

# Direct Non-Potable Water Reuse in the Northeastern US – A Resource for Campus Energy Facilities

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Presented by: Bruce Douglas, PE



## **Issue Statement**

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### **Cost of Potable Water & Sewer**

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### **Onsite Reclamation Standards**

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### **New School University Case Study**

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### **Gillette Stadium Case Study**

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## **Lessons Learned**

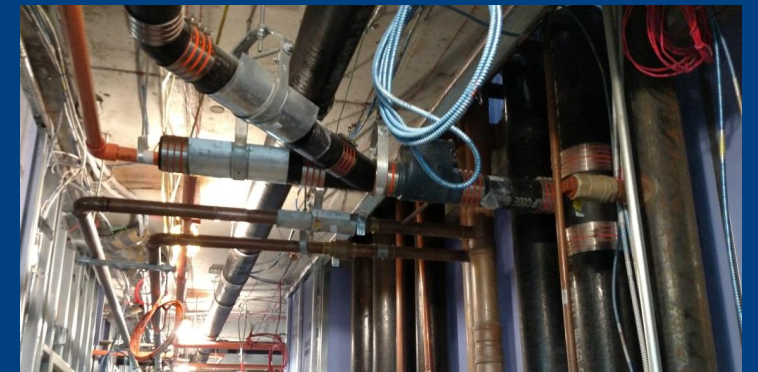
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## **Q&A**

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# Issue Statement

- Campus use large amounts of water for non-potable purposes
- Campus energy facilities typically are the single largest user of non-potable water
- Campus cooling water is often constrained by either:
  - Cost of Municipal Water
  - Availability of Water
- Building-scale uses of reclaimed water can enable broader acceptance of water reuse on campus



# The Case for Water Reuse



**Water Supply & Demand**

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**Sustainability & Resiliency**

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**Rising Costs**

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**Aging Infrastructure**

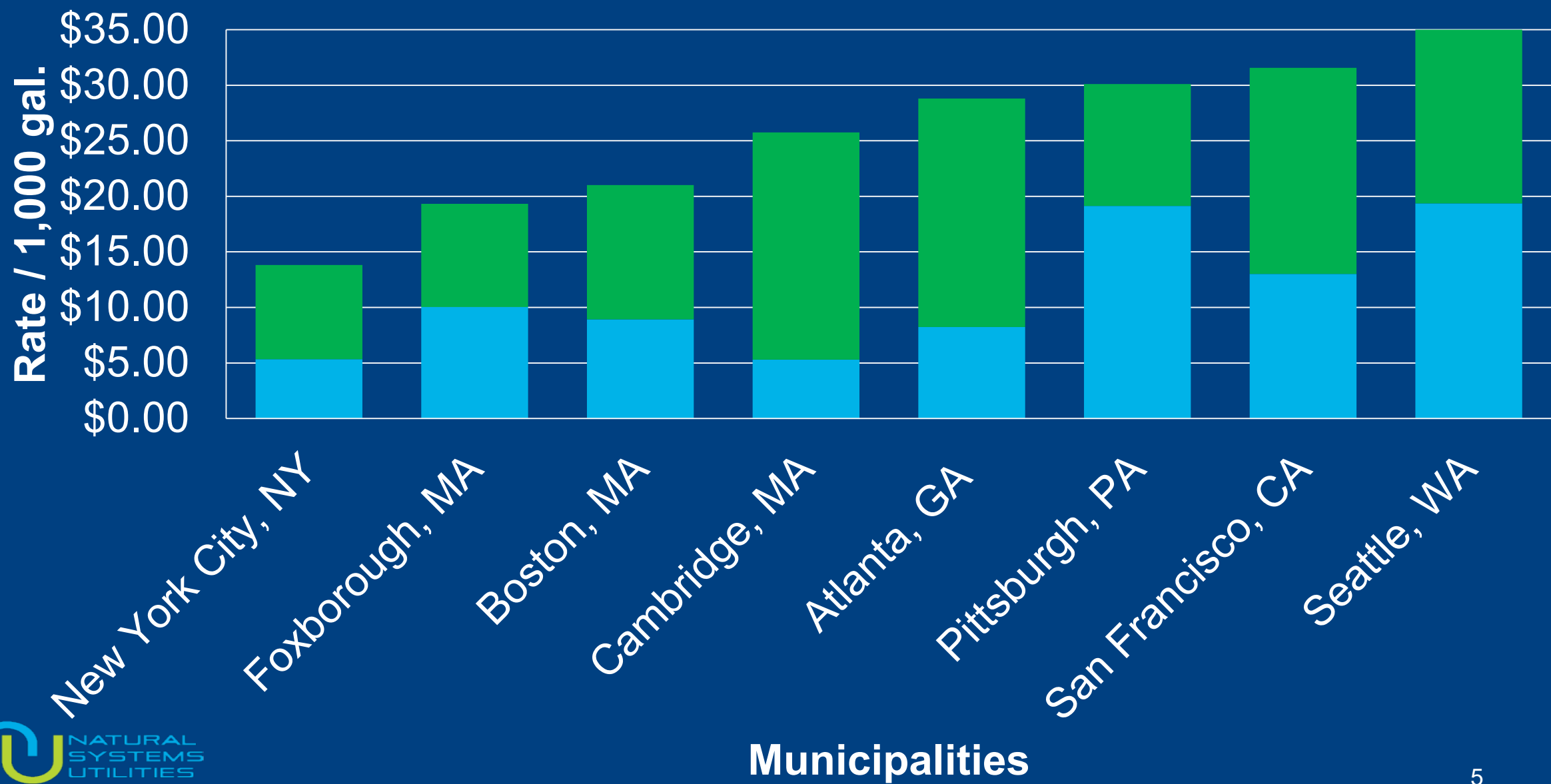
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**Going Green**

# How Do Local Water & Sewer Rates Relate to Cities with High Water & Sewer Rates?

Top Tier Water & Sewer Rates



# Campus-Scale Reuse in Foxborough, MA



**2002- Present**

**Onsite** water use  
**50%** of wastewater reused onsite  
**900,000** gallons buffer capacity  
**20 MGY** potable use savings

**Gillette Stadium**

**68,000** seats +  
**5,000** employees



**2007 - Present**

**Patriot Place**

**250,000** GPD water reuse facility

**Landscape Irrigation** using  
reclaimed water

**0.5 MG** reclaimed water  
Storage

**1,300,000** sq. feet retail,  
restaurants & commercial

# Massachusetts Direct/Onsite Water Reuse Regulatory Requirements and Uses

Allowed Uses for Class A Water in MA
Irrigation
Cooling Water
Toilet and Urinal Flushing
Agricultural Use
Industrial Process Water
Commercial Laundries and Carwashes
Snowmaking
Fire Protection
Creation of Wetlands & Recreational Impoundments



## MADEP 314 CMR 20 Class A Reuse Limits

Parameter	Class A Requirements
pH	6.5 – 8.5
Biochemical Oxygen Demand	<10 mg/L
Total Suspended Solids (TSS)	<5 mg/L
Total Nitrogen	<10 mg/L
Turbidity	2 NTU*
Fecal Coliform	Not Detectable**
Other Parameters specified by the DEP	To be determined

**Notes:**

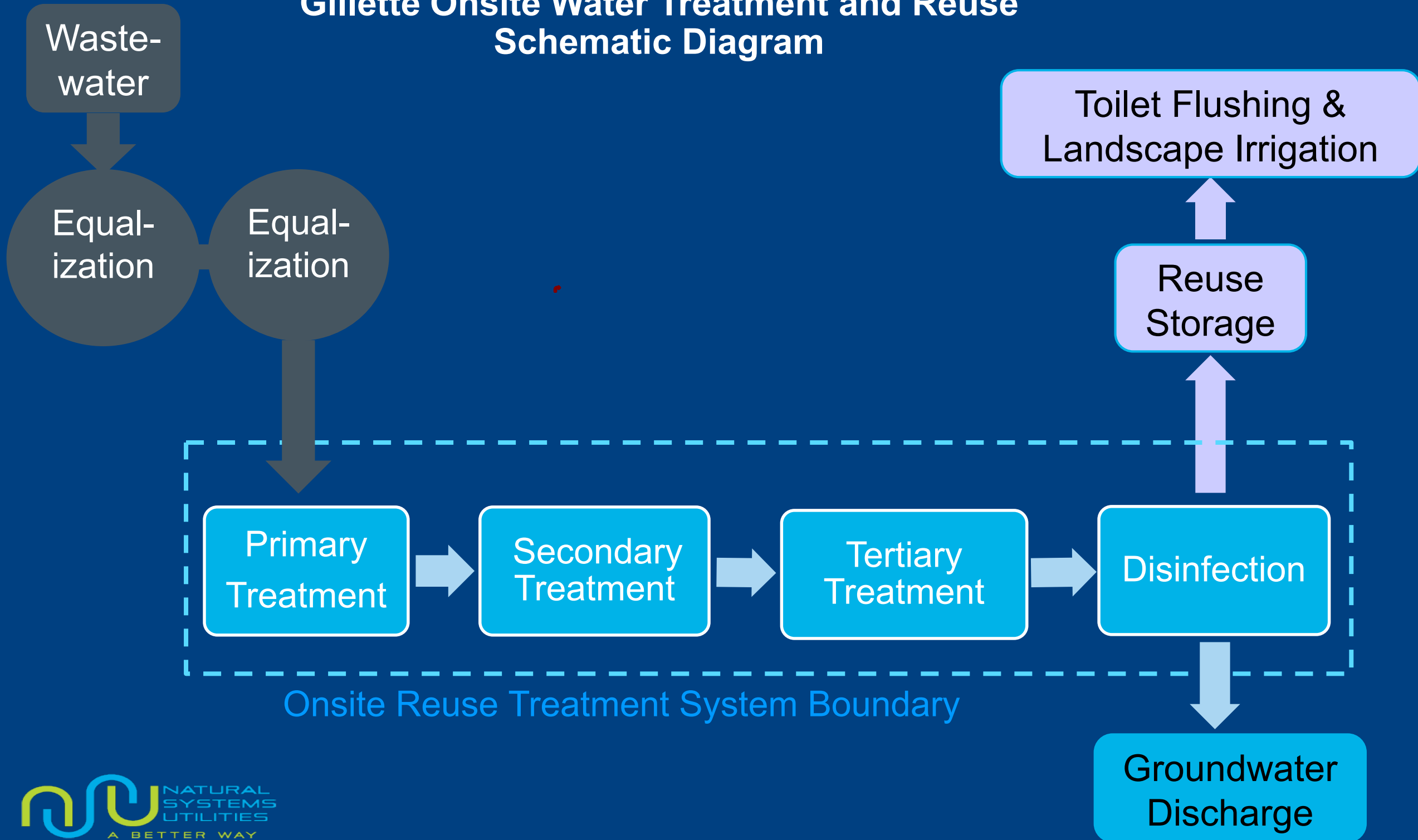
\* Less than average of 2 NTU within a 24-hour period, cannot exceed 5 NTU more than 5% of the time within a 24 hour period, and cannot exceed 10 NTU at any time.

\*\*Median of no detectable fecal coliform/100 ml over continuous seven-day sampling periods, not to exceed 14 /100 ml in any one sample

Reuse  
Storage  
Tower



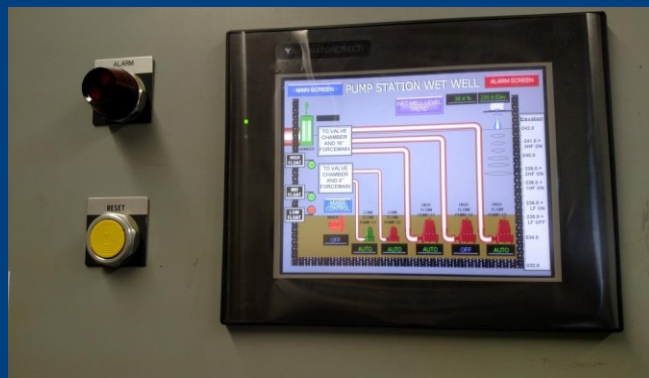
# Gillette Onsite Water Treatment and Reuse Schematic Diagram



## Gillette Stadium Water Reclamation Facility Membrane Bioreactor (MBR)



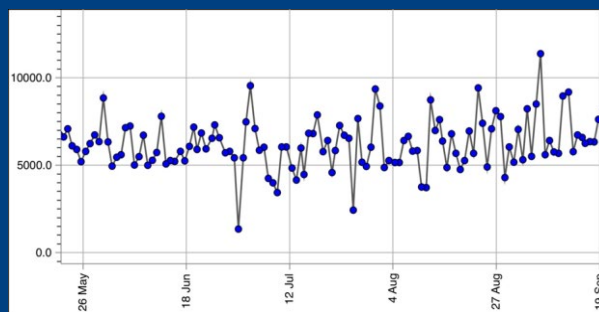
# Secure Remote Access At Gillette Stadium/Patriot Place



Programmable Logic Control (PLC)  
& Supervisory Control and  
Data Acquisition (SCADA)

Work Order	Reported Area	Client PO #	Req. Priority	Status	Type	Asset #	Title	Contact	Address	Assignment
5210	SEP 23, 2018	NHAM FR	2-High	0-Open	Car		Locate Channel at 18 Woodland Terrace, Bloomington	Jim Bauer	28 Lawn Run Drive	
5210	SEP 22, 2018	NHAM RR	2-High	0-Open	Car		Locate Channel at 18 Coldwater Ct.	Karl Weber	27 Waters Edge	
5211	SEP 22, 2018	Catholics	3-Normal	0-Open	Car		HP Pump Seal Leak	Karl Weber	40 Potash Road	Glynn
5209	SEP 21, 2018	NHAM BC	2-High	0-Open	Car		Calibrate endress and hauser recorder	Jim Bauer	4 Stevens Lane	Michael W. Burt C.
5204	SEP 20, 2018	Concerns	2-High	0-Open	Plant		Pick up isolator from Concerns	Dennis Kelle	135 Rocky Point Road	Low P
5203	SEP 20, 2018	Concerns	2-High	0-Open	Plant		Pick up Isolator from Concerns	Dennis Kelle	135 Rocky Point Road	Low P
5196	SEP 20, 2018	Arakis	0-Emergency	0-Open	Compl		Daily Flow Reading	Karl Weber	51 Thurston Road	
5195	SEP 21, 2018	THSC	3-Normal	0-Open	Car		Membrane Auto Air Serv	Brian Delaney	900 Lantington Road	Low P
5194	SEP 20, 2018	THSC	3-Normal	0-Open	Car		EC2M TR PLC	Equipment Run Hours	900 Lantington Road	Michael W

Computerized Maintenance  
Management System (CMMS)



Digitized Daily Rounds  
(LogCheck)

# Lessons Learned

- Source water
  - Equalization is effective in handling peak flow rates
  - Influent quality required a plant expansion in 2007
- Reclaimed water
  - Significant non-potable water storage volume is necessary to handle peak demands
  - High quality of reclaimed water enabled a permit amendment to meet new regulatory requirements and add landscape irrigation as a use for reclaimed water





# One Water NYC: 2018 Water Demand Management Plan



Bill de Blasio  
Mayor  
Vincent Sapienza, P.E.  
Commissioner

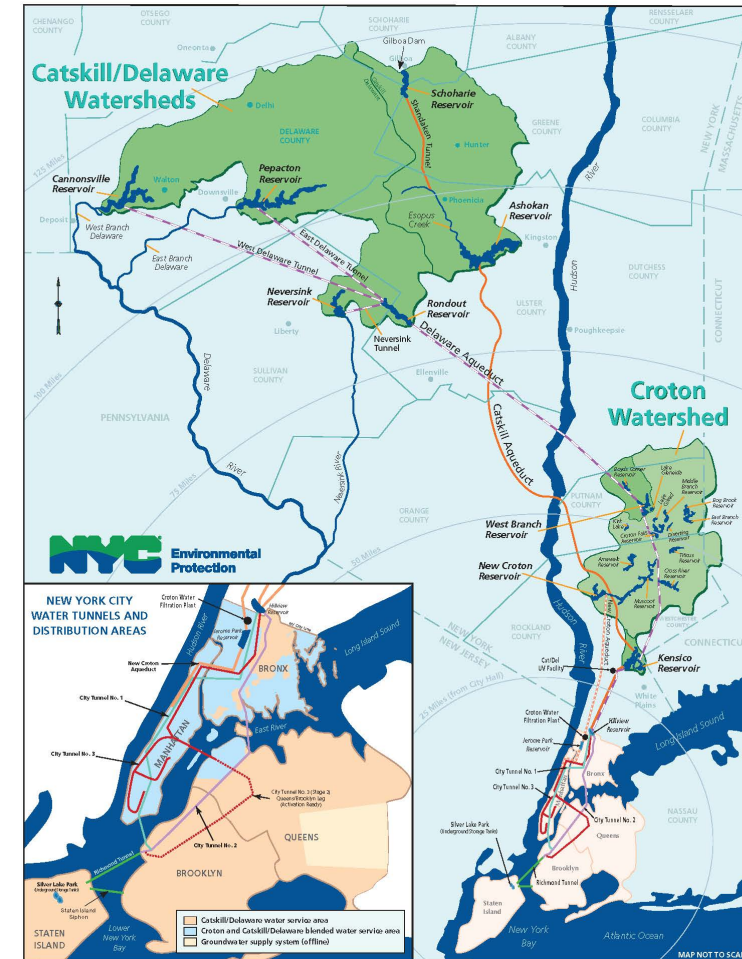


Figure 3. New York City Water Supply System

Strategy 1

Strategy 2

Strategy 3

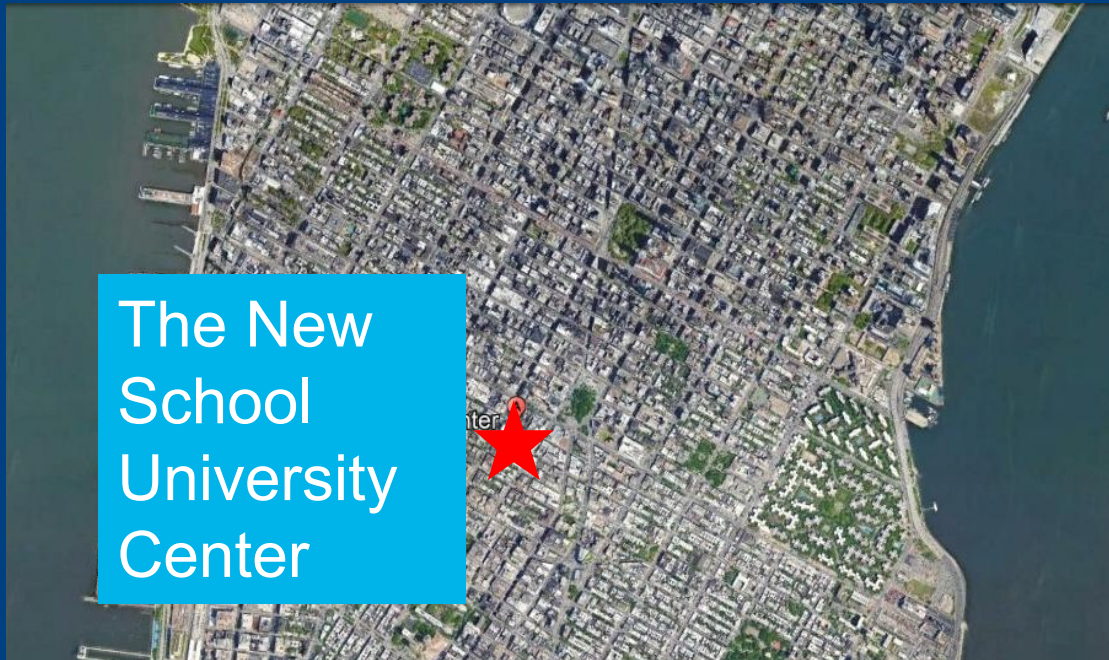
Strategy 4

Strategy 5

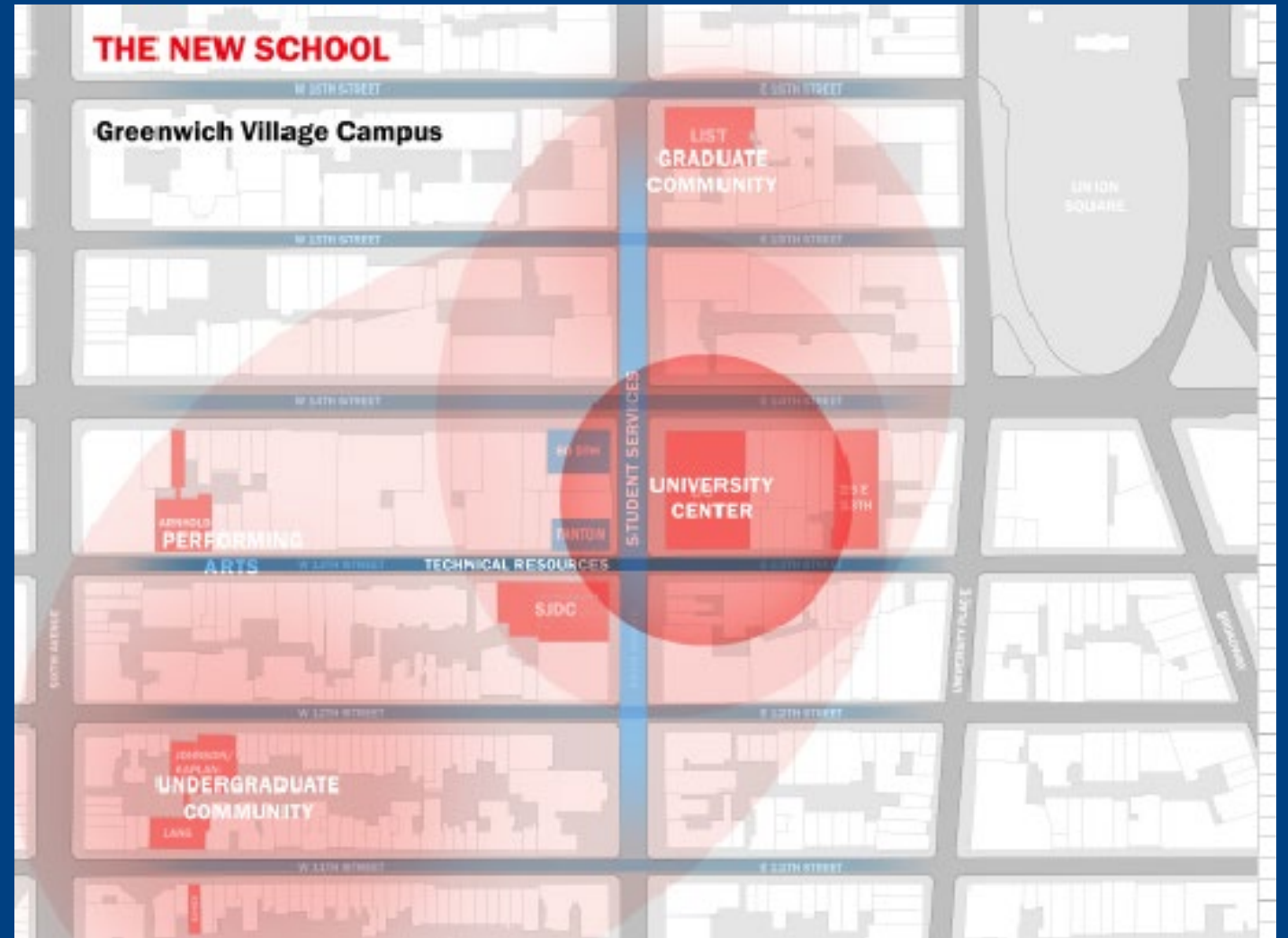
Strategy 6

# The New School University

- Downtown Manhattan
- 100 years old
- 10,000 students



Source: Google Earth



<http://www.newschoolfreepress.com/2013/04/29/the-war-for-space/>

# New School University

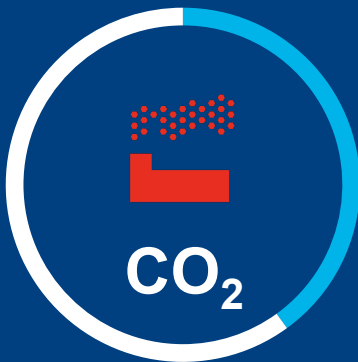
## Long-Term Goals

Target for 2030, vs 2015 (baseline)

### Aligned with NYC Carbon Challenge



**40%**  
Reduction



**40%**  
Reduction

### Internal TNS Goals



**20%**  
Reduction



**10%**  
Increase

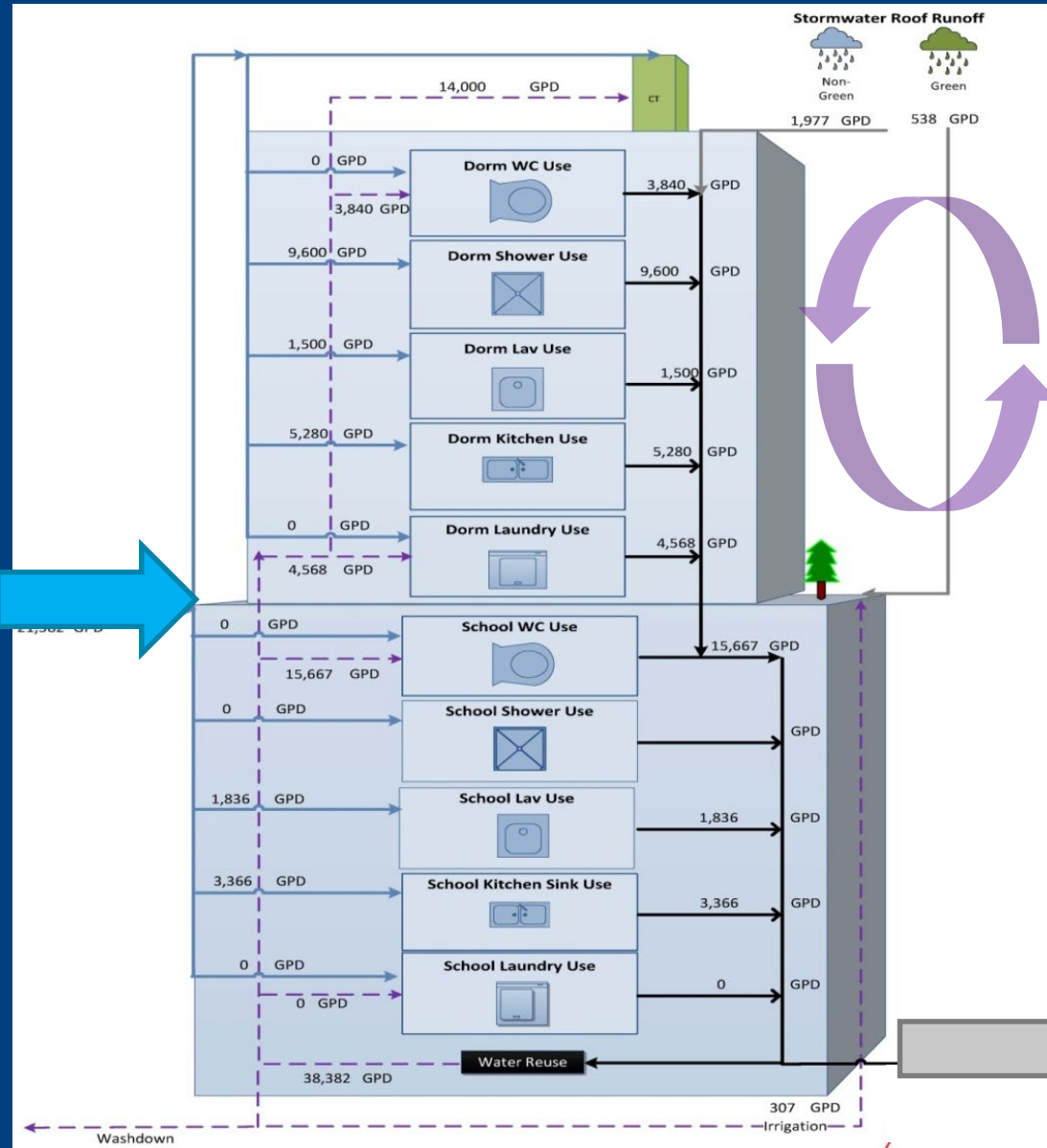
# The New School University's University Center

- 365,000 sq. ft.
- Classrooms
- Library-research center
- Auditorium
- Cafeteria
- Event café
- 600-bed student residence



# The New School University Center Water Balance

Total Building  
Domestic Potable  
Water Input =  
21,600 GPD

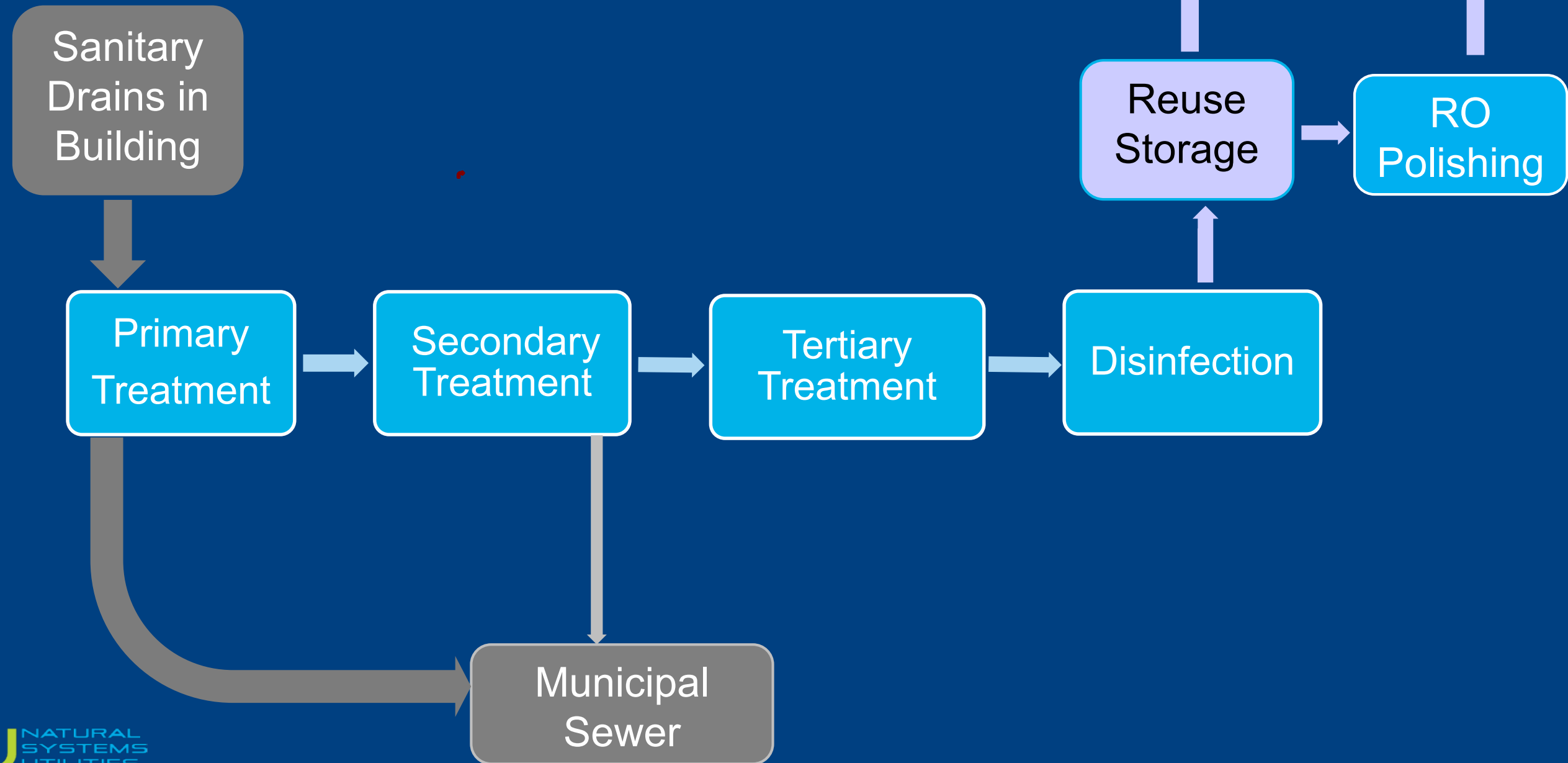


## NON-POTABLE REUSE (gpd)

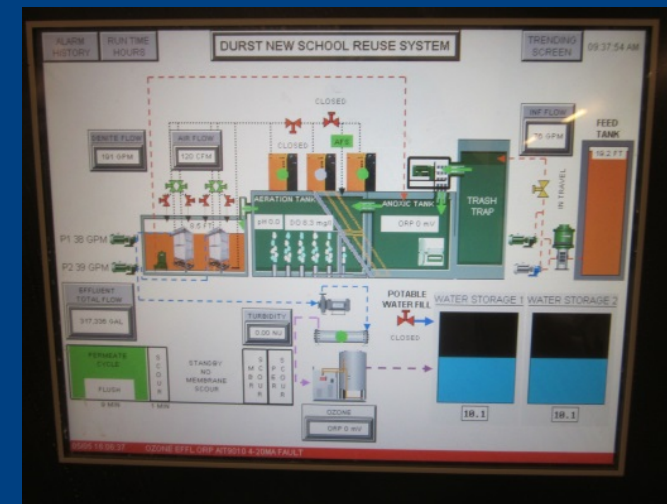
- Cooling Towers = 14,000
- Toilet Flushing = 19,500
- Laundry = 4,500
- Irrigation = 300
- Total = 38,300

Discharge to Sewers = 7,300 gpd

# The New School University Center Onsite Water Treatment and Reuse Schematic Diagram



# New School Onsite Water Reuse System



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# NYCOnsite Water Reuse System Performance

## Technologies/System Operations Results

System Location/Criteria	BOD (mg/l)	TSS (mg/l)	Turbidity (NTU)	Fecal Coliform (#/100 ml)	E. Coli (#/100 ml)
NYC Limit	<10	<10	<2	<100	<2.2
MBR Specification	<2	<2	<0.2	NA	NA
The New School	<6	<1	<0.2	< 1	< 1
The Solaire	< 6	< 1	0.05 – 0.25	< 1	—
Millennium	< 6	< 1	0.15 – 0.45	< 1	—
The Visionaire	< 6	< 1	0.15 – 0.45	< 1 (Total coliform)	< 1
The Helena	< 6	< 1	0.05 -0.20	< 1	—

# New School University, NYC

## Outcomes:

- 74% Water Use Reduction
- 89% Sewer Discharge Reduction



## Lessons Learned:

- High strength influent due to water conserving fixtures
- Multiple barrier approach provides resiliency
- Need for reverse osmosis treatment prior to cooling tower use

# The Case for Onsite Non-Potable Reuse



Imbalance of Water  
Supply & Demand



Sustainability, Resiliency  
& Resource Recovery



Rising Costs

Aging  
Infrastructure



# Questions?



## Contact Natural Systems Utilities:

**Bruce Douglas**  
**Vice President**

**[bdouglas@nsuwater.com](mailto:bdouglas@nsuwater.com)**  
**802.999.6797**



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