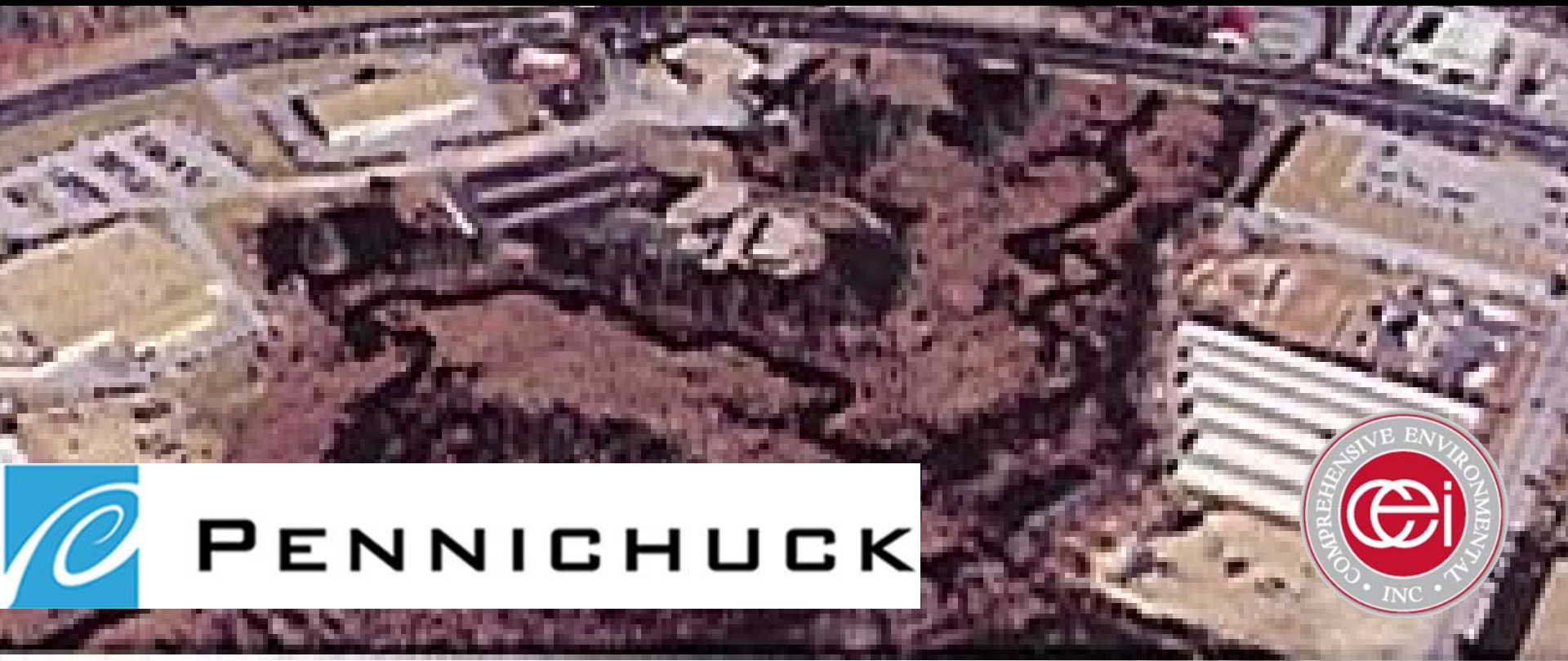


Capital Improvement Planning on a Watershed Scale

Case Study Pennichuck Water Works, Inc.



Acknowledgements

- ▣ New Hampshire Department of Environmental Services 319 Program
- ▣ New Hampshire Department of Environmental Services Source Water Protection Program



Background

- ▣ Pennichuck Water Works, a private water company, serves roughly 100,000 in population
- ▣ Main source is Pennichuck Brook which crosses through five towns
- ▣ 17,000 acre urbanizing/urbanized watershed
- ▣ Flow regime has become more flashy over the years
- ▣ Watershed program has been ongoing for about 10 years



Basic Concepts

- ▣ Quantifying and comparing costs per unit for all projects helps sell them
- ▣ Projects may need to be compared using more than one measure
 - Volume of runoff prevented
 - Volume of runoff disconnected
 - Volume of sediment load collected
 - Change in areal extent of flood zone



Overview

▣ Integrated LID (ILID)

1. Quantified Measureable Results
2. Detention basin retrofits
3. Commercial Retrofits & Maintenance
4. Regulatory modifications
5. Public Education & Outreach

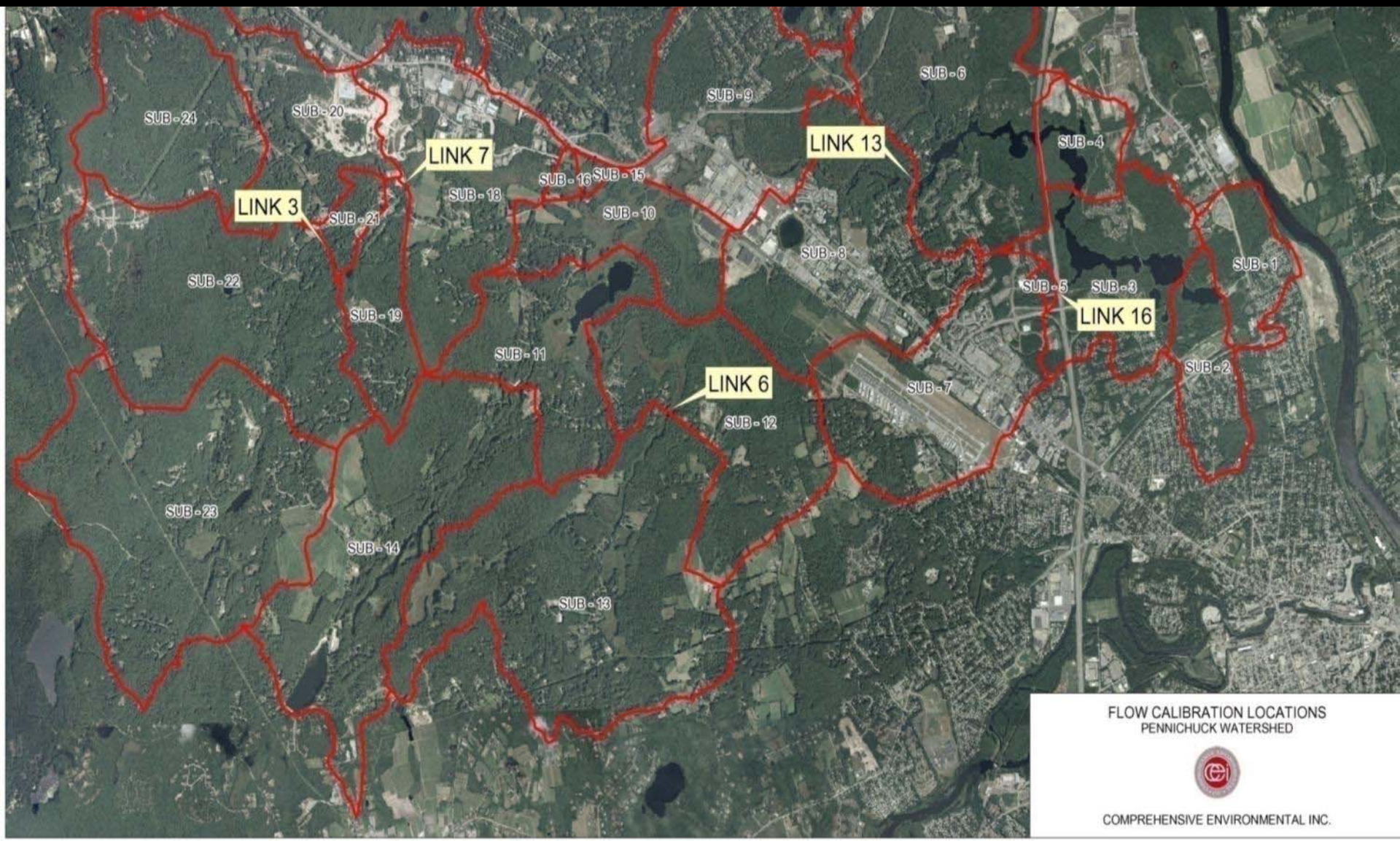


1. Quantified Measurable Results

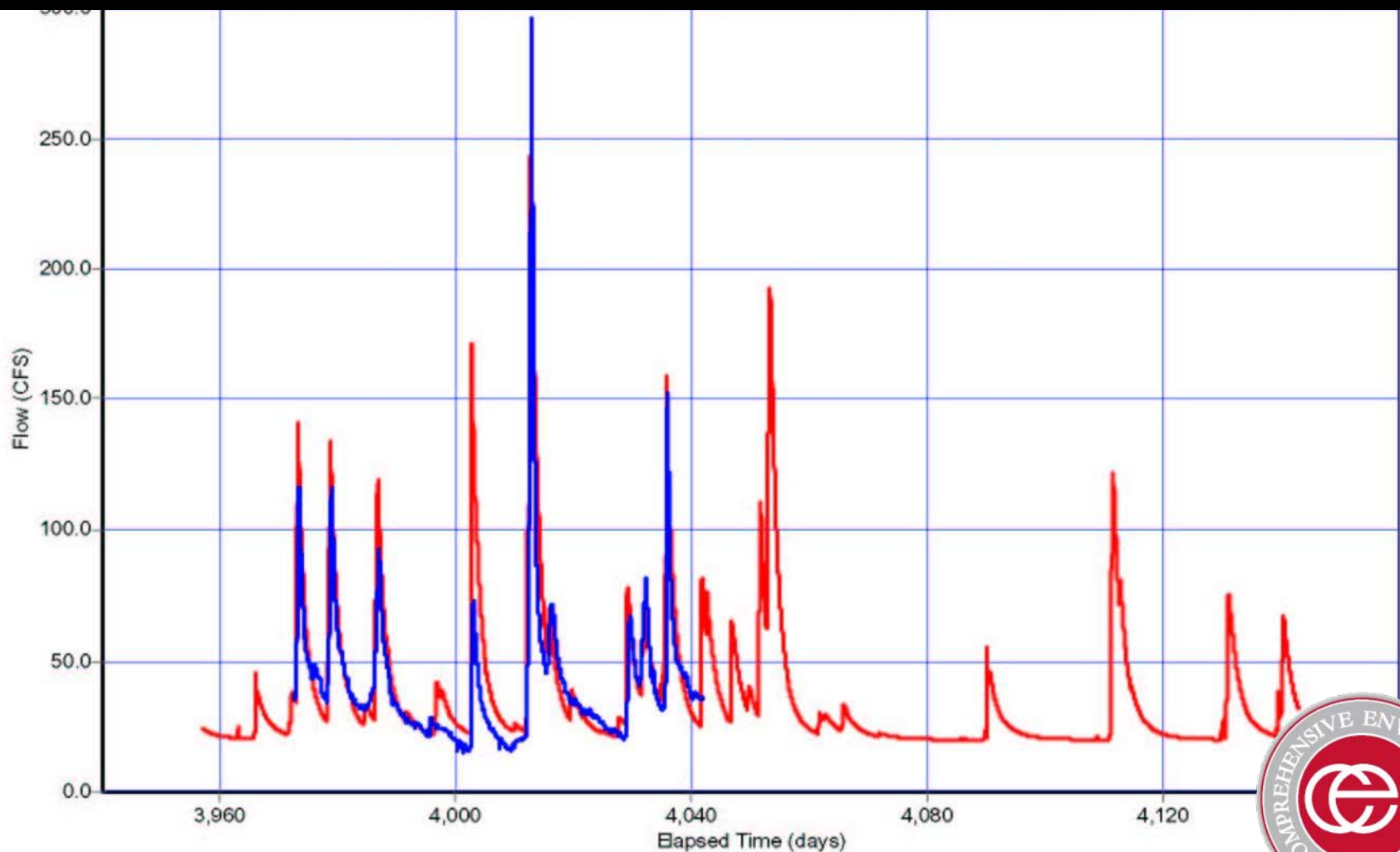
- ▣ Estimated flows based on watershed characteristics
 - Land use
 - Soil infiltration rates
 - Local stream geometry
 - Local precipitation
- ▣ Calibrated with observed streamflows from data loggers



2. Quantified Measureable Results



1. Quantified Measureable Results



1. Quantified Measureable Results

1. All projects are monitored to evaluate results
2. Estimated quality calibrated to the real time monitoring
3. Finished projects compare estimated and measured volumes of water/sediment
4. 10-Year CIP tied to estimated removals



1. Quantified Measureable Results

10-Year Capital Improvement Plan

- ▣ Quantifiable – identifies best alternatives
- ▣ Clear and concise implementation
 - Who, when, where, how much?
- ▣ Easy to update
- ▣ **Prioritizes future spending to get the greatest benefit**



1. Quantified Measureable Results

Initial 10-Year CIP

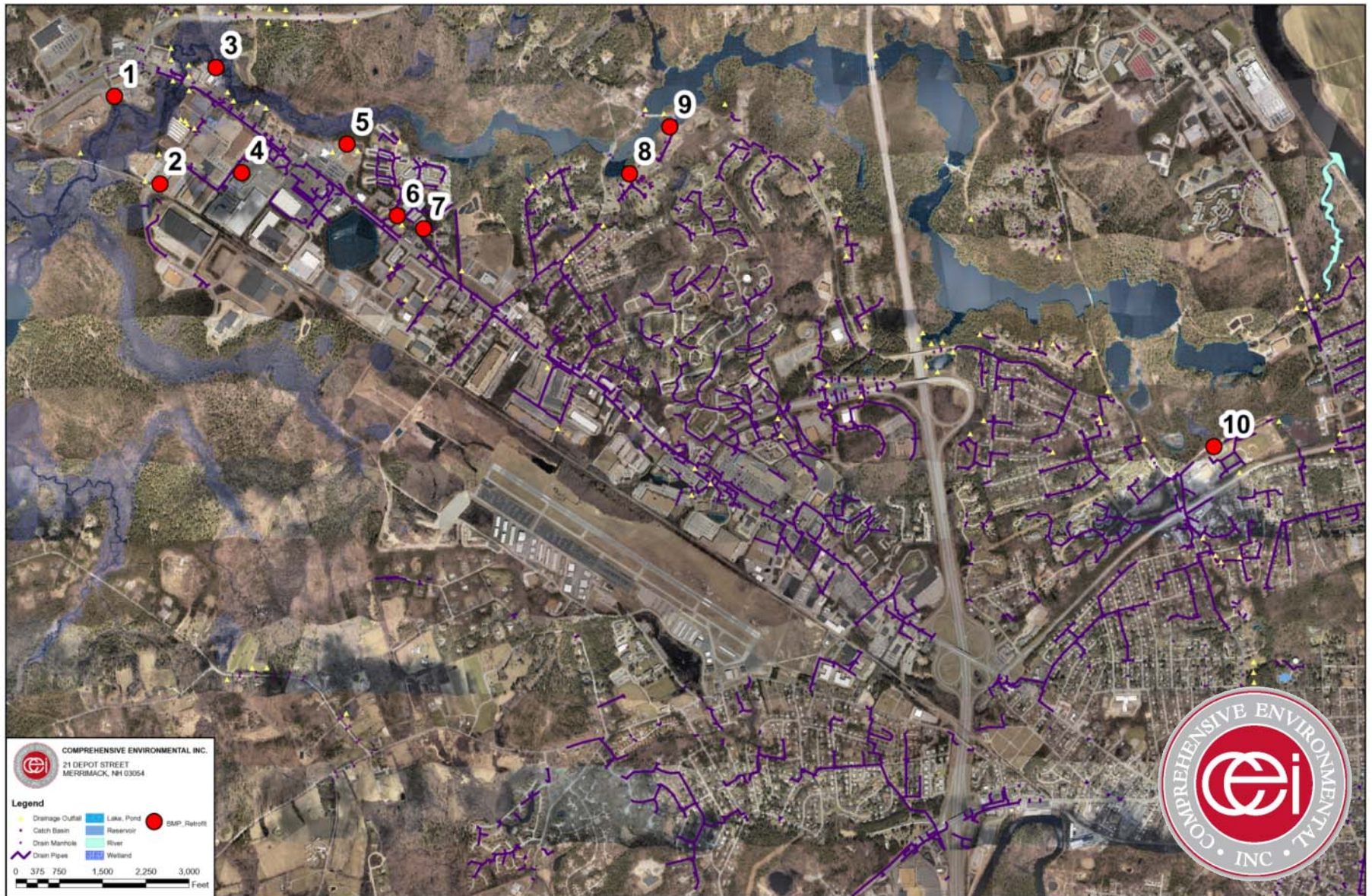
Option	Measurement
1. Public Ed	Volume of Runoff Prevented
2. Retrofit Detention Basins	Volume of Runoff Disconnected
3. Local Adoption of State Stormwater Regulations	Volume of Runoff Disconnected & Prevented
4. Increased Maintenance Commercial	Volume of Sediment Prevented
5. Roof Leader Disconnection Program	Volume of Runoff Disconnected
Program Cost = ~\$2 Million	

2. Detention Basin Retrofits

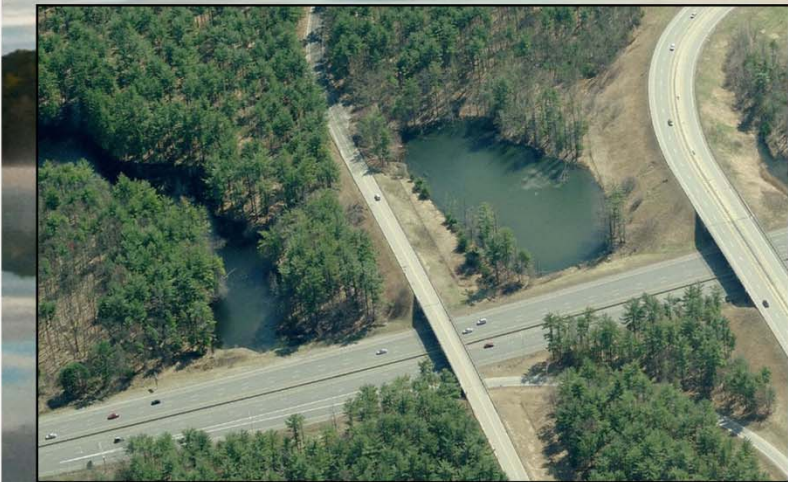
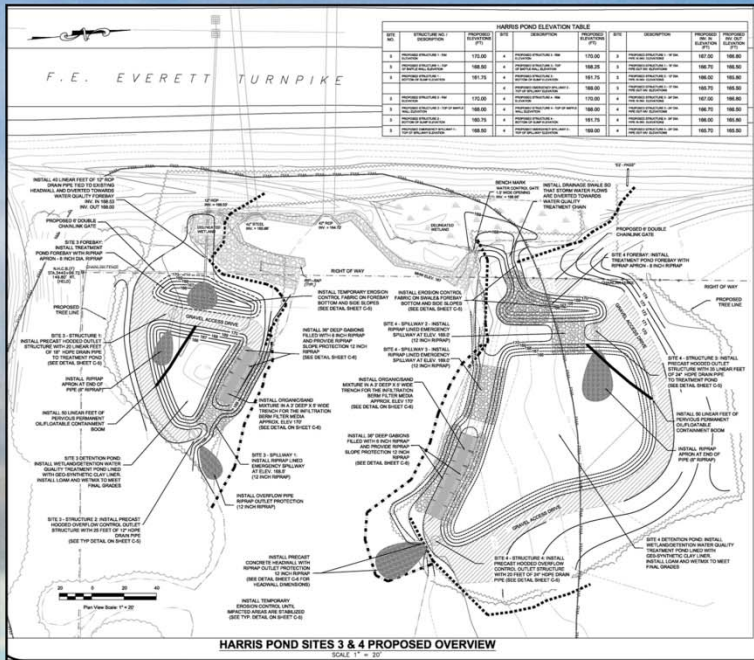
- ▣ Chose largest Drainage Areas first
- ▣ Estimated Impervious Area
- ▣ Majority Land Use
- ▣ Majority hydrologic soil group
- ▣ Distance to Water Body
- ▣ Discharge Path
- ▣ Subwatershed
- ▣ Available Land (sf)
- ▣ Current WQV?
- ▣ Pretreatment?
- ▣ Short-Circuited?
- ▣ Maintained?



POSSIBLE RETROFIT LOCATIONS



TURNPIKE WATER TREATMENT AND SPILL CONTROL PROJECT



Everett Turnpike was built next to Harris Pond, the source water for Pennichuck Water Works and the City of Nashua. To protect the water supply, a detention pond was built between busy Tinker Road and Harris Pond. The basin receives over 160 acres of stormwater, but is inaccessible for maintenance. Harris Pond is also unprotected from spills at this busy intersection. CEI's innovative design provided pretreatment and wetlands treatment for Tinker Pond, previously known by locals as "Scum Pond". New spill control was also put in for the Turnpike, along with a maintenance road. The project is estimated to remove >70 lbs/year of phosphorus from entering the water supply where it causes algae blooms among other problems.



2. Detention Basin Retrofits

BMP Description	Regulation Type	Drainage Area (Acres)	Estimated Impervious Area (Acres)
Blackstone Apartment Complex Wet Pond & Gravel Wetland	Retrofit	64.5	33.8
Somerset Plaza Swale	Retrofit	65.1	48.8
Crowne Plaza Wet Pond & Swale	Redevelopment Site	83.1	45.8
PC Connection Infiltration Dividers & Treatment Pond	Retrofit	27.6	21.9
Abandoned Saturn Dealership Infiltration Dividers, Vegetated Buffers & Swale	Redevelopment Site	2.9	2.5
Post Office Gravel Wetland	Retrofit	24.4	18.3
Northwest Blvd/ RR-Xing Bioretention & Swale	Retrofit	4.6	4.0
White Oak Drive Residential Detention Basin 1 & 2	Retrofit	25.4	6.4
Ford Dealership Swale & Pocket Wetland	Retrofit	13.1	9.0
Kessler Farms Pocket Wetland	Retrofit	25.4	10.4

3. Commercial Retrofits

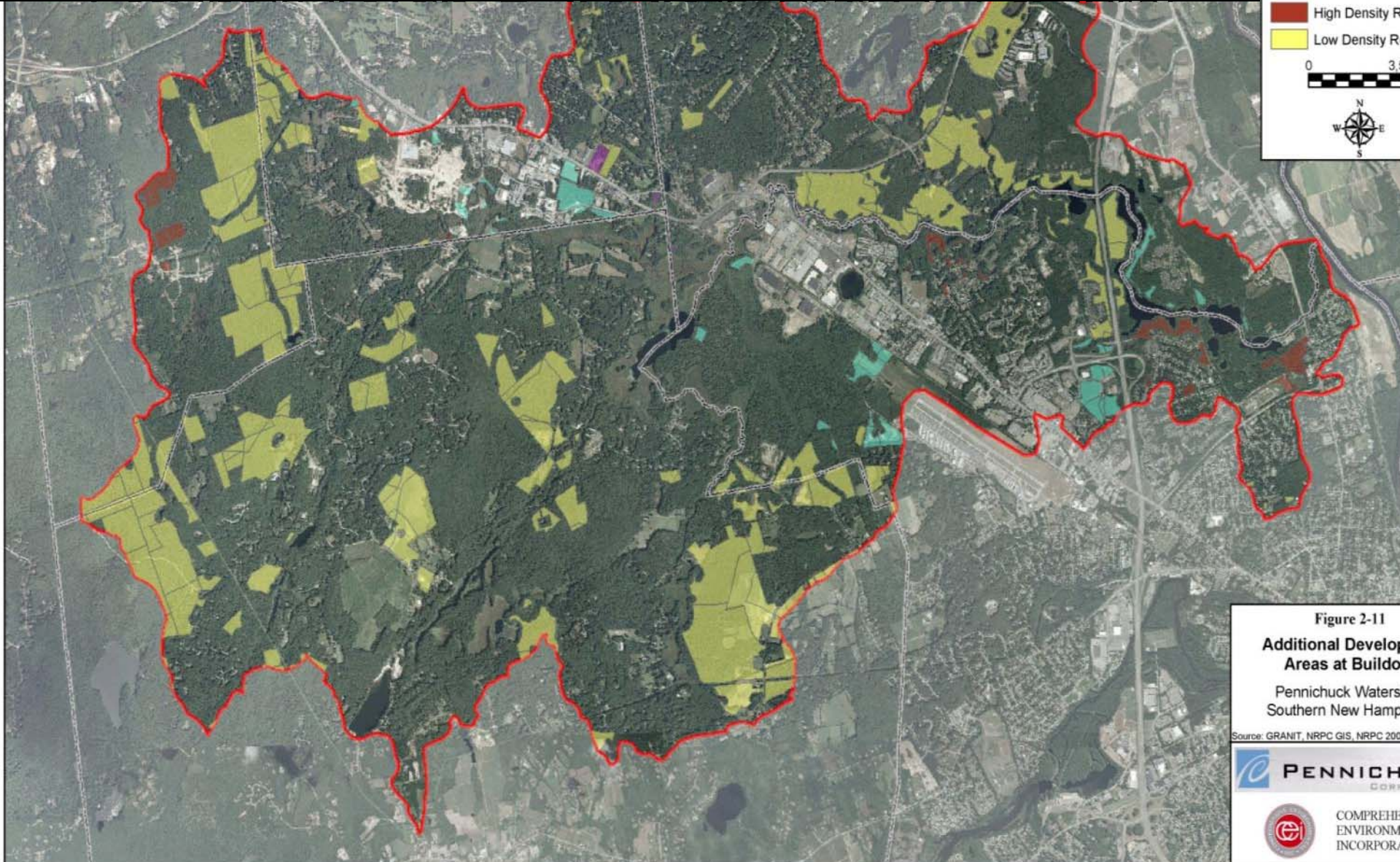
- ▣ LID for commercial redevelopment
 - Pennichuck Square demonstration
 - Initiate grant program for communities to foster LID in redevelopment projects



4. Regulatory Modifications



4. Regulatory Modifications Additional Developable Areas



4. Regulatory Modifications

- ▣ 1" Water Quality Volume
- ▣ Pretreatment Requirements
- ▣ Channel Protection
- ▣ Recharge requirements
- ▣ Town-by-town Implementation encouraging adoption of state AOT standards on a smaller scale



5. Public Education & Outreach

Education = future

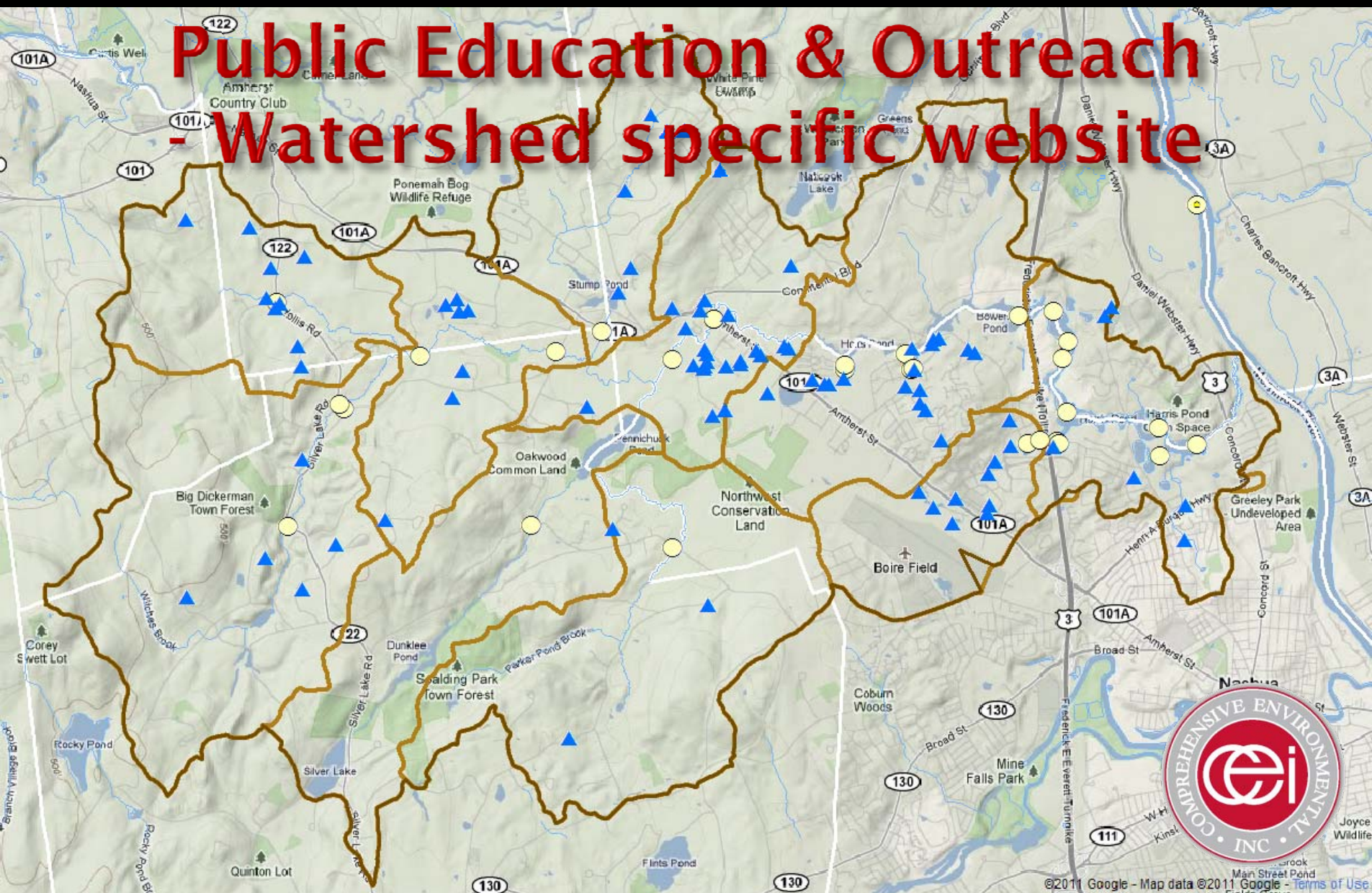


5. Public Education & Outreach

- a. Street Specifications Manual containing conceptualls and specifications for LID BMPs
- b. Storm drain marking program
- c. Community Based Social Marketing Program
- d. Watershed specific website and outreach
- e. School education program

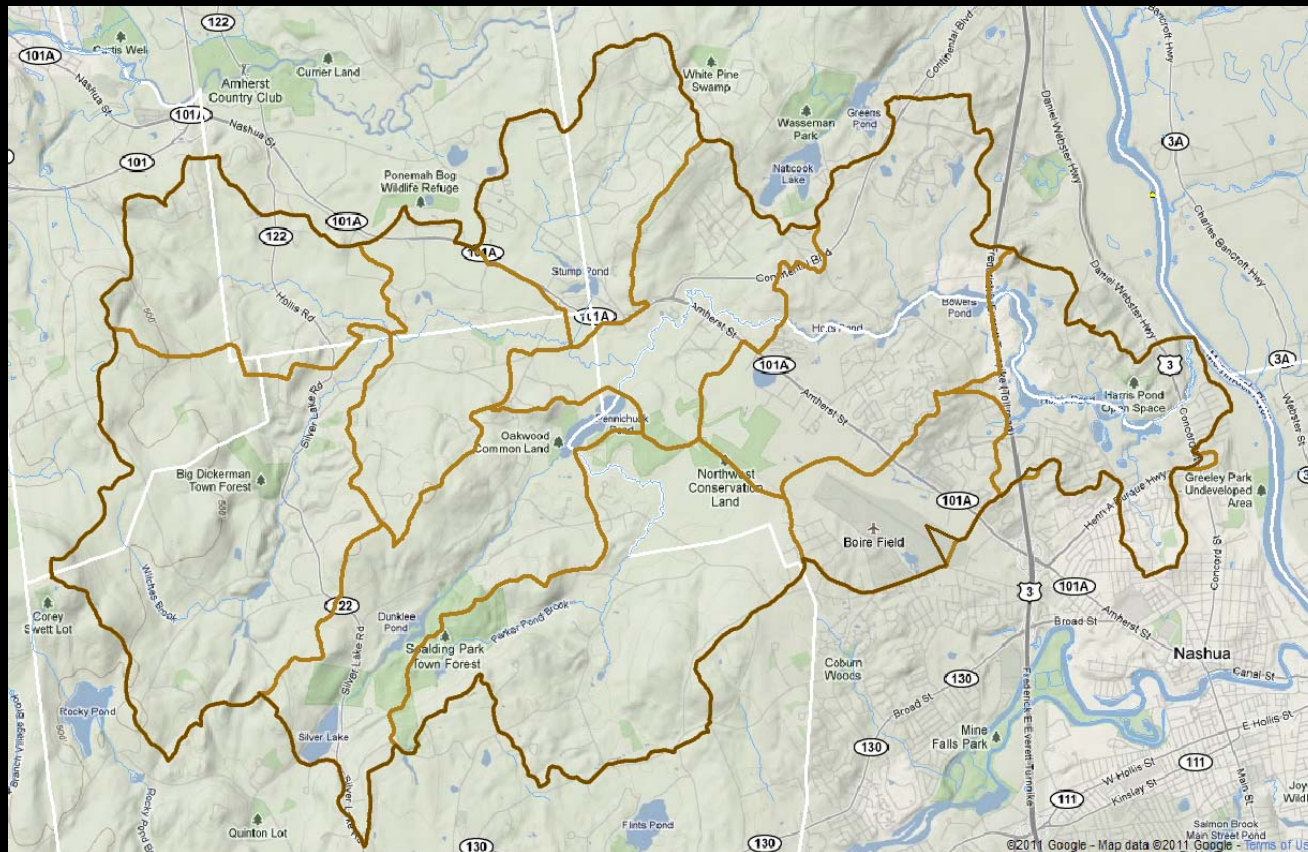


Public Education & Outreach - Watershed specific website











About the Pennichuck Watershed | [Watershed Interactive Map](#) | Watershed Data Explorer | Watershed Initiatives and Resources

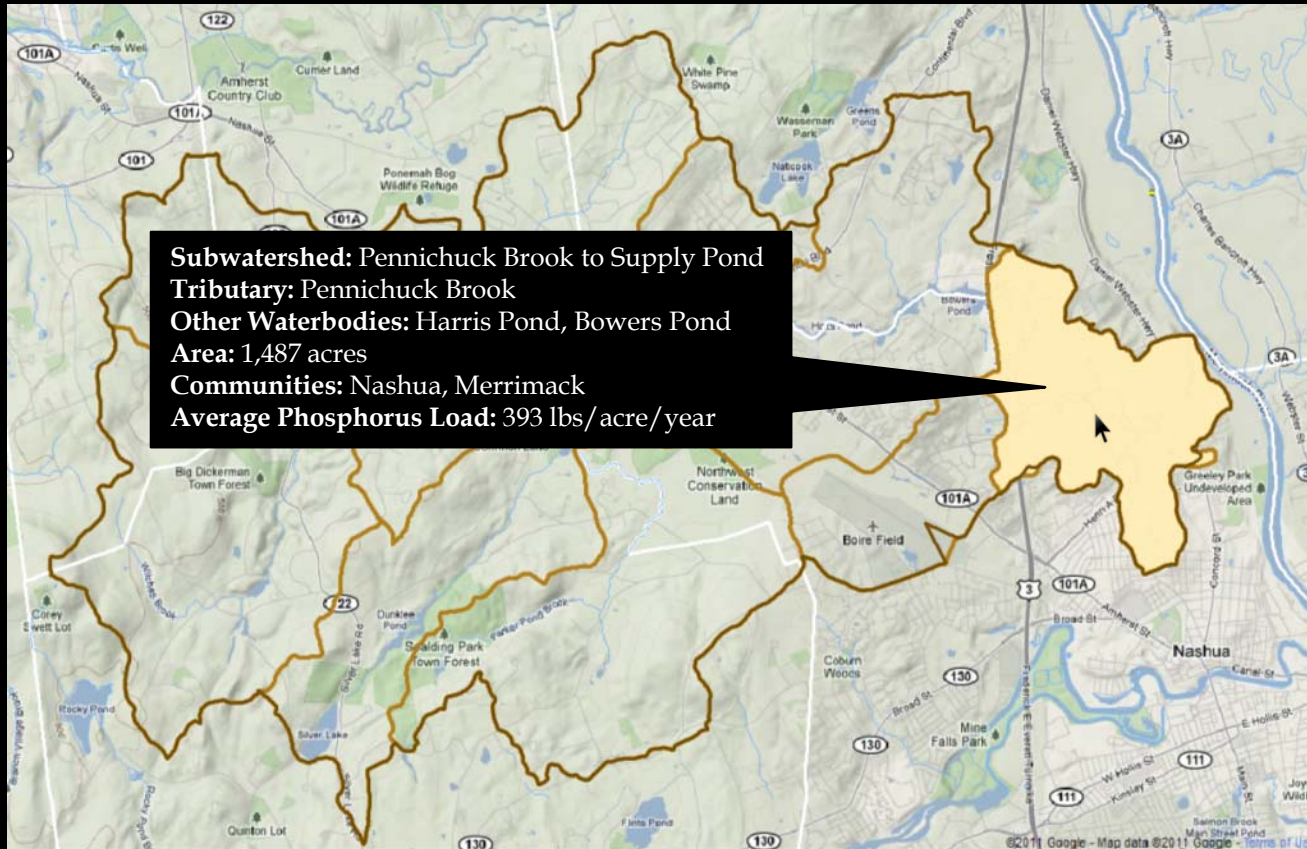


Layer

-  Pennichuck Watershed
-  Town Boundaries
-  Subwatersheds
-  Monitoring Sites
-  Best Management Practices
-  Storm Drain Marking



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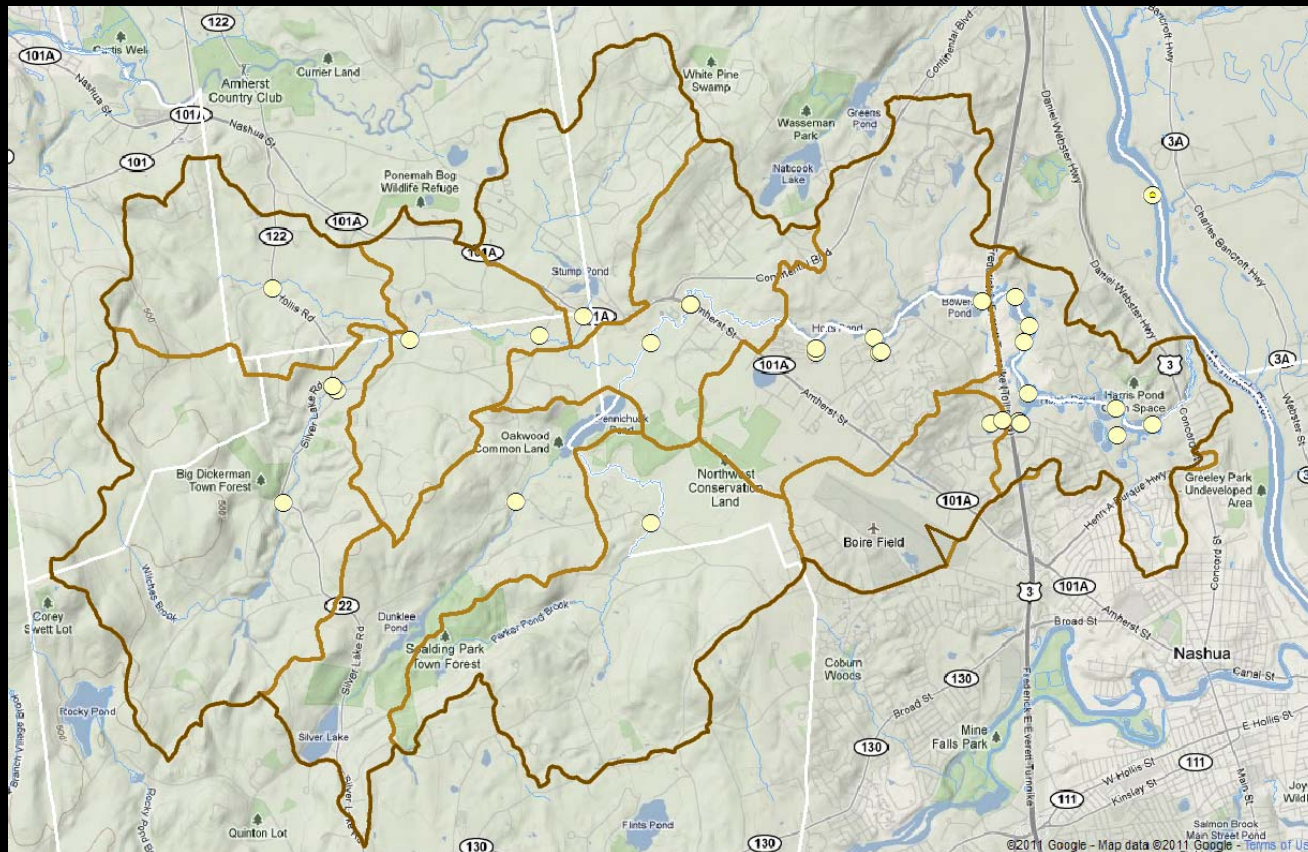


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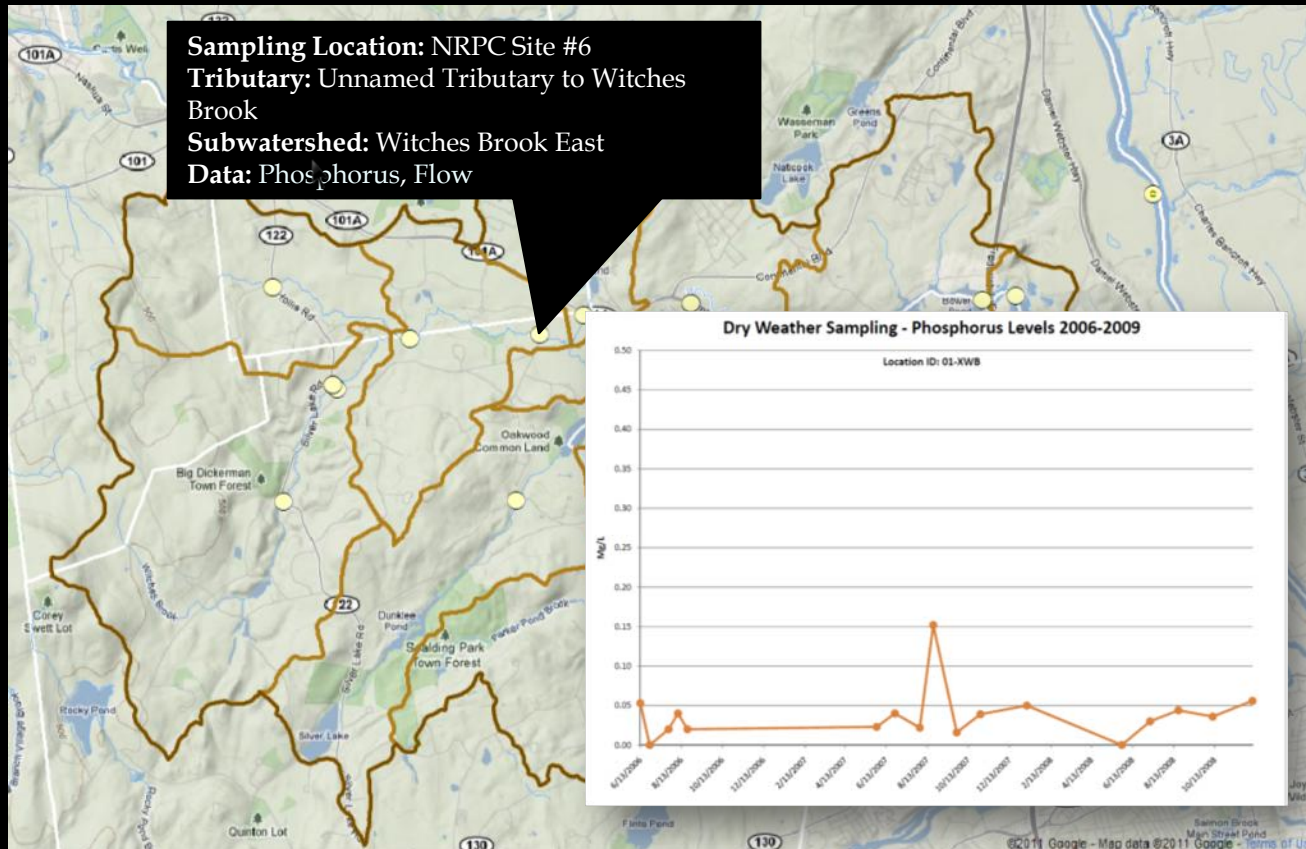


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Layer

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Increased Maintenance in Commercial Areas

- ▣ Pennichuck Watershed Stewards
 - Contact vendors for interest in discounting
 - News articles promoting water-friendly business (e.g., clean catch basins annually, infiltrate roof runoff, etc.)
 - Link to “good watershed stewards” on Pennichuck site
- ▣ Signage advertising “green status”
 - Green Watershed Business
 - Friends of the Pennichuck Watershed



Conclusions

- ▣ Quantifying and comparing costs per unit for all projects helps sell them
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