Continuous Monitoring and Adaptive Control (CMAC) Retrofits Maximize Your Stormwater Infrastructure Assets





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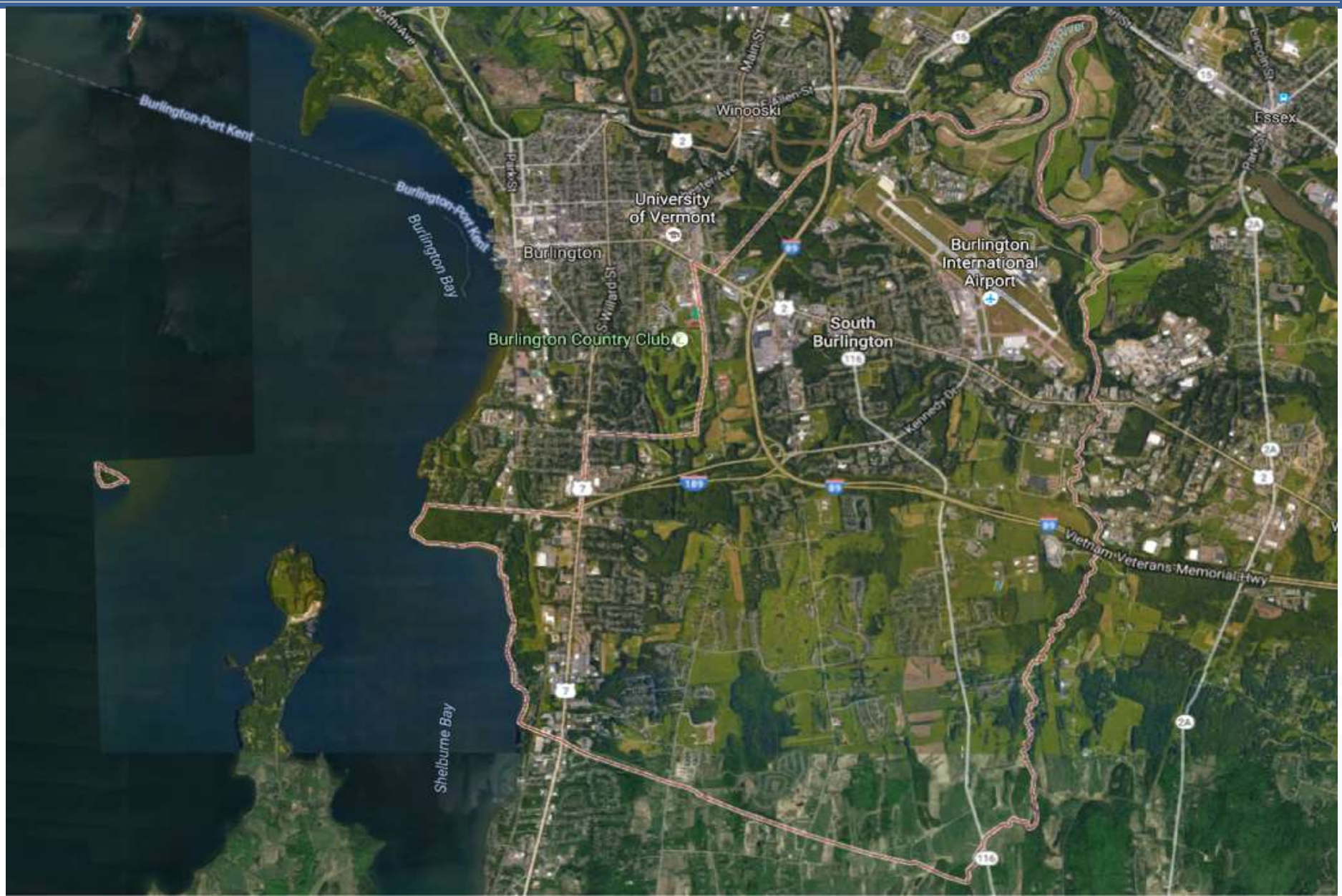
Lake Champlain cleanup could exceed $1 billion

WILSON RING, Associated Press | Published 5:56 p.m. ET Jan. 17, 2017 | Updated 23 hours ago

https://www.google.com/search?q=lake+champlain+algal+blooms&espv=2&biw=1707&bih=844&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjfu6m7kM_RAhXC3YMKHQo2AtwQ_AUIBygC#tbm=isch&q=lake+champlain+water+quality&imgrc=36oEbjQNNnrYsM%3A

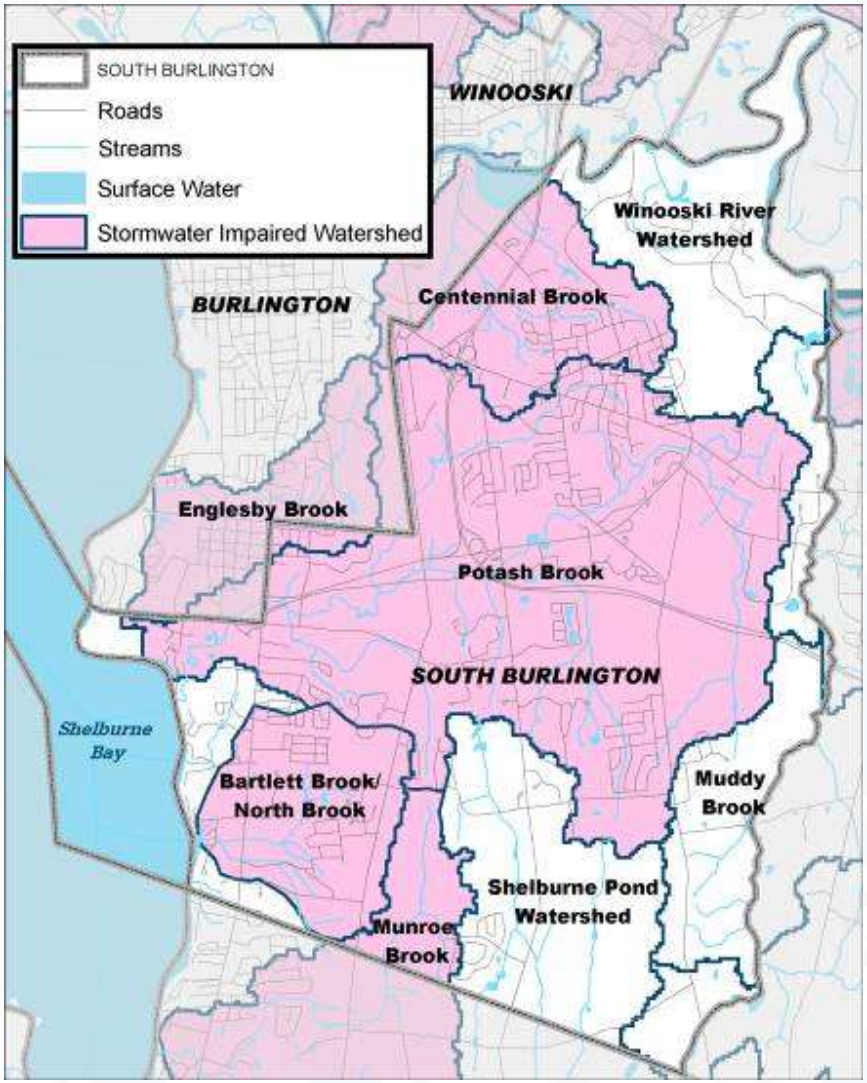
Introduction



Stormwater Impaired Lake and Streams

Five different stormwater impaired watersheds can be found in South Burlington.

Approximately 61% of the land area in South Burlington is in a stormwater impaired watershed.



Flow Restoration Plan (FRP) Schedule

- MS4 Permit FRP requirements:

☑Submit a FRP to VTDEC by October 1, 2016.

Potash Target – 16% Peak Flow Reduction the 1year, 24hr Storm (2.1inches)

☐Implement the FRP by December 5, 2032.

FRP Projects & Cost

Watershed	Number of BMPs in Flow Restoration Plan	FRP Cost	South Burlington's "Share"
Bartlett Brook	18	$3,500,000	$3,450,000
Centennial Brook	27	$10,250,000	$6,694,000
Englesby Brook	5	$900,000	$128,700
Munroe Brook	3	$7,000,000	$48,000
Potash Brook	109	$17,000,000	$13,750,000
Total	**162**	**$38,650,000**	**$24,070,700**

Stormwater Utility Revenue	$1.5MM
Operating Costs	($1.5MM)
Capital Costs	($1.5MM)
Funding Gap	($1.5MM)

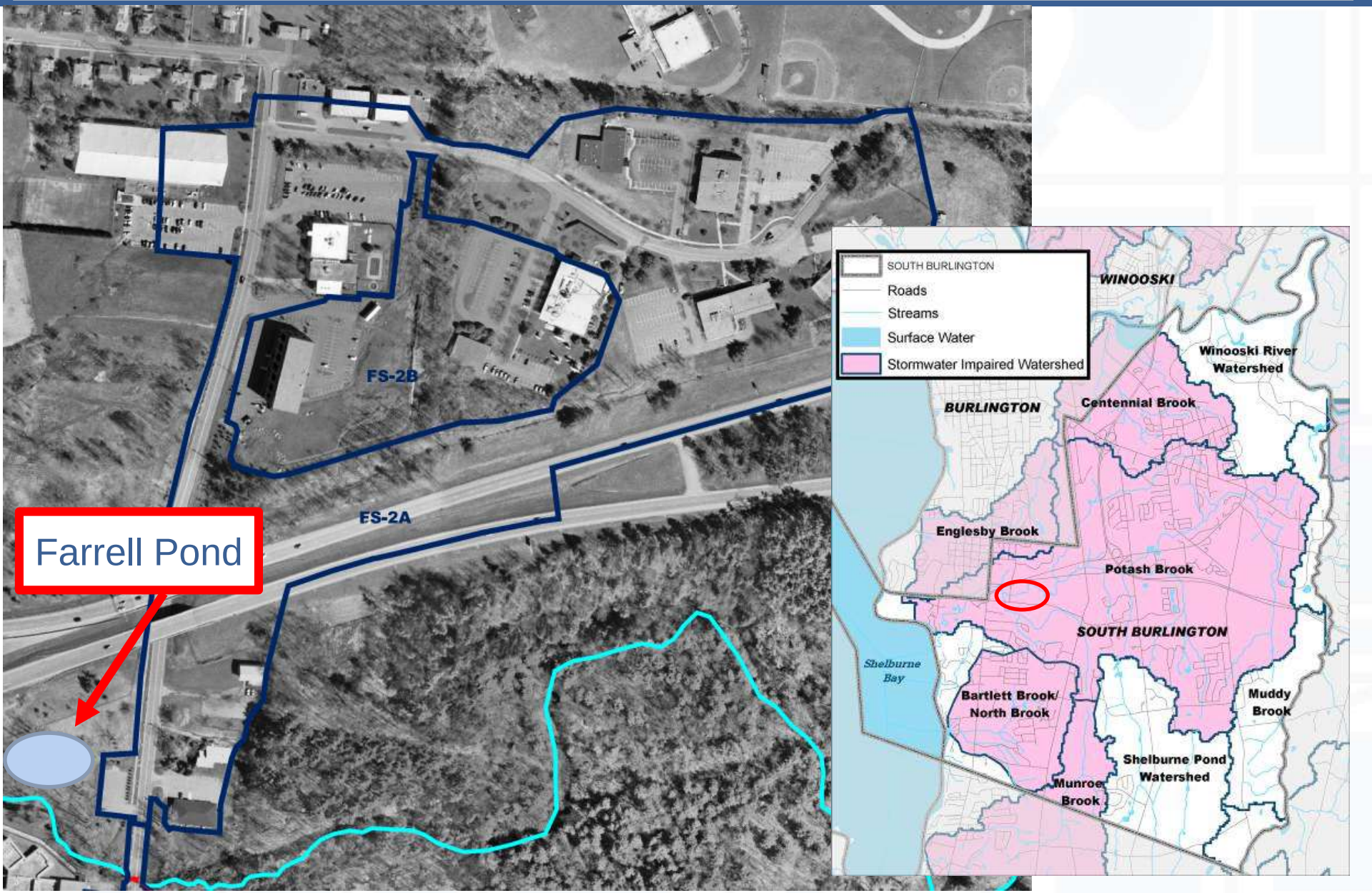
Project Prioritization

- Land Available
  - City Owned or Existing Easements
- Site Conditions
  - Soils & Depth to Ground Water
  - Utilities
- Cost/Volume Treated
  - Drainage Area
  - Retrofit vs. New

Farrell Pond - Overview

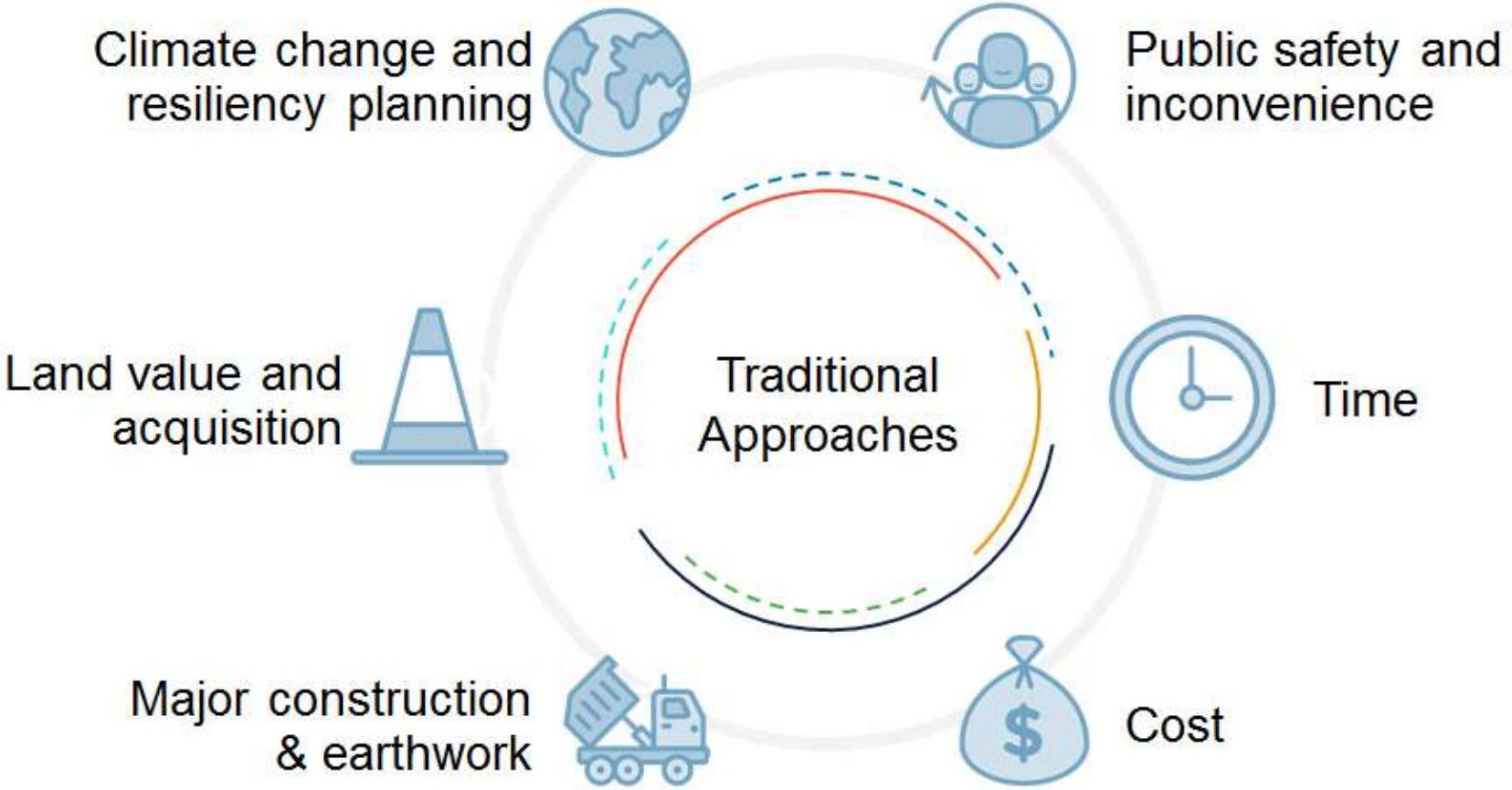
- Land Available
  - ☑ City Owned Easement
- Site Conditions
  - ☑ Existing Pond
- Cost/Volume Treated
  - ☑ Drainage Area: 33 Acres
  - ☑ Retrofit = Low Cost

Farrell Pond – Watershed Overview



Farrell Pond – Passive (pre-retrofit)

Opportunities to enhance traditional approaches

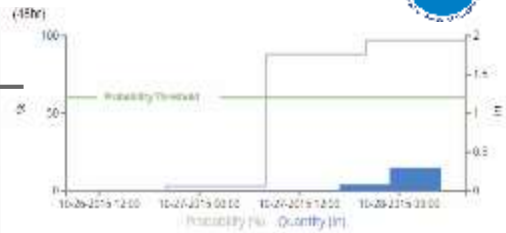


How forecast-based control works

web-based dashboard

Opti
cloud software

NWS forecast



control panel

runoff

Adaptive use of storage - improved
water quality and flood control

water level sensor

actuated valve
outlet or pump

stormwater infrastructure

infiltration

Farrell Pond - CMAC Installation

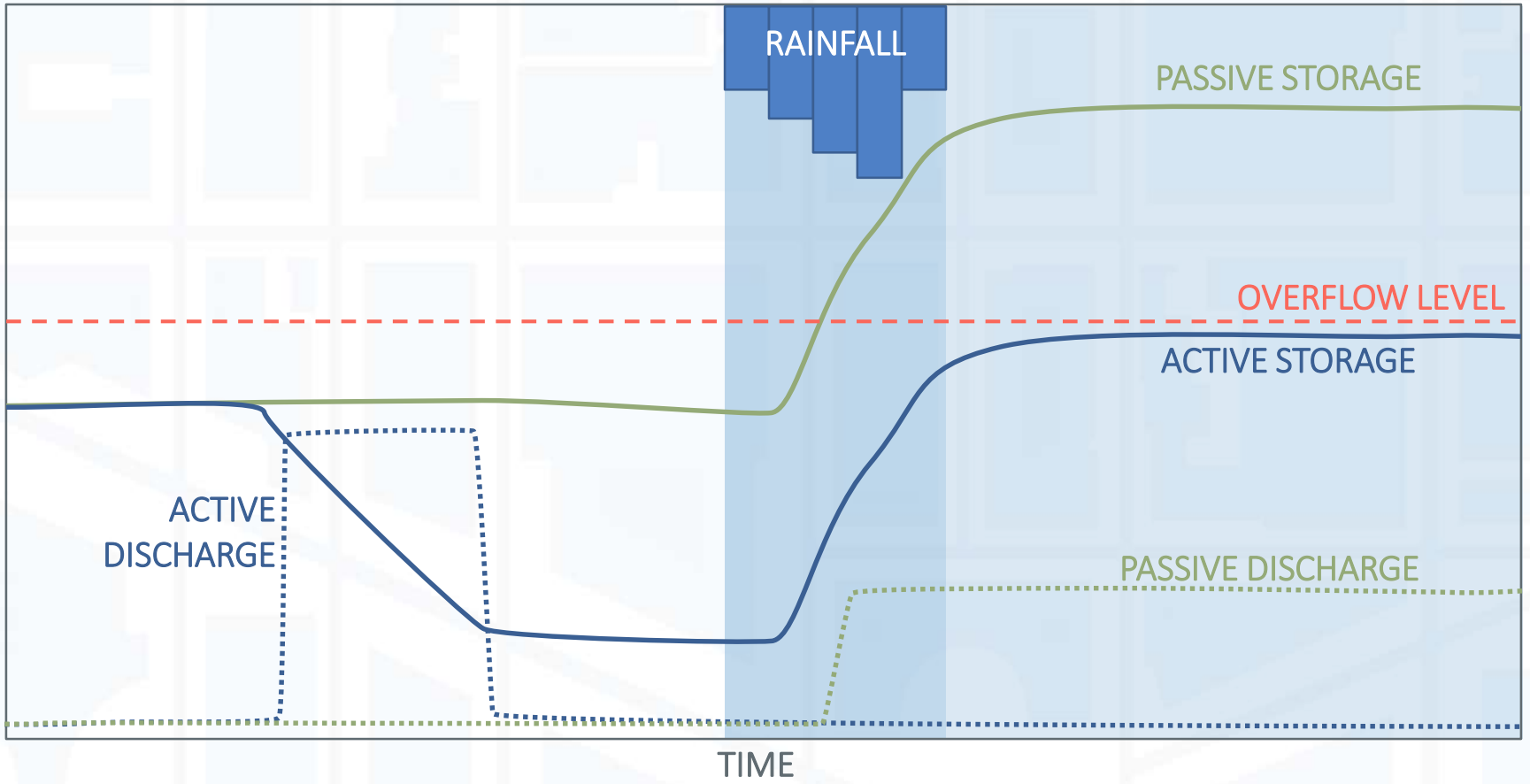
Farrell Pond - CMAC Installation

Farrell Pond - Active

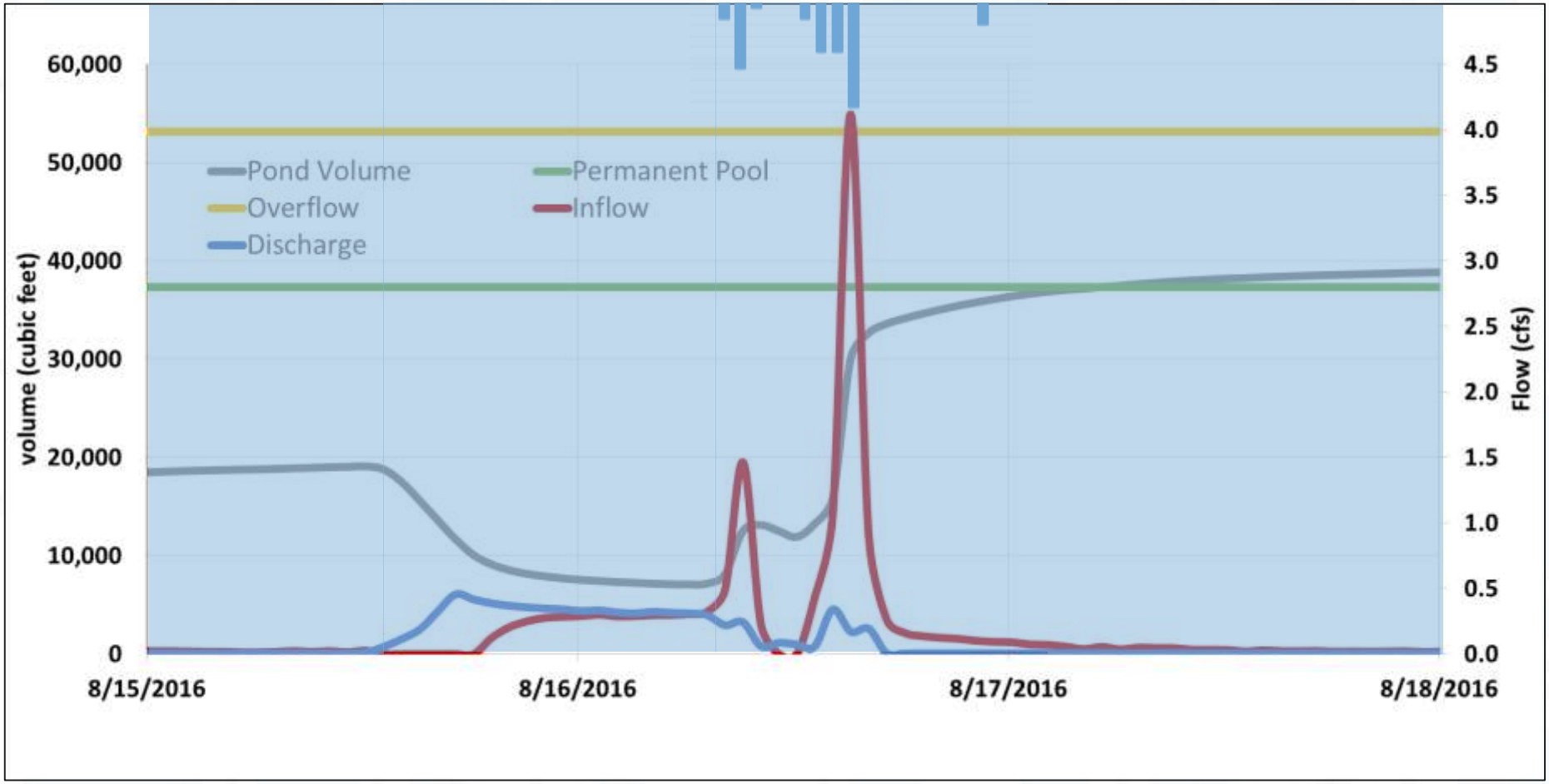
Farrell Pond - Active

Forecast-Based Control

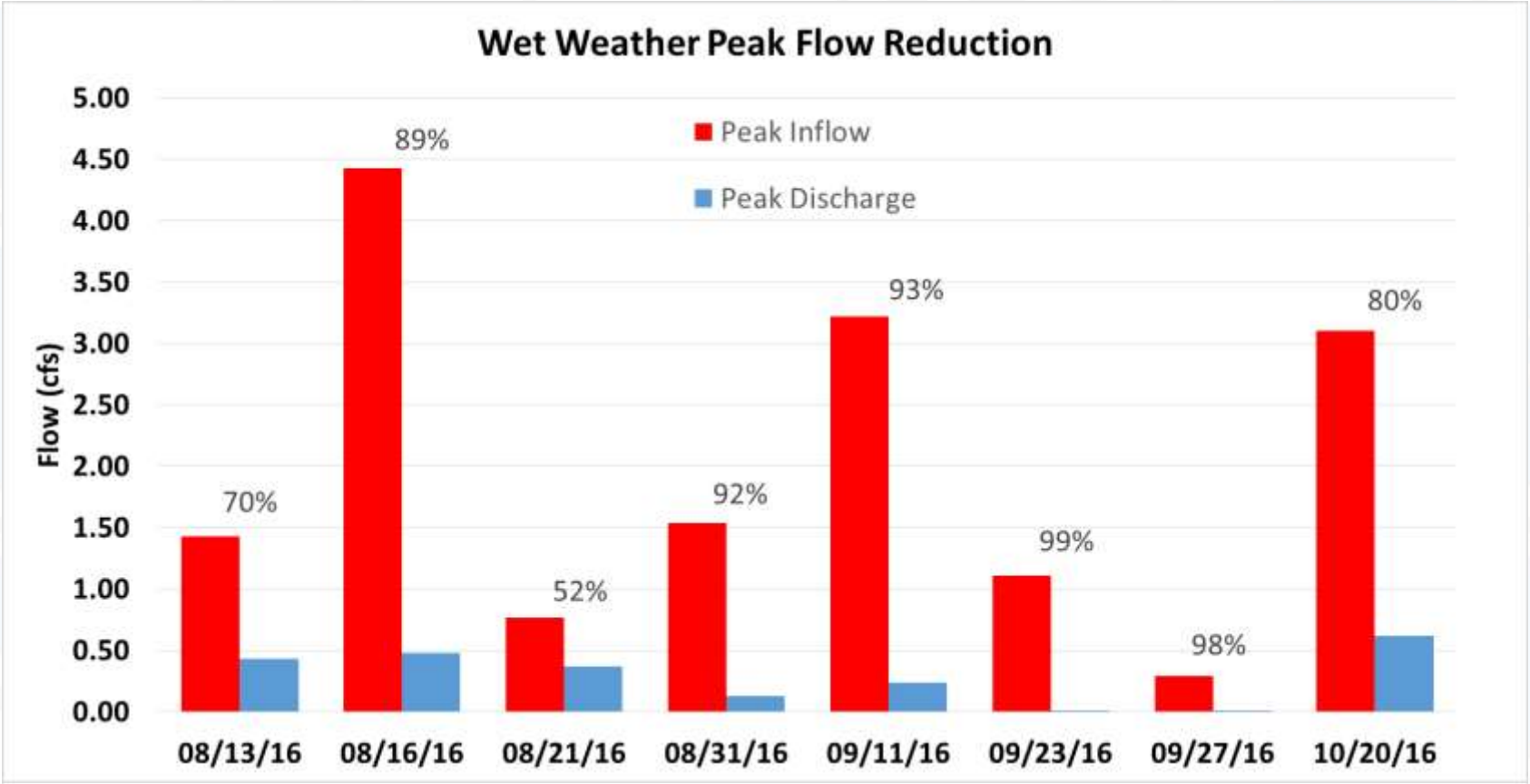
Adjust storage by releasing water in advance of a storm event

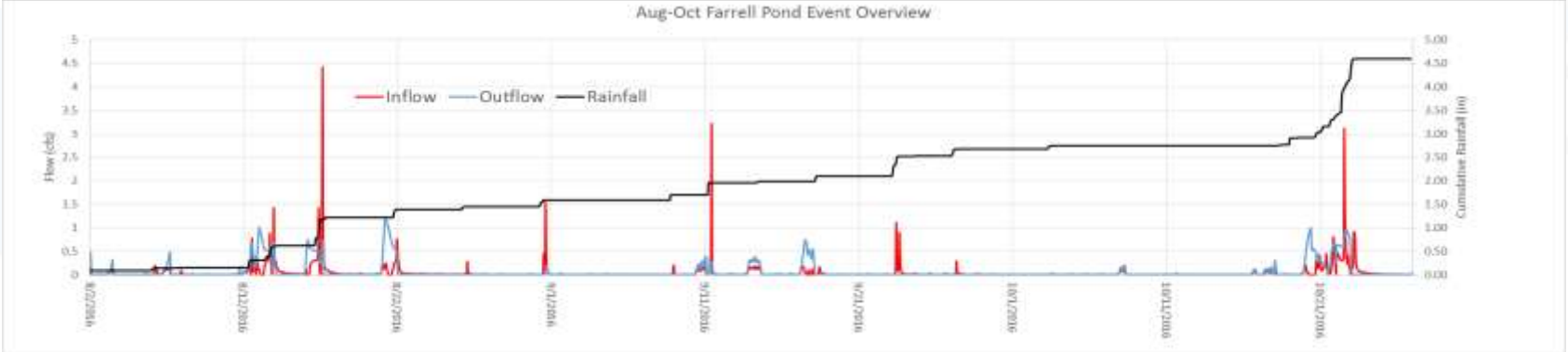


89% Peak Flow Reduction - 0.92in Storm



August – October 2016,
Runoff - 319,000 cu.ft, Avg Peak Flow Reduction - 84%





Farrell Pond – Current Status

Pond Retrofit Comparison
30,000 cu.ft of Incremental Effective Storage

Costs	Traditional Approach	CMAC Retrofit
Design	$25,000	$10,000
Construction, Hardware and Installation	$75,000	$20,000
Capital Cost	$100,000	$30,000
Annual CMAC Services	-	$5,000 (1 site)
Benefits		
Water quality	•	•
Channel protection	•	•
Low impact and fast		•
Meet multiple objectives		•
Adaptive design		•

Next Steps

1. Data Analysis
   a) Water temperature
   b) Incremental benefit analysis (passive vs. CMAC)
   c) Watershed evaluation and site prioritization

2. Further Optimization (meet pre-development hydrology)
   a) Timing
   b) Conservation factor

3. Regulatory Approval

Continuous Monitoring and Adaptive Control