



Town of

*Orleans*  
Massachusetts

# Massachusetts Department of Transportation

## Route 6 Exit 12 Aquifer Recharge Meeting

August 9, 2017

# Aquifer Recharge Site Investigations

## Background

- ❖ **Tri-Town Septage Treatment Facility Operated From 1987 thru 2016**
  - Permitted to Discharge 45,000 gpd to Namskaket and Little Namskaket Watersheds
  - Discharge Nitrogen Concentration = 50 mg/L
  - Existing Effluent Discharge Permit Based on 1985 MEPA Finding of “No Significant Impact”
  
- ❖ **2010 CWMP Approved by MassDEP, MEPA, and Cape Cod Commission**
  - 740,000 gpd from New WWTF to Namskaket and Little Namskaket Watersheds
  - Discharge Nitrogen Concentration = 10 mg/L
  - Based on USGS and SMAST studies concluding there would be no significant impact to either marsh system
  
- ❖ **Begin Work to Find Alternative Discharge Locations**
  - Fourth Detailed Site Identification Study in Last 12 years
  - Two Areas to be Sewered: Downtown Area and Meetinghouse Pond Area
  - Discharge of Current Treated Flow From Downtown Area
    - 150,000 gpd
    - Discharge Nitrogen Concentration < 10 mg/L



# Aquifer Recharge Site Investigations (cont.)

## Evaluation Criteria

### ❖ Site Suitability

- Property Ownership
- Distance from WWTF
- Site Topography
- Uses of Site
- Depth to Groundwater
- Potable Water Wells
- Land Area Available for Discharge
- Funding Potential
- Community Impacts

### ❖ Permitting

- Wetlands
- ACEC
- Priority/Estimated Habitat of Rare Species
- MHC Sites

### ❖ Engineering Factors

- Nitrogen Impacted Estuary
- Results of Previous Studies
- Effluent Quality - Nitrogen
- Groundwater Discharge Method(s)

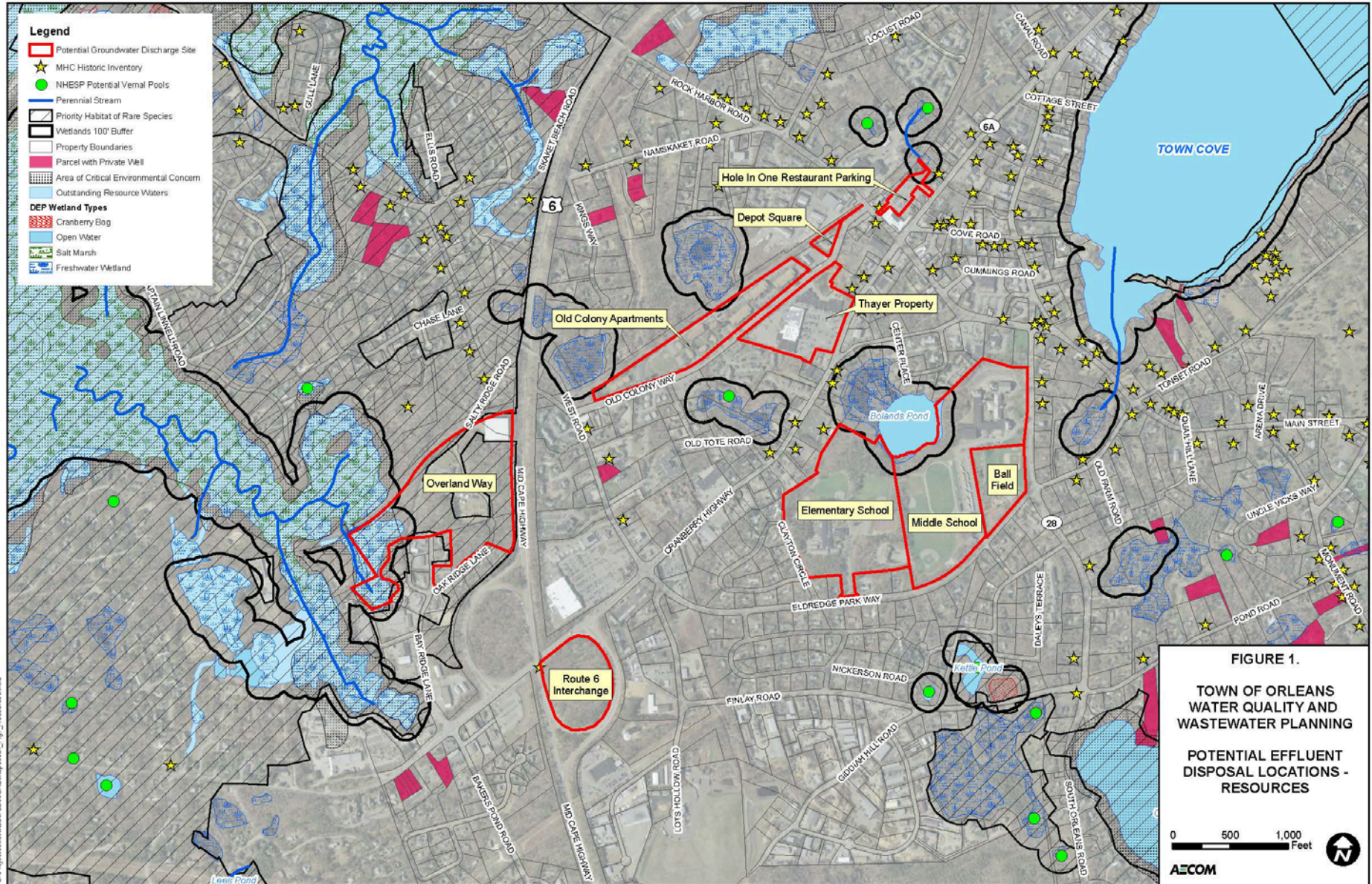


# Aquifer Recharge Site Investigations

## Potential Site Summary

- ❖ Parcel 1/1A
- ❖ Route 6 Exit 12
- ❖ Thayer Site (Orleans Market Place)
- ❖ Old Colony Apartments (Old Colony Way)
- ❖ Hole in One Restaurant (Cranberry Highway)
- ❖ Depot Square (Old Colony Way)
- ❖ Orleans Elementary School (46 Eldredge Park Way)
- ❖ Nauset Regional Middle School (70 Eldredge Park Way)
- ❖ Ball Field (76 Eldredge Park Way)





# Aquifer Recharge Site Investigations (cont.) Evaluation Results

Potential Effluent Discharge Location	Score	Rank
Site 1/1A	673	1
Route 6 Exit 12	492	4
Thayer Site (Orleans Market Place)	510	3
Old Colony Apartments (Old Colony Way)	466	7
Hole in One Restaurant (Cranberry Highway)	411	9
Depot Square (Old Colony Way)	485	5
Orleans Elementary School (46 Eldredge Park Way)	477	6
Nauset Regional Middle School (70 Eldredge Park Way)	545	2
Firebirds Ball Field (76 Eldredge Park Way)	440	8



# Aquifer Recharge Site Investigations

## Status of Current Evaluations

### ❖ **Hydrogeologic Evaluation for Two Sites - Completed**

- Parcel 1/1A (Limited to Existing Disturbed Area)
- Route 6 Exit 12

### ❖ **Hydrogeologic Evaluation Results**

- Summary of Model Run Parameters: Locations, Flows, Flow Paths
- Analysis of Discharge Flow Paths
- Summary of Allocation of Discharges to Watersheds

### ❖ **Effluent Disposal Plan for Downtown System**

- Complete Estimation of Discharge Capacities for Each Site
- Confirm Redundancy Requirements
- MEPA Consultation and Notice of Project Change
- Meeting with MassDOT to Discuss Necessary IMA



# Aquifer Recharge Site Investigations

## Route 6 Exit 12

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



# Aquifer Recharge Site Investigations (cont.)

## Erickson Retirement Communities - Linden Ponds

### ❖ Retirement Community

- Hingham, MA
- 2,266 Units
- 4,000 People

### ❖ Restaurants, Medical Center, Pharmacy, Pools, Health Spas, Beauty Salon, Library, Game Rooms, Banks, Theater, more

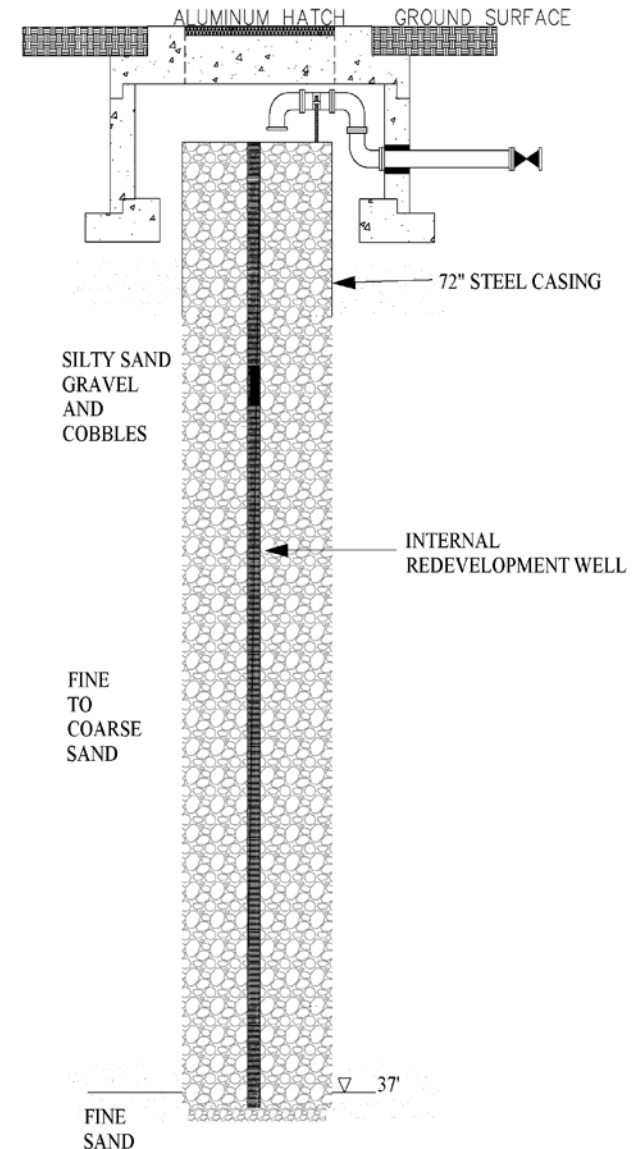


# Aquifer Recharge Site Investigations (cont.)

## Erickson Retirement Communities - Linden Ponds

### Wick Design

- ❖ Column of Stone
- ❖ 4 to 6 Feet in Diameter
- ❖ 50 to 65 Feet Deep
- ❖ No Well Screen
- ❖ Access by Vault
- ❖ Vault Less Than 10 sq. ft.



# Aquifer Recharge Site Investigations (cont.) Erickson Retirement Communities - Linden Ponds Wick Installation



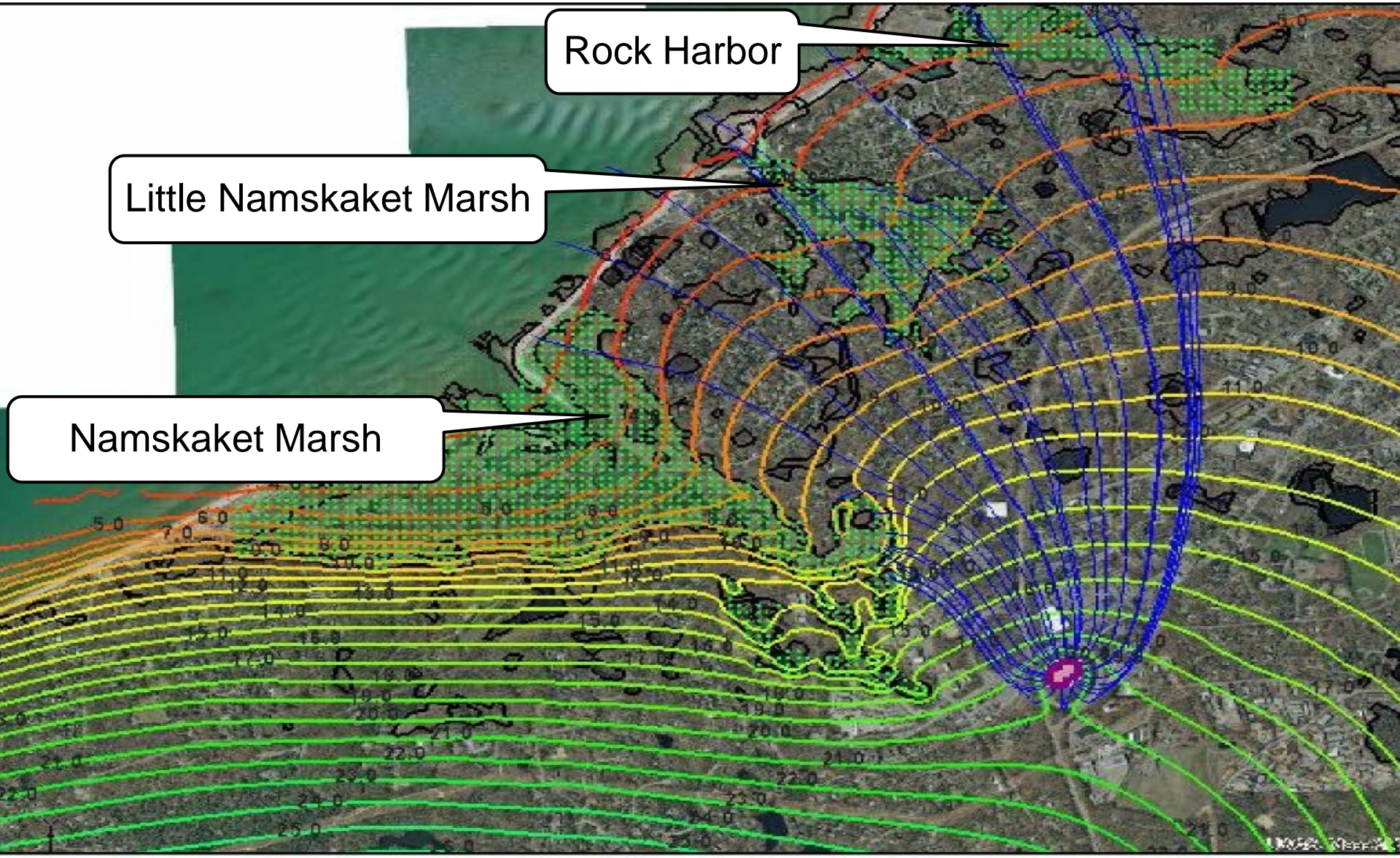
# Aquifer Recharge Site Investigations (cont.)

## Erickson Retirement Communities - Linden Ponds

### Wick Completion



# Aquifer Recharge Site Investigations Route 6 Exit 12 at 400,000 gpd



Rock Harbor

Little Namskaket Marsh

Namskaket Marsh

# Aquifer Recharge Site Investigations

## Estimated Nitrogen Loading to Watersheds (kg/yr)

### Route 6 Exit 12 at 400,000 gpd

Location	Present Nitrate Load <sup>1</sup>	Present Nitrate Threshold Load <sup>1</sup>	Allowable Additional Watershed Load <sup>2</sup>	Estimated WWTF Nitrate Load	Excess Watershed Load with WWTF Load <sup>3</sup>	Increase to Baseline Flow (percent)
Namskaket Marsh	3,446	16,750	13,304	1,610	11,694	2.79
Little Namskaket Marsh	2,797	4,650	1,853	945	908	3.24
Rock Harbor	ND	ND <sup>4</sup>	ND	43	ND	1.94
Cape Cod Bay	ND	ND	ND	2,400	ND	1.13

1. Present and Threshold Loads from Draft and Final MEP Reports for Namskaket Marsh, Little Namskaket Marsh, and Rock Harbor.

Tri-town Septage Treatment Facility Loads Removed.

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



# Aquifer Recharge Site Investigations Estimated Discharge to Watersheds

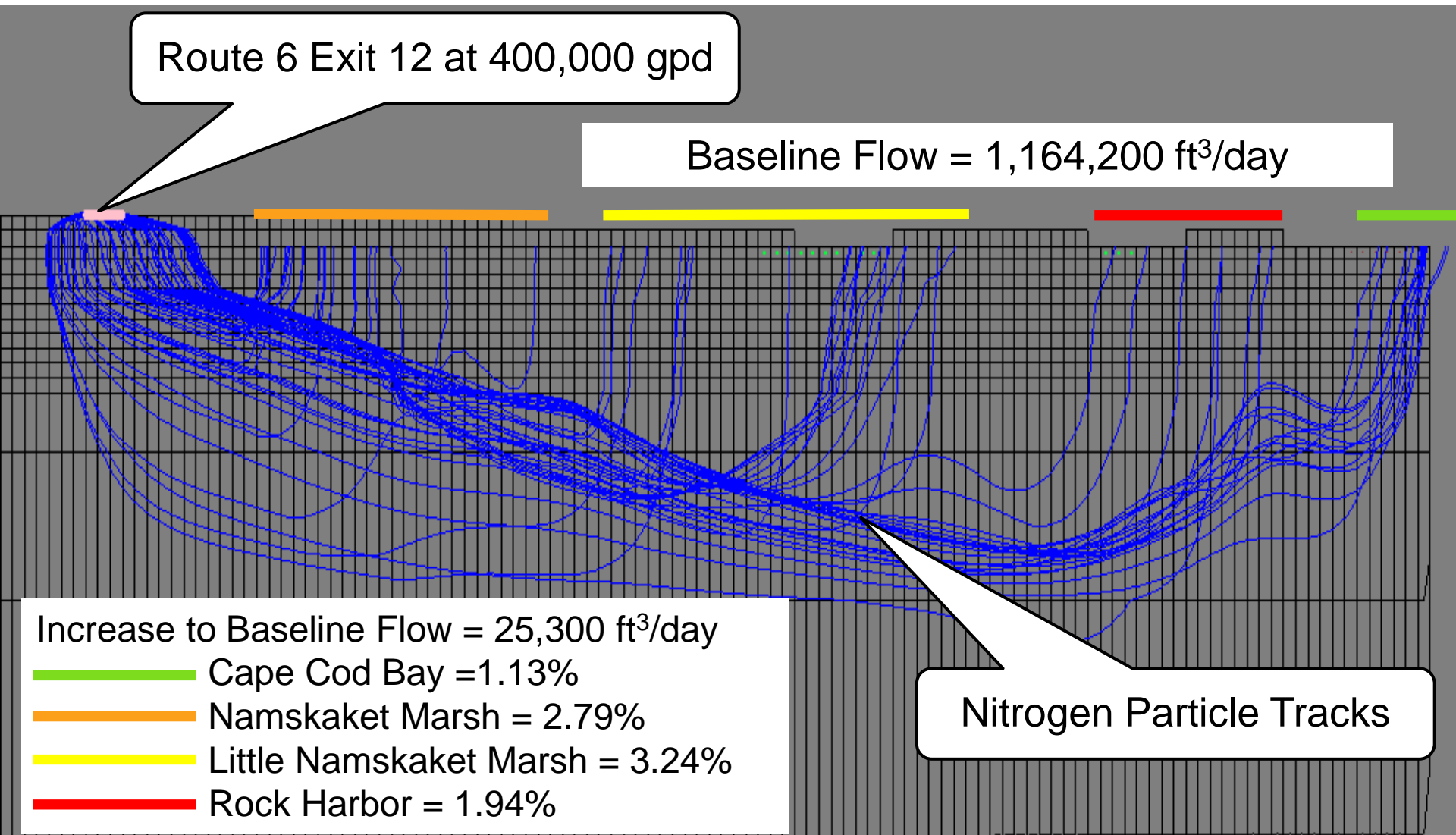
Route 6 Exit 12 at 400,000 gpd

Baseline Flow = 1,164,200 ft<sup>3</sup>/day

Increase to Baseline Flow = 25,300 ft<sup>3</sup>/day

- Cape Cod Bay = 1.13%
- Namskaket Marsh = 2.79%
- Little Namskaket Marsh = 3.24%
- Rock Harbor = 1.94%

Nitrogen Particle Tracks



# Aquifer Recharge Site Investigations

## Site Summary

Location	Ownership	Capacity (gpd)	MassDEP Approved GeoHydro Report
223 Beach Road	Town	200,000	Yes
Overland Way	Town	400,000	Yes
Parcel 1/1A	Town	150,000	Pending
Route 6 Exit 12	MassDOT	400,000	Pending
Thayer Site (Orleans Market Place)	Private	140,000	Yes
Depot Square (Old Colony Way)	Town	48,000	No
Old Colony Apartments (Old Colony Way)	Private	80,000	No



# Aquifer Recharge Site Investigations (cont.)

## Next Steps

- ❖ **Town Approve Wick Testing at Fall Town Meeting**
- ❖ **Prepare Wick Testing Proposal for Submittal to MassDEP**
- ❖ **Perform Wick Testing**
  - Obtain Site Access Permit from MassDOT
  - Install Test Wick
  - Install Observation Wells
  - Perform 8-hour Step Test
  - Perform 30-day Loading Test
- ❖ **Wick Testing Evaluation and Report**
  - Evaluate Discharge Capacity of site
  - Evaluate Capacity of Final Wicks and Number Wicks
  - Work with MassDOT on Placement
  - Submit Final Report to MassDEP





Thank You