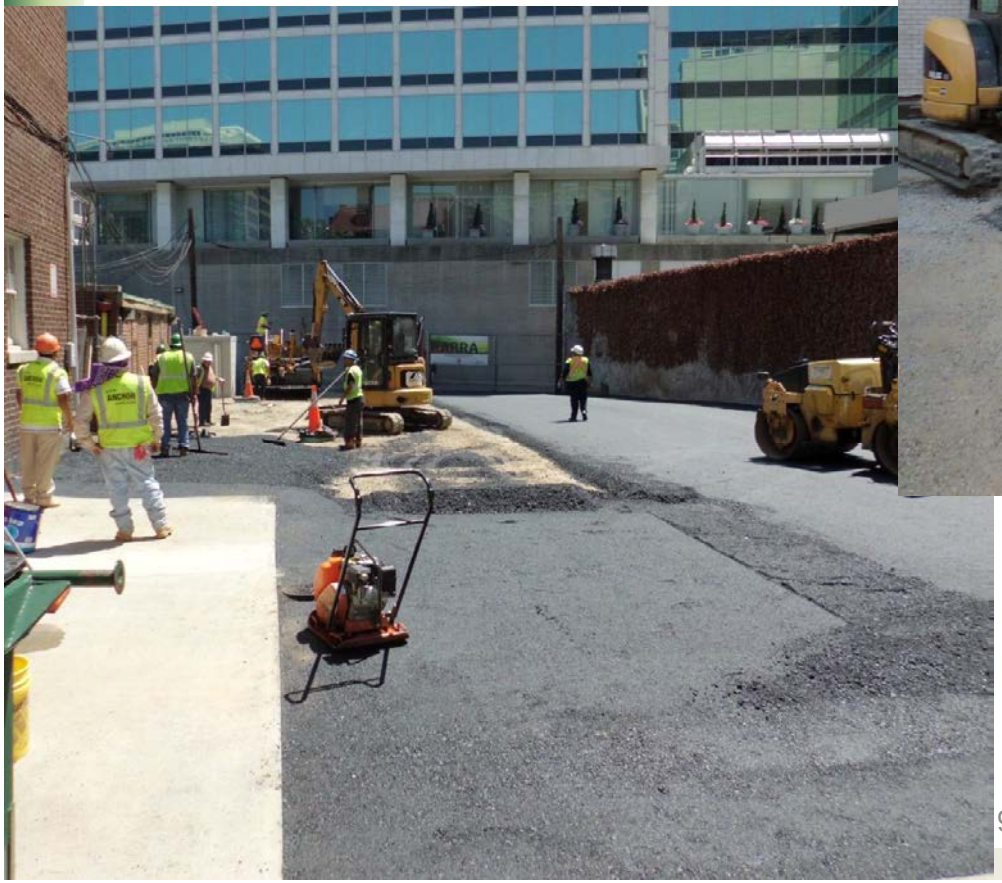
Background: Engine House #3





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Background: Engine House #3

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Background: Engine House #25

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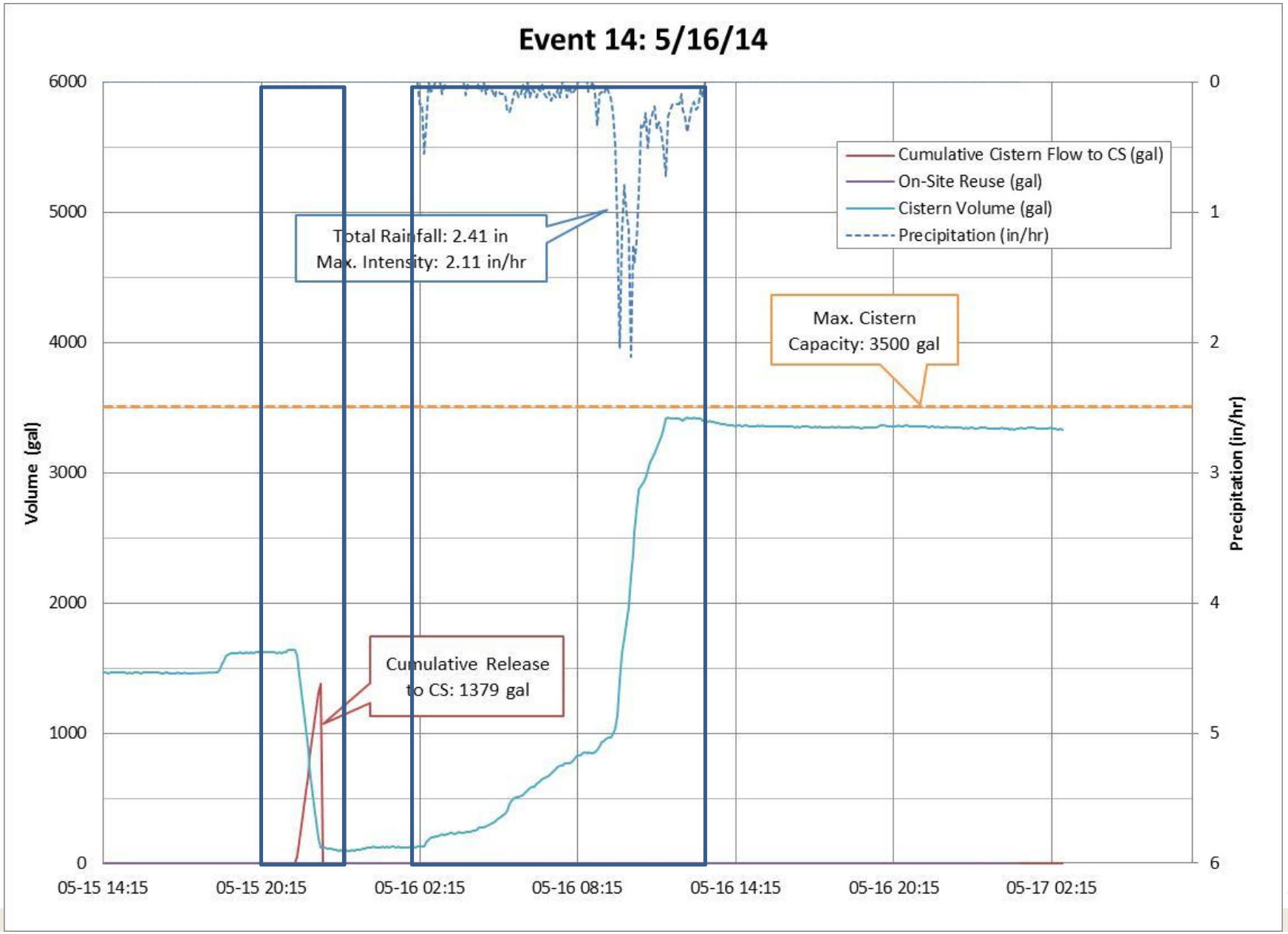
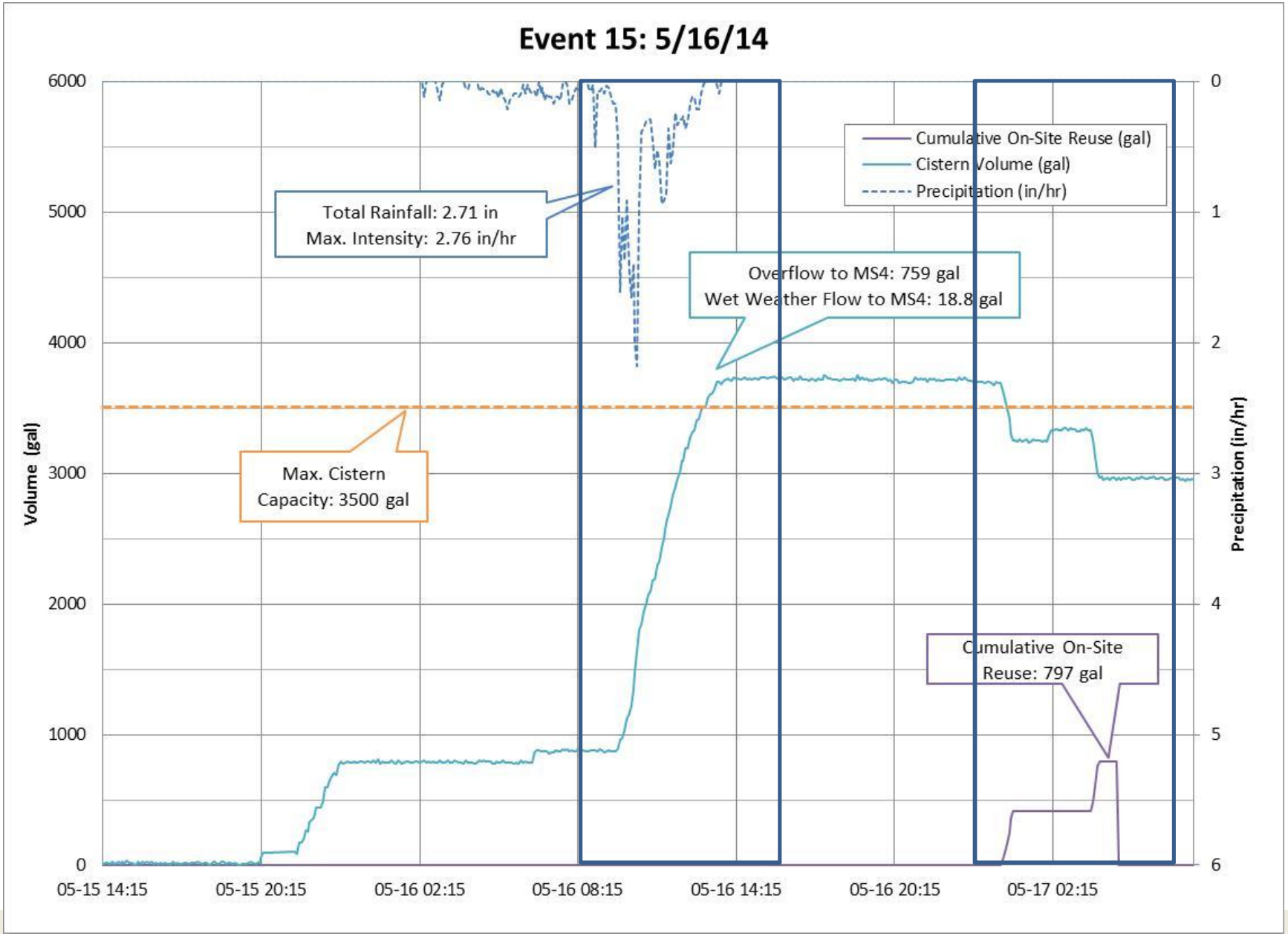
Advanced Rainwater Harvesting: EH #3



Advanced Rainwater Harvesting: EH #25



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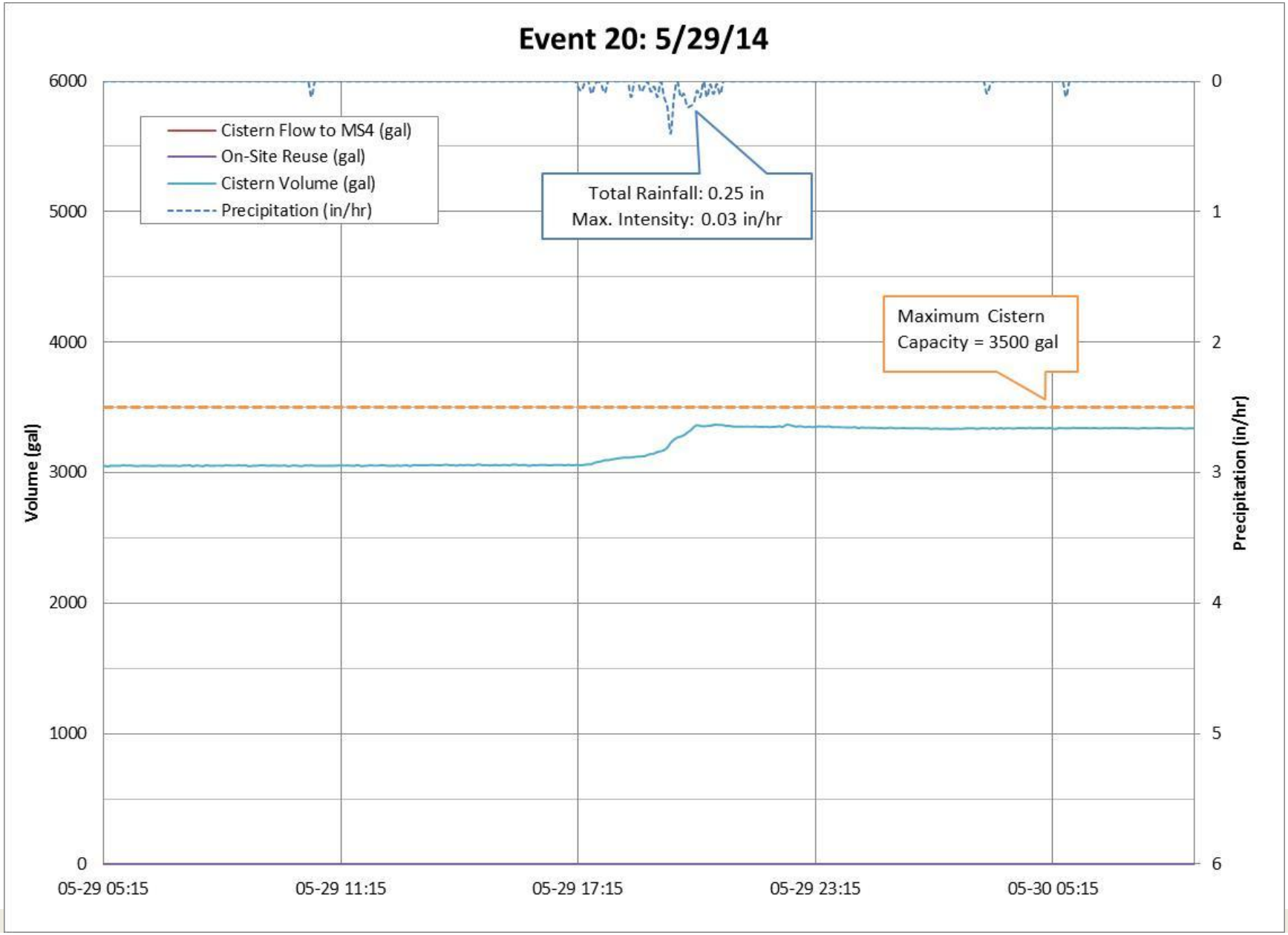
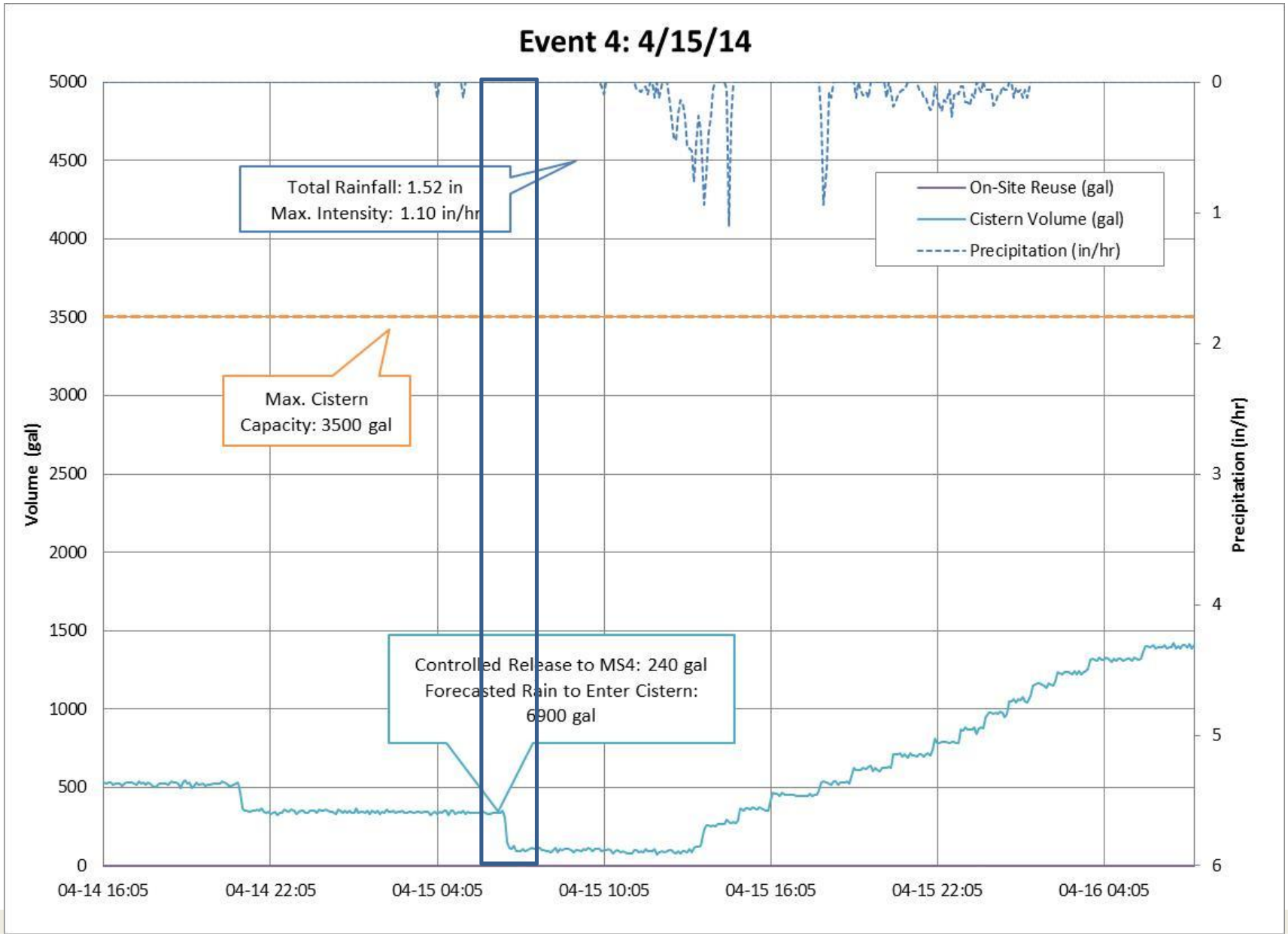


Advanced Rainwater Harvesting: EH #25

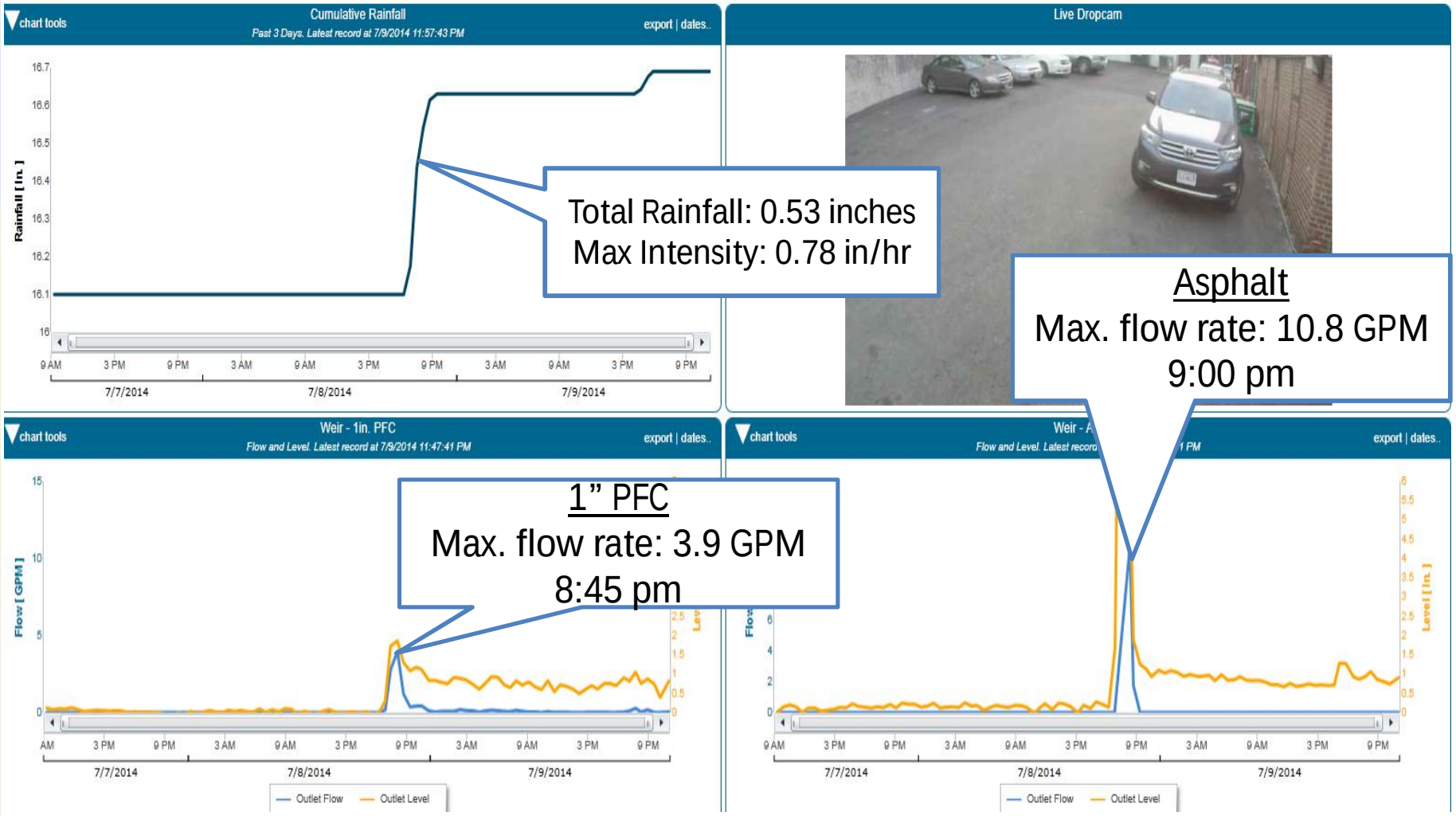


Advanced Rainwater Harvesting Results

	Sum of Rainfall (in)	Sum of Cistern Flow to MS4/CS (gal)	Sum of Wet Weather Flow to MS4/CS (gal)	Sum of On-Site Reuse (gal)	Wet Weather Flow Reduction
Engine House 3	29.6	21,200	226	1,260	98%
Engine House 25	32.5	44,900	799	12,120	98%

Monitoring Period: 3/28/2014 – 12/31/2014

Permeable Friction Course Flow Rates: EH #3



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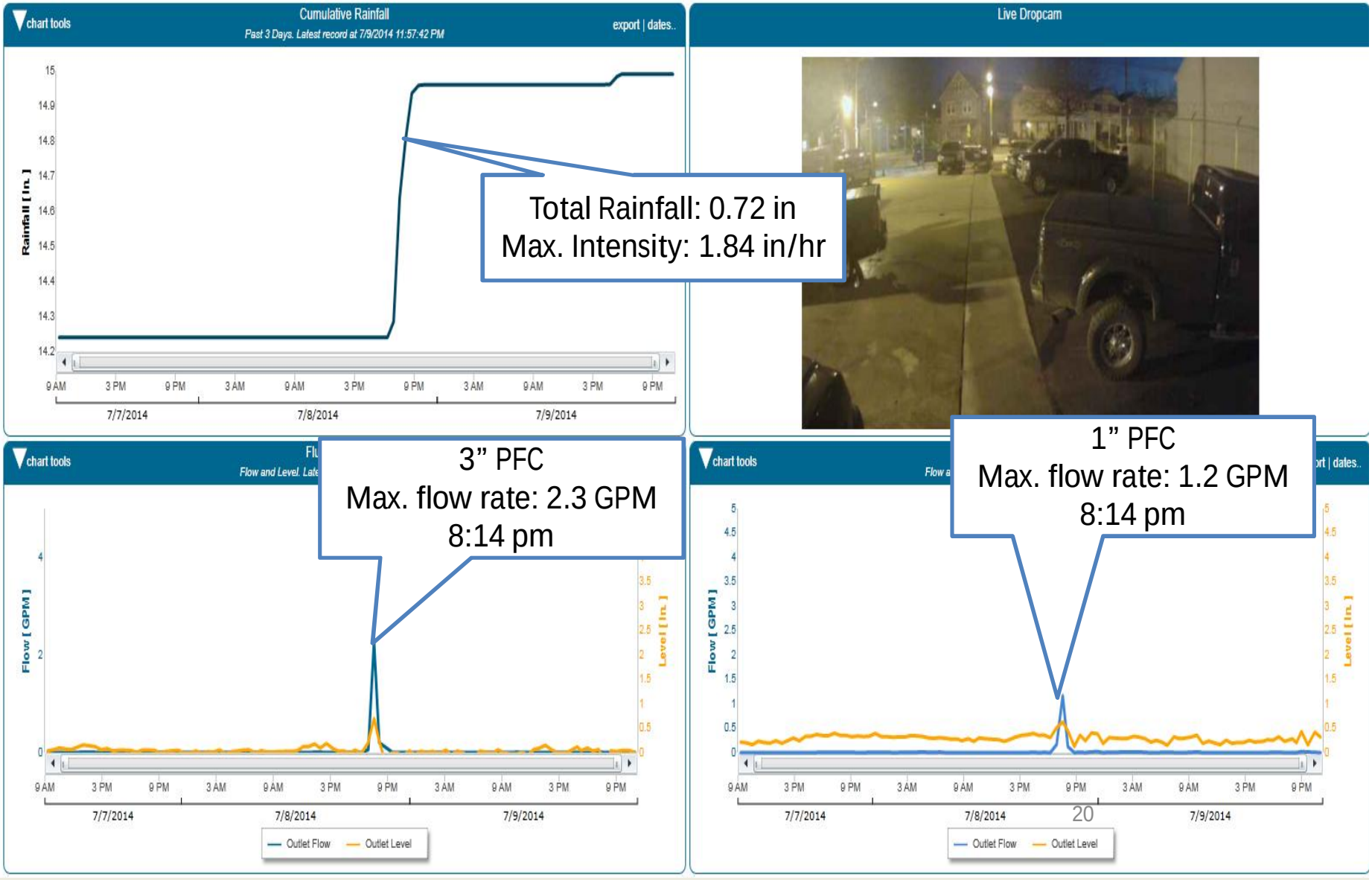
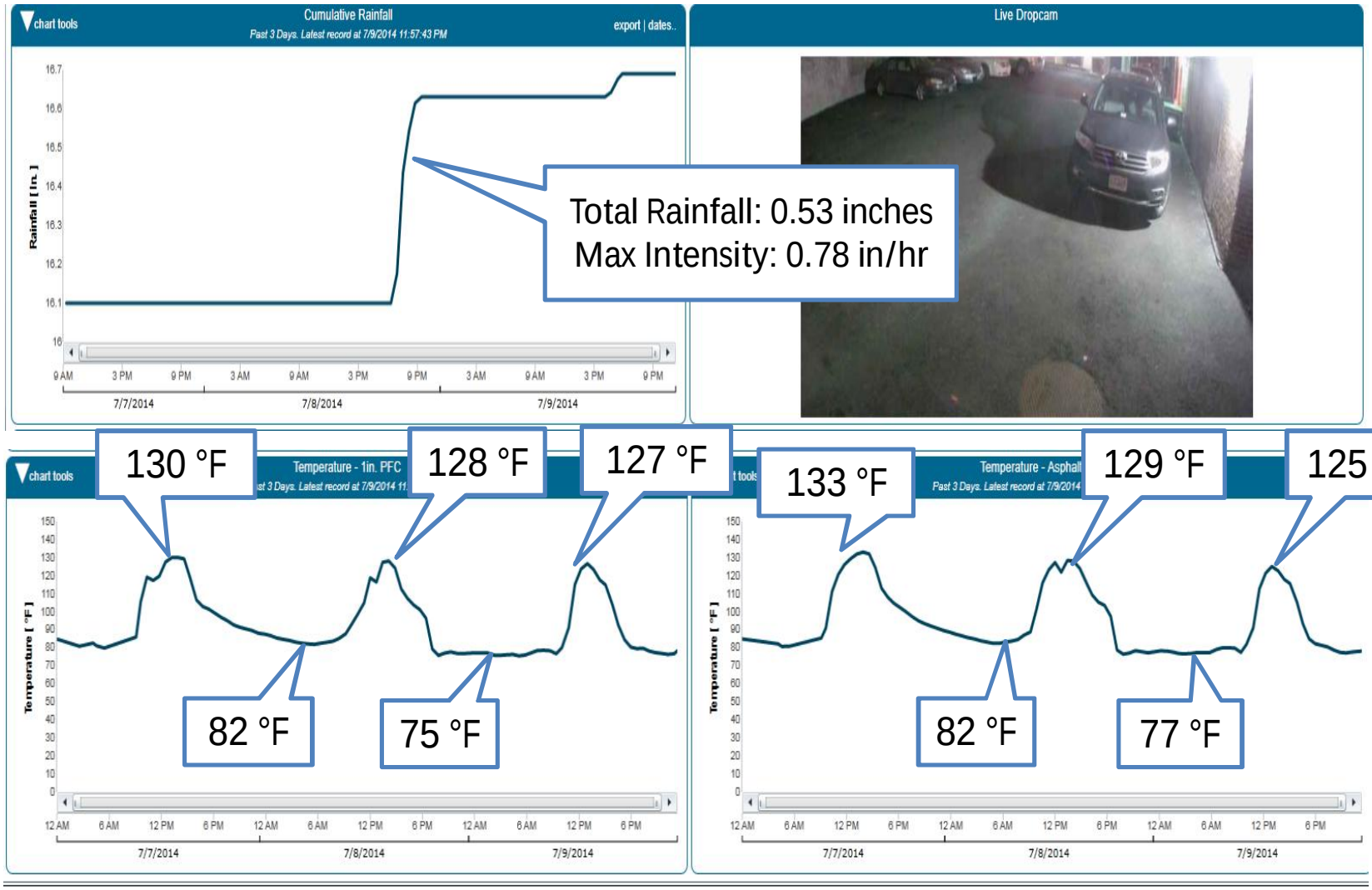
Permeable Friction Course Flow Rates: EH #25



Permeable Friction Course Temp: EH #3



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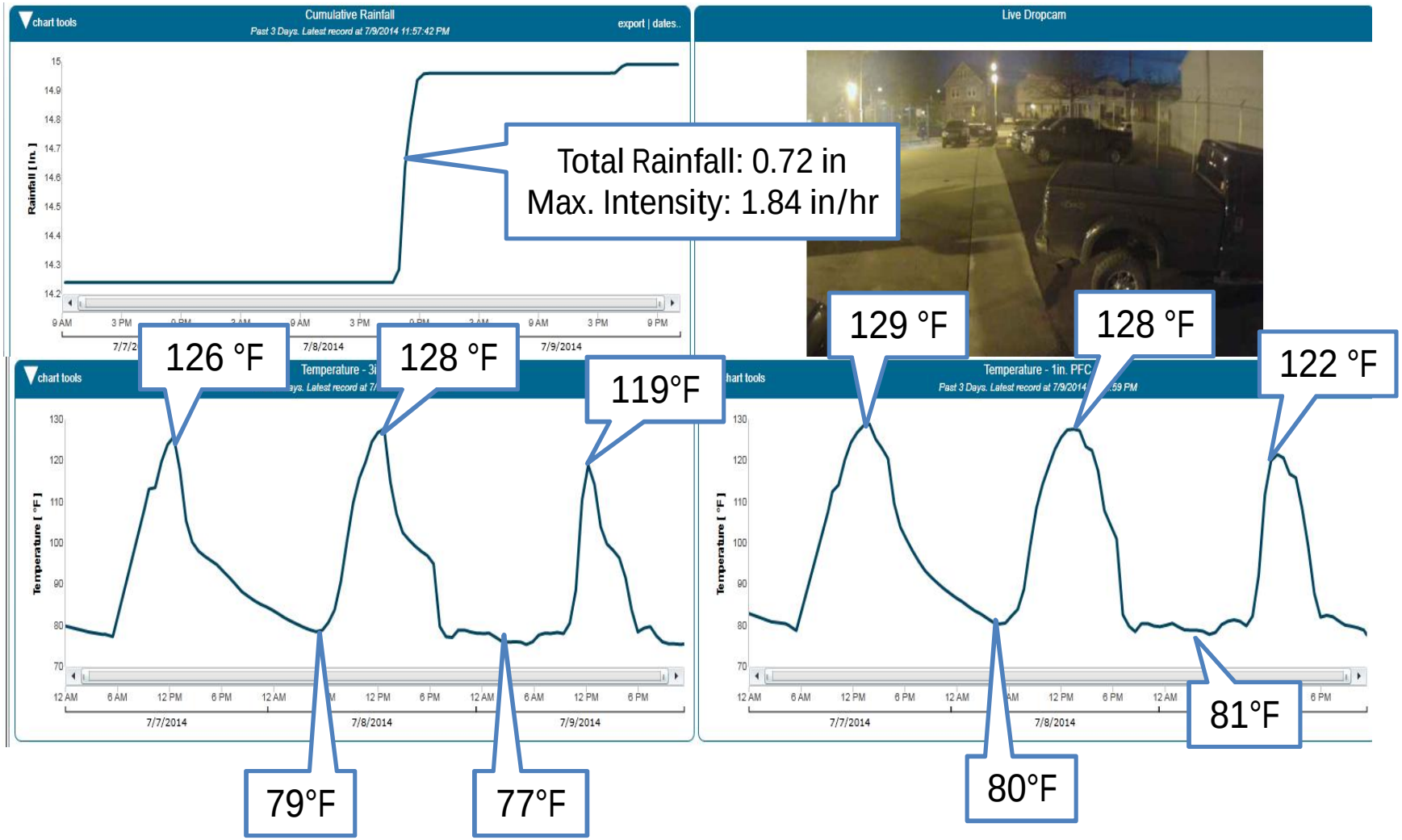
Permeable Friction Course Temp: EH #25



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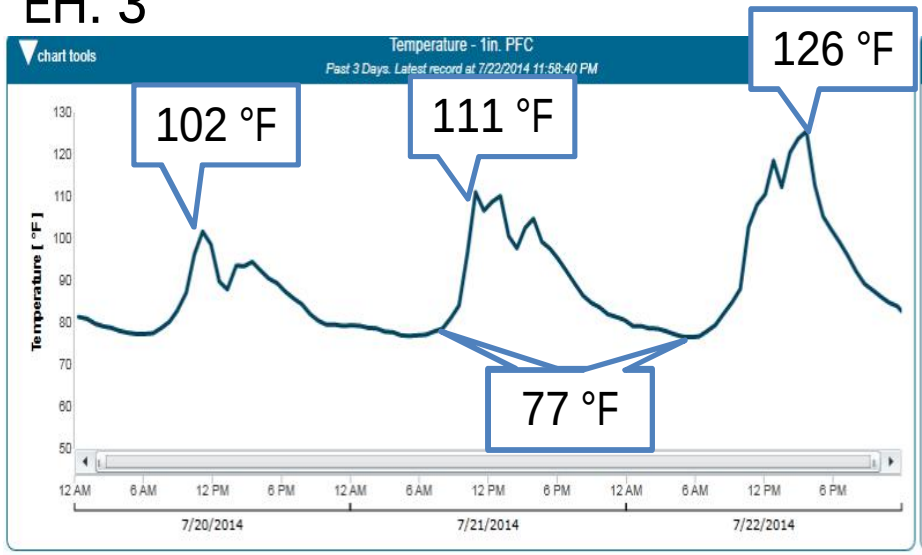
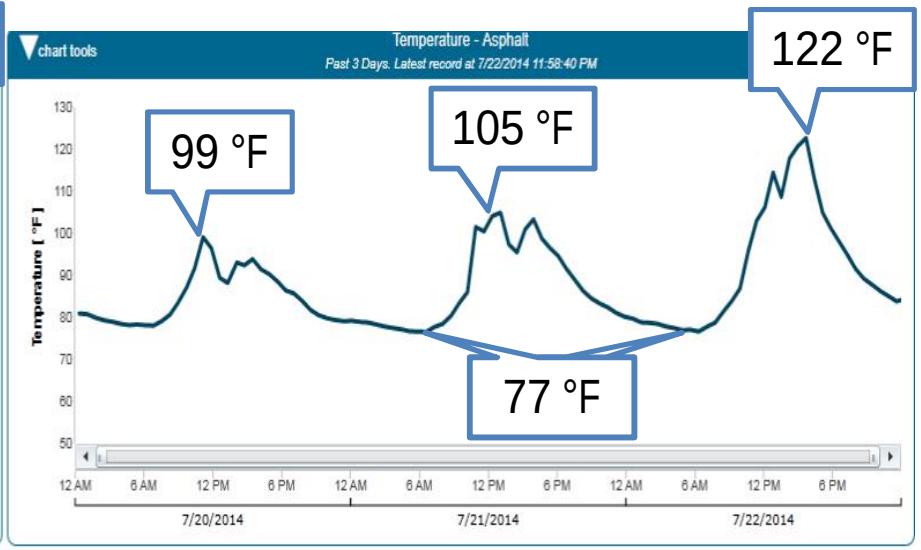
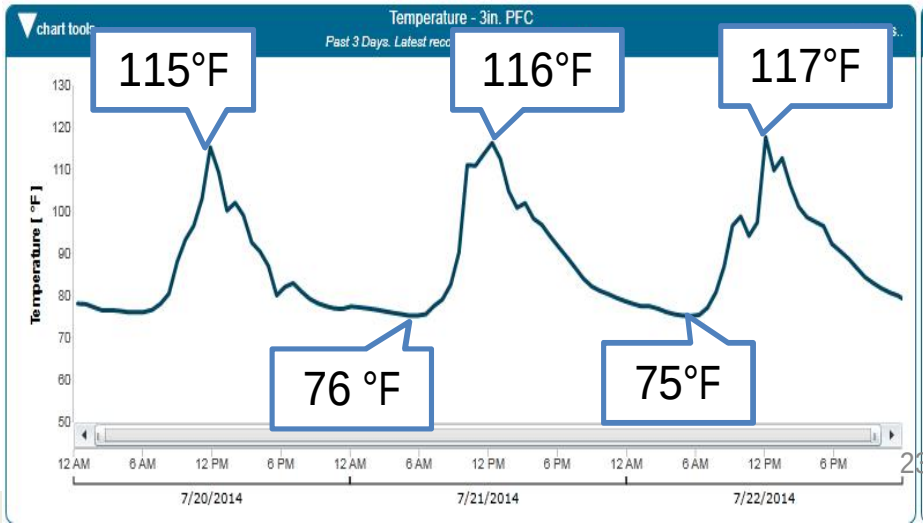
Permeable Friction Course Temp: No Rainfall

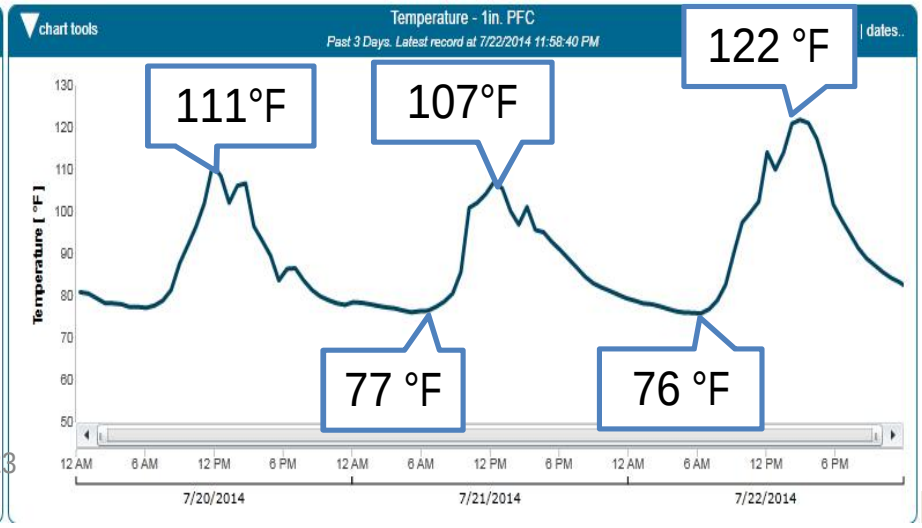
EH: 3





EH: 25





Conclusions and Next Steps

- Reduced cistern discharges to combine sewers/MS4 during rain events
- Preliminary results indicate little differences in surface temperature between PFC and asphalt
- Preliminary results indicate lower peak flow rates in PFC than asphalt

- Next Steps:
  - Turbidity monitoring within cisterns (installed 12/2014)
  - Pollutant monitoring of asphalt, PFC, and cisterns
  - Complete data analysis for next two year monitoring period
  - Compare active systems to passive systems in D.C.

Thank you for your time!

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