Falmouth Case Study

Traditional Engineering Solutions Become the Cornerstone of Adaptive Management Strategy

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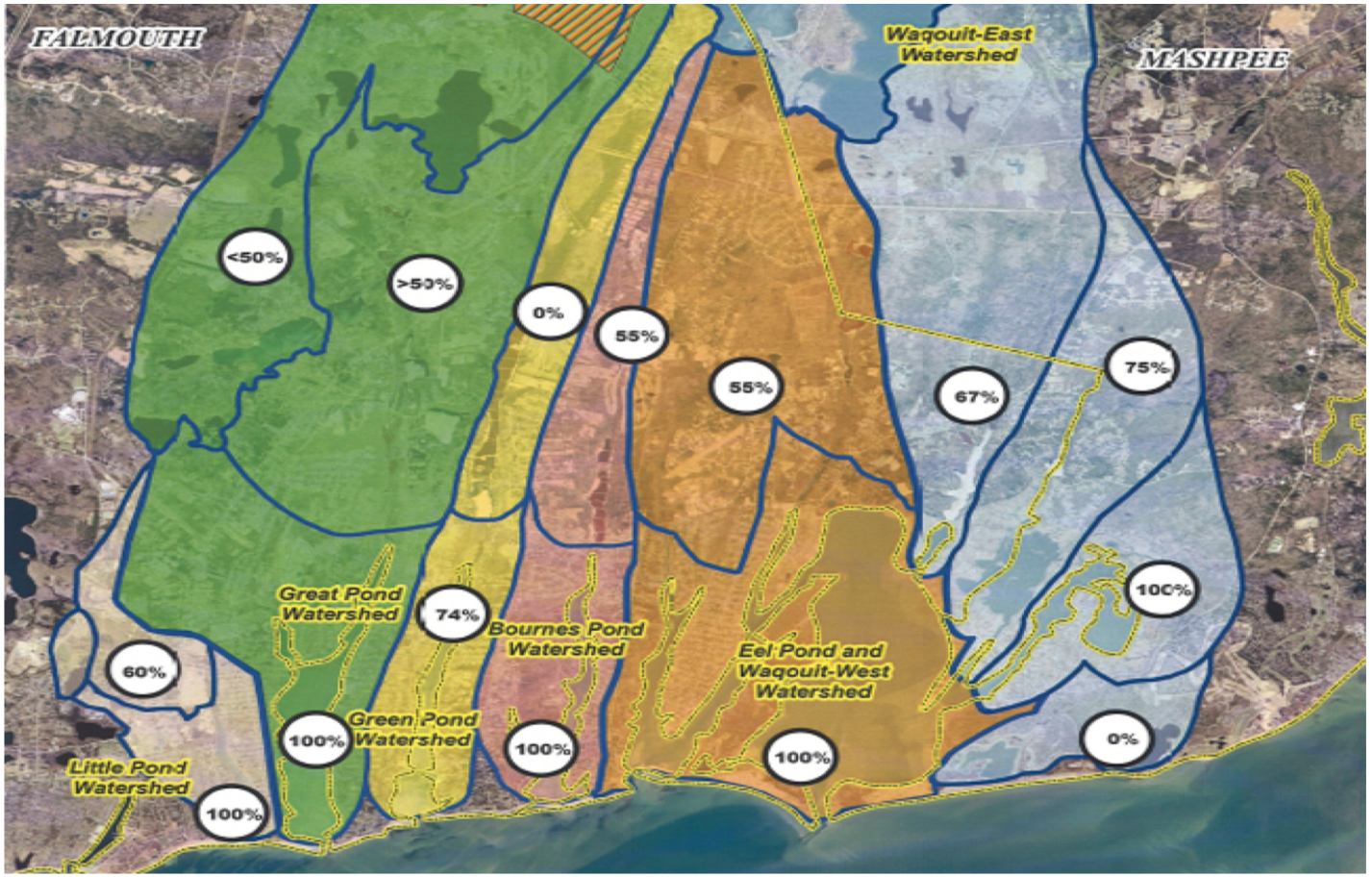
Outline

1. Background and history
2. Adaptive Management Alternatives
3. Little Pond Sewer Project - Flood plain sewer design
4. Next steps

Setting

- Falmouth is located on Cape Cod
- Coastline along Buzzards Bay, Vineyard Sound
- The Town contains 15 coastal embayments / watersheds

Southern embayments CWMP



Wastewater Nitrogen Reduction to Meet TMDLs

CWMP challenges and strategy

Town Challenges

- Scale of nutrient problem
- Cost of sewering solution
- Interest in alternative / non-traditional solutions

Town Strategy

- Move forward with sewers in one of most impacted watersheds
- Simultaneously pilot and gather data on alternative strategies
- Incorporate results into adaptive management solution for all watersheds

Alternative nutrient management solutions

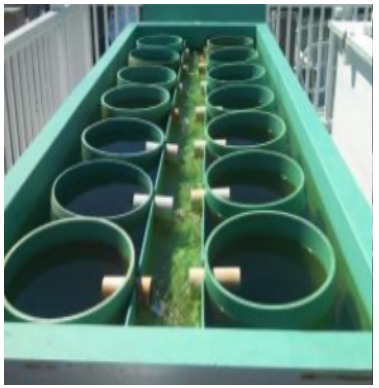
Water Quality Management Committee –

Leadership Role in piloting, collecting data and evaluating these strategies

- Shellfish aquaculture
- Fertilizer management
- Inlet widening
- Permeable reactive barriers
- Improved stormwater management
- Eco-Toilets
- Enhanced I/A systems for non-sewered properties

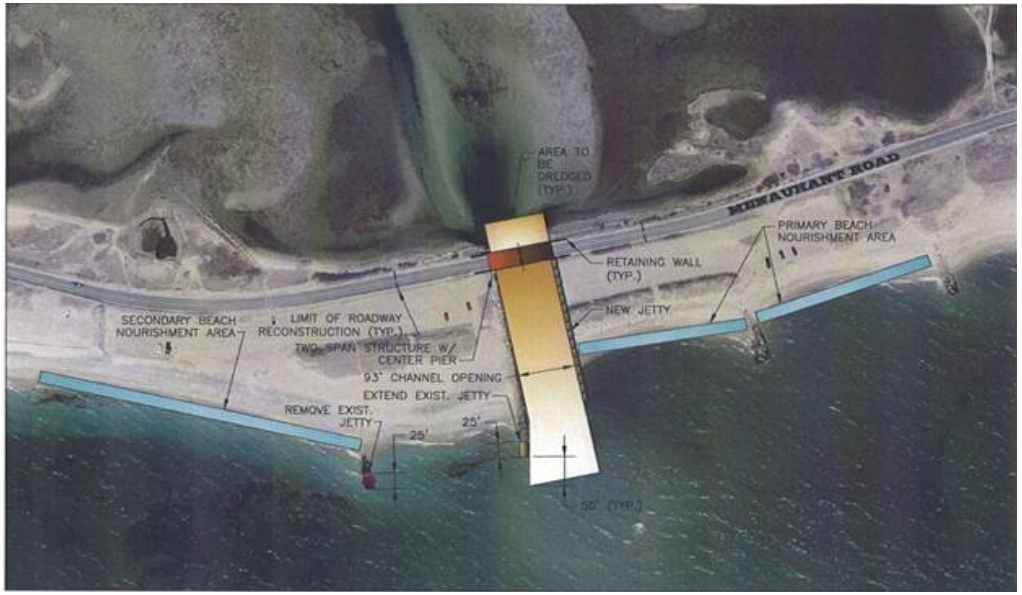
Shellfish aquaculture

- Water Quality Management Committee collaborated with Town Marine Environmental Services (MES)
  - Grew 1-2 million oysters in Little Pond 2013 - 2015
  - Monitored water quality – Overall TN levels in Little Pond did not change significantly but appeared to improve water clarity and reduce water TN concentration locally
  - MES grew > 3 million oysters in Little Pond in 2017, relayed to other ponds for recreational/commercial harvest.
  - Estimate nitrogen removal based on increase in oyster mass x N content (%) of shell and tissue
- Appealing/popular program – cultural history, recreation, not expensive, not “big pipe”



Inlet widening

- Bournes Pond widening project
- Doubling inlet width, from 45 ft to 90 ft to improve pond flushing
- Anticipated to achieve 50% of the required removal of controllable load to meet TMDL
- Would not be equally effect everywhere - depends on bathymetry of pond, etc
- Designing improvements to protect access road as well

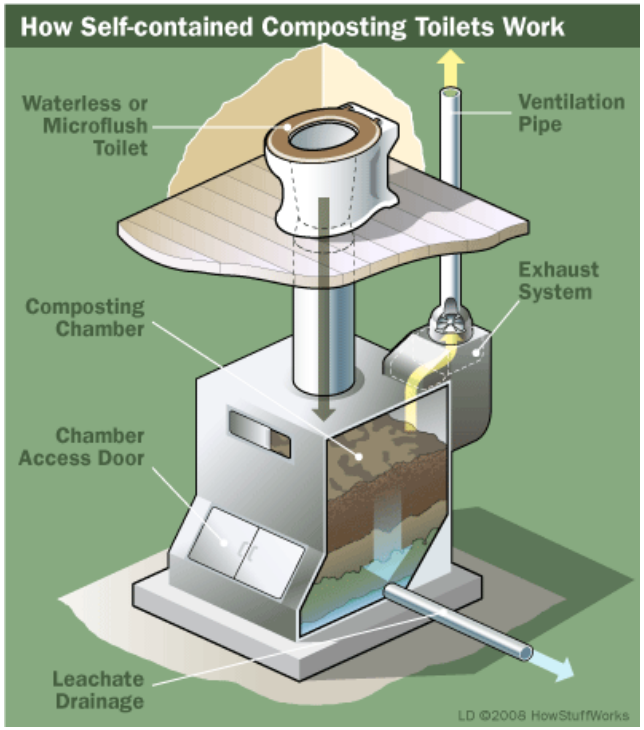


Fertilizer management

- Town passed nitrogen control bylaw
- No fertilizer use within 100 feet of resource areas
- No application of fertilizer from October 16 through April 14
- No application of fertilizer during heavy rains in the growing season
- Golf course application limited to 1 lb of nitrogen per 100 sf for entire growing season
- Reminder letter each year

Eco toilets

- Town incentive program ($5000)
- 9 participants (+2 pre-existing)
- County monitored and issued report summarizing results April 2018
  - Reduces water use
  - Can significantly reduce nutrient load
  - Need to remove residuals from watershed to actually remove load
  - Low participation in program

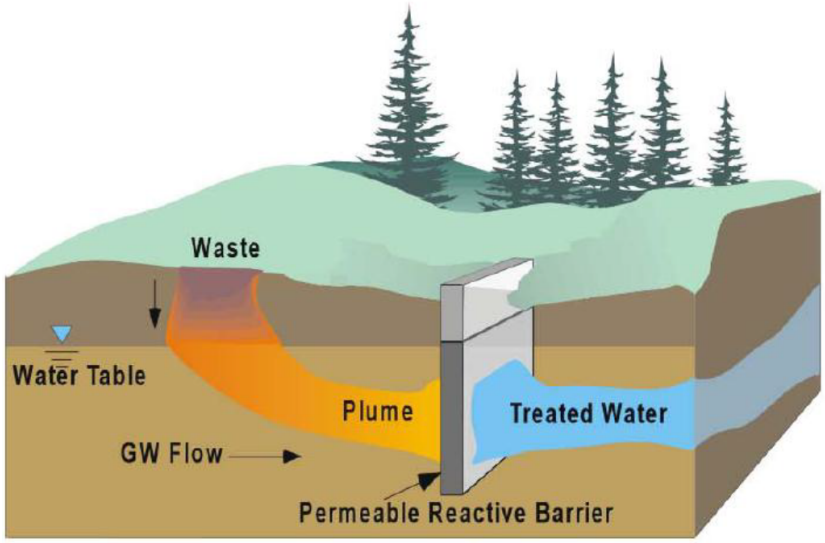


Enhanced innovative / alternative systems

- West Falmouth Harbor Shoreline Septic System Remediation Program
- Collaboration: Buzzards Bay Coalition, Town WQMC
- 20 I/A systems in Phase 1, 10 more in Phase 2
  - Blackwater holding tanks
  - HOOT systems
  - Eliminite
  - Layered SAS
- Incentive/reimbursement ($7,500-$10,000)
- Intensive monitoring program
- Goal: enhanced I/A septic systems effluent standard of 10 mg/L nitrogen

Permeable reactive barriers

- Trench or injection of a liquid carbon source
- Evaluated sites based on depth to water table, distance from wetlands, and accessibility for monitoring wells
- Completed groundwater and soils investigations of sites in 2 watersheds
- Favorable where elevated nitrate concentration at shallow depth, high horizontal groundwater velocity
- Seeking grant funds for a PRB pilot – likely carbon injection



Improved stormwater management

- Stormwater runoff contributes 5-10 percent of the controllable nitrogen sources entering Falmouth's watersheds
- WQMC working with DPW to ID locations where BMPs could be installed to mitigate stormwater nitrogen input to coastal ponds

Traditional nutrient management solutions

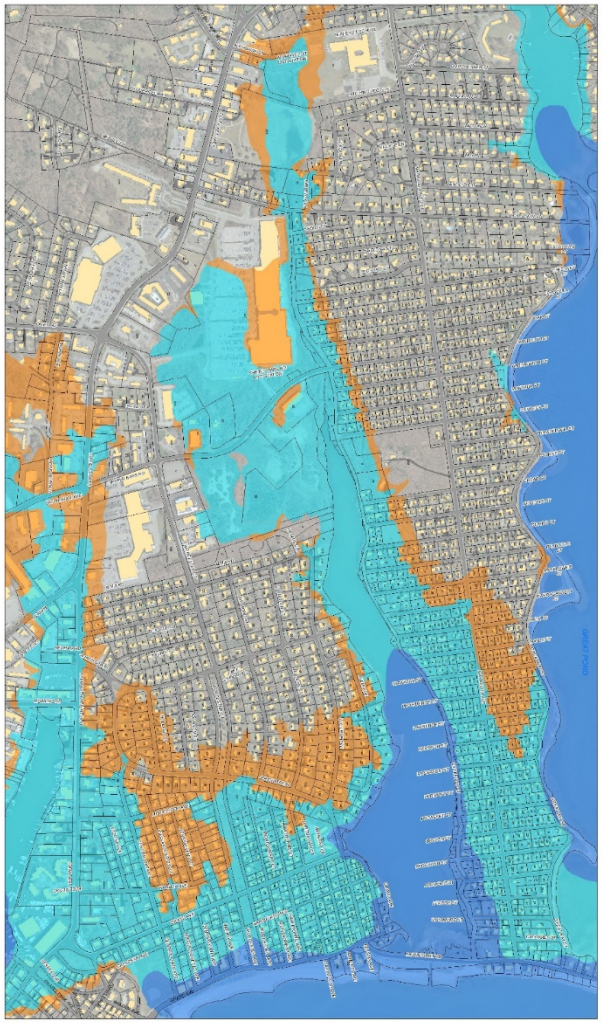
Little Pond watershed

- One of the most nitrogen-impaired estuaries in Falmouth
- One of the most densely developed parts of Town that was not already sewered
- A part of Falmouth that the Town has been talking about sewering “next” for > 30 years

Little Pond watershed and sewer area

Service area prone to flooding:

- High risk coastal areas (blue)
- 1 percent change of 1 to 3 feet of sheet flow flooding (light blue)
- High probability of some flooding (orange)



New collection system alternatives

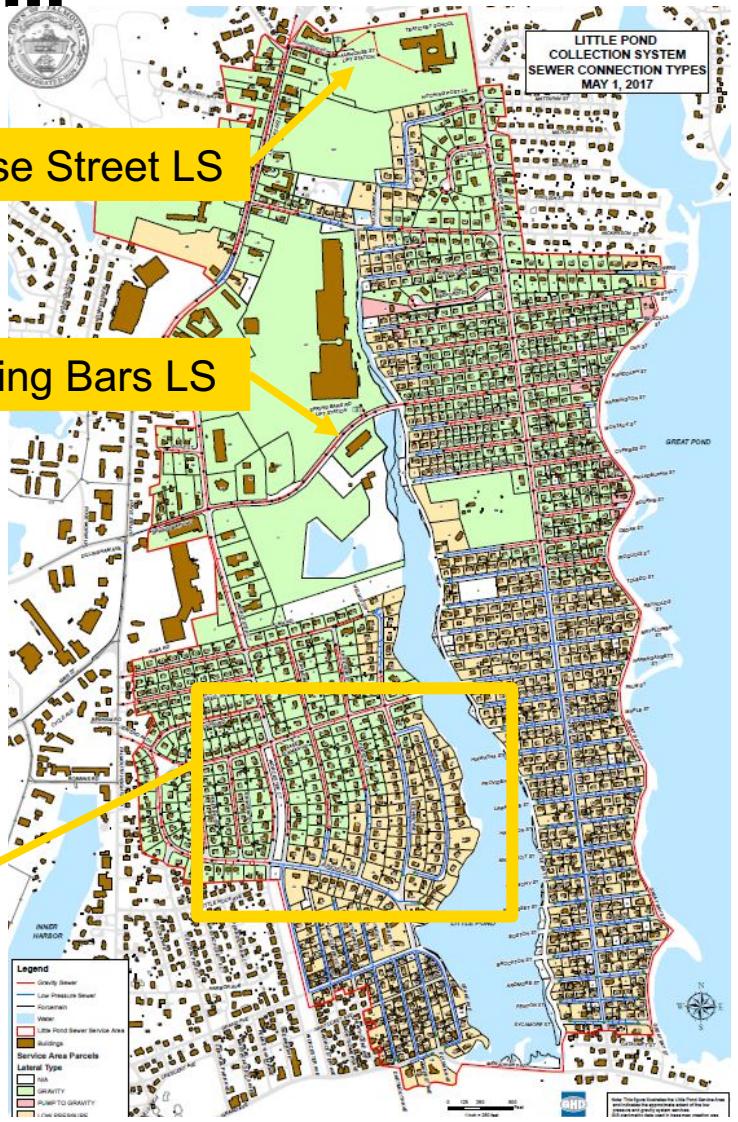
- Traditional gravity sewers with lift stations
- Pressure sewers with grinder pumps
- Septic tank effluent sewers
- Septic Tank Effluent Pump (STEP) System
- Septic Tank Effluent Gravity (STEG) System
- Vacuum sewers
- Combination of technologies

Selected: Combination of Gravity Sewers, Lift Stations, and Low Pressure Sewers with Grinder Pumps

Little Pond collection system

Little Pond collection system

- Two new lift stations
- Gravity flow where possible (inland outside flood plain)
- Low pressure system with grinder pumps in flood plain/low areas




Ditch Witch


Link-Belt
ROAD CLOSED
TO
THRU TRAFFIC

Little Pond collection system and associated improvements

- 16 miles of underground piping
  - Gravity sewers
  - Force main
  - Low pressure sewers
- Two new submersible lift stations
- 700 package grinder pump stations
- Improved roads
- Selected stormwater improvements

Board of selectmen grinder pump policy summary – single family residential

- Town will purchase pumps and transfer ownership to property owners
- Town will provide a one-time partial reimbursement for grinder pump installation cost (value to be determined),
- Town will provide for maintenance of the pumps.
- Town will provide emergency pump-out service during temporary power outage
- Town will replace the pumps (if no evidence of abuse/improper use) when they reach the end of their useful service life.

Little Pond service area improvements status

- Construction Award May of 2015
- Final Completion Summer 2017
- Of about 1400 service area parcels:
  - About 1150 sewer connections completed as of January 2019

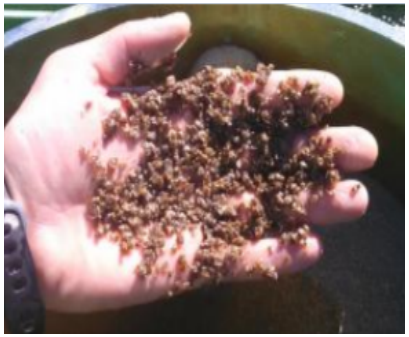
Project completed ahead of schedule and below budget

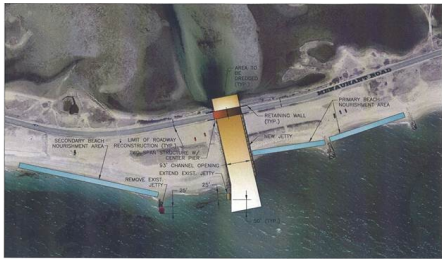
Success factors

- Water Quality Management Committee - community involvement in planning
- Town Manager / Board of Selectmen - response to community input
- Public Works - public information during construction
- Cost and schedule control
- Concern for property owners during construction
- Installer training
- Permitting and inspection processes

Next steps

- Complete sewer connections by mid-2019
- Implement Bournes Pond Inlet Widening
- Monitor water quality to gage improvement over time
- CWMP Update due December 2019
  - Incorporate data from pilot projects and Little Pond Sewer System project into next phases of planning





Acknowledgements

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Questions

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