COMPARISON OF COSTS FOR WASTEWATER SYSTEMS APPLICABLE TO CAPE COD

Presentation to Cape Cod Water Protection Collaborative
April 20, 2010

Wastewater Costs Report

• Goals
  – Determine what has already been spent for wastewater systems of all sizes (use local data wherever possible)
  – Establish a uniform basis for evaluation
  – Conduct an “apples-to-apples” comparison
  – Perform sensitivity analysis and identify key cost factors
  – Guide towns in CWMP preparation

Wastewater Costs Report

• Task Force Members
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Wastewater Costs Report

• Sponsors
  – Association to Preserve Cape Cod
    • CapeCod5 Charitable Trust Foundation
    • Horizon Foundation
  – Cape Cod Business Roundtable
  – Cape Cod Water Protection Collaborative

Types of Wastewater Systems

• Individual nitrogen-removing systems
  – serving one home or business
• Cluster systems
  – multiple lots—flow < 10,000 gpd
  – no Groundwater Discharge Permit
• Satellite systems
  – flows of 10,000 to 300,000 gpd
• Centralized systems

Elements of a Wastewater System
Wastewater Costs Report

- Survey of construction costs
  - 24 plants
  - 15,000 gpd to 3.2 mgd
- Survey of O&M costs
  - 21 plants
  - 17,000 gpd to 4.2 mgd

Construction costs for treatment ($/gpd)

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<tr>
<th>Short-Term Peak Flow, gpd</th>
<th>Construction Cost, $ per gpd of capacity</th>
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O&M costs for treatment ($/yr/gpd)

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<tr>
<th>Annual Average Flow, gpd</th>
<th>O&amp;M Cost, $/yr per gpd of Actual Flow</th>
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Economies of Scale

- Construction costs
  - 10,000 gpd $70 / gpd
  - 100,000 gpd $35 / gpd
  - 1,000,000 gpd $17 / gpd
- O&M costs
  - 10,000 gpd $13 /yr / gpd
  - 100,000 gpd $5 /yr / gpd
  - 1,000,000 gpd $2 /yr / gpd

Wastewater Costs Report

Cost measures
1. Capital costs (design, permitting, construction, land, etc)
2. O&M (labor, power, chemicals, etc.)
3. Equivalent annual costs (EAC)
   - Amortized capital cost, plus
   - O&M cost
4. EAC per pound of nitrogen removed from sensitive watershed

Measure of Cost-Effectiveness
Predicted Costs—Capital ($/property)

Predicted Costs—O&M ($/yr/property)

Predicted Costs—EAC ($/yr/property)

Predicted Costs—EAC ($/lb-N)

- Individual $770/lb +170%
- Cluster $710 +150%
- Satellite—50,000 gpd $680 +140%
- Satellite—200,000 gpd $510 +80%
- Central—1.5 mgd $305 +7%
- Central—3.0 mgd $295

Sensitivity Analysis (EAC/lb-N)
Example Costs—EAC/lb-N

- Chatham—2.3 mgd $250 / lb ($265)
- Provincetown—0.575 mgd $300 ($330)
- Tisbury—104,000 gpd $560
- Mashpee Commons $340 ($750)
  --80,000 gpd
- Brackett Landing $455 ($550/$720)
  --8,230 gpd

Wastewater Costs Report

- Best case for individual N-removing systems:
  - Average collection density > 200 ft/conn
  - TMDL < 50% septic N removal
  - Nearest sewer > 5 miles

Wastewater Costs Report

- Best case for cluster systems:
  - Small-lot developments remote from sewers with public land available
  - New cluster developments—developer later turns over to town
  - Near-shore areas of small poorly-flushed embayments where larger-scale system is not planned for some time.

Wastewater Costs Report

- Best case for satellite systems:
  - Remote areas (>4 to 5 miles) with public land available
  - New commercial/residential developments—developer later turns over to town
  - Existing satellite systems that can be expanded to serve nearby un-sewered areas

Wastewater Costs Report

- Best case for centralized systems:
  - Dense development in watersheds with high septic N removal requirements
  - Town-owned treatment/disposal sites within 3 miles
  - Disposal site outside sensitive watersheds
  - Opportunities for regionalization

Wastewater Costs Report

- Most significant cost drivers
  - Economies of scale
  - Density of development—minimize sewer length per pound of N collected
  - Location of effluent disposal—avoid N-sensitive watersheds and Zone IIs
  - Land costs—seek town-owned land or dual use of appropriate sites (e.g. golf courses and ball fields)
Wastewater Costs Report

What is the best wastewater system for a given community?

There is no one answer. This report:
- Establishes a uniform basis for analysis
- Presents a detailed comparison based on one set of typical Cape Cod circumstances
- Shows example projects from the region
- Identifies the factors that most influence the costs, so towns can readily adapt this approach to their specific circumstances