Nauset and Cape Cod Bay Marsh Group

Technologies and Approaches
What is the stakeholder process?
208 Planning Process

Public Meetings
- Goals, Work Plan & Roles
- Affordability, Financing

Watershed Working Groups
- Baseline Conditions
- Technology Options Review
- Watershed Scenarios

July  August  September  October  December
208 Planning Process

Public Meetings

- Goals, Work Plan & Roles
  - Advisory Board
- Affordability, Financing
  - Advisory Board

Watershed Working Groups

- Baseline Conditions
  - Advisory Board
- Technology Options Review
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July August September October December
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Watershed Working Groups
- Advisory Board
- Regulatory, Legal & Institutional Work Group

July
- Regulatory, Legal & Institutional Work Group
August
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Watershed Working Groups

- Advisory Board
- Regulatory, Legal & Institutional Work Group
- Technical Advisory Committee of Cape Cod Water Protection Collaborative
208 Planning Process

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July
- Regulatory, Legal & Institutional Work Group

August
- Advisory Board
- Finance
- TAC

September
- Advisory Board
- Finance
- TAC

October
- Advisory Board
- Finance
- TAC

December
- Advisory Board
- Finance
- TAC

Technical Advisory Committee of Cape Cod
Water Protection Collaborative
**208 Planning Process**

**July**
- Public Meetings: Goals, Work Plan & Roles
  - Advisory Board
  - RLI
- Financial Work Group: TAC

**August**
- Public Meetings: Affordability, Financing
  - Advisory Board
  - RLI
- Financial Work Group: TAC

**September**
- Watershed Working Groups: Baseline Conditions
  - Advisory Board
  - RLI
  - Tech Panel

**October**
- Watershed Working Groups: Technology Options Review
  - Advisory Board
  - RLI
  - Tech Panel

**December**
- Watershed Working Groups: Watershed Scenarios
  - Advisory Board
  - RLI
  - Tech Panel

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**RLI**
- Regulatory, Legal & Institutional Work Group

**TAC**
- Technical Advisory Committee of Cape Cod

**Finance**

**Tech Panel**

**Water Protection Collaborative**
Goal of the First Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.
Progress since last meeting

- Meeting materials
Progress since last meeting

- Meeting materials
- GIS data layers
Progress since last meeting

- Meeting materials
- GIS data layers
- Chronologies
Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process
Baseline Conditions
11 Working Group Meetings: Sept 18-27

Technology Options Review
11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios
11 Working Group Meetings: Dec 2-11

208 Planning Process
Wrap up of Cape2O: ur in charge!

Summary of planning process to date

Outline of second 6 months of the 208 planning process
Goal of Today’s Meeting:

To develop a shared understanding of the potential technologies and approaches identified to date, and the benefits and limitations of each; to explore the environmental, economic, and community impacts of a range of categories of solutions; and to identify priorities and considerations for applying technologies and approaches to remediate water quality impairments in your watershed.
Technologies and Approaches for Improving Water Quality
Technologies and Approaches for Improving Water Quality

- The Fact Sheets present various information on the technologies being considered.
- Additional information is contained on the Technology Matrix including the following:
  - Site Requirements
  - Construction, Project and Operation and Maintenance Costs
  - Reference Information
  - Regulatory Comments
- Input from the Stakeholders is requested regarding a technology’s Public Acceptance
Technologies and Approaches for Improving Water Quality

- Comprehensive analysis of nutrient control technologies and approaches.
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- Not all of the technologies and approaches will be applicable to Cape Cod.
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- Workshop 3 will embark on hands on problem solving in each watershed to meet target load reductions.
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- Certain technologies or approaches will be effective at preventing nutrients from entering the water body. Others will be effective at reducing or remediating nutrients that are already in the groundwater or water body.
Technologies and Approaches for Improving Water Quality

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- Regulatory programs can address nutrient controls for both existing development and future development.
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Waterless Urinal

IBC container (220 gallons)

40" x 40" x 48"

Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.
water vapor
CO₂
ammonia N

bathroom is odor-free
air is continuously drawn
down the toilet and is
exhausted out a roof vent

Source: Earle Barnhart, The Green Center Inc.
Precedent: 12th Ave. Stormwater Project, Portland, OR
Source: City of Portland
Rain Gardens
Solutions: Neighborhood

**Site Scale**
- Standard Title 5 Systems
- I/A Title 5 Systems
- I/A Enhanced Systems
- Toilets: Urine Diverting
- Toilets: Composting
- Toilets: Packaging
- Stormwater: Bioretention / Soil Media Filters

**Neighborhood**
- Compact Development
- Cluster & Satellite Treatment Systems
- STEP/STEG Collection
- Constructed Wetlands: Surface Flow
- Constructed Wetlands: Subsurface Flow
- Stormwater: Wetlands

**Watershed**
- Remediation of Existing Development
- Transfer of Development Rights
- Conventional Treatment
- Advanced Treatment
- Wastewater Collection Systems
- Effluent Disposal Systems
- Effluent Disposal: Out of Watershed/Ocean Outfall

**Cape-Wide**
- Fertilizer Management
- Stormwater BMPs
- Phytoirrigation

**Eco-Machines & Living Machines**
- Phytobuffers
- Permeable Reactive Barrier
- Fertigation Wells
- Shellfish and Salt Marsh Habitat Restoration
- Aquaculture/Shelfish Farming

**Additional Solutions**
- Inlet / Culvert Widening
- Pond and Estuary Dredging
- Surface Water Remediation Wetlands
Scale: NEIGHBORHOOD
Target: WASTEWATER

Collection Tanks
Solids Collection
STEP/STEG Liquid Collection Line
Treatment and Disposal
STEP / STEG Collection
Precedent: Living Machine, South Burlington, VT

Source: Todd Ecological
Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambareri
Precedent: Quinli Stormwater Park, China
Source: Turenscape
Precedent: Koh Phi Phi Treatment Wetland, Thailand

Source: Hans Brix
Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2M HILL
Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2M Hill

Phytoirrigation
**Solutions: Ex. Water**

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- Pond and Estuary Dredging
- Surface Water Remediation Wetlands

**Cape-Wide**
- Remediation of Existing Development
- Transfer of Development Rights
- Stormwater BMPs
- Fertilizer Management
Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Precedent:
Pine Hills
Plymouth, MA
Interceptor/Irrigation Wells
WWTP
Zone II

Precedent:
Pine Hills
Plymouth, MA
Precedent: Falmouth PRB
Source: Mike Domenica
Oyster Reef

Scale: NEIGHBORHOOD/WATERSHED
Target: EXISTING WATER BODIES

Shellfish Habitat Restoration
Measuring Oysters' Improvements on Water Quality

- Already 2-3 million additional oysters
- Great 1,800 pounds of nitrogen removed per year
- Likely increase in commercial shellfish value of $1 million/year
- Increased water filtration approximately 100 million gallons/day
- Oxygen control
- Sediment reduction
- Increased native, estuarine fish habitat

Overall project area with new oysters

Source: Anamaria Francik

Precedent: Wellfleet Oyster Restoration Project
Precedent: Wellfleet Oyster Restoration Project
Source: Anamaria Francik
Precedent: Shanghai Houton Park
Source: Turenscape
Precedent: Pond and Estuary Dredging - Dennis, MA
Source: Cape Cod Times
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Transfer of Developments Rights
The Concept

Owner of “sending” parcel sells development rights in exchange for permanent conservation easement.

Owner of “receiving” parcel buys development rights to build at densities higher than allowed under base zoning.

Source: Massachusetts Smart Growth Toolkit
Nitrogen Targets/Goals

\[
\text{Present Load: } X \text{ kg/day} \quad - \quad \text{Target: } Y \text{ kg/day} \quad = \quad \text{Reduction Required: } N \text{ kg/day}
\]

Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas

Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation

Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture

Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems

Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones

Supplemental Sewering
Total Controllable Nitrogen Percent Removal to meet Total Maximum Daily Load
Septic Nitrogen Percent Removal to meet Total Maximum Daily Load
Nitrogen Targets/Goals

Present Load: X kg/day  -  Target: Y kg/day  =  Reduction Required: N kg/day

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Supplemental Sewering
Town Consideration of Alternative Technologies & Approaches

Wellfleet - Coastal habitat restoration & aquaculture

Mashpee - Aquaculture & Expanding Existing Systems

Brewster - PRB & Bioswales

Orleans - Fertilizer Control By-Law

Harwich - Muddy Creek & Cold Brook Natural Attenuation

Falmouth - Aquaculture
  Inlet Widening
  Eco-Toilet Demonstration Project
  PRBs
  Stormwater Management (Little Pond Watershed)
  Fertilizer Control By-Law
  Subsurface Nitrogen Removal Septic Systems
Triple Bottom Line

Impacts of Technologies and Approaches

Environmental

Economic

Social
Technology Selection: Process and Principles

- 100% septic removal subwatershed
- Scale: On-Site vs. Collection System vs. Natural System
- Nutrient intervention and time of travel
- Permitting Status
- Land use and Impacts of Growth
Preparing for Meeting 3 and Beyond

- Review tools and alternatives analysis approach
- Evaluating scenarios for meeting water quality goals
- Attend the November 13th meeting:
  6:00  
  Cape Cod Museum of Art  
  Dennis, MA