Orleans Water Quality Advisory Panel

Water Quality and Wastewater Planning

Program Status Update

July 19, 2017

Agenda

- Approval of Meeting Minutes of April 12, 2017 and June 14, 2017
- Public Comment
- Tri-Town Septage Treatment Facility Demolition Status Update
- Non-Traditional Project Update
- Landfill Nitrogen Investigations and Next Steps

BREAK

- Effluent Disposal Site Investigations and Plan
- Downtown Facilities Engineering and Cost Estimate Update
- Freshwater Ponds Remediation Update
- Financial Plan Update and Next Steps
- Summary: Key Decisions for Fall Special Town Meeting
- OWQAP Web Site Status
- Communication from Paull Ammann
- Public Comment

Town of Orleans Massachusetts

Tri-Town Septage Treatment Facility Demolition Update

Tri-Town Septage Treatment Facility Demolition Update
Next Steps and Decisions

- **July and August – Contractor Submittals**
- **On-Site Activities - August**
  - Install Temporary Fencing and Windscreen
  - Install Erosion Control
  - Pump-out Existing Tanks of Any Liquids and/or Solids
  - Collect Hazardous Materials and Package for Disposal
- **September 2017 through April 2018 – Demolition and Site Restoration**

Town of Orleans Massachusetts

Non-Traditional Project Update

Non-Traditional Project Update
Aquaculture

- **Lonnie's Pond**
  - Prepare Management Plan
  - Perform O&M and Monitoring
  - Prepare Year 2 Report
  - Using Lonnies Pond Project as Basis for Resolving "Source Control" Issue with DEP/EPA
- **Kent's Point**
  - N/A
- **Existing Grant Expansion**
  - Develop Future Implementation Planning Program Pending Management Plan Approval
- **Town Cove**
  - Develop Future Implementation Planning Program Pending Management Plan Approval

Non-Traditional Project Update (cont.)
Eldredge Park PRB and NRB "Layer Cake"

- **PRB Eldredge Park**
  - Perform Quarterly Sampling and Analysis
  - Prepare Quarterly Report
- **NRBs**
  - No Variable Sites Identified Located Outside of the Proposed Sewer Service Areas
  - Reviewing Sites Located Within the Proposed Sewer Service Areas
  - Working with County On-Site Test Center for Design and Monitoring Plans
  - Perform Quarterly Sampling and Analysis and Prepare Quarterly Report Pending Site Identification and Implementation

Town of Orleans Massachusetts

Landfill Nitrogen Investigations and Next Steps

Landfill Nitrogen Investigations and Next Steps Status

- **Completed Phase 1 Field Investigation Plan**
- **Completed Phase 1 Field Investigation Report**
- **Completed Field Investigation and Risk Evaluation for 1,4-Dioxane**
- **Completed Phase 2 Field Investigation Report Being Completed**
- **Ongoing Coordination with UMass Dartmouth's School for Marine Science & Technology (SMAST)**
- **Confirming and Conducting the Next Phase of Investigations**

Landfill Nitrogen Investigations and Next Steps (cont.)
Nitrogen Flux Questions

- **What Nitrogen Load is Coming Out of the Landfill Now?**
- **What Nitrogen Load is in Transit to Town Cove?**
- **How Quickly is the Nitrogen Load Moving to Town Cove?**

G:\Projects\MUNI\60476644ORL\Maps\PRB_Figure4_Landfillv3.mxd

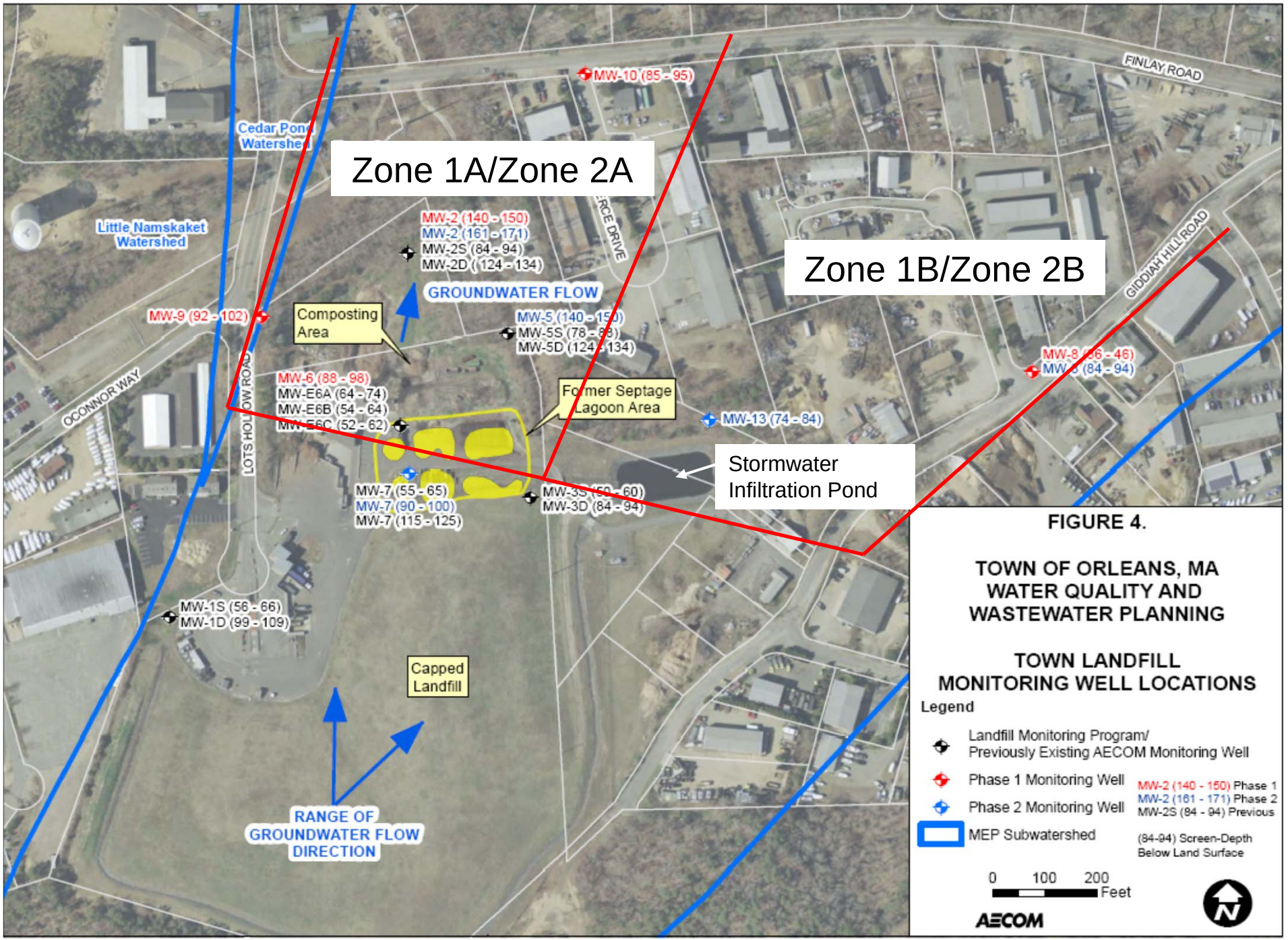


FIGURE 4.

TOWN OF ORLEANS, MA
WATER QUALITY AND WASTEWATER PLANNING

TOWN LANDFILL MONITORING WELL LOCATIONS

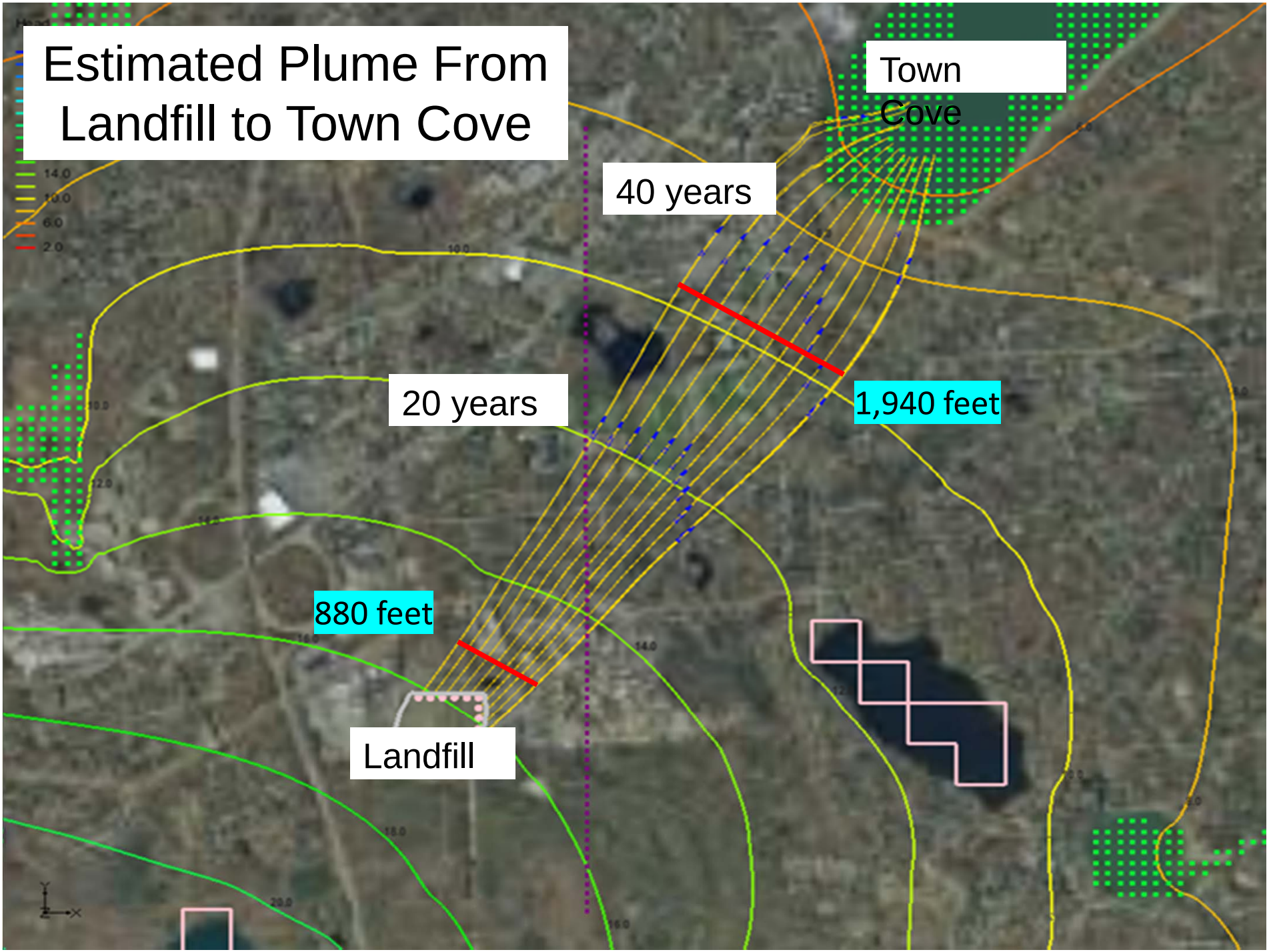
Legend

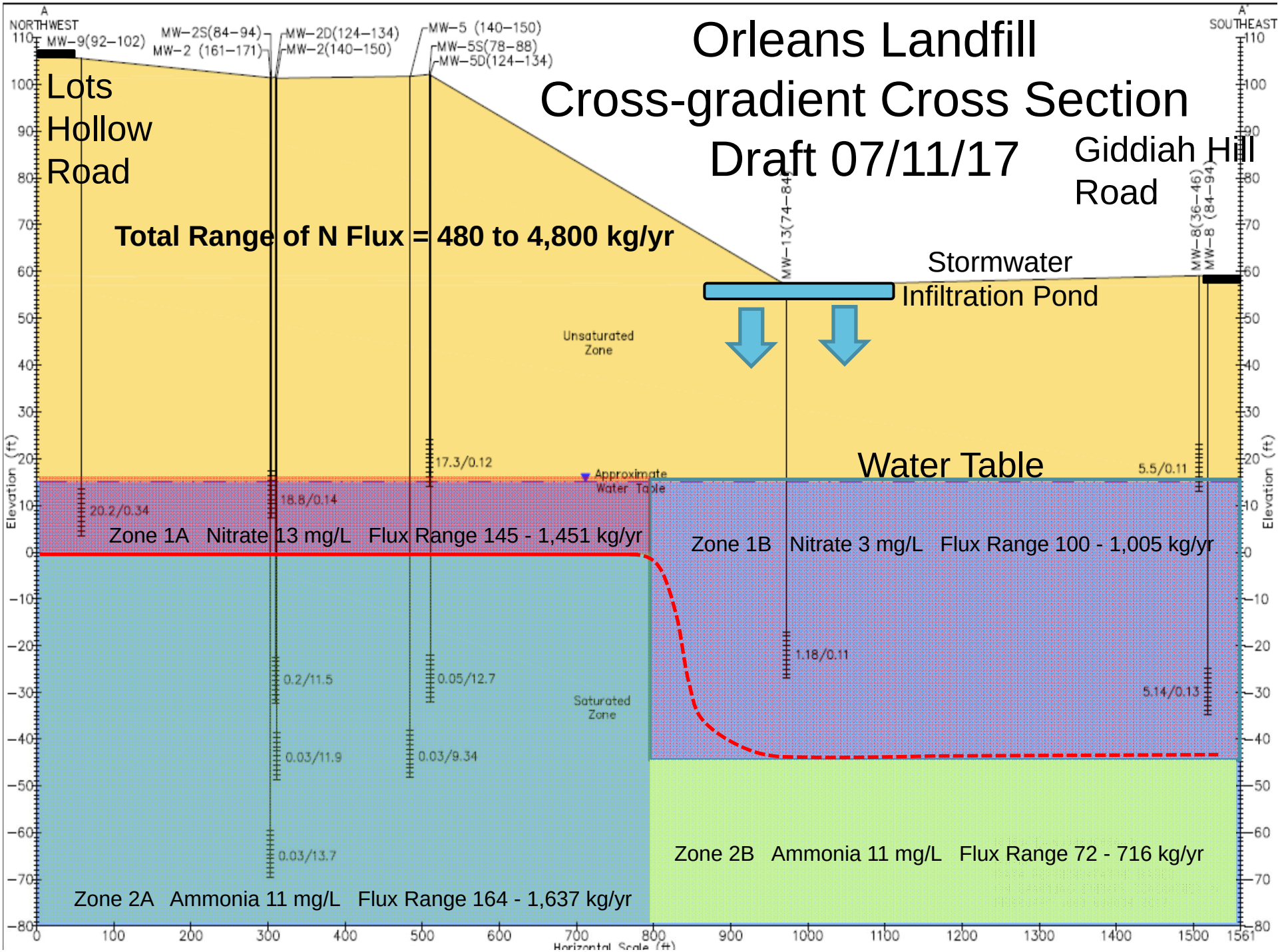
- Landfill Monitoring Program/ Previously Existing AECOM Monitoring Well
- Phase 1 Monitoring Well — MW-2 (140 - 150) Phase 1
- Phase 2 Monitoring Well — MW-2 (161 - 171) Phase 2
- MEP Subwatershed — MW-2S (84 - 94) Previous

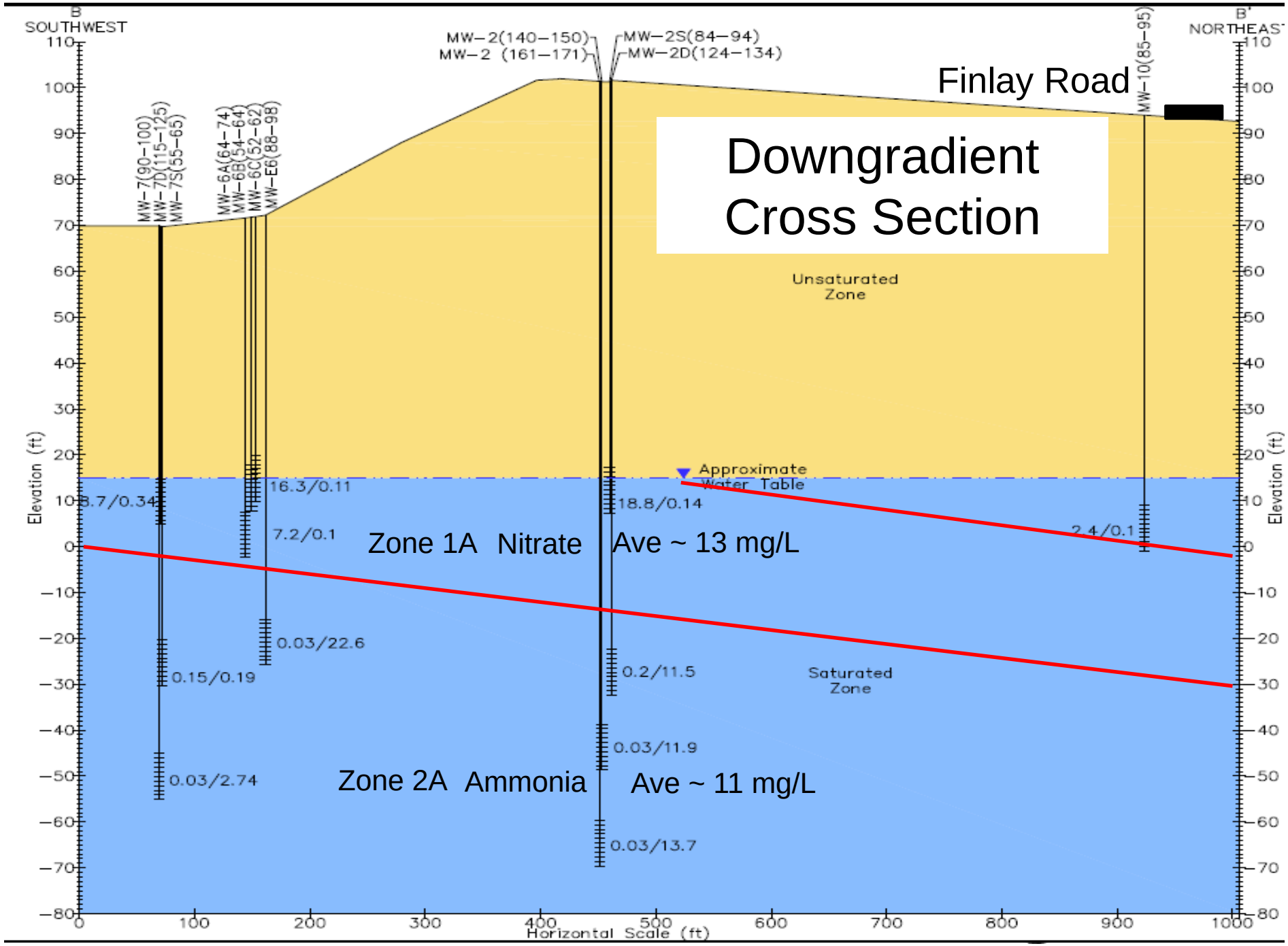
(84-94) Screen-Depth Below Land Surface

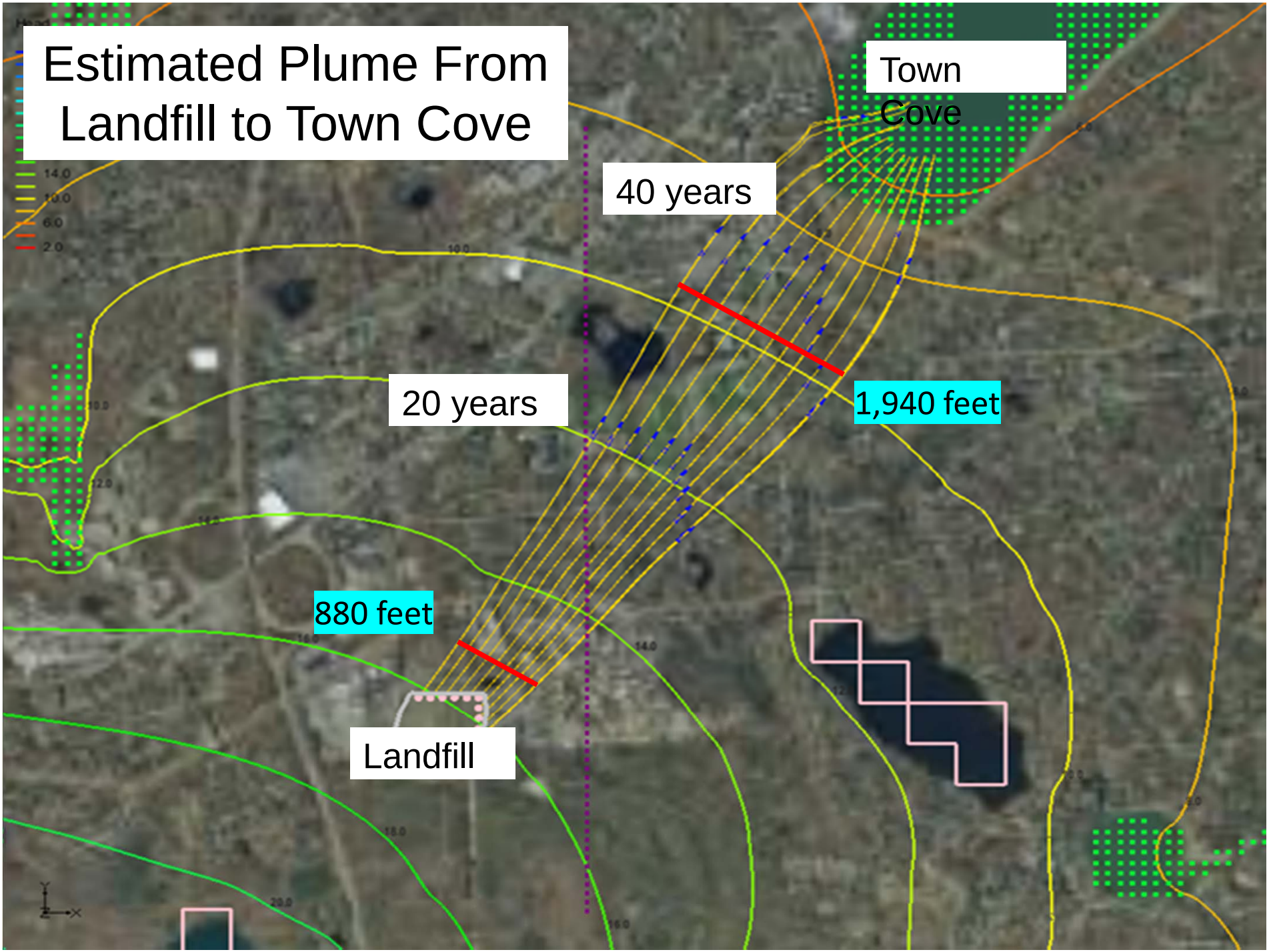
0 100 200 Feet

AECOM


Estimated Plume From Landfill to Town Cove
Town Cove
40 years
20 years
1,940 feet
880 feet
Landfill


Orleans Landfill
Cross-gradient Cross Section
Draft 07/11/17
A
NORTHWEST
A'
SOUTHEAST
MW-9(92-102)
MW-2S(84-94)
MW-2 (161-171)
MW-2D(124-134)
MW-2(140-150)
MW-5 (140-150)
MW-5S(78-88)
MW-5D(124-134)
MW-13(74-84)
MW-8(36-46)
MW-8 (84-94)
Lots Hollow Road
Giddiah Hill Road
Total Range of N Flux = 480 to 4,800 kg/yr
Stormwater Infiltration Pond
Unsaturated Zone
Water Table
Approximate Water Table
Saturated Zone
20.2/0.34
18.8/0.14
17.3/0.12
5.5/0.11
1.18/0.11
5.14/0.13
0.2/11.5
0.05/12.7
0.03/11.9
0.03/9.34
0.03/13.7
Zone 1A Nitrate 13 mg/L Flux Range 145 - 1,451 kg/yr
Zone 1B Nitrate 3 mg/L Flux Range 100 - 1,005 kg/yr
Zone 2A Ammonia 11 mg/L Flux Range 164 - 1,637 kg/yr
Zone 2B Ammonia 11 mg/L Flux Range 72 - 716 kg/yr
Elevation (ft)
Horizontal Scale (ft)


B
SOUTHWEST
B'
NORTHEAST
MW-2(140-150)
MW-2 (161-171)
MW-2S(84-94)
MW-2D(124-134)
MW-10(85-95)
Finlay Road
MW-7(90-100)
MW-7D(115-125)
MW-7S(55-65)
MW-6A(64-74)
MW-6B(54-64)
MW-6C(52-62)
MW-E6(88-98)
Downgradient
Cross Section
Unsaturated
Zone
Approximate
Water Table
16.3/0.11
18.8/0.14
2.4/0.1
8.7/0.34
7.2/0.1
Zone 1A Nitrate
Ave ~ 13 mg/L
0.03/22.6
0.15/0.19
0.2/11.5
Saturated
Zone
0.03/11.9
0.03/2.74
Zone 2A Ammonia
Ave ~ 11 mg/L
0.03/13.7
Elevation (ft)
Elevation (ft)
Horizontal Scale (ft)


Estimated Plume From Landfill to Town Cove
Town Cove
40 years
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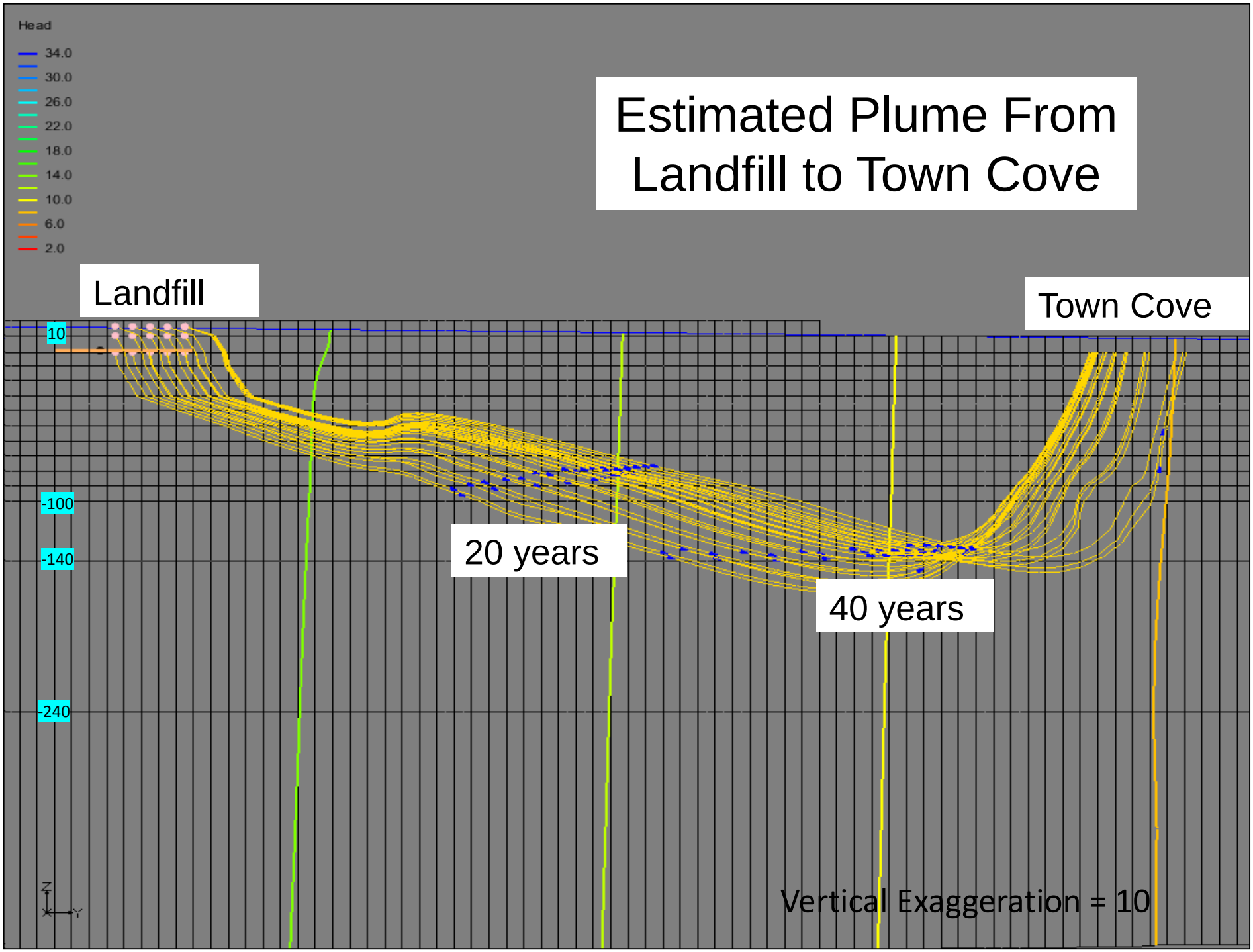
Landfill


Head
34.0
30.0
26.0
22.0
18.0
14.0
10.0
6.0
2.0
Estimated Plume From Landfill to Town Cove
Landfill
Town Cove
10
-100
-140
-240
20 years
40 years
Vertical Exaggeration = 10

Landfill Nitrate Plume
Near-term Response Actions with DPW

- **Modify Salt Shed and Materials Area to Include Impermeable Pavement over Septage Lagoons**
- **Replace Leaching Drainage Swale on North Side of Landfill Cap with Swale or Culvert with Impermeable Base**
- **Add Stormwater Treatment BMPs Prior to General Stormwater and Compost Area Runoff Infiltration**

Landfill Nitrate Plume
Next Steps for Long-Term Planning

- **Complete Pump Tests and Other Field Work this Summer**
- **Update Velocity, Concentration and Flux Estimates**
- **Rerun MEP Model to Determine Impact on Wastewater Plan**

Town of Orleans Massachusetts

Break

Town of Orleans Massachusetts

Effluent Disposal Site Investigations and Plan

Effluent Disposal Site Investigations and Plan Status

- **Hydrogeologic Evaluation for Two Sites**
  - Parcel 1/1A
  - Route 6, Exit 12, Cloverleaf
- **Hydrogeologic Evaluation Results**
  - Summary of Model Run Parameters: Locations, Flows, Flowpaths
  - Analysis of Discharge Flow Paths
  - Summary of Allocation of Discharges to Watersheds
- **Effluent Disposal Plan for Downtown System**
  - Estimation of Discharge Capacities for Each Site
  - Redundancy Requirements
  - MEPA Notice of Project Change Consultation

Effluent Disposal Site Investigations and Plan (cont.) Locations

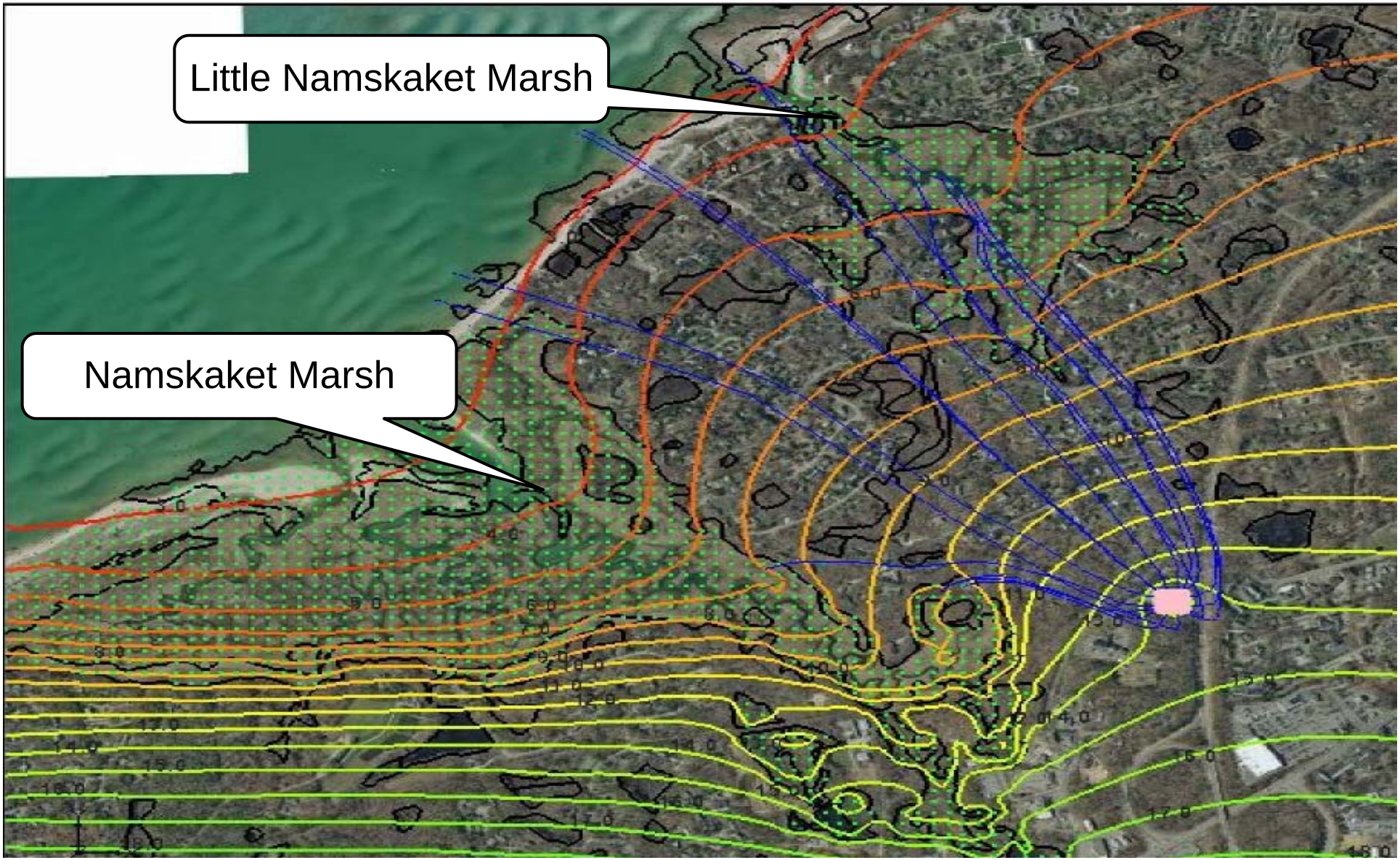
Site 1/1A

- Technology: Open Basins
- Rationale: Shallow Depth to Groundwater, Soil Type and Small Physical Area
- Design Capacity: 150,000 gpd

Route 6 Exit 12

- Technology: Wick Wells
- Rationale: Deep Depth to Groundwater, Soil Type, Large Physical Area, Dense Vegetation and Steep Contours
- Design Capacity: 400,000 gpd

Effluent Disposal Site Investigations and Plan (cont.)
Site 1/1A at 150,000 gpd



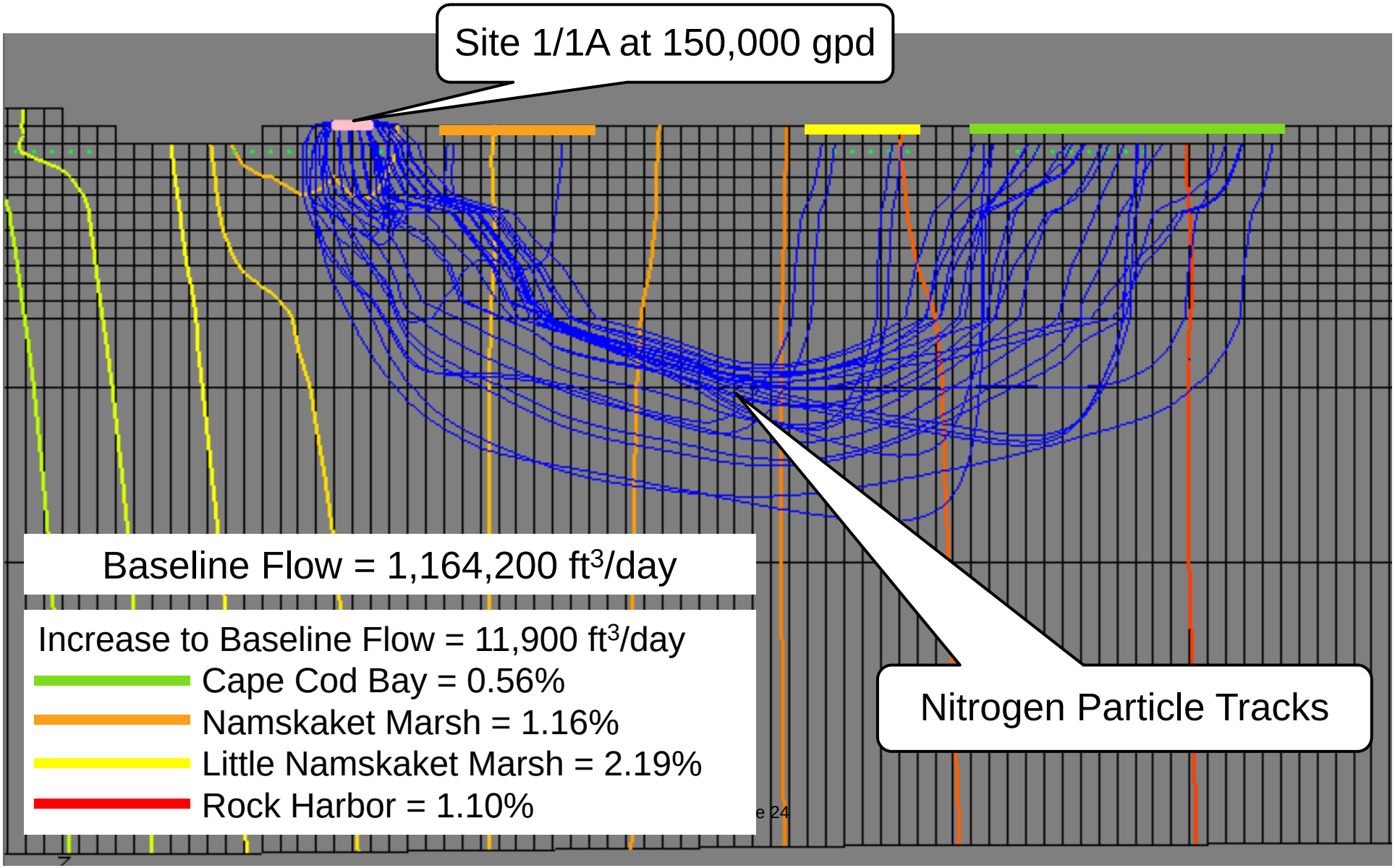
Effluent Disposal Site Investigations and Plan (cont.)
Estimated Nitrogen Loading to Watersheds (kg/yr)

Site 1/1A at 150,000 gpd

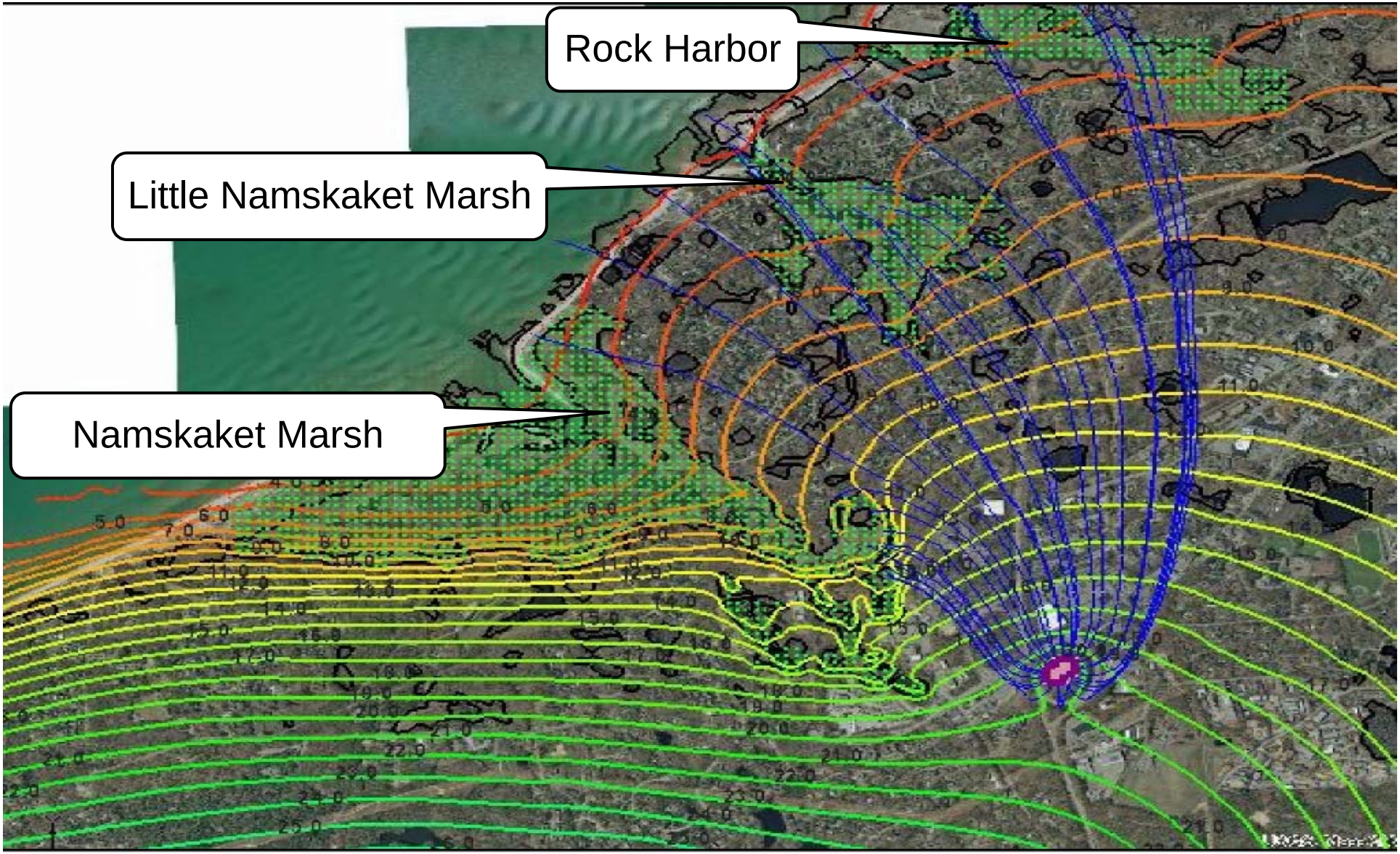
Location	Present Nitrate Load[1]	Present Nitrate Threshold Load[1]	Allowable Additional Watershed Load[2]	Estimated WWTF Nitrate Load	Excess Watershed Load with WWTF Load[3]
Namskaket Marsh	4,630	16,750	12,120	316	11,804
Little Namskaket Marsh	2,815	4,650	1,835	421	1,414
Rock Harbor	ND	ND[4]	ND	0	ND
Cape Cod Bay	ND	ND	ND	1,335	ND

1. Present and Threshold Loads from Draft and Final MEP Reports for Namskaket Marsh, Little Namskaket Marsh, and Rock Harbor.
2 . Watershed Load = Threshold Load - Present Load
3. Estimated Watershed Load with WWTF = Threshold Load -(Present Load + Estimated WWTF Load)
4 . Threshold Load From Draft MEP Report for Rock Harbor - 1,951 kg/yr (Subject to Change)
gpd = gallons per day
kg/yr = kilograms per year
ND = No Data

Effluent Disposal Site Investigations and Results (cont.)
Estimated Discharge to Watersheds



Effluent Disposal Site Investigations and Plan (cont.)
Route 6 Exit 12 at 400,000 gpd



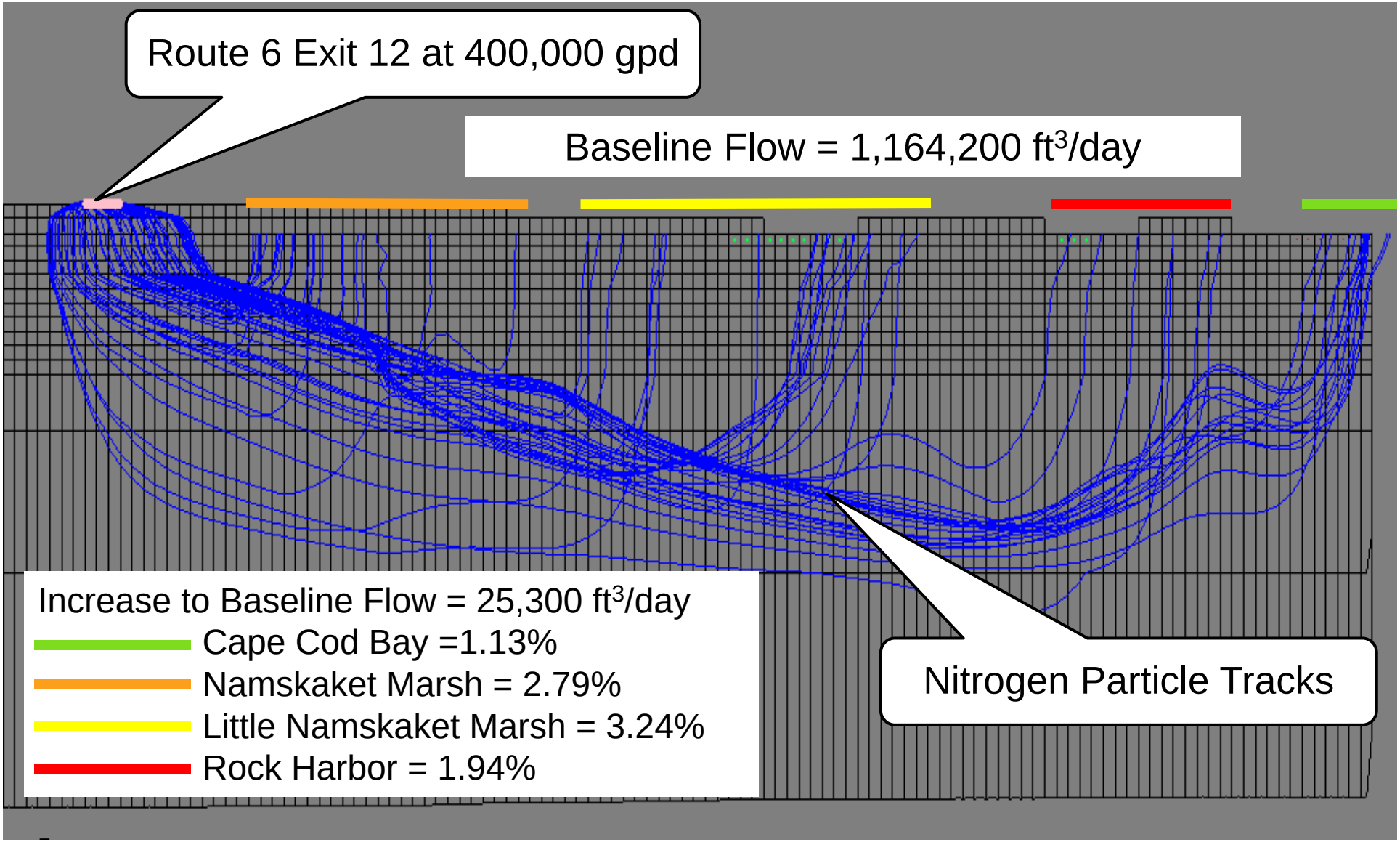
Effluent Disposal Site Investigations and Plan (cont.)
Estimated Nitrogen Loading to Watersheds (kg/yr)

Route 6 Exit 12 at 400,000 gpd

Location	Present Nitrate Load[1]	Present Nitrate Threshold Load[1]	Allowable Additional Watershed Load[2]	Estimated WWTF Nitrate Load	Excess Watershed Load with WWTF Load[3]
Namskaket Marsh	4,630	16,750	12,120	1,610	10,510
Little Namskaket Marsh	2,815	4,650	1,835	945	890
Rock Harbor	ND	ND[4]	ND	43	ND
Cape Cod Bay	ND	ND	ND	2,400	ND

1. Present and Threshold Loads from Draft and Final MEP Reports for Namskaket Marsh, Little Namskaket Marsh, and Rock Harbor.
2 . Watershed Load = Threshold Load - Present Load
3. Estimated Watershed Load with WWTF = Threshold Load -(Present Load + Estimated WWTF Load)
4 . Threshold Load From Draft MEP Report for Rock Harbor - 1,951 kg/yr (Subject to Change)
gpd = gallons per day
kg/yr = kilograms per year
ND = No Data

Effluent Disposal Site Investigations and Results (cont.)
Estimated Discharge to Watersheds



Effluent Disposal Site Investigations and Plan (cont.)
Next Steps

- **Site 1/1A**
  - Further Investigation of Soils under Compost Shed
- **Route 6 Exist 12 - MassDOT**
  - Wick Well Pumping Test
  - DEP Approval of Wick Well Design
  - Long Term Agreement with MADOT
- **Both or Either Site**
  - Submit Hydrogeologic Evaluation Reports
  - Confirmation with SMAST of MEP compliance
  - File Notice of Project Change with MEPA (based on preferred site)

Town of Orleans Massachusetts

Downtown Facilities Engineering and Cost Estimate Update

Downtown Facilities Engineering and Cost Estimate Update - Proposed Infrastructure

WWTF

- One Facility Implemented in 2 Phases at Overland Way
- Detailed Evaluation of MBR vs SBR Processes
- SBR Selected
  - Lowest Capital Cost
  - Lowest O&M Costs
  - More Common Process in the Region Results in More Familiarity by Technical and Operating Staff

Collection System

- Hybrid System
  - Gravity Sewers
  - Low Pressure Sewers
- More Familiarity of System Components by General Contractors, Contract Operators and Design-Built-Operate Teams = Reduced Costs
- Provides Flexibility with Phased Implementation and Potential Future Expansion
- Provides Less Impact on Private Property Owners

Downtown Facilities Engineering and Cost Estimate Update - Proposed Infrastructure

- **Rationale**
  - Evaluation Incorporated the All Requirements of the Regulatory Documents for Projects Located in Massachusetts
  - Considered Input from Various Groups and Individuals
  - Considered All Costs - Capital and O&M

Downtown Facilities Engineering and Cost Estimate Update (cont.) - MassDOT Intersection Projects

- **Utilize Existing 25% Documents (Topographic Survey, Subsurface Investigation, etc.)**
- **Develop Specifications to Supplement Existing MassDOT Documents**
- **Obtain Cost Proposal From MassDOT Contractor**
- **Install System Using MassDOT Contractor**
- **Missing Window of Opportunity Results in MassDOT Five Year "No Dig" Moratorium**

Downtown Facilities Engineering and Cost Estimate Update (cont.) - MassDOT Intersection Projects Savings

Engineering

- Full Contract Documents
- Bidding Services
- Construction Administration

Construction

- Mobilization/Demobilization
- Control Density Fill
- Compaction Testing
- Roadway Reconstruction
- Sidewalk Reconstruction
- Engineer's Field Office
- Environmental Protection
- Planting

Downtown Facilities Engineering and Cost Estimate Update (cont.) - AECOM's Estimated Costs

Component	Estimated Cost	Estimated Savings
Capital Cost	$2,400,000	$900,000
Contingency at 10%	$240,000	$90,000
Construction Total	$2,640,000	$990,000
Town Administration and Engineering	$960,000	$610,000
Totals	$3,600,000	$1,600,000

At the July 12, 2017 Board Selectman's Meeting
Recommendation: Proceed with Design to Incorporate as Part of MassDOT Project

- Endorsed and Recommend by DPW & NR Director
- Approved by the Board of Selectmen

Town of Orleans Massachusetts

Freshwater Ponds Remediation Update

Freshwater Ponds Remediation Update

- **Uncle Harveys Pond and Pilgrim Lake Prioritized for 2018**
- **Field Studies for Remediation Plan for Uncle Harveys Pond Being Completed Now**
- **Alternatives Workshop for Uncle Harveys Pond on July 25**
- **Developing Action Plan in August 8 and 22 Workshops**
- **Recommendations for Fall Special Town Meeting Warrant Article by September 8**
- **Comments on SMAST Data Base Technical Memorandum Being Received and Addressed**

Town of Orleans Massachusetts

Financial Plan Update and Next Steps

Financial Plan Update and Next Steps Enhancements

- **“De-couple” Septage Revenue from Septage Construction and Operation and Maintenance Costs: Ability to Utilize Revenue for Properties Who Continue to Utilize On-Site System**
- **Ability to Change Distribution of Operation and Maintenance Costs: By User Group and Revise Distribution of Costs**
- **Incorporate Minimum and Maximum Calculations with Input via the User Selection Tab: All Properties and Address Very High and Low Cost Allocations**
- **Incorporate Possible New Tax Revenue Source: Proposed Short Term Rental Tax to Off-set Operation and Maintenance Costs**
- **Ability to Better Represent the Per-parcel Results in Graphical or Table Format: Based on Input from BOS and Finance Committee Workshops**

Financial Plan Update and Next Steps (cont.)

- **Prepare a Financial Model User Manual**
- **Apply Updated Program Costs Developed as Part of the Downtown Area Preliminary Design Report**
  - Reduction in Capital Costs for WWTF
  - Reduction in Capital Costs for Downtown Area Collection System
- **Recommend Cost Allocation and Financial Management Plan in August 2017**
- **BOS and/or Finance Committee Workshops in August and September 2017**

Financial Plan Update and Next Steps (cont.)
Cost Allocation Assumptions – One Plant

- **Capital Costs- WWTF and Collection System**
  - Case 1 – 100% Tax Rate
  - Case 2 – 50% Tax Rate, 50% Downtown Area/MHP Special Assessment
  - Case 3 – 20% Tax Rate, 80% Downtown Area/MHP Special Assessment (Split 50% Downtown Non-residential, 30% Downtown Residential/MHP)
- **Capital Costs Effluent Disposal and NT - 100% Tax rate**
- **O&M&R&M - 100% User Fees**
- **Financing**
  - 30-year 0% SRF
  - 10% Grant
  - Additional 5% Local Tax Option
  - Septage Revenue ($584,000 annually)
  - 15% Contingency for Capital/ Replacement Costs
- **Non-traditional and Septic Only costs do not include individual owner costs to pump and maintain on-site septic systems**

Financial Analysis Update - Cost Allocation
Setting Minimum and Maximum Costs Methodology

- **Apply Maximum Annual Cost**
- **Apply Minimum* Annual Cost**
- **Re-allocate* the difference of costs Town-wide**

*Excludes undevelopable parcels

		Case 1	Case 2	Case 3
		100% Tax Rate	50% Tax Rate, 50% Special Assessment	20% Tax Rate, 80% Special Assessment (50% Downtown Non-Residential, 30% Downtown Residential/ Meetinghouse Pond)
Number owners with annual cost above:	$7,000	30	52	66
Total costs owed by owners with costs above maximum:		$ 420,464	$ 765,052	$ 1,182,348
Balance to cover if they only pay the maximum:		$ 210,464	$ 401,052	$ 720,348
Number of Owners to Increase to Minimum:	$300	1199	1547	1998
Surplus after minnimum charge applied:		$ 166,946	$ 224,930	$ 306,879
Net amount remaining to allocate:		$ 43,518	$ 176,122	$ 413,469
Number of Owners to allocate to:		6,398	6,398	6,398
Additional cost allocated per owner:		$ 7	$ 28	$ 65

Total Owners/Users Town-Wide:	6,559
Total number of owners/users with undevelopable land:	161

Financial Analysis Update - Cost Allocation Summary – Annual Costs (Year 20)

							Case 1		Case 2		Case 3	
							100% Tax Rate		50% Tax Rate, 50% Special Assessment		20% Tax Rate, 80% Special Assessment (50% Downtown Non-Residential, 30% Downtown Residential/ Meetinghouse Pond)	
	Area of Orleans	**Type of Wastewater Service[1]**	**Number of Users in Category**	**Average Wastewater (gpd)[4]**	**Average Assessed Value[5]**	**Cost Description[7]**	**Total Average Annual Charges (Year 20)**	**Range of Total Annual Charges (Year 20)[8, 9]**	**Total Average Annual Charges (Year 20)**	**Range of Total Annual Charges (Year 20)[8, 9]**	**Total Average Annual Charges (Year 20)**	**Range of Total Annual Charges (Year 20)[8, 9]**
Sewered Areas	**Sewered Area** Downtown Non-Residential	Sewers &WWTF	384	235	$505,512	*Former Scenario Runs*	*$1,550*	*$0 - $35,544*	*$2,494*	*$0 - $55,128*	*$3,737*	*$0 - $81,405*
						New Scenario Runs	$1,285	*$307* - $7,007	$1,727	*$307* - $7,028	$2,148	*$307* - $7,065
	Downtown Residential/Meetinghouse Pond		1,176	95	$330,644	*Former Scenario Runs*	*$722*	*$0 - $10,657*	*$1,072*	*$0 - $19,079*	*$1,056*	*$0 - $19,607*
						New Scenario Runs	$738	*$307* - $7,007	$1,091	*$307* - $7,028	$1,114	*$307* - $7,065
Unsewered Areas	**Nitrogen Sensitive Areas** Non-Traditional Areas	NT Technology or I/A System	4,208	118	$533,329	*Former Scenario Runs*	*$928*	*$0 - $36,577*	*$755*	*$0 - $36,432*	*$644*	*$0 - $36,339*
						New Scenario Runs	$939	$307 - $7,007	$801	$307 - $7,028	$739	$307 - $7,065
	Non-Nitrogen Sensitive Areas Septic Only	Title 5 On-Site System	791	130	$643,889	*Former Scenario Runs*	*$476*	*$0 - $12,791*	*$317*	*$0 - $8,524*	*$216*	*$0 - $5,790*
						New Scenario Runs	$518	$307 - $7,007	$418	$307 - $7,028	$397	$307 - $5,855

Notes

1. NT Technology = Shellfish, PRB, NRB or On-site I/A System
2. The WWTF will be implemented in phases and therefore users do not pay user charges or special assessments until their phase is implemented. All costs shown here represent "Year 20" when everyone will be connected and paying user charges.
3. Wastewater flows were determined as 95% of the average 2014-2015 water usage data.
4. Assessed values based on FY 2015 assessor's data.
5. Special Assessments are applied to applicable user groups (Downtown and Meetinghouse Pond).
6. Non-residential categories include all parcels that are not 100% residential, such as mixed use, conservation, developable, etc.
7. "Former Scenario Runs" (as determined by the Financial Model) are shown in italics.
8. Maximum and minimum total annual costs were applied, Town-wide. The minimum charge was not applied to the 161 undevelopable parcels. The cost differential was allocated equally Town-wide (with the exception of the 161 undevelopable parcels).
9. The minimum shown for the re-allocated costs does not include undevelopable parcels, which may have an annual cost less than the minimum charge.
   Minimum: $300 Maximum: $7,000

Financial Model Flow Chart

Cost Estimate Sheets	Financing	Downtown Area	Downtown Area Special Assessment Breakdown	Meetinghouse Pond Area	Non-Traditional Technology Area	Septic System Only Area	Discounts, Offsets, and Additional Funds	Financial Model Outputs
Upload Files	Type (SRF or Conventional)	Special Assessment Percentage	Same for Residential, and Non-Residential/ Mixed Use Properties	Special Assessment Percentage	Property Taxes Percentage	Property Taxes Percentage	Grant(s) Percentage	Project Complete "All in Year 1" – Average Property Costs
Number of WWTFs	Term (Years)	Property Tax Assessment	Residential Percentage	Property Tax Assessment			Design/Build Savings Percentage	Program Phased over 40-Years – Average Property Costs
Folder for Saving Files	Interest Rate		Non-Residential/ Mixed Use Percentage				Design/Build/Operate Savings Percentage	Program Phased over 40-Years – Per Property Costs
							Additional Local Tax Options Percentage	
							Annual Septage Revenue	

Town of Orleans Massachusetts

Summary: Key Decisions for Fall Special Town Meeting

Summary: Key Decisions for Fall Special Town Meeting

- **Effluent Disposal Plan for Downtown System**
- **Landfill – Long-Term Nitrogen Management Plan**
- **Financial and Cost Allocation Approach**
- **Downtown Project Procurement Approach**

Wastewater Management Timeline
Summer – Fall 2017

Town of Orleans Massachusetts

OWQAP Web Site Status

OWQAP Web Site Status

- **All Final Meeting Summary and Minutes Updated to Finals**
- **All AECOM Documents to Date Added to Web Site**

Town of Orleans Massachusetts

Other Items and Public Comment

Other Items and Public Comment

- **Recent and Proposed Public Information Activities**
  - BOS Effluent Disposal, Landfill, Financial and DBO Workshops - TBD
  - OWQAP
    - August 16, September 20, October 18, 2017
  - Freshwater Ponds Work Group Meetings
    - July 25, August 8, August 22, 2017
  - Shellfish and Waterways Improvement Advisory Committee
    - July 11, 2017 - Management Plan
    - August 8, 2017 - Management Plan
- **Recent and Proposed Public Information Activities (cont.)**
  - Special Town Meeting – October 16, 2017
- **Status Reports and FAQ on Various Projects**

Town of Orleans Massachusetts

Thank You