Orleans Water Quality Advisory Panel

Water Quality and Wastewater Planning

Program Status Update

March 15, 2017

Agenda

- Approval of Meeting Minutes of February 15, 2017
- Public Comment
- Tri-Town Septage Treatment Facility Demolition
- Non-Traditional Technology Demonstration Project Update
- Downtown Area PDR (25% Design) – Status
- BREAK
- Design/Build/Operate Delivery Options- Status
- Financial Model - Cost Allocation Update
- Freshwater Ponds Planning Update
- Other Items and Public Comment

Town of Orleans Massachusetts

Tri-Town Septage Treatment Facility Demolition

Tri-Town Septage Treatment Facility Demolition
Bid Opening – February 15, 2017 at 9:00 am

Bidder	Tri-Town Septage Treatment Facility	Compost Shelter	Total
S&R Corporation	$1,650,560.00	$152,500.00	$1,803,060.00
Costello Dismantling Co.	$1,793,184.00	$194,760.00	$1,987,944.00
McConnell Enterprises	$1,804,280.00	$243,390.00	$2,047,670.00
Ramco Survey Stakes	$1,940,019.50	$306,980.50	$2,247,000.00

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Tri-Town Septage Treatment Facility Demolition (cont.)
FY18 Town Meeting Cost Allocation by Town

- **Demolition = $1,803,060.00**
- **Contingency (12.5%) = $226,940**
- **Engineering = $232,400**
- **Proposed FY18 Appropriation = $2,262,400**

Item	Orleans	Brewster	Eastham
Septage Treatment Facility	$696,800	$696,800	$696,800
Compost Shelter	$172,000	$0	$0
Totals	$868,800	$696,800	$696,800

Town of Orleans Massachusetts

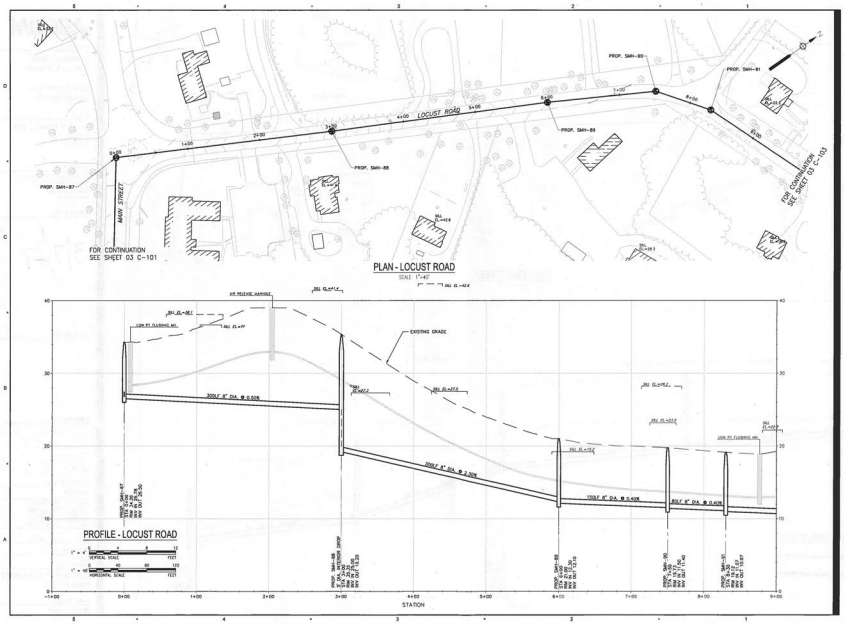
Downtown Area PDR (25% Design) Status

Downtown Area PDR (25% Design) – Status

- **Topographic Survey**
  - Ground Survey
    - Survey at the Route 6A/Route 28/Canal Road Roundabout Has Been Completed
    - Differential Leveling for Benchmarks and Plan Check is on Going
    - Acquiring Sill Elevations in the Downtown Area Has Been Completed
  - Aerial Survey
    - Ground Control Survey Has Been Completed
    - Aerial Flight Completed on 2/27/17
    - Data Processing Scheduled to be Completed by 3/17/17
- **Subsurface Investigation**
  - 125 Locations
    - Over 50% Complete (66 Borings)
    - Scheduled to Complete by 3/24/17
  - Nothing Unexpected Observed/Discovered to Date
    - Groundwater: Locus Road and Canal Road Area
    - Bike Path (Old Railroad) Bed Material: Old Pavement

Downtown Area PDR (25% Design) – Status (cont.)

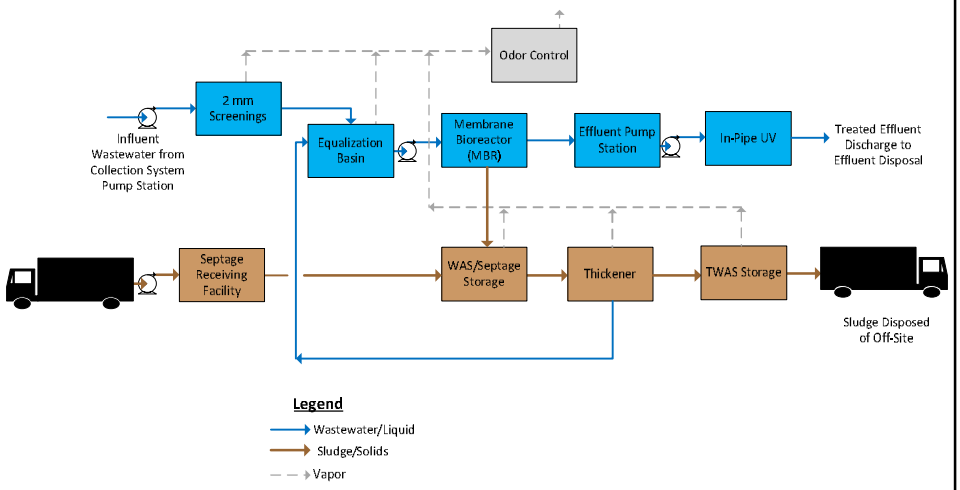
- **Cultural Resource Evaluation**
  - Received Draft Report from PAL
    - Not Recommending Conducting Any Intensive Level Testing
    - Recommending Development of an Unanticipated Discoveries Plan and Monitoring During Construction
  - Preparing Draft Technical Memorandum
- **Update Collection System Type Evaluation and Preliminary System Configuration**
  - Added Sills
  - Updated Profiles Showing Gravity Sewer and Pressure Sewer
  - Updated Quantities
  - Reviewing Impacts from Existing Utilities



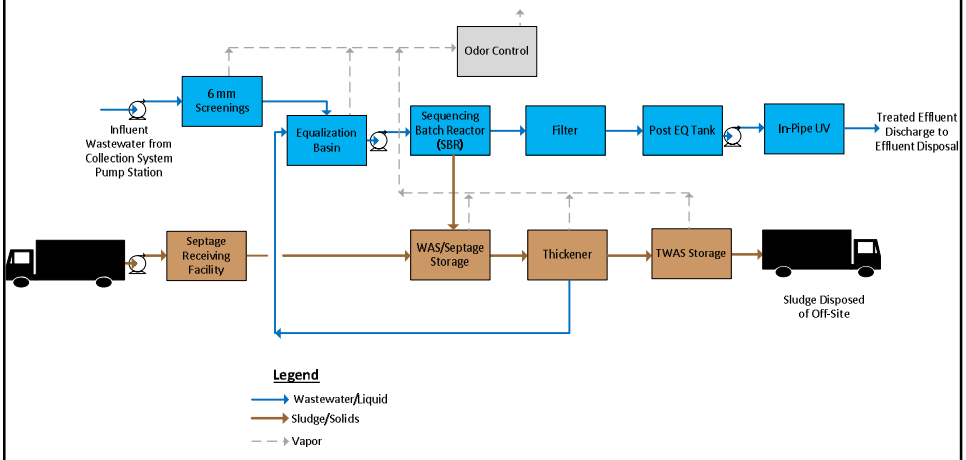
Downtown Area PDR (25% Design) – Status (cont.)

- **Update WWTF Process Selection**
  - Design for Sewage and Septage Receiving/Treatment
  - Two Top Candidates Identified in Concept Design Phase Being Further Explored (SBR and MBR)
  - Design to Include Biosolids Thickening but Not Dewatering
- **Design Data**
  - Flows Derived from Collection System Evaluation
  - Sewage Strength (Assumed medium to strong)
    - Provincetown and Chatham Used as a Reference
  - Tri-town Septage Treatment Facility Data Used for Septage Characteristics
  - Anticipated Effluent Requirements
    - BOD & TSS <= 30 mg/l
    - TN <= 10 mg/l
    - Designing for Lower Limits

Wastewater Treatment Facility Process Evaluation
MBR Conceptual Design



Wastewater Treatment Facility Process Evaluation (cont.)
SBR Conceptual Design



Wastewater Treatment Facility Process Evaluation (cont.)
Process Component Caparison

	Option – 1 SBR Treating Sewage/Septage	Option – 2 MBR Treating Sewage/Septage	MBR Treating STEP Effluent
Screening	X (6 mm)	X (2 mm)	X (2 mm)
Pre-Equalization	X	X	X
Biological Process	X	X (smaller than Opt–1)	X (smaller than Opt-2)
Post Filtration	X		
Post-Equalization	X		
Disinfection	X	X	X
Septage Receiving	X	X	X
Biosolids Storage	X	X	X (slightly smaller than Opt-2)
Biosolids Thickening/Storage	X	X	X
Supplemental Carbon Addition			X

Wastewater Treatment Facility Process Evaluation (cont.)
Comparison of Wastewater Characteristics

	Sewage[1]	Septage[2]	Sewage/Septage Blend[3]	STEP Effluent[4]	Comments
BOD, mg/l	270	2,300	275	270	
TSS, mg/l	310	3,600	300	75	
TN, mg/l	55	1,600	60	120	Achieving Effluent TN of 10 mg/l or less with STEP Effluent Could Prove Difficult

Notes:

1. Sewage characteristics based on “medium to strong” typical values, cross checked with Provincetown and Chatham data where available.
2. Septage characteristics based on Tri-town Septage Treatment Facility supplemented with EPA guidelines as needed.
3. Sewage/septage blend characteristics assume blending after septage thickening.
4. STEP effluent characteristics based on Septage Characteristics, but assuming 98% solids capture in septic tank.

Effluent Disposal Investigations

- **MassDEP Approved Hydrogeology Evaluations**
  - Orleans Market Place – 140,000 gpd
  - 223 Beach Road – 200,000 gpd
- **Ongoing / Planned Hydrogeology Evaluations**
  - Site 1/1A
  - Route 6 – Exit 12 Cloverleaf
  - Nauset Regional School District Pending FY18 Town Meeting Funding

The Town of Orleans Has Not Decided on the Location(s) for Effluent Disposal

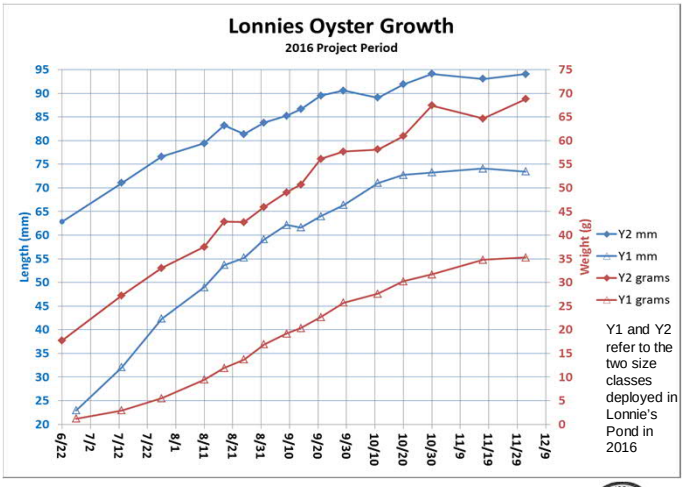
Town of Orleans Massachusetts

Non-Traditional Technology Demonstration Projects Update

Non-Traditional Technologies
Shellfish/Aquaculture – Background of Demo Projects

- **Shellfish demonstrations in general are designed to:**
  - Evaluate the efficacy of oysters and quahogs in achieving reduced nitrogen concentrations within the Town's impaired waters;
  - Determine the most advantageous approaches for growing the quantities of shellfish prescribed to meet nitrogen removal goals; and
  - Develop realistic cost estimates for the preferred approaches to growing shellfish to meet nitrogen removal goals in specific waterbodies.
- **Four Aquaculture Demonstrations in Orleans:**
  - Town Cove: enhanced quahog propagation (population and species assessment);
  - Kent's Point: oyster bed development (viability study);
  - Pleasant Bay: enhanced aquaculture (working with growers); and
  - Lonnie's Pond: scientific analysis of uptake and denitrification caused by oysters (continuation from Year 1).

Non-Traditional Technologies (cont.)
Shellfish/Aquaculture
Lonnie's Pond - Year 1 Growth



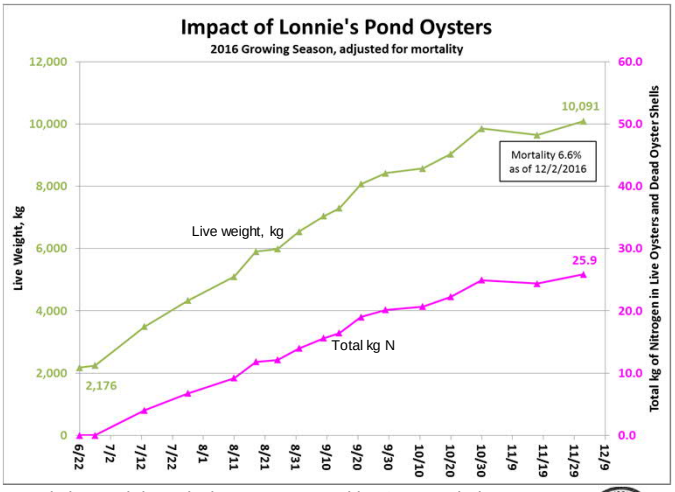
Non-Traditional Technologies (cont.)
Shellfish/Aquaculture
Lonnie's Pond Year 1 - Nitrogen Content

Lonnie's Pond Oysters as Compared to Results from Other Studies

Location	Sample Time	Length (mm)	Whole Weight (g)	Dry Tissue Weight (g)	Total N, Shell and Tissue (g)	N as a percent of Dry Tissue Weight (%)
Pleasant Bay (other studies)	Spring	77.8	64.9	2.31	0.29	12.6
Pleasant Bay (other studies)	Fall	80.92	54.3	2.99	0.30	10.0
Y2 Lonnie's Incoming	Spring	62.9	17.73	0.66	0.0683	10.3
Y2 Lonnie's New Growth	Fall	100	80.4	2.49	0.257	10.3
Y1 Lonnie's New Growth	Fall	74.3	37.4	1.20	0.126	10.5

Note: Y1 and Y2 refer to the two size classes of oysters that were deployed in Lonnie's Pond during the growing season of 2016

Non-Traditional Technologies (cont.)
Shellfish/Aquaculture
Lonnie's Pond - Year 1 Nitrogen Uptake

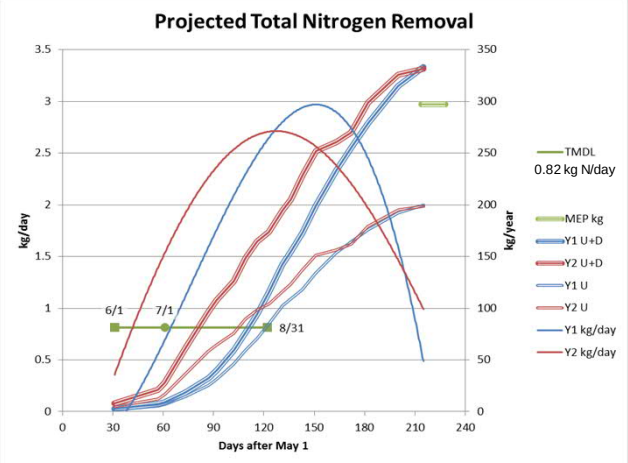


Total Live Weight and Nitrogen Removed by Oysters during Year 1

Non-Traditional Technologies (cont.)
Shellfish/Aquaculture
Lonnie's Pond - Nitrogen Removal Considerations

- **Target nitrogen reduction load (~300 kg/year)**
- **Total Maximum Daily Load (TMDL): ~0.82 kg/day**
- **Critically impaired period is July and August**
- **Timing matters for TMDL**

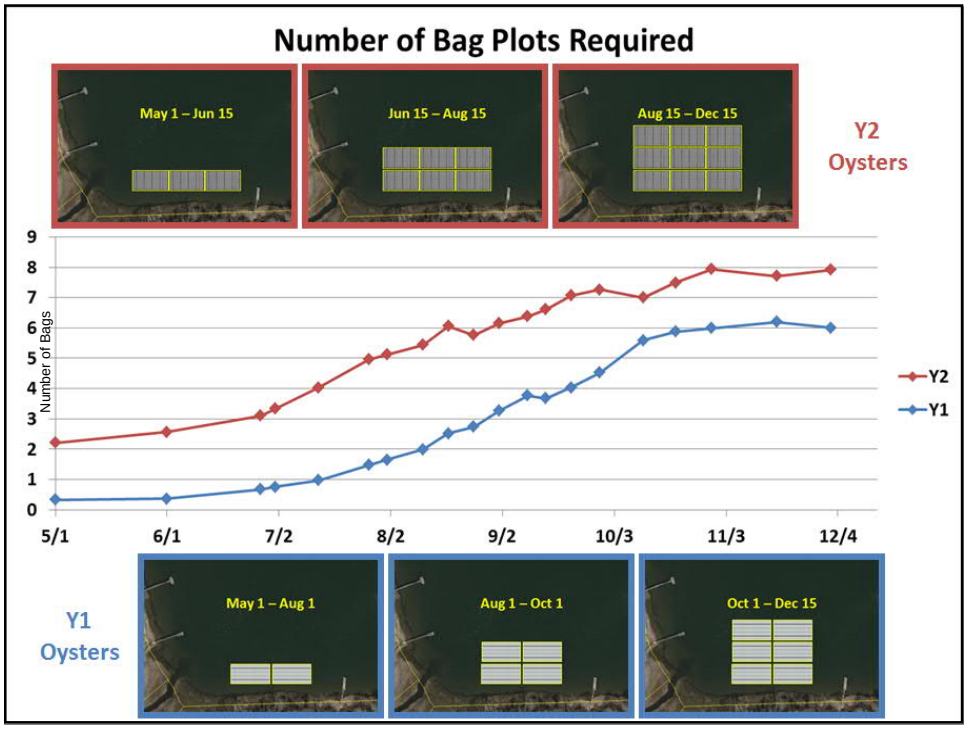
Non-Traditional Technologies (cont.)
Shellfish/Aquaculture
Projected N-Removal for Full Scale Implementation



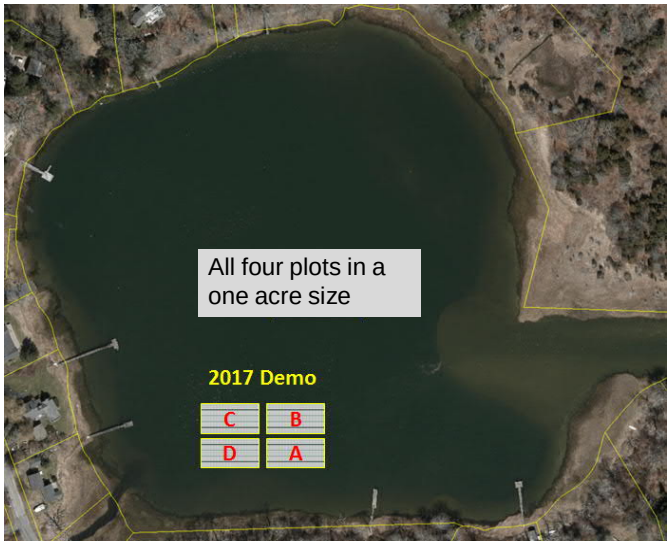
Year 1 (Y1) Oysters:
3,000 bags at 600 oysters/bag

Year 2 (Y2) Oysters:
4,500 bags at 250 oysters/bag

Note: Year 1 and Year 2 refer to seed sizes that could be deployed in full scale implementation scenarios
U = Uptake of N by oysters
D = Denitrification



Non-Traditional Technologies (cont.)
Shellfish/Aquaculture - Lonnie's Pond Year 2 Details



Plot A:
- 140,000 Y2 oysters @ ~280 oysters/bag
- Adding biodeposits on top of the same area used by last year's site

Plot B:
- 60,000 Y2-L oysters @~150 oysters/bag and 28,000 Y2 oysters @ ~280 oysters/bag
- Over deeper water and softer bottom than last year's site

Plot C:
- 590,000 Y1 oysters @ ~1,000 oysters/bag
- Over bottom similar to that used by last year's site

Plot D:
- 360,000 Y1 oysters @ ~600 oysters/bag
- Over deeper water and softer bottom than last year's site

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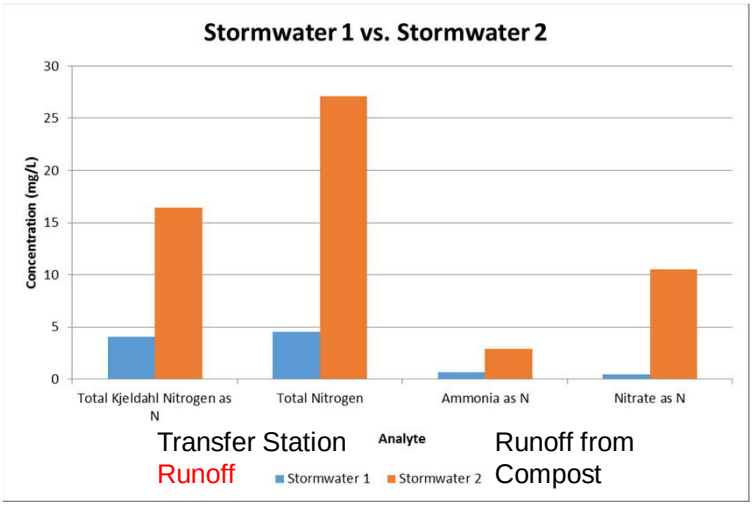
Non-Traditional Technologies (cont.)
Town Landfill – Project Objectives

- **Implement Groundwater Assessment to confirm groundwater nitrogen flux based on groundwater flow and concentrations**
  - Significant vertical section of aquifer potentially affected
  - Large geographic area potentially affected
- **Identification and Evaluation of Alternatives for Nitrogen and 1,4-dioxane**
- **Conceptual Design and Cost Estimate for the Recommended Alternative**

Non-Traditional Technologies (cont.)
Town Landfill - Summary

- **Groundwater Affected by:**
  - Shallow - Significant Nitrate
  - Deep - Nitrogen (by Ammonia Nitrogen) and 1,4 Dioxane
- **Sources of 1,4 Dioxane and Nitrogen Identified**
- **Nitrogen Flux Estimated**
- **1,4-dioxane Detected in More Monitoring Wells > 0.0003 mg/L Standard**
- **Potential Area of Downgradient Migration Area in Watershed Identified**
- **Down Gradient Wells Installed**

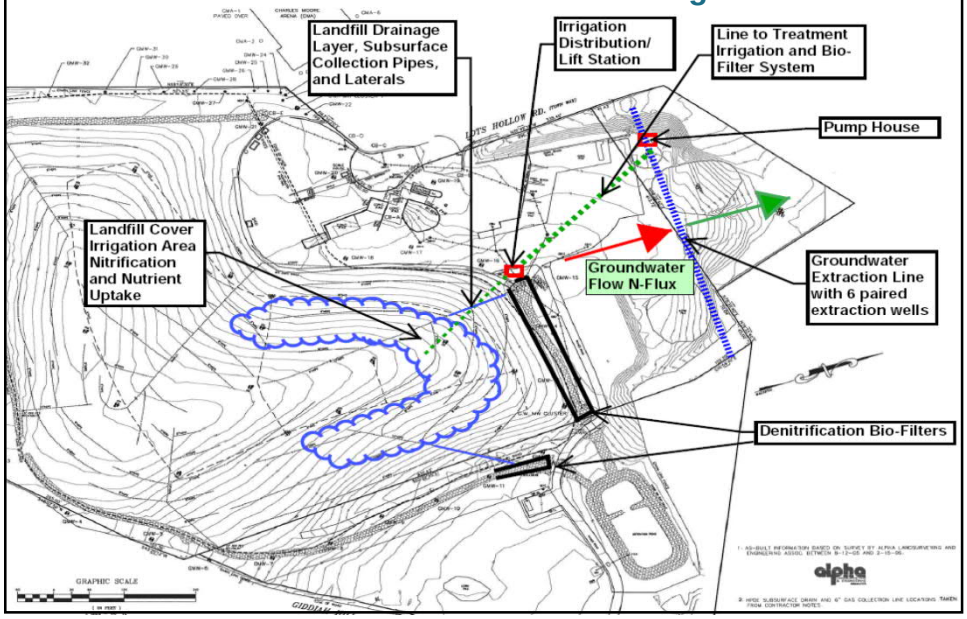
Non-Traditional Technologies (cont.)
Town Landfill - Compost Operation Significant Nitrogen



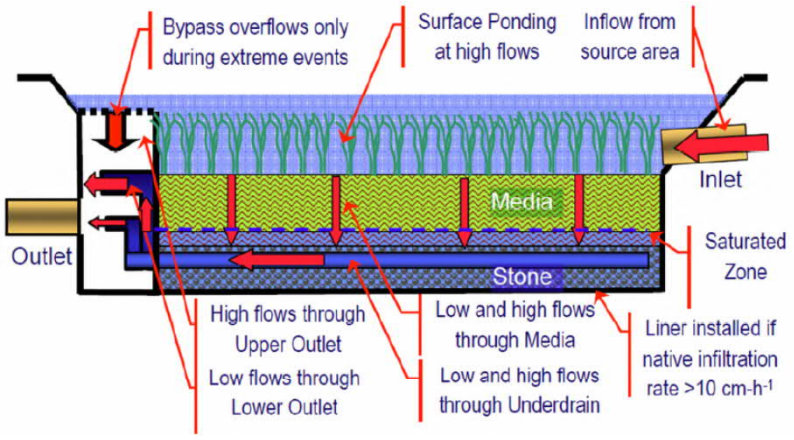
Non-Traditional Technologies (cont.)
Town Landfill – Proposed Corrective Action for Nitrogen

- **System Components**
  - Groundwater extraction pumping system (solar powered)
  - Landfill cap irrigation nitrification system (convert ammonia to nitrate and plant uptake of nitrogen)
  - Collection of 1st stage treated water through existing landfill cap drainage system
  - 2nd stage denitrification treatment with nitrification bio-filters constructed in landfill runoff and transfer station stormwater collection and infiltration system

Non-Traditional Technologies (cont.)
Town Landfill - Corrective Action for Nitrogen Flux



Non-Traditional Technologies (cont.)
Town Landfill - Denitrification Bio-Filter with Organic Carbon/Sand Media



From 2012 GREEN INFRASTRUCTURE COMMUNITY PARTNERS
CAPE COD COMMISION

BSG3

AECOM

Slide 30

BSG3 assume that Mark pulled this reference or was it Jim Begley? -Commission
Shreve, Betsy, 3/10/2017

Non-Traditional Technologies (cont.)
Landfill Landfill – Next Steps

- **Complete Initial Design and Cost Estimate to Reduce Nitrogen Flux**
- **Implement Final Design, Permit, and Construct Landfill Nitrogen Flux Corrective Action in FY-18**

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Non-Traditional Technologies (cont.)
Eldredge Park Way PRB Demonstration - Monitoring

- **Initial testing of PRB monitoring wells - baseline concentrations measured as high as 35 mg/L nitrate-nitrogen**
- **Wide range of nitrate concentrations at different sampling locations**
- **No unwanted migration of EVO detected during injection (monitoring turbidity and dissolved organic carbon 10, 20, 50 and 100 ft. downgradient)**
- **Initial monitoring in January indicated positive developments with both nitrate and dissolved oxygen lower in the wells closest to the injection points**

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Non-Traditional Technologies (cont.)
Eldredge Park Way PRB Demonstration - Results

- **Updated new slide with discussion of Feb Data to be added with available new data week of 3/6**

Non-Traditional Technologies (cont.)
Eldredge Park Way PRB Demonstration - Next Steps

- **Evaluate PRB Layout and Test Results to Determine if Modifications Required**
- **Continue Monitoring Demonstration Test at Eldredge Park – FY 2017 through FY 2019**

Non-Traditional Technologies (cont.)
Nitrogen Reducing Barriers

- Identified Seven Sites with BOH
- Letters Mailed to Property Owners
- Responding to Questions
- Based on Responses, Evaluate and Identify Four Sites for Spring 2017 Implementation
- Working with County On-Site Test Center for Design and Monitoring Plans

Town of Orleans Massachusetts

Break

BSG20

Town of Orleans Massachusetts

Design/Build/Operate Delivery Options Update

Design/Build/Operate Delivery Options

- **Brief Overview of Major Options**
  - Design-Bid-Build with Contract Operations
  - Design-Build with Contract Operations
  - Design-Build-Operate
- **Steps to Get Legislation – FY18 Town Meeting**
  - Drafted Special Legislation – March 6, 2017
  - Meeting with Town Counsel
  - Decide if Outside Counsel Should Draft Special Legislation
  - Conduct Workshop with Board of Selectman and Town Counsel on Key Issues and Risks – March 22, 2017
- **Draft FY18 Warrant Article to Reflect BOS Decision on Viability of Delivery Option for Orleans and Whether to File Legislation**

Slide 37

BSG20 Shreve, Betsy, 3/10/2017

Town of Orleans Massachusetts

Financial Model - Cost Allocation

Financial Plan Development

- **Developed Detailed Model with Functionality**
- **Developed Initial Scenarios and Average Costs per User Category using Total Number of Users/Owners per User Area**
- **Incorporated Implementation Phasing Program for Downtown Area and Meetinghouse Pond Area Systems**
- **Incorporated Parcel Level Water Use and Property Assessment Data (to Better Refine Rates for User Categories)**
- **Updated and Adjusted Project Costs**
- **Estimated Average and Parcel-specific Rates for User Categories**
- **Compared User Costs to EPA Affordability Benchmark (2% MHI) and 2010 Approved CWMP**

Current Financial Planning Scenarios

- **Base Case (Capital Costs on 100% Tax Rate)**
- **Majority of Capital Cost via Special Assessments to Owners in Sewered Areas**
- **Split Residential and Non-Residential Assessments in Sewered Areas**

Next Steps

- **Provide Cost Allocation Scenario Results to BOS on March 15, 2017 and March 22, 2017**
- **BOS to Decide on One WWTF or Two WWTFs**
- **Continue Discussion with Downtown Area Owners**
- **Continue to Assist Finance Committee in Testing the Financial Model**

Town of Orleans Massachusetts

Freshwater Ponds Planning Update

Freshwater Ponds Planning Update

- **Work Group has had several meetings**
- **Presentations and plans for integrating Town stormwater management information into the ponds management plans**
- **Developed screening criteria to prioritize ponds for detailed evaluation and management plans**
- **Prioritized two ponds: Uncle Harvey's Pond and Crystal Lake**
- **Developing scopes of work and budgets for FY2018 Warrant Article for these two ponds**
- **Developing scope and budget to prepare freshwater ponds Quality Assurance Project Plan (QAPP)**

Other Items and Public Comment

- **OWQAP Meeting**
  - April 12, 2017
- **Recent and Proposed Public Information Activities**
  - Downtown Collection System Working Group – March 9, 2017
  - SMAST / Commercial Harvesters - March 13, 2017
  - Shellfish Working Group - March 13, 2017
  - PRB / NRB Working Group – March 15, 2017
  - BOS FY18 TM Warrant Article Workshop – March 15, 2017
  - Freshwater Ponds Working Group – March 17, 2017
  - BOS – Design-Build-Operate Workshop – March 22, 2017
- **Status Reports and FAQ on Various Projects**

Town of Orleans Massachusetts

Thank You