Town of Orleans Massachusetts

Board of Selectmen

Water Quality and Wastewater Planning Program Status Update

March 9, 2016

Agenda

- Non-Traditional Technologies
- Wastewater Collection System
  - Collection System Types
  - Cost Evaluation
- Effluent Disposal
  - Parcel 1/1A, Exit 12 Cloverleaf
  - Location, Particle Tracking, Watershed Flow Split
- Septage Management Plan
- Financial Plan Factors

AECOM

Non-Traditional Technologies Demonstration Project Task Progress

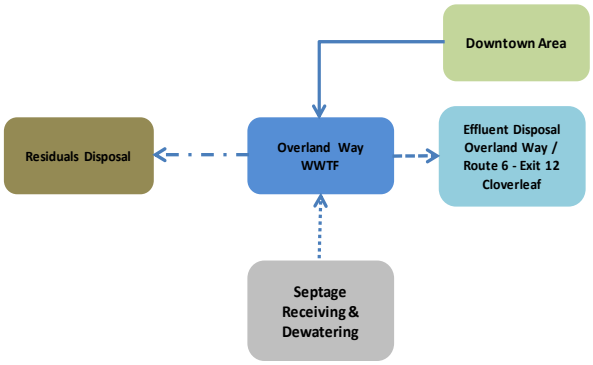
Technology

- Aquaculture/Shellfish Propagation
- Floating Constructed Wetlands
- Permeable Reactive Barriers

Tasks

- Completed 50% Work Plans
- Local Input Ongoing
- Finalize Work Plans

Downtown Collection, Treatment and Disposal System



Downtown Area Flow Schematic

Wastewater Collection System (cont.)

Collection System Types

- Gravity Sewers (GS)
- Low Pressure Sewers (LPS)
- Septic Tank Effluent Pumping (STEP)
- Septic Tank Effluent Gravity (STEG)
- Vacuum Sewers (VS)
- Hybrid

Cost Evaluation

- Prepared Preliminary System Layouts
- Developed Quantities
- Developed Unit Prices
  - Project (Capital)
  - Operation and Maintenance
  - Replacement
  - Monitoring
- Prepared Life-Cycle Cost Analysis

AECOM

Wastewater Collection System (cont.) Assumptions / Considerations

- Conventional and Alternative Construction
  - Off Season
  - Full Roadway Restoration
  - No Topographic Survey or Geotechnical Investigations
- Compared with 100% of Each Collection System Type
- Present Value
  - 20 Years
  - 3% Inflation Rate
  - 3% Value of Money

AECOM

Wastewater Collection System (cont.)
Assumptions / Considerations

- Investigation of Capital Costs
  - Communities and Vendor Information
  - AECOM's Project Experiences
- Costs Adjusted to New England Market
  - Material Costs
  - Wage Rates
  - Local Conditions
- Land Purchase at $200,000 per Acre
- Design-Bid-Construct Format

Wastewater Collection System (cont.)

Project (Capital)

- Public Property
  - Pipes
  - Pump Stations
  - Force Mains
- Private Property
  - Service Pipes
  - Replace Septic Tanks
  - Pump/Valve Units, as Applicable
  - Abandonment of On-Site Systems, as Applicable

Operation and Maintenance

- 1 Full Time Employee Plus 260 Hours Per Pump Station
- Utilities, Chemicals, etc.
- Clean and TV 25% of Gravity Sewers per Year
- Clean 100% of Pressure Pipes per Year
- Private Property Components
- Pump-out Septic Tanks Every 3 Years, as Applicable

Wastewater Collection System (cont.)

Replacement

- Pump Stations at 1% of Capital Cost per Year
- Private Property Pumps/Valves at 5% of Total Number Installed

Monitoring

- Pump Stations at $2,500 per Year
- Private Property Pumps/Valves at 8 Hours Per Connection

Wastewater Collection System (cont.)
Present Value Comparison

Downtown Area						
	Gravity Sewers	Septic Tank Effluent Gravity	Low Pressure Sewers	Vacuum Sewers	Septic Tank Effluent Pumping	Hybrid (GS and LPS)
Capital	$ 26.82	$ 28.52	$ 18.71	$ 28.30	$ 19.46	$ 24.18
O&M	$ 0.82	$ 0.85	$ 0.67	$ 1.01	$ 0.70	$ 0.62
PV	$ 38.89	$ 41.10	$ 28.63	$ 43.33	$ 29.90	$ 33.36

Note: Costs in Million of Dollars

Wastewater Collection System (cont.)
Present Value Comparison

Meetinghouse Pond Area						
	Gravity Sewers	Septic Tank Effluent Gravity	Low Pressure Sewers	Vacuum Sewers	Septic Tank Effluent Pumping	Hybrid (GS and LPS)
Capital	$ 32.35	$ 34.16	$ 21.92	$ 29.83	$ 22.73	$ 21.20
O&M	$ 1.33	$ 1.37	$ 0.74	$ 1.05	$ 0.77	$ 0.55
PV	$ 52.18	$ 54.55	$ 32.85	$ 45.40	$ 34.21	$ 29.40

Note: Costs in Million of Dollars

Effluent Disposal

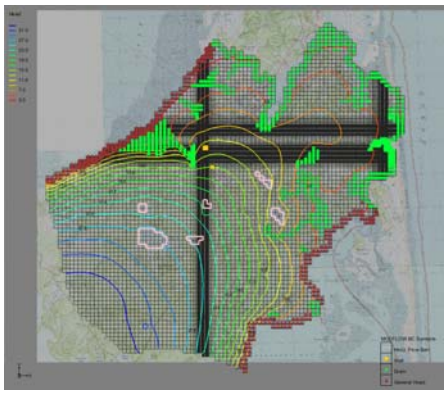
Proposed Locations

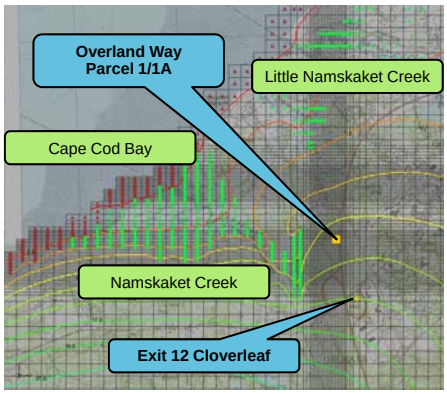
- Overland Way - Parcel 1/1A
- Route 6 – Exit 12 Cloverleaf

Hydrogeologic Site Evaluation

- Effluent Volume: 250,000 gpd
- Preliminary Hydrogeologic Evaluation – USGS Model
- Particle Tracking
- Watershed Flow Split

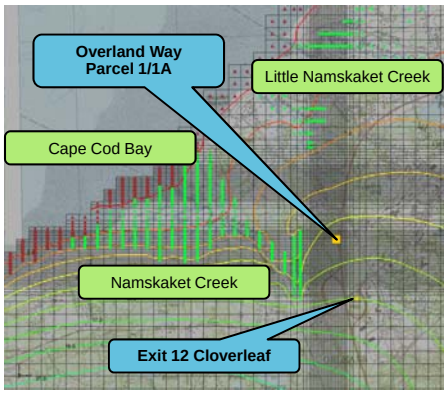
Overland Way – Parcel 1/1A and Route 6 - Exit 12 Cloverleaf

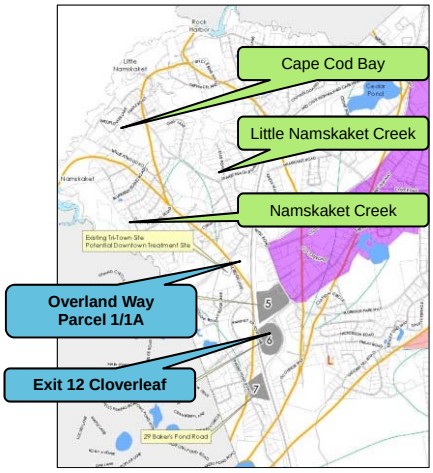




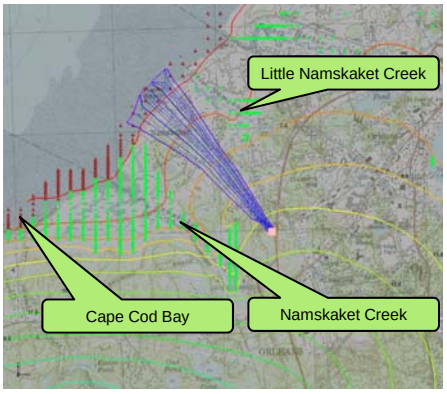
Model Domain and Grid

Watersheds

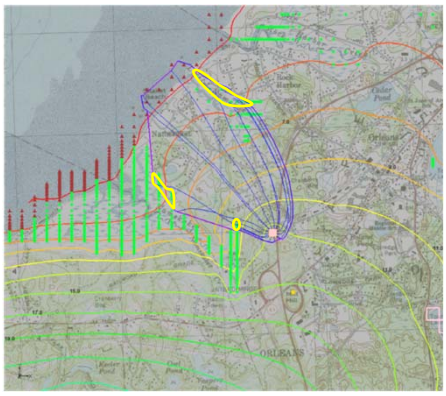




Overland Way – Parcel 1/1A



Steady State / Zero Discharge

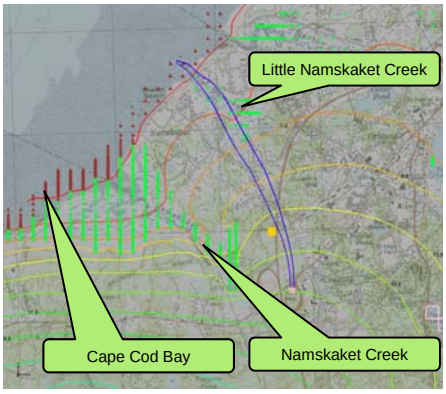


250,000 gpd Discharge

Watershed Flow Split

Overland Way – Parcel 1/1A							
Watershed	Steady State Base Flow (gpd)	Effluent Discharge (gpd)					
		25,000	50,000	100,000	150,000	200,000	250,000
Namskaket Creek	3,171,700	1,560 gpd 0.0005%	3,120 gpd 0.001%	6,240 gpd 0.002%	9,370 gpd 0.0029%	12,490 gpd 0.0039%	15,620 gpd 0.0049%
Little Namskaket Creek	363,550	7,950 gpd 0.022%	15,890 gpd 0.044%	31,790 gpd 0.087%	47,700 gpd 0.131%	63,590 gpd 0.175%	79,480 gpd 0.219%
Cape Cod Bay	29,324,000	15,490 gpd 0.0005%	30,990 gpd 0.0011%	61,970 gpd 0.0021%	92,940 gpd 0.0032%	123,920 gpd 0.0042%	154,900 gpd 0.0053%

Route 6 - Exit 12 Cloverleaf



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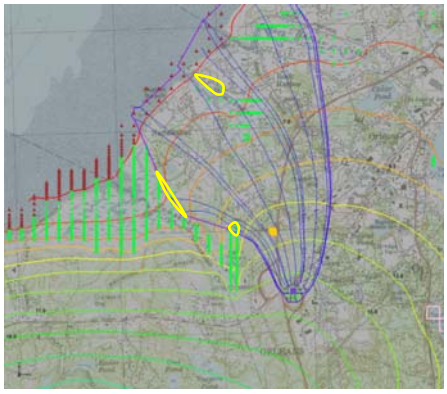

250,000 gpd Discharge

Watershed Flow Split

Route 6 - Exit 12 Cloverleaf

Watershed	Steady State Base Flow (gpd)	Effluent Discharge (gpd)					
		25,000	50,000	100,000	150,000	200,000	250,000
Namskaket Creek	3,171,700	970 gpd 0.0003%	1,940 gpd 0.0006%	3,870 gpd 0.0012%	5,810 gpd 0.0018%	7,750 gpd 0.0024%	9,690 gpd 0.0031%
Little Namskaket Creek	363,550	6,880 gpd 0.022%	13,750 gpd 0.044%	27,520 gpd 0.076%	41,310 gpd 0.114%	55,060 gpd 0.151%	68,840 gpd 0.189%
Cape Cod Bay	29,324,000	17,150 gpd 0.0006%	34,310 gpd 0.0012%	68,610 gpd 0.0023%	102,880 gpd 0.0035%	137,190 gpd 0.0047%	171,470 gpd 0.0058%

Septage Management Plan

- Downtown Area WWTF to include Septage Receiving
  - Available for Current Service Area Towns
  - Plan for 6 mg/year +/-
  - Initial Capacity Supplemented in Incremental Units
- Process
  - Use Existing Storage Basins for Aeration
  - Store, Degrit and Dewater Only – No Solids Treatment
  - Solids Combined with WWTF Residuals to Y/D or Off-Cape
- Incremental Capital Cost ~ $500,000
- Incremental O&M Cost ~ $250,000 per year
- Septage Processing Cost at $0.06 - $0.08 per Gallon
- Net Revenue to Off-set O&M Costs

Financial Plan Factors

- O&M Costs are Substantial
  - Especially in Meetinghouse Pond Area
  - Downtown Area More Affordable to Businesses
- Collection System is Very Costly – Regardless of Type
- Small Number of Users in Both Areas is Key Issue
  - Meetinghouse Pond Area is a Problem
  - Private Investment in Downtown Area Required
- Financing Costs are Substantial – 0% Financing is Critical
- Floating Wetlands – Initial Too High; Being Reviewed
- Principal Forgiveness (Grants) Necessary

Town of Orleans Massachusetts

Thank You