

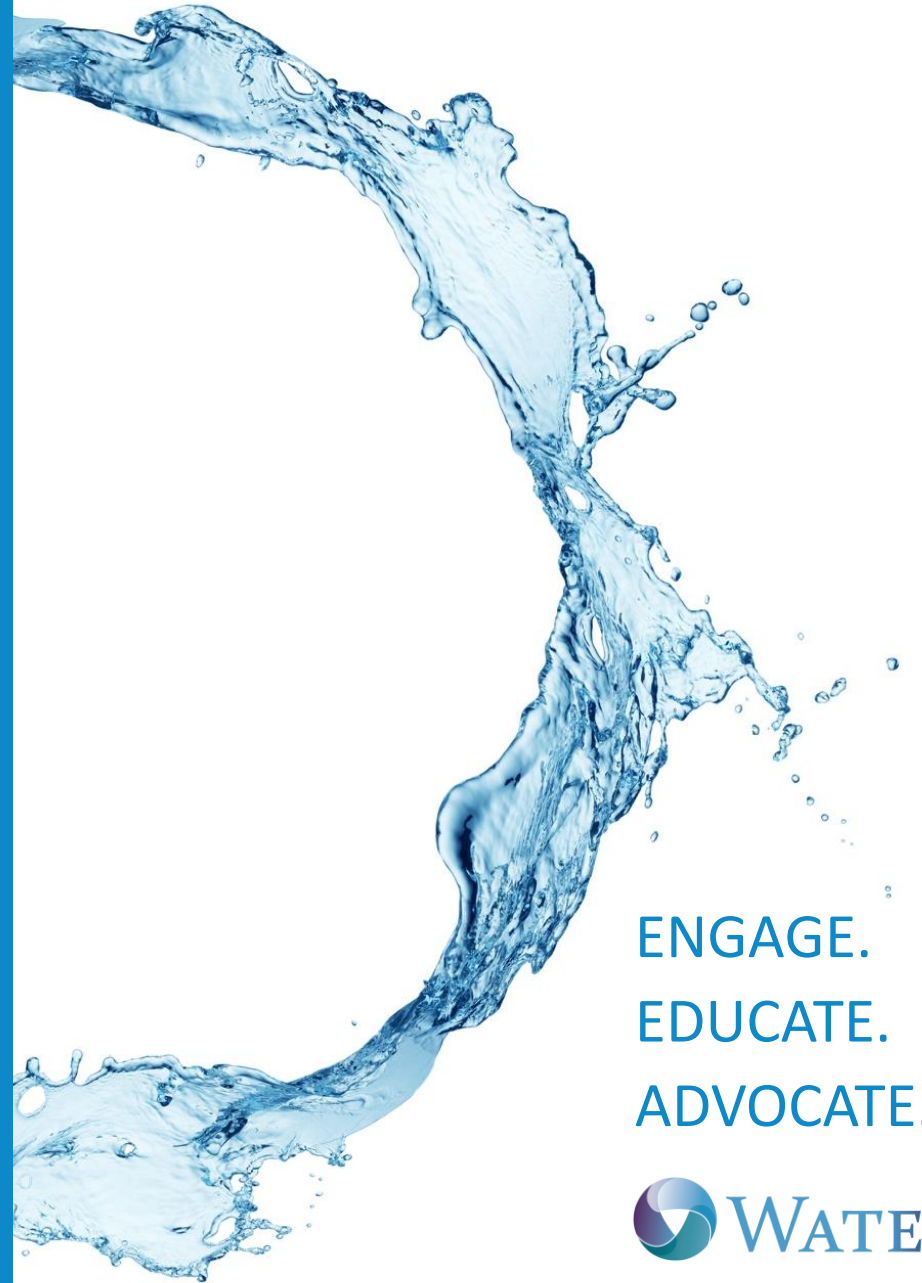
EXPLORING WATER REUSE PRACTICES AND APPROACHES IN THE NORTHEAST

*IN PARTNERSHIP WITH
NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
(NEWEA)*



THURSDAY, NOVEMBER 07, 2024
11:00 AM PT | 2:00 PM ET

WATEREUSE ASSOCIATION WEBCAST SERIES



ENGAGE.
EDUCATE.
ADVOCATE.



A Few Notes Before We Start...

- Today's webcast is scheduled for 60 minutes.
- A PDF of this presentation will be shared afterwards via email
- Please type questions for the presenters into the Q&A box located at the bottom of your screen.
- There is one (1) Professional Development Hour (PDH) available for this webcast. Please email the PDH form to webcasts@watereuse.org





 **WATERREUSE[®]**
2025 SYMPOSIUM
Celebrating 40 Years

MARCH 16-19
JW MARRIOTT TAMPA
WATER STREET

IN COLLABORATION WITH THE WATER RESEARCH FOUNDATION



Registration Open
Early Bird Closes Dec 17, 2025
<https://watereuse.org/news-events/conferences/symposium-2025/>



Moderator:



Alan Cohn
Senior Policy &
Science Advisor
NYC Dept Of
Environmental
Protection

Today's Presenters



Bruce Douglas, PE
Wastewater
Program Manager
Vermont
Department of
Environmental
Conservation
Drinking Water &
Groundwater



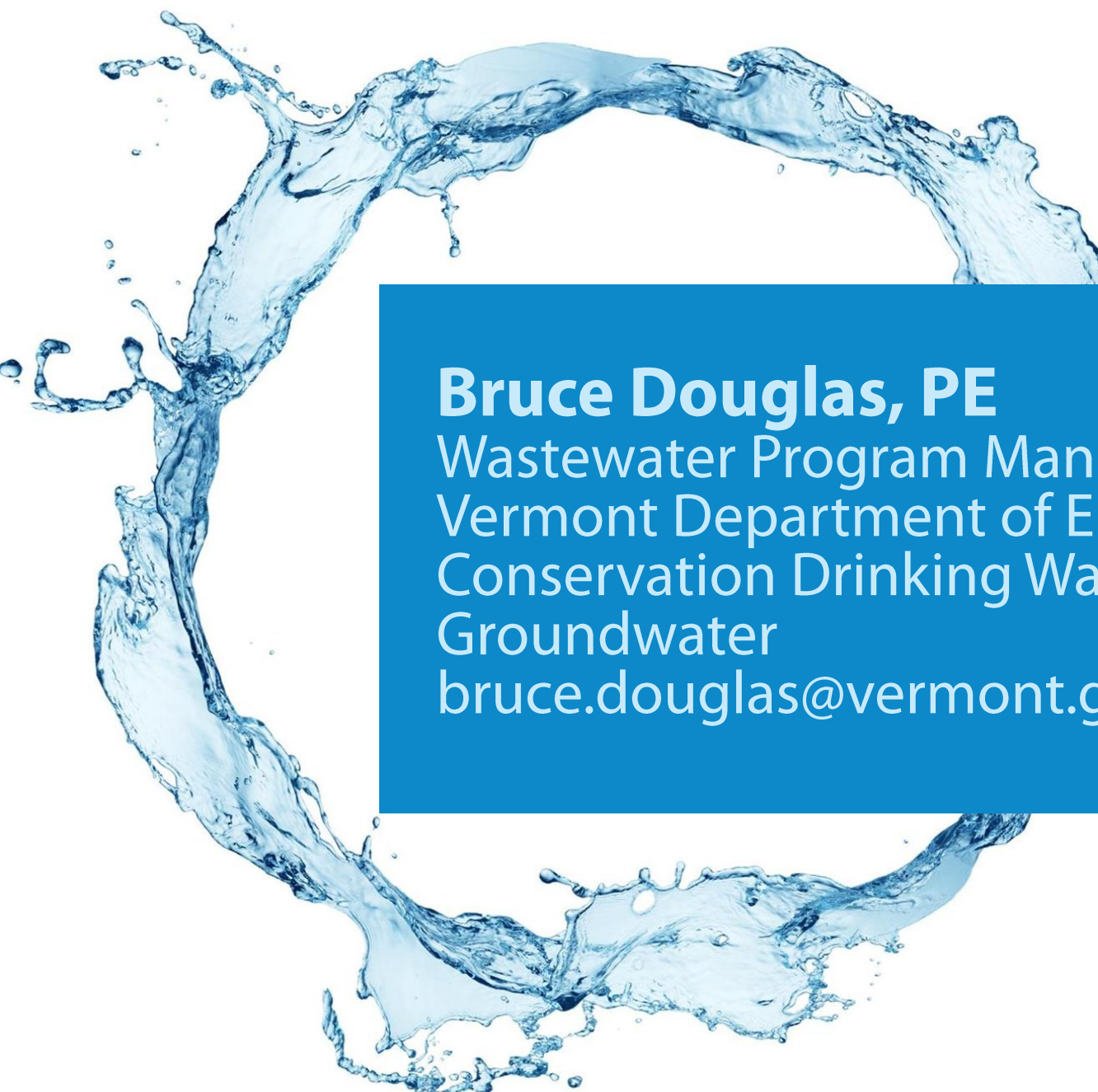
Zach Gallagher, PE, LEED-AP
President &
CEO
Natural
Systems
Utilities



John Turner
Conservation
Policy
Advocate
Seatuck
Environmental
Association



Stephen Hadjiyane, PE, BCEE.
Associate
Principal
IMEG,
Formerly
Cameron
Engineering



Bruce Douglas, PE
Wastewater Program Manager
Vermont Department of Environmental
Conservation Drinking Water &
Groundwater
bruce.douglas@vermont.gov

Member of
NEWEA Water Reuse Committee



A Brief History of Non-Potable Water Reuse in New England

Bruce Douglas, PE

November 7, 2024

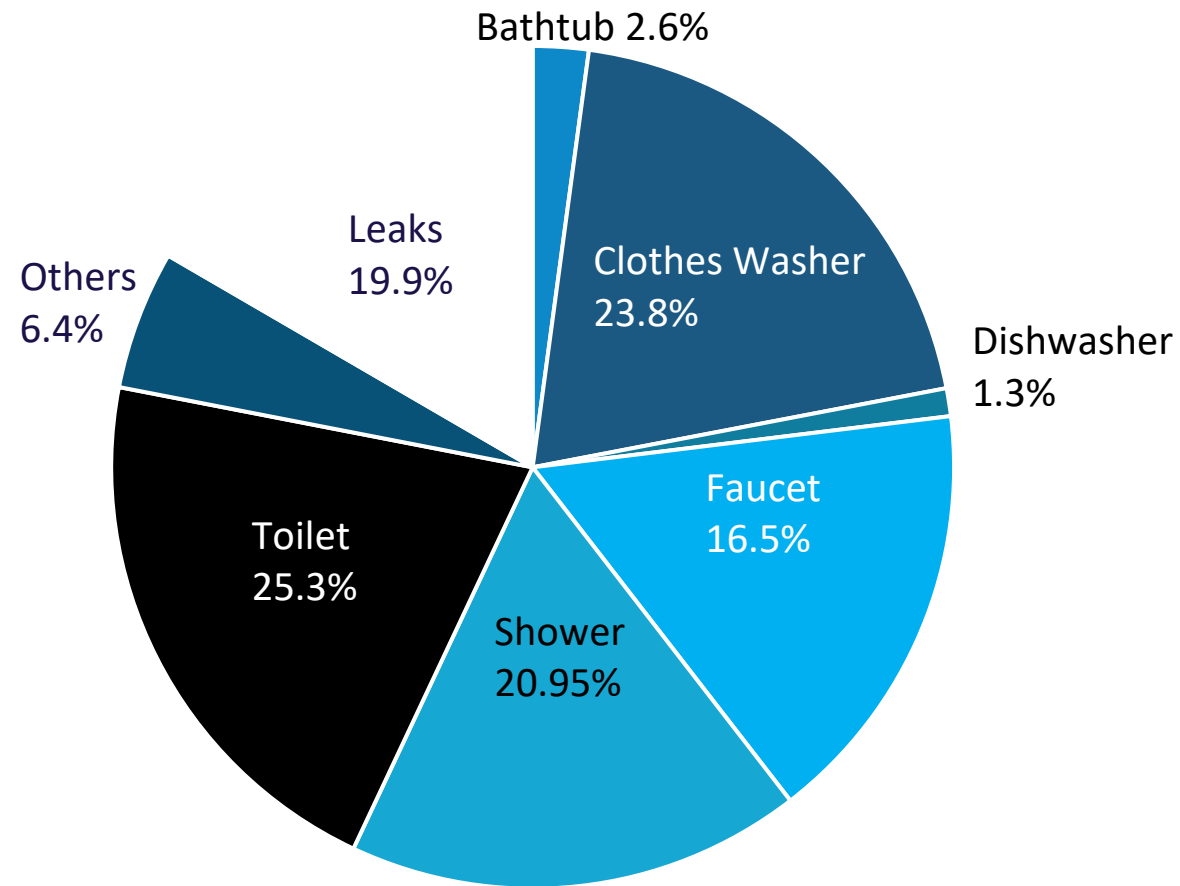
Wastewater Infrastructure Terminology for Today's Presentation

- **General Terminology***
 - **Distributed** – a wastewater system owned or managed by one professional management entity serving single or multiple properties within one neighborhood or district.
 - **Centralized** – a wastewater system owned and managed by a sole service provider that operates on a municipal or regional basis.



* Adapted from Distributed Water Infrastructure Task Force Draft document

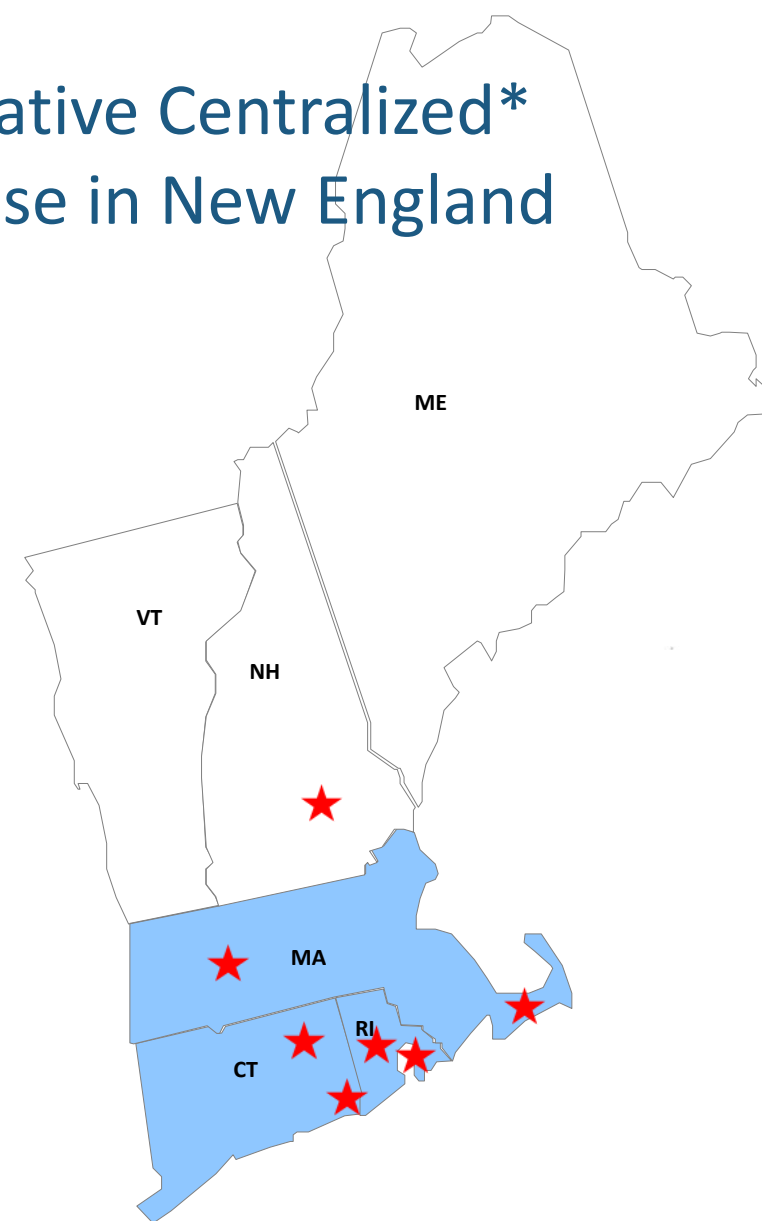
Residential Blackwater Sources



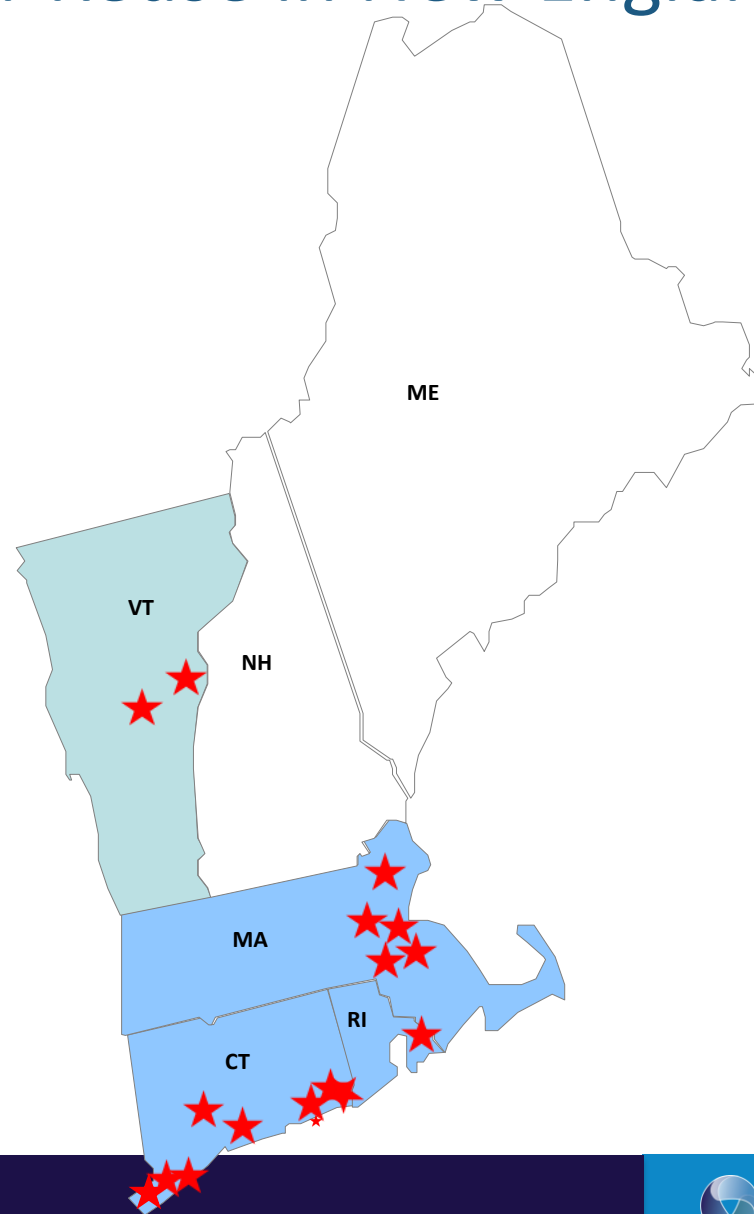
Buchberger, et al (2017) <https://www.iapmo.org/media/3857/peak-water-demand-study-executive-summary.pdf>

Locations & Uses: Representative Centralized* Non-Potable Wastewater Reuse in New England

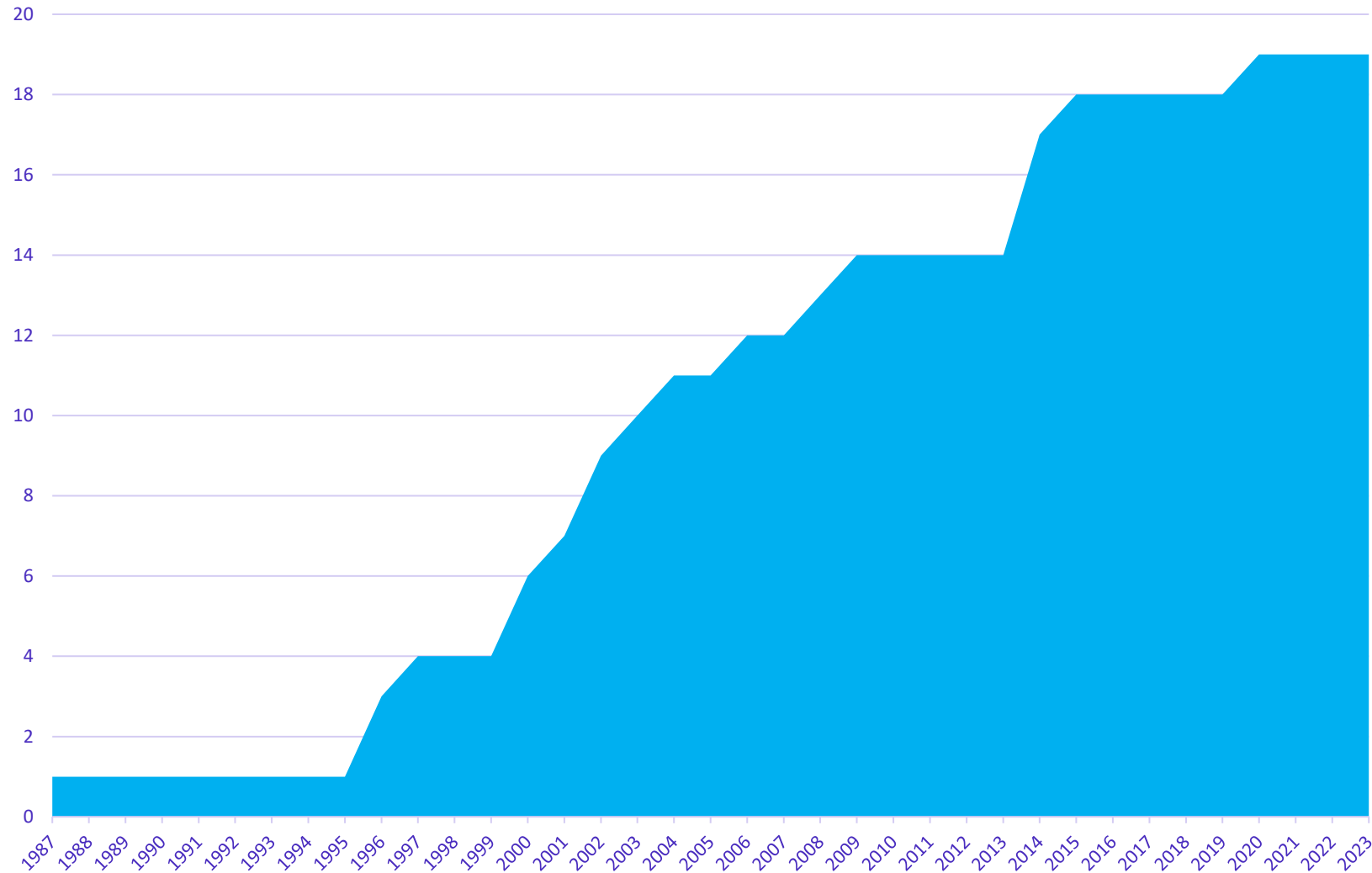
Location	State	Use
UConn/Storrs	CT	Cooling Water
Lake of Isles	CT	Golf Course Irrigation
Cranston/Johnston	RI	Cooling Water
Jamestown	RI	Golf Course Irrigation
Yarmouth	MA	Golf Course Irrigation
UMass-Amherst	MA	CHP Steam & Hot Water, Cooling Water, Dust Control, Irrigation
Manchester	NH	Cooling Water



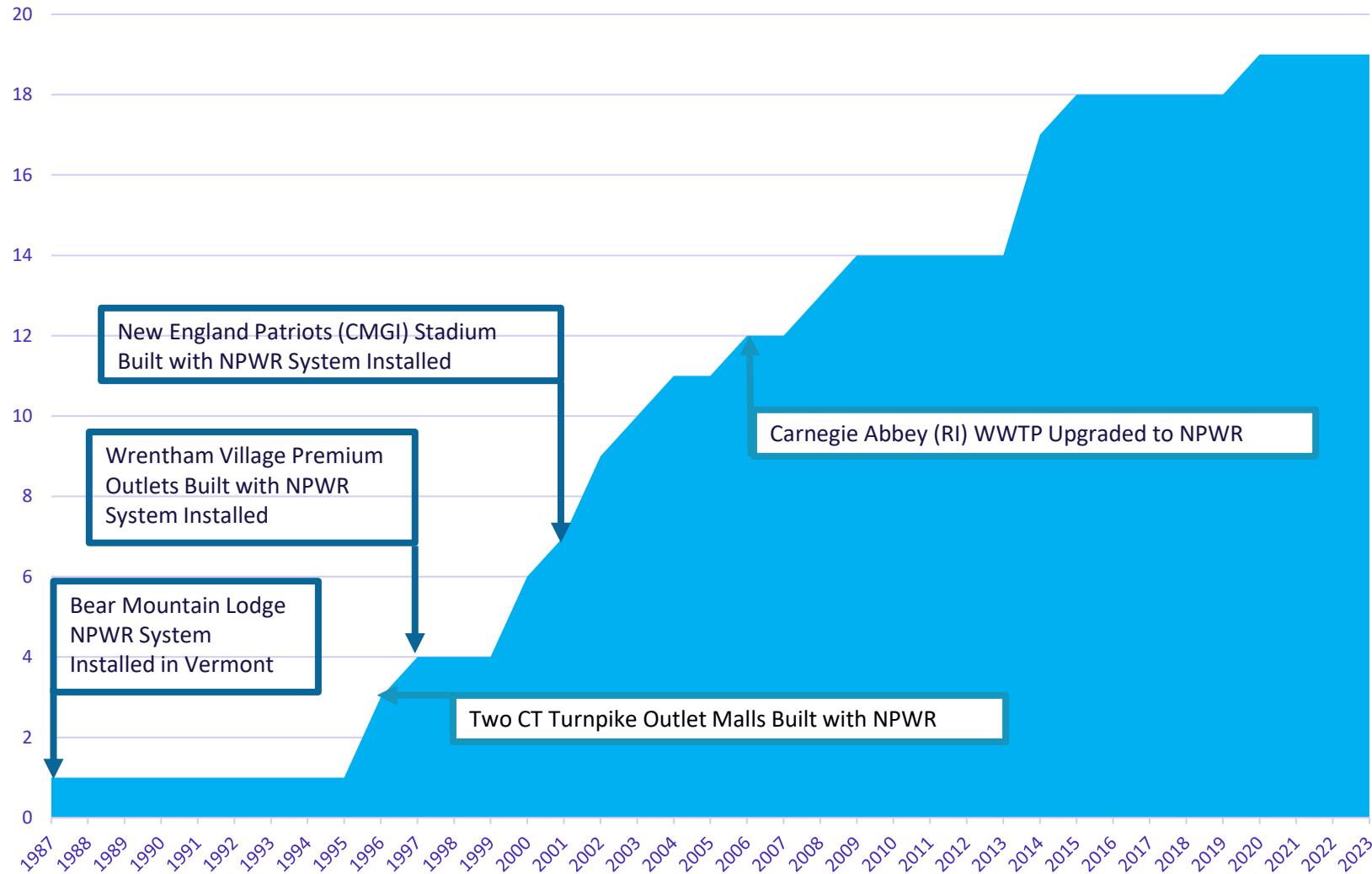
Locations of Representative Distributed Non-Potable Water Reuse in New England



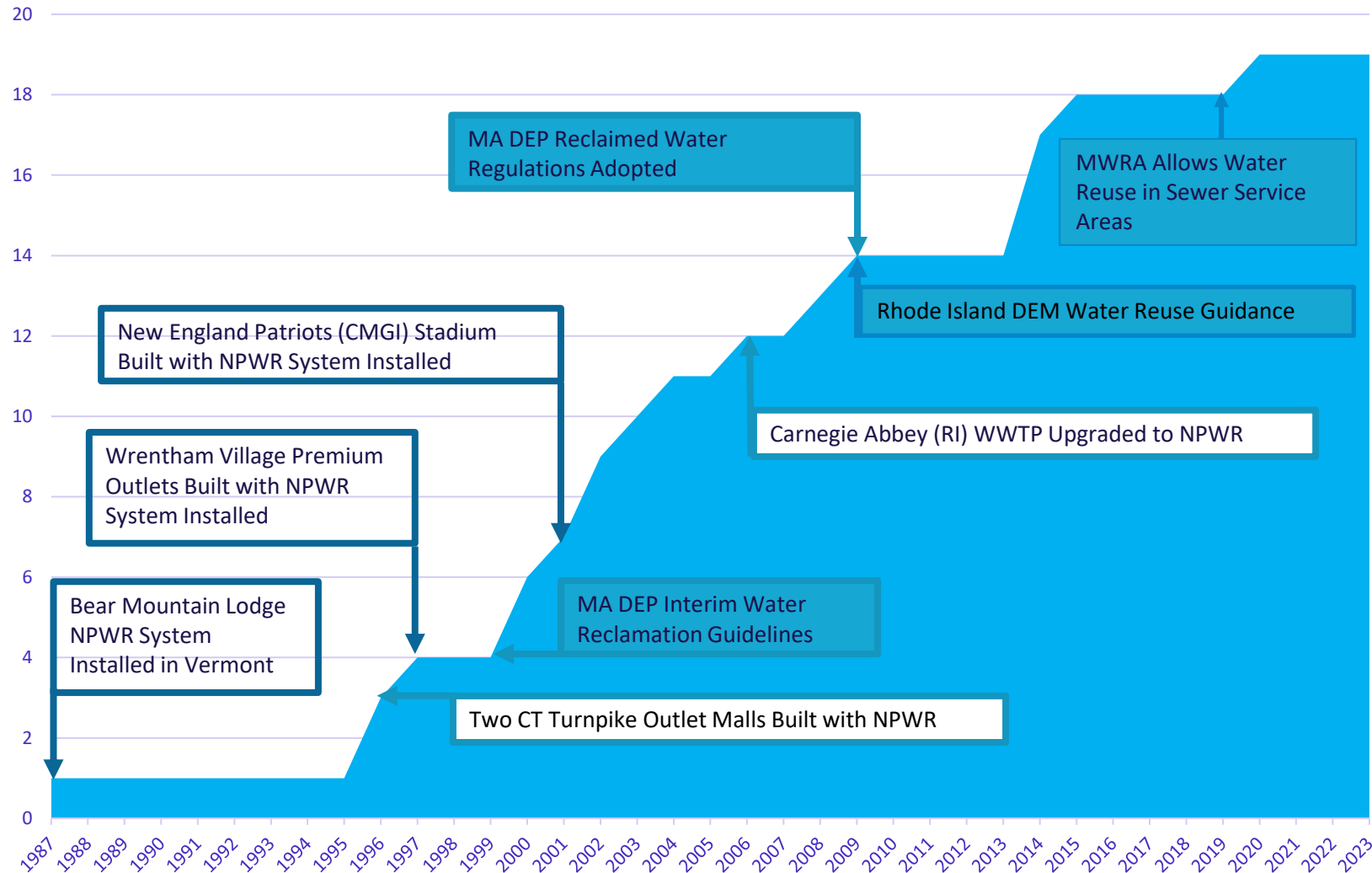
Timeline for Distributed Non-Potable Water Reuse in New England



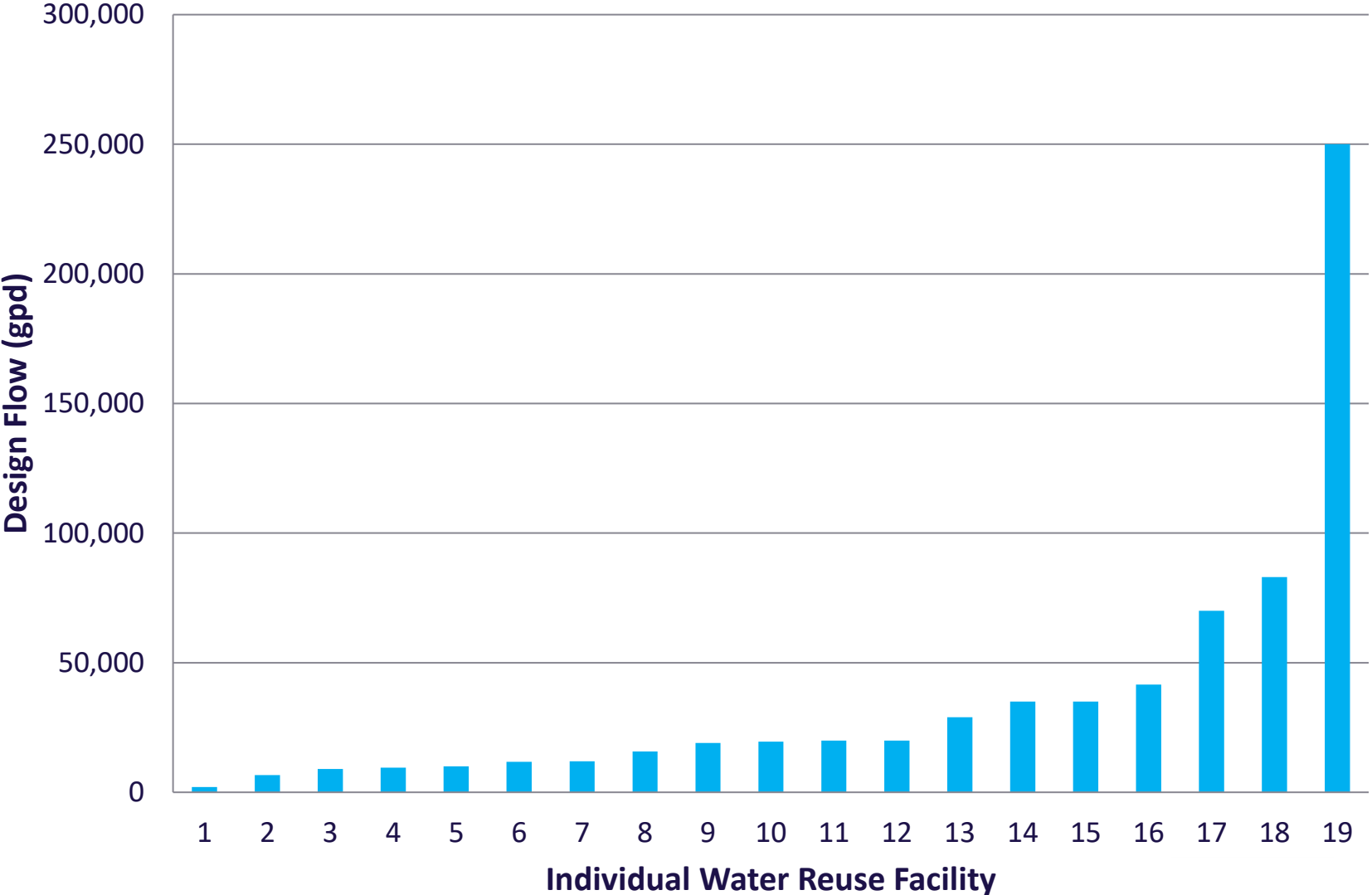
Construction of Distributed NPWR in New England



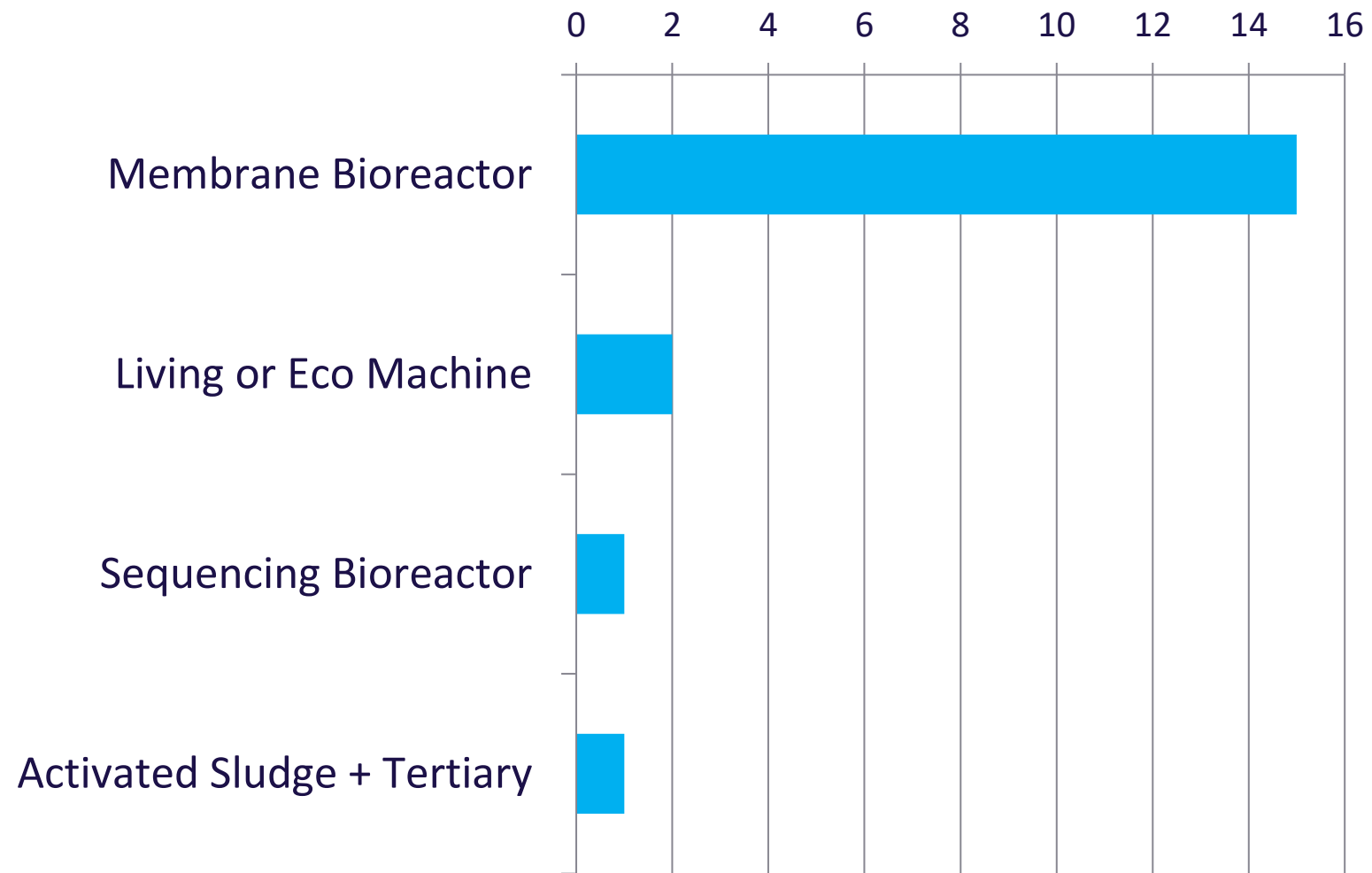
Published Guidance or Regulations for Distributed NPWR in New England



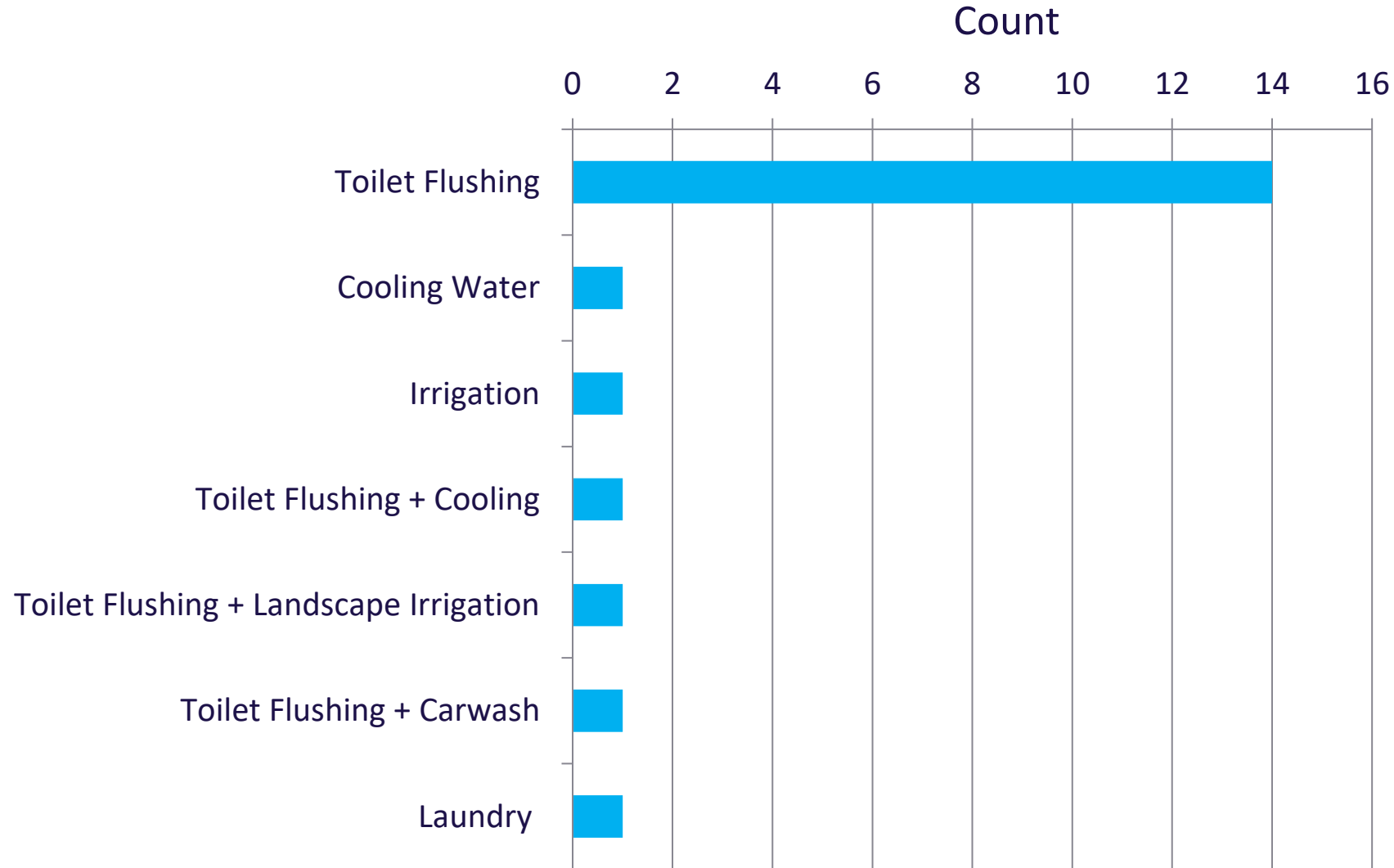
Scale of Distributed Non-Potable Water Reuse in New England Based on Capacity



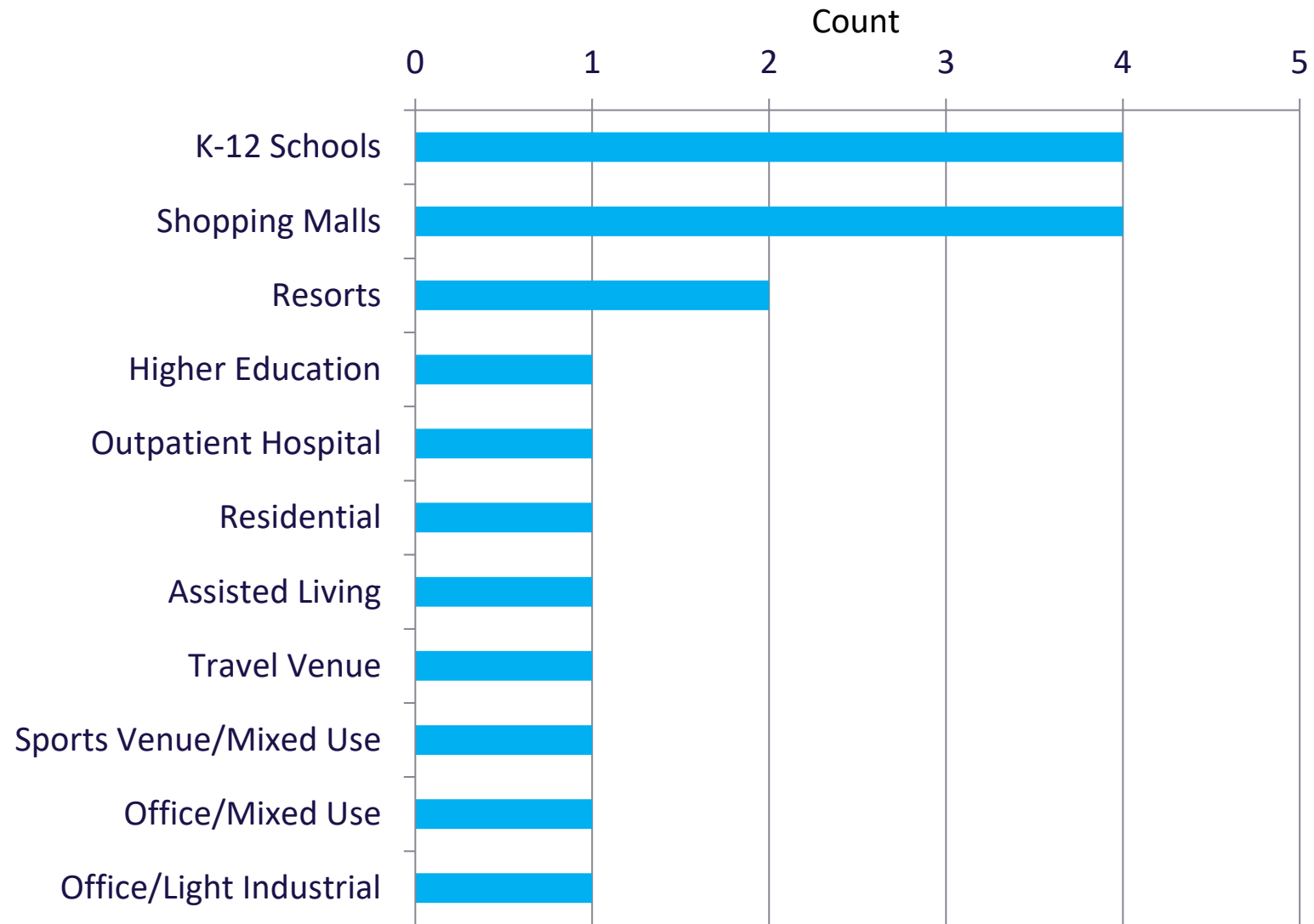
Distributed Non-Potable Water Reuse Treatment Systems in New England



Distributed Non-Potable Reuse Water Uses in New England



Distributed Non-Potable Reuse Water Project Types in New England




Current Distributed NP Water Reuse Regulatory Landscape In New England

State	Reuse Guidance	Reuse Regulations	Distributed NP Water Reuse Systems
CT	No	No	Yes
RI	Yes	No	Yes
MA	No	Yes	Yes
VT	No	No	Yes
NH	No	No	No
ME	No	No	No

Thank You!



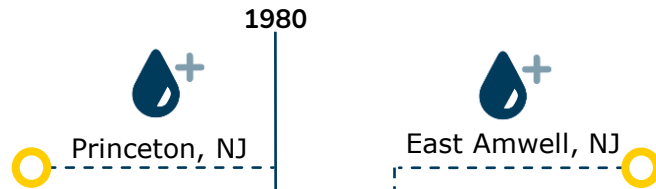


Zach Gallagher, PE, LEED-AP
CEO
Natural Systems Utilities
zgallagher@nsuwater.com



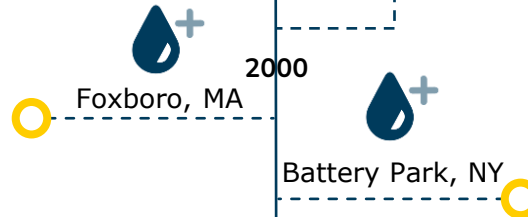
40+ Year History of Reuse Innovation in the Northeast

1st Pharmaceutical Onsite Direct Water Reuse for **Bristol Myers Squibb**



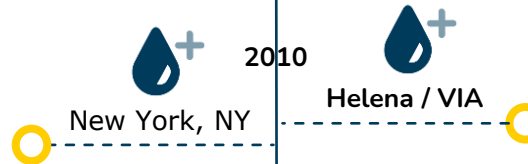
1st Public School Water Reuse System Implemented at **Copper Hill**

250,000⁺ GPD on-site water reuse system
1st Uv/Ozone System For Direct Reuse
 Ne Patriots @ Gillette Stadium



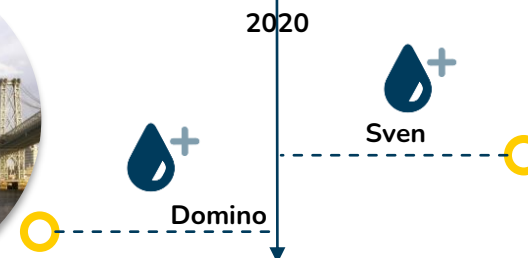
1st High-rise in-building onsite water reuse
1st Online Biological Monitoring Solution
1st Thermal Energy Recovery Retrofit for net zero energy onsite water reuse
The Solaire

40,000⁺ GPD water treatment & reuse for flush water, cooling & irrigation
1st Onsite Reuse For Laundry In Nyc
 New School University



The **Helena** in-building water reuse system was upgraded/**retrofitted** with capacity increased to **60,000** gpd to serve the adjacent **VIA** building

410,000 gpd water reuse facility. District Scale. 99% Sewer Discharge Reduction.
1st permitted CSO abatement



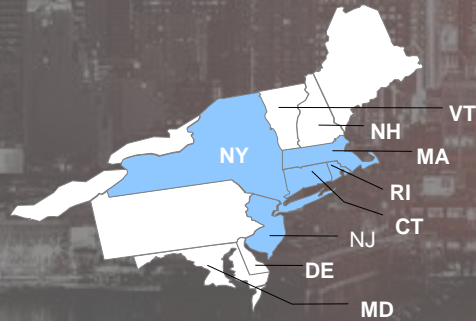
Sven is the tallest building in Queens and contains the largest in-building water reuse at **100,000** gpd.

Onsite Reuse in NYC for 20+ Years

- **Six (6)** in-building water reuse systems serving **eight (8)** buildings in BPC **Operating since 2003.**
- **>2,000 residents** who are capable of reusing **~200,000 gpd** of renewable water sources
- **>20 years** of operating data. **ZERO permit exceedances** and **ZERO user complaints/public health concerns**
- Achieving **>55% Water Use Reduction.** Reduced strain on municipal/centralized infrastructure
- Achieving **>65% Sewer Discharge Reduction.** Reduced environmental impacts due to combined sewer overflows
- **Net-Zero** and **net-positive** energy systems now possible with thermal energy recovery
- Integration of **Online Biological Monitoring** for **reduced labor requirements** and **improved public health/regulatory compliance**
- **Improved resiliency** in wastewater treatment and water supply



Onsite Reuse Drivers are evolving with Climate Change Increasing Demands for Public-Private Partnerships: Lessons Learned from Super-storm Sandy, Wet Weather Impacts, CSO's

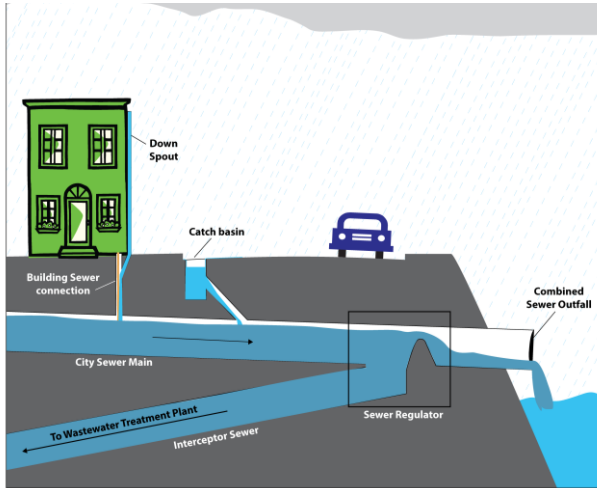


80 NSU systems within area impacted by Super-Storm Sandy.

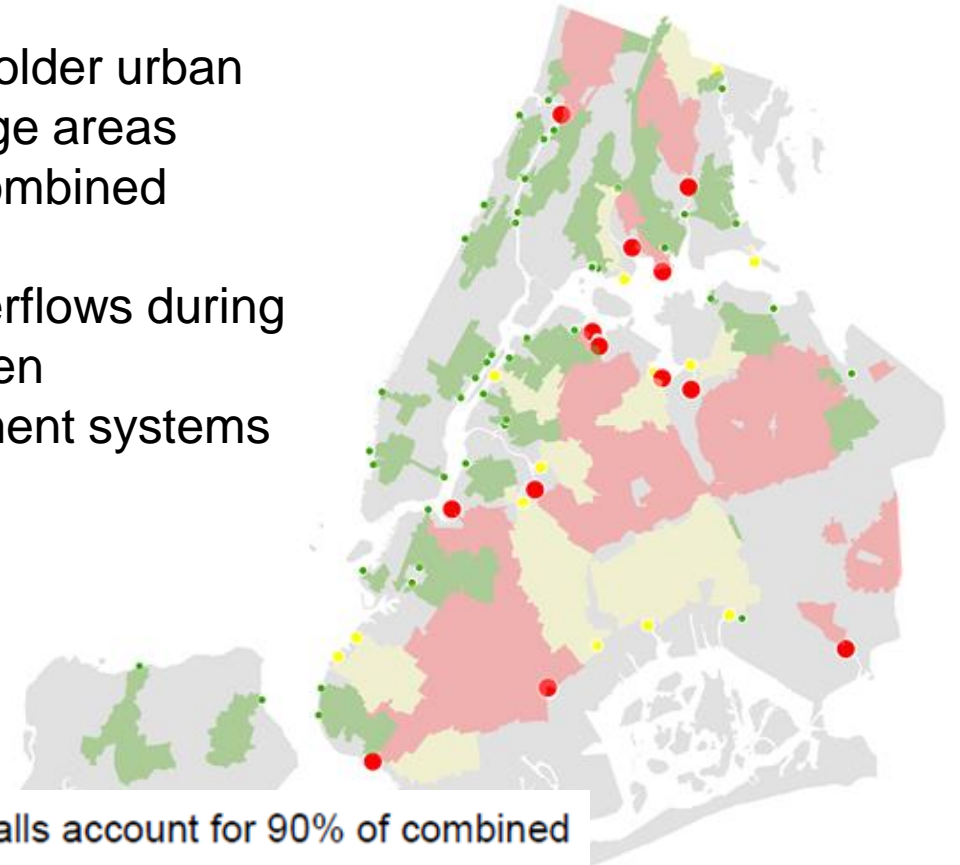
ZERO NSU onsite facilities exceeded effluent permit requirements while many centralized facilities were down for weeks or longer discharging untreated sanitary wastewater into the local water bodies.

Resiliency: Water is Local

Wet Weather Impacts / CSO's



- NYC, like other older urban centers, has large areas serviced by a combined sewer system.
- This system overflows during wet weather when collection/treatment systems are at capacity



Tier 1 through Tier 3 outfalls account for 90% of combined sewer overflows.

Tier 1: >500 MG per year

Tier 2: >250 MG per year and <500 MG per year

Tier 3: >50.7 MG per year and <250 MG per year

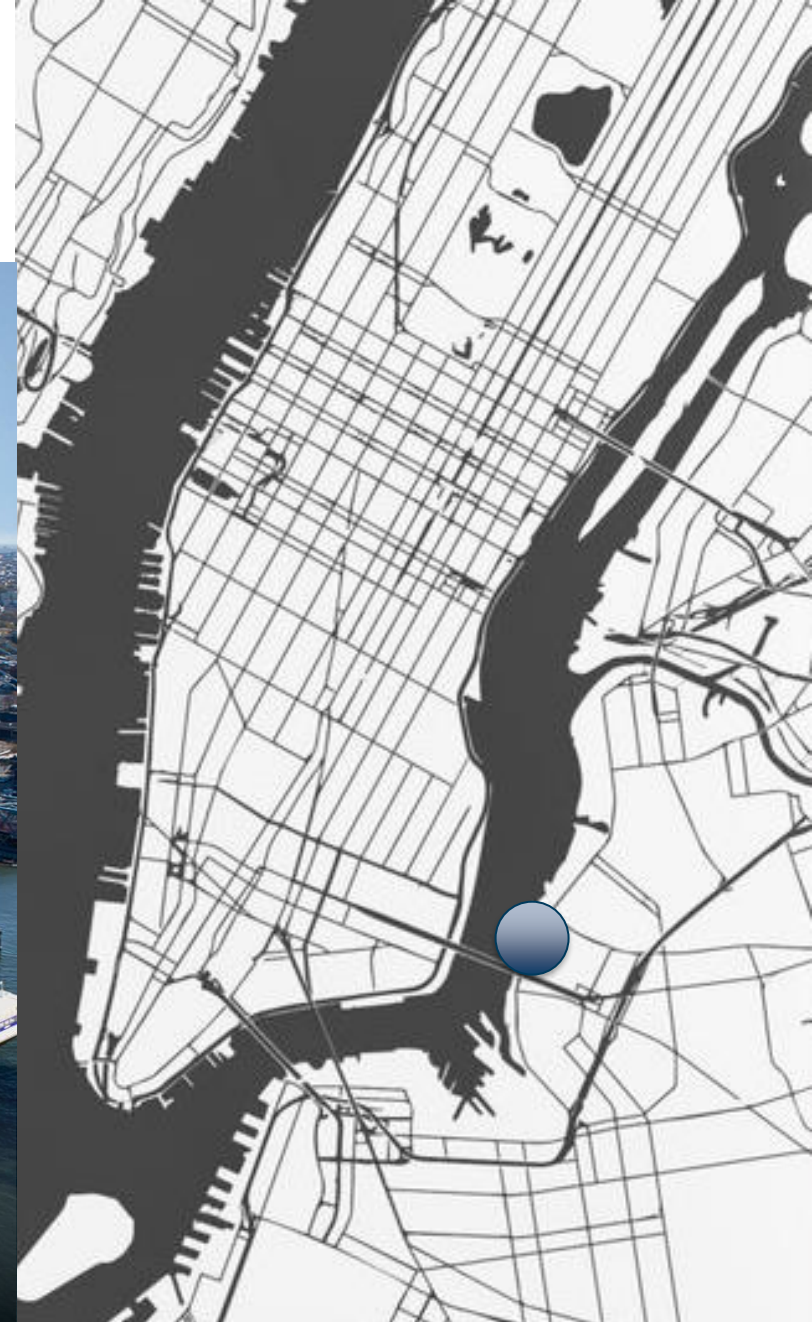
Combined Sewer Overflow Tiers

- Tier 1
- Tier 2
- Tier 3

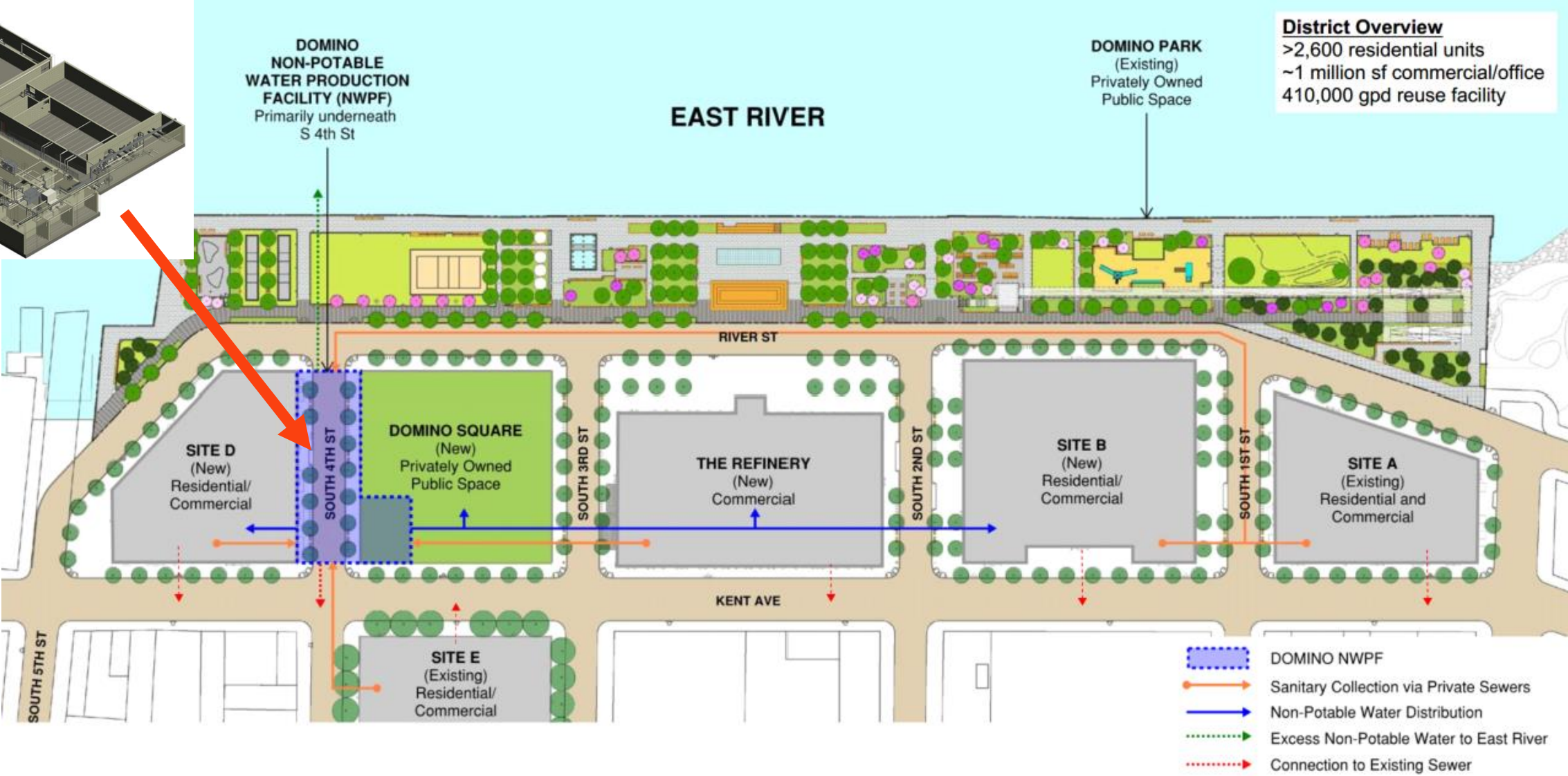
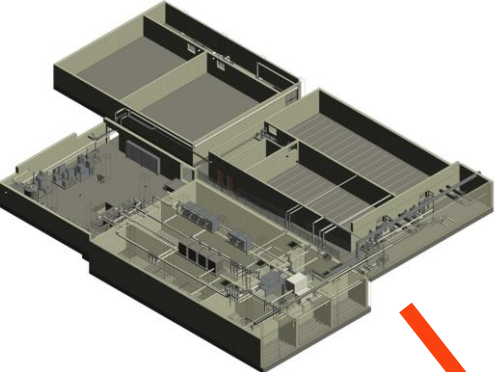
Domino Sugar Factory Redevelopment Brooklyn, NY



- District-scale water reuse and treatment facility
- ~50% projected reduction in water use for the District
- 95+% projected reduction in sanitary loads going to the municipal combined storm and sanitary sewer system



Domino District Non-Potable Water Reuse Project



Volpe: MIT Volpe Redevelopment Project Kendall Square, Cambridge MA



Broadway View Looking West



Volpe: MIT Redevelopment Project Kendall Square: Cambridge, MA

DPW Questions/Comments on 10/27/2020:

- 1.) DEP / MWRA / DPW Regulations
- 2.) System Owner / Operator
- 3.) Residual Discharge
- 4.) Emergency Overflow / Bypass
- 5.) Routine Maintenance
- 6.) Long-term Maintenance
- 7.) Schematic Layout of System
- 8.) 8-Hour Holding (MWRA Capacity vs. Blackwater)
- 9.) Other?
- 10.) Next Steps

Sewer Generation Summary
MassDEP Title 5 Calculation
 Phase 1 - 134,320 Gallons/Day
 Phase 2 - 118,125 Gallons/Day
 Phase 3 - 127,373 Gallons/Day
 Phase Any - 85,146 Gallons/Day

Total Sewer Generation:
 ~464,964 Gallons/Day

Blackwater Re-Use
 - 3 Systems w/8-Hour Holding;
 Non-Lab, Toilet Flushing and Cooling Re-Use

Anticipated Blackwater Flow:
 System #1 - 74,434 Gallons/Day
 System #2 - 129,431 Gallons/Day
 System #3 - 43,517 Gallons/Day
 Total - 247,382 Gallons/Day
 Residual Flow (1%) - 2,474 Gallons/Day

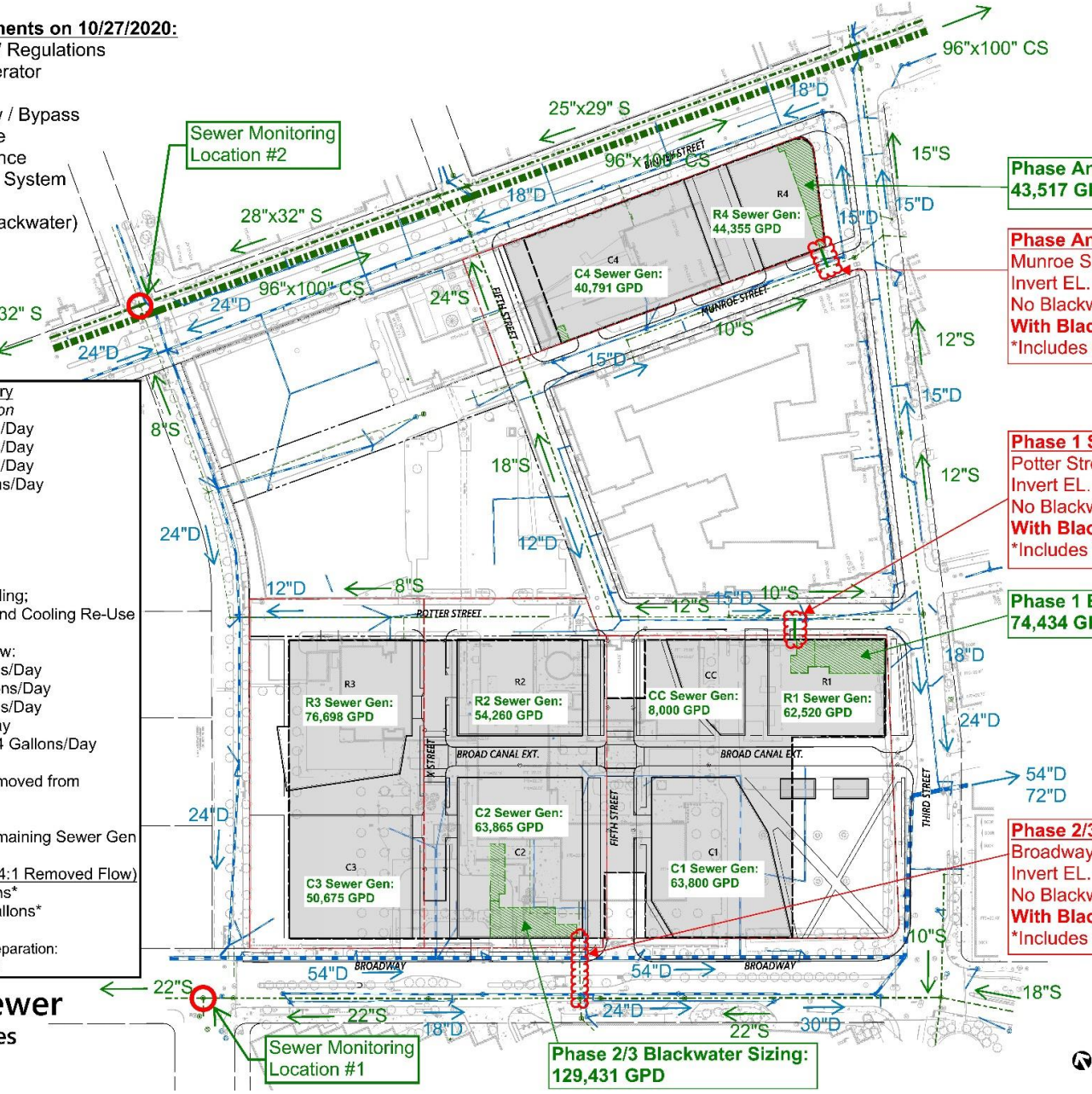
~244,908 Gallons/Day Removed from Municipal Sewer System

~220,055 Gallons/Day Remaining Sewer Gen

Anticipated I&I Mitigation (4:1 Removed Flow)
 Baseline: 1,765,856 Gallons*
 w/ Blackwater: 786,220 Gallons*

*Includes GSA Fifth Street Separation:
 ~94K Gallon Mitigation Credit

**Drain and Sewer
Volpe Site | Utilities
Kendall Square**



Phase Any Blackwater Sizing:
 43,517 GPD

Phase Any Sewer Connection:
 Munroe Street 10-Inch Sewer
 Invert EL. ~13.7 CCB
 No Blackwater: 85,146 GPD
With Blackwater: 42,064 GPD*
 *Includes 435 GPD Residual Flow

Phase 1 Sewer Connection:
 Potter Street 12-Inch Sewer
 Invert EL. ~12.0 CCB
 No Blackwater: 134,320 GPD
With Blackwater: 60,630 GPD*
 *Includes 744 GPD Residual Flow

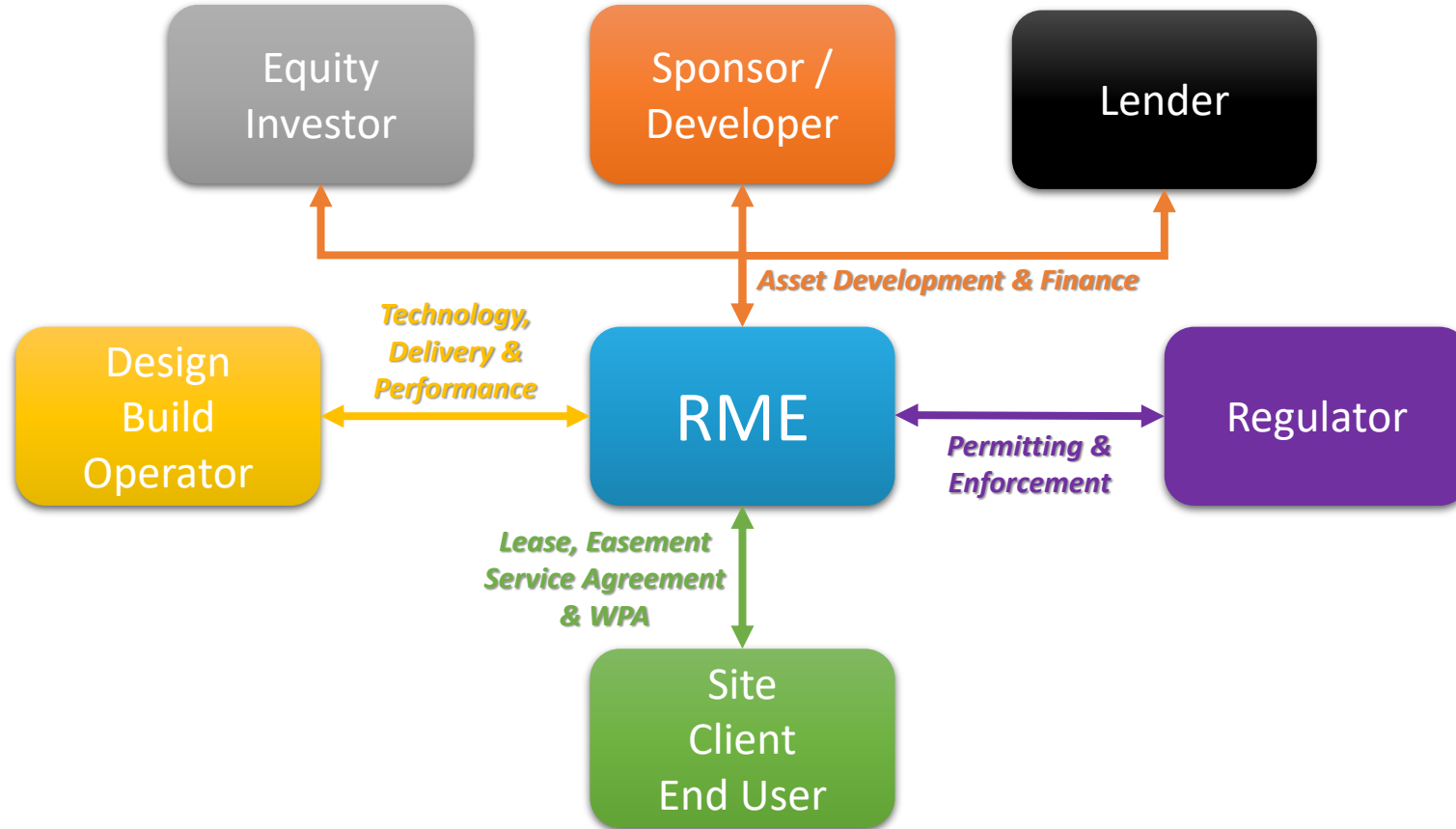
Phase 1 Blackwater Sizing:
 74,434 GPD

Phase 2/3 Sewer Connection:
 Broadway 22-Inch Sewer
 Invert EL. ~9.0 CCB
 No Blackwater: 245,498 GPD
With Blackwater: 117,361 GPD*
 *Includes 1,294 GPD Residual Flow

Phase 2/3 Blackwater Sizing:
 129,431 GPD



Responsible Management Entity (RME) Risk, Roles & Responsibilities



Risk Management Criteria

- *RME provides safe, affordable and dependable customer service*
- *RME is financially secure and provides performance guarantee*
- *Regulations protect public health*
- *DBO provider is licensed and experienced*
- *Developer shares project development risk*

Onsite Water Reuse Evolution / Lessons Learned Summary

Building to Campus to District Scales



Water is local. Onsite reuse is a tool and can be integrated with centralized systems at different scales with regional benefits.

Evolving Drivers: Wet Weather/CSO Benefits



Water conservation to CSO mitigation for more resilient cities with changing climate patterns in all regions. Sandy, Harvey, IDA...

Regulatory Inflection Point / Delivery RME



- NYC
- San Francisco

- NYC
- San Francisco
- Denver
- Boston
- Austin
- & More, Who's Next?

Onsite Innovation/Opportunities



Thermal energy recovery for net zero energy onsite water reuse & online microbial monitoring for improved public health, regulatory compliance & reduced O&M costs.
NSU Patent No. 9,719,704 B2 (Thermal). Microbial patent pending

Water Reuse Association

November 7, 2024

Stephen Hadjiyane PE, BCEE

John L. Turner

Long Island Water Reuse Road Map & Action Plan





John Turner
Conservation Policy Advocate
Seatuck Environmental Association
jturner@seatuck.org



THE PROMISE OF WATER REUSE ON LONG ISLAND

Let's Choose to Reuse Since... Twice is Nice

WATER *QUALITY* PROBLEM



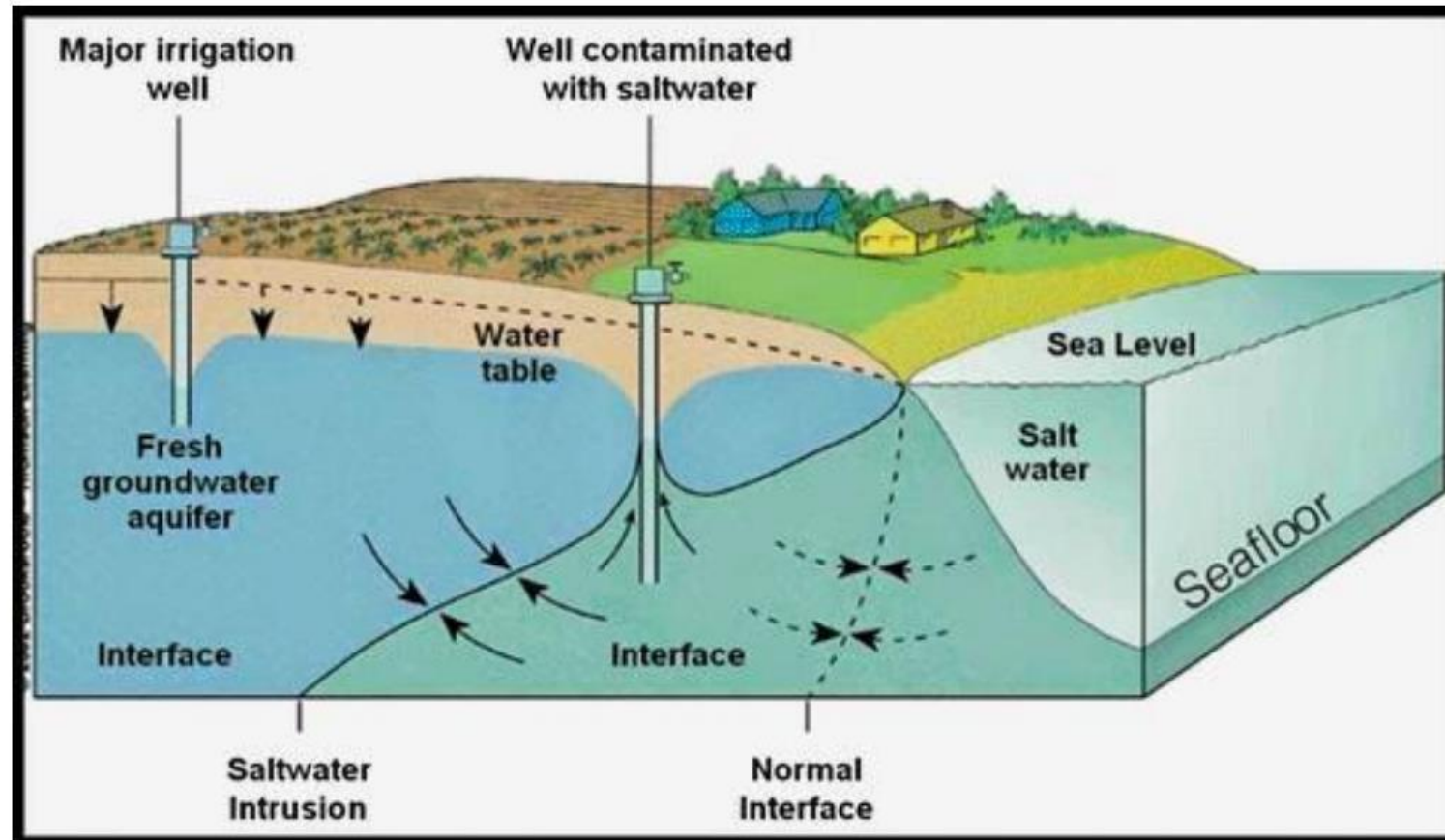
Weakening of Tidal Marshes

WATER *QUANTITY* PROBLEM




Loss of Wetlands

WATER QUANTITY PROBLEM



Salt Water Intrusion



Stephen Hadjiyane, PE, BCEE
Associate Principal
IMEG, Formerly Cameron
Engineering
steve.hadjiyane@imegcorp.com



WATER REUSE ROAD MAP FOCUS

- Current Water Reuse Regulation/Guidelines (State and National)
- Water Reuse Categories/Potential LI Applications
- Focus On Source Of Wastewater Discharge From Nassau and Suffolk Counties Wastewater Treatment Plants
- Water Reuse Treatment Technologies and Distribution
- Specific Water Reuse Targets of Opportunity
- Road Map Prioritization Matrix
- Road Map Action Plan

WATER REUSE REGULATIONS

- USEPA Guidelines
- California Title 22 Disinfected Tertiary Recycle Water Criteria
- New York (not yet developed)
- Indian Island County Golf Course
- Other States (Florida, New Jersey)

CALIFORNIA TITLE 22

DISINFECTED TERTIARY CRITERIA

Parameter	Criteria
Total Coliform	<ul style="list-style-type: none"> • Median Concentration Does Not Exceed An MPN Of 2.2 / 100 ML In A 7-day Period. • Does Not Exceed MPN Of 23 / 100 ML More Than Once In A 30-day Period. • Never Exceeds MPN Of 240 / 100 ML.
Turbidity	<ul style="list-style-type: none"> • Cannot Exceed An Average Of 2 NTU Within A 24-hr Period. • Cannot Exceed 5 NTU More Than 5% Of The Time Within A 24-hr Period. • Cannot Exceed 10 NTU At Any Time.
Virus Inactivation	<ul style="list-style-type: none"> • > 5-log Removal Of MS2 Phage Or Polio Virus

Note: Indian Island County Golf Course < 2 NTU and 23 / 100ML max in 4 of 7 days

WATER REUSE APPLICATIONS

Type	End Uses of Recycled Water
Environment	<ul style="list-style-type: none">• Streamflow Augmentation• Wetlands Restoration• Seawater Intrusion Barrier
Non-potable Distribution	<ul style="list-style-type: none">• Agriculture Irrigation• Municipal or Residential Irrigation• Building or Industrial Cooling Towers• Boiler Makeup• Process Water• Industrial Wash Water• Industrial Fire Protection• Toilet Flushing
Potable	<ul style="list-style-type: none">• Indirect Potable Reuse• Direct Potable Reuse

Source: WEF: Water Reuse Road Map Publication

SCREENING CRITERIA OF WATER REUSE OPPORTUNITIES

- Publicly Owned Wastewater Treatment Plants
- End User Within 2-mile Radius Of WWTP
- Satisfies Road Map Prioritization Factors

POTENTIAL WATER REUSE OPPORTUNITIES

- Internal WWTP Water Reuse
- Stream Augmentation
- Nature Preserves/Parks
- Industrial Facilities/Power Generating Plants
- Educational Institutions
- Golf Courses
- Agricultural

WATER REUSE RESEARCH

Identified WWTP Potential End Users (Baseball Cards)

- Nassau County
- Suffolk County DPW
- Suffolk County Municipal Owned

Long Island Golf Course Association

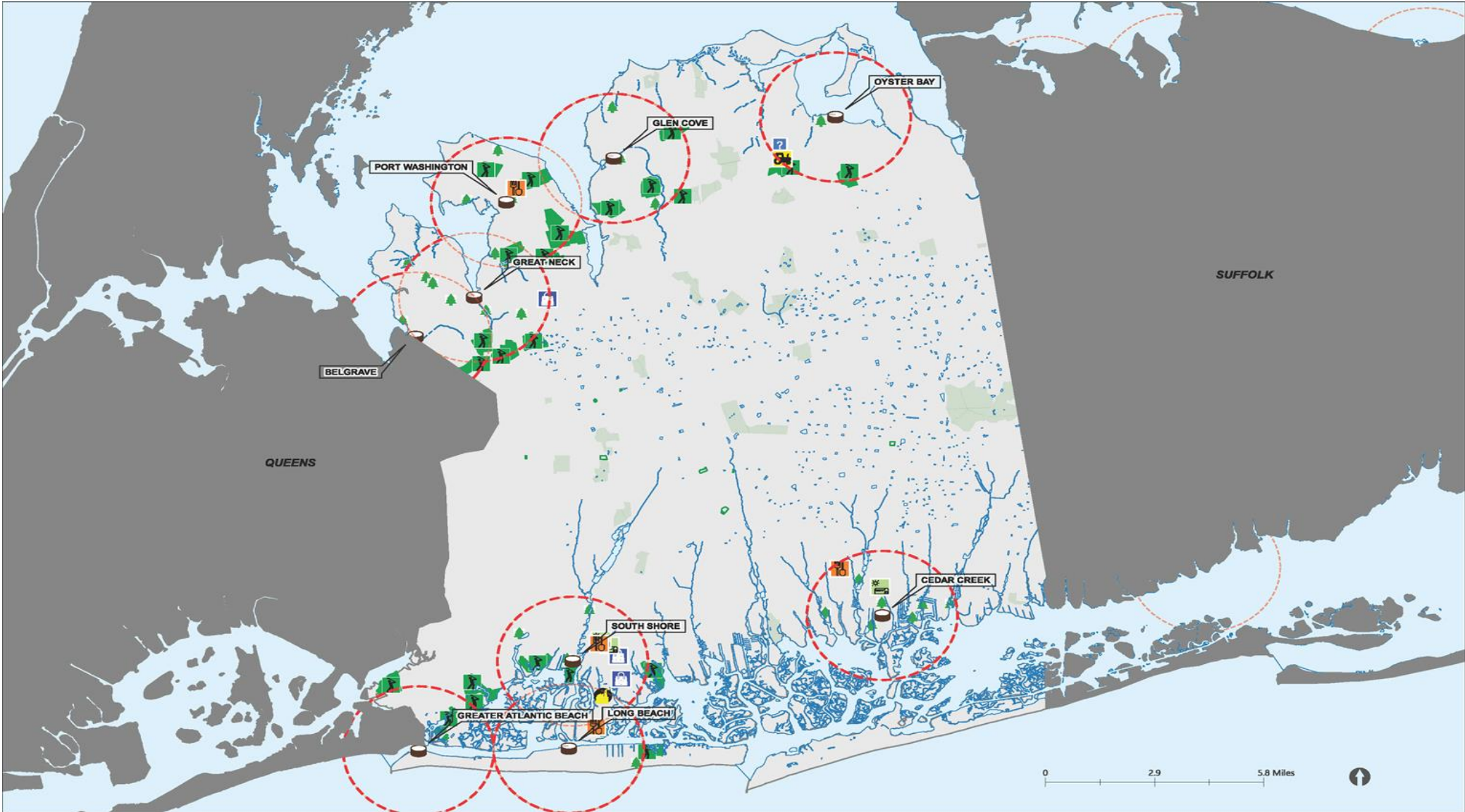
L.I. Farm Bureau

NYSDEC/NYSDOH: Water Reuse Limits/Standards

Long Island Publicly Owned WWTP

Nassau County	9
Suffolk County – SCDPW	24
Suffolk County – Non-SCDPW	15
TOTAL	48

NASSAU COUNTY WWTP

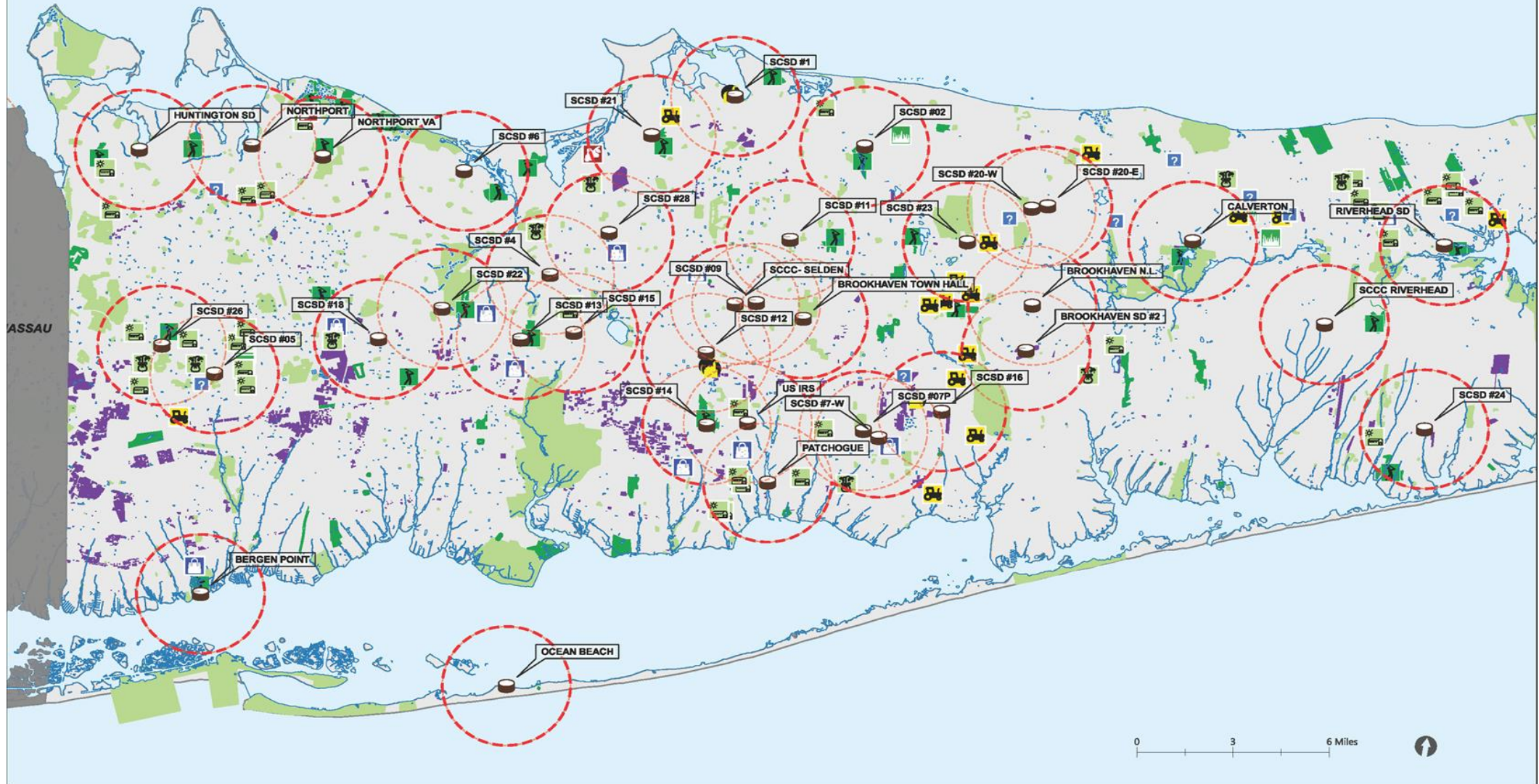


Suffolk County Privately Owned WWTP*

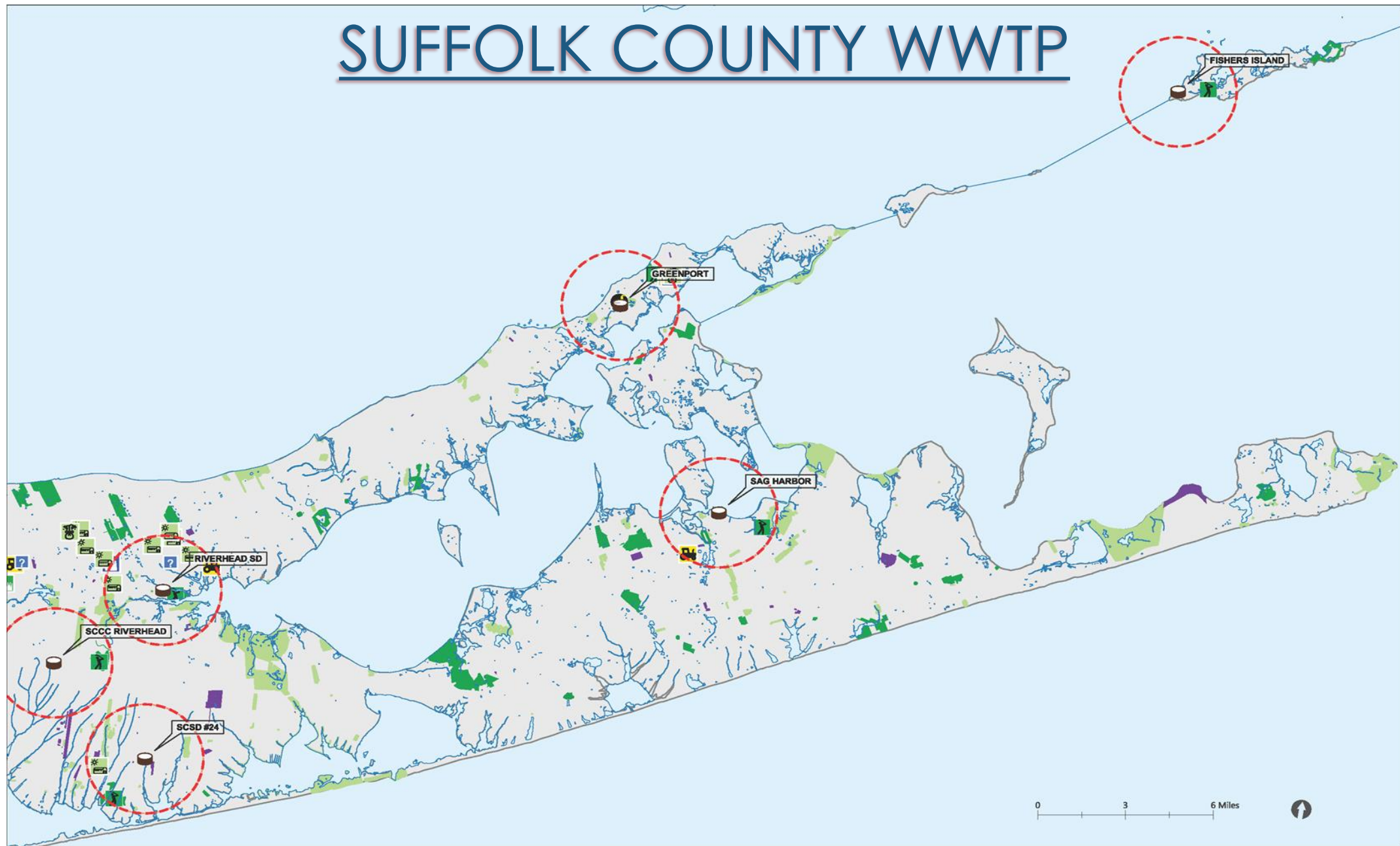
<u>DESIGN PERMITTED FLOW (GPD)</u>	<u>NUMBER OF FACILITIES</u>
< 20,000	61
20,000 – 50,000	5
50,000 – 100,000	41
> 100,000	20
TOTAL	127

* Not including Industrial WWTPs

SUFFOLK COUNTY WWTP



SUFFOLK COUNTY WWTP



Sample Potential End Users (2-Mile Radius)

NASSAU COUNTY WWTP Summary Cards

WWTP: Cedar Creek WPCP
Address: 3340 Merrick Rd
Wantagh, NY 11793



Capacity: 72 MG
Avg Flow: 65 MGD

Treatment Level: 3 - Disinfection and Coliform
Limits (surface water discharge)
Compliance History: 4 - Consistently within Limit
Receiving Water: - Atlantic Ocean

POTENTIAL END USERS (2 Mile Radius)

Agricultural

- Abby's Parkside Nursery & Florist (0.9 mi)
- Islands Greenery (1.9 mi)

Golf Courses

- n/a

Commercial Centers

- n/a

USGS Identified Saltwater Intrusion Area

- Issue

Industrial Facilities

- n/a

Plant Water Reuse

- Washdown/Cleaning Water
- Seal Water
- Spray Water Systems
- Fire Protection

Parks

- Wantagh Park (0.4 mi)
- Cedar Creek Park (0.5 mi)
- Seamans Neck Park (0.8 mi)
- Anchor Park (1.1 mi)
- Mill Pond Park (1.2 mi)
- Newbridge Park (1.5 mi)
- Alhambra Park (1.9 Mi)

Waterbodies

- Cedar Creek (0.3 mi)
- Seamans Creek (0.6 mi)
- Bellmore Creek (0.6 mi)
- Newbridge Creek (1.1 mi)
- Wantagh Pond (1.5 mi)
- Seaman Pond (1.6)
- Cedar Swamp Creel (1.61)

TREATMENT TECHNOLOGIES FOR WATER REUSE

- Tertiary Treatment (Filters/Screening, Strainers)
- UV Disinfection/Chlorination
- Indian Island County Golf Course
 - - Cloth Media Filter
 - - UV Disinfection

CALIFORNIA TITLE 22 TREATMENT REQUIREMENTS

- Filtration System
 - Turbidity/Solids Removed
- UV Disinfection
 - Amiad Micro-fiber Filter
 - <20 Microns Removed



- Trojan In-Line UV
 - Up to 300 GPM Capacity

SCREENING/PRIORITIZATION OF REUSE OPPORTUNITIES

- Normalized Capital Cost
- Nitrogen Reduction
- Annual Quantity of Potable Water Savings
- Water Supply Pumping Concerns
- Effect on Water Management at the Project Location
- Transmission Distance
- Potential for Associated Projects to Share Infrastructure

PROJECTS IDENTIFIED

Tier 1

- \$4.3 to \$28 Million
- Lower Capital Cost Projects: Golf Course Closest to WWTP

Tier 2

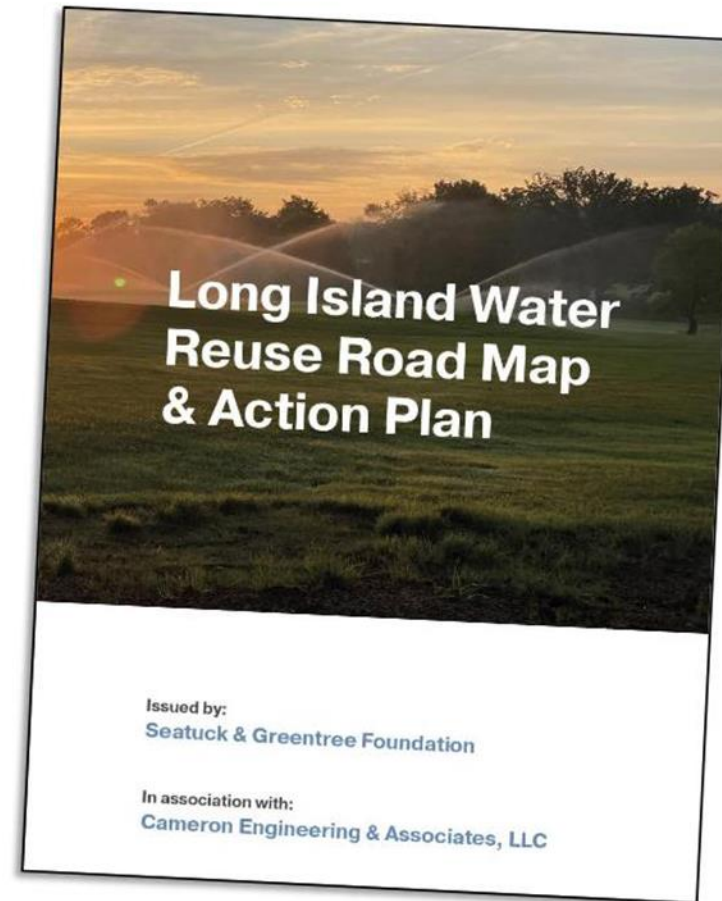
- Sod Farms
- Greenhouses
- Parks
- Educational Institutions
- Farms

SUFFOLK COUNTY TIER 1 PROJECTS

WWTP	User	ID	Score	Annual Usage (gal)	Capital Cost (\$)	Normalized Cost (\$/annual usage)	Ib N removed annually	\$/Ib N removed Lifetime	End Users that Could Share Capital Costs
Suffolk County SD No. 2	Willow Creek Country Club	5	3.40	35,040,000	\$5,110,000	\$0.15	2918	\$88	None
Suffolk County SD No. 3	Bergen Point Golf Course	4	3.40	37,060,000	\$5,360,000	\$0.14	1543	\$174	None
Suffolk County SD No. 6	Smithtown Landing Golf Course	12	3.10	41,760,000	\$14,150,000	\$0.34	3478	\$203	None
Suffolk County SD No. 13	Wind Watch Golf Course	6	3.35	32,850,000	\$4,950,000	\$0.15	2736	\$90	None
Suffolk County SD No. 21	St. Georges Country Club	2	3.60	34,450,000	\$8,630,000	\$0.25	1435	\$301	None
	SUNY Stony Brook Campus	9	3.25	13,020,000	\$4,370,000	\$0.34	542	\$403	None
Suffolk County SD No. 26	Greens Golf Course	8	3.25	22,450,000	\$4,950,000	\$0.22	1869	\$132	None

LI Water Reuse Roadmap & Action Plan

- Issued in 2023 by Seatuck and The Greentree Foundation in association with Cameron Engineering
- Technical Advisory Group included USGS, NYSDEC, Nassau & Suffolk Counties, etc.
- Identifies & prioritizes reuse opportunities across Long Island
- Prioritization based on environmental benefits, costs.





QUESTIONS





Thank You, Presenters!



SEATUCK
CONSERVING LONG ISLAND WILDLIFE



Thank You, Co-host





Audience Q & A

Email for PDHs: Webcasts@watereuse.org
Email for staff support: Mmerk@watereuse.org