

Cost Savings, Reliability and Readiness via Campus-Wide Wastewater Reclamation Strategies



Presented by Jonathan Lanciani
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Specialize in Water Reuse for Bulk Water Users

- Evaluate
- Optimize
- Collaborate
- Create Awareness
- Finance
- Permit
- Plan/Design/Build
- Operations
- End-Use Expertise



Complete Project Execution

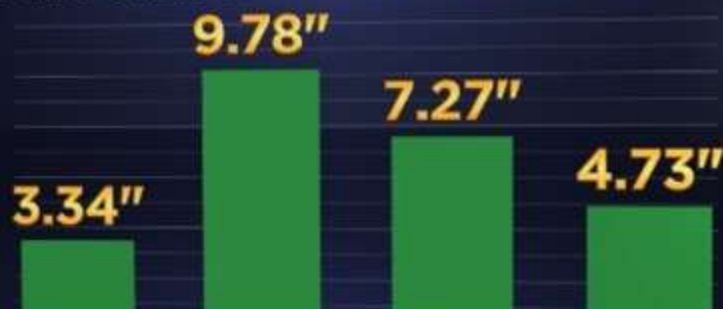
Drought: 2014 Rainfall Nearly as Low as 2011

Like 32 Tweet 1 Pin it Share

05/13/2014 10:24 AM 05/14/2014 07:25 AM

DROUGHT COMPARISON

RAINFALL JAN-MAY EACH YEAR



This shows the amount of rain that fell in Texas from January through May of the stated year. (Bryan Rupp, 2014 KFDX)

U.S. southwest could see a 60-year drought like that of 12th century — only hotter — this century

Extreme Drought Expands North Into Kansas

Brief showers to give wheat some relief, but may also come with severe weather this week.

Published on: May 8, 2014

Drought prompts irrigation water cuts in Fallon

Published 8:16 am, Friday, May 9, 2014

Partially Parched: Half of US Is In Drought

By Stephanie Pappas, Senior Writer | May 13, 2014 01:35pm ET

U.S. Drought Monitor

May 6, 2014
Released Thursday, May 8, 2014
Mid 6 a.m. EDT



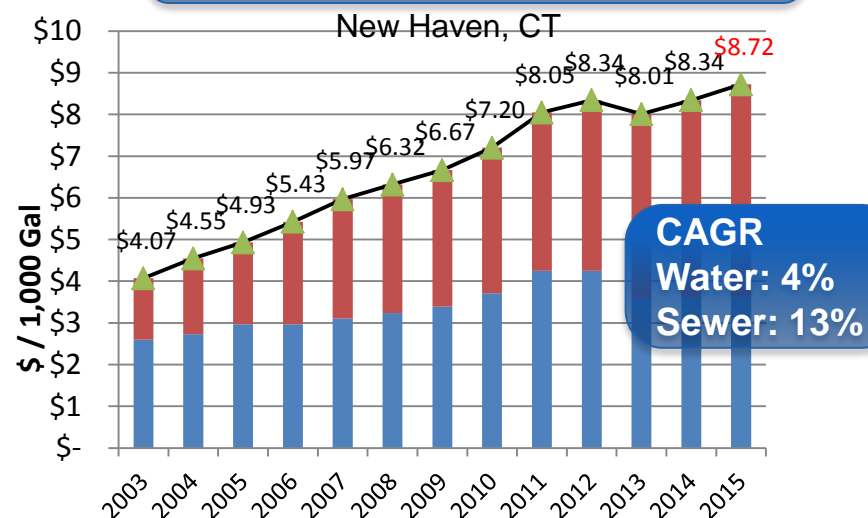
Aging Infrastructure



Scarcity



Rate Pressure



Environmental Constraints



Rate Increases Are Necessary for Infrastructure Improvements

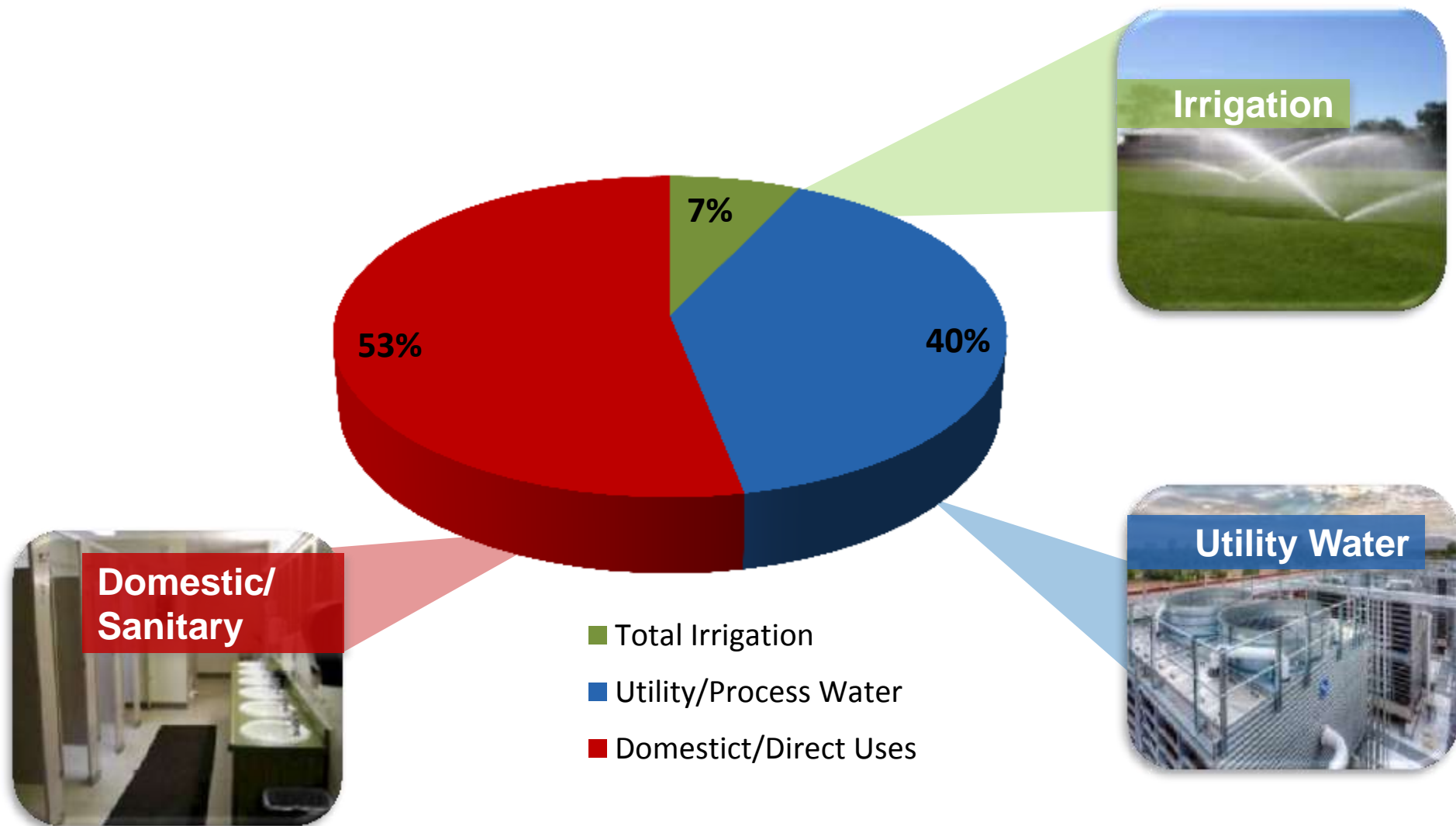
N+1 Redundancy:

- Redundant Water Supply
 - Drought
 - Municipal infrastructure failures
- Additional On-Site Storage
 - Most District Energy Facilities Lack Water Redundancy
- Flexibility & Resilience
- Independence
- Availability in the event of failure
- Minimum recovery time
- Insulation from rising water costs



N+1: Reliable and Safe Alternatives to Potable Water

Water Use at a Typical Campus



Typically, 50% of water is for non-potable uses

Before



After



~Risk Management ~Cost Savings ~Environmental Responsibility

Water Footprint Assessment and Economic Validation



- Water balance & use
- WW flow projections
- Non-potable demand
- Economic assessment



Utility Water Assessment



- Equipment inventory
- Water quality needs
- Program admin.
- Water modeling



Site & Infrastructure Assessment



- Infrastructure review
- Prelim. siting & design
- Regulatory review
- Lifecycle costs



Save Millions of Gallons and Millions of Dollars

Bulk Users of Water



Photos Courtesy of International District Energy Association



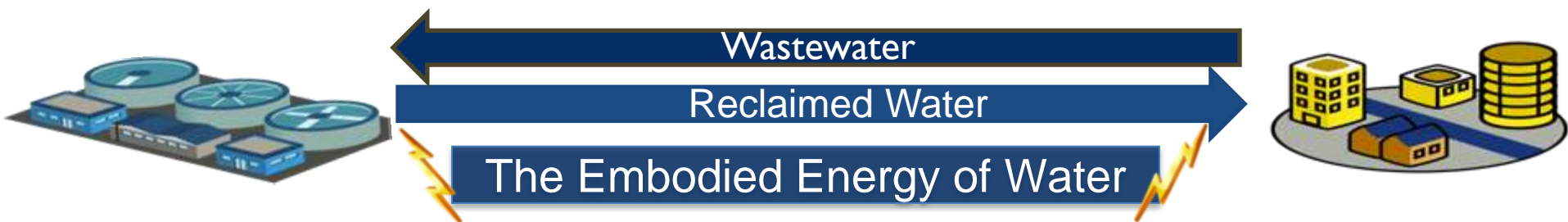
Water Reuse is Prevalent Amongst IPPs



Water Treatment Facility

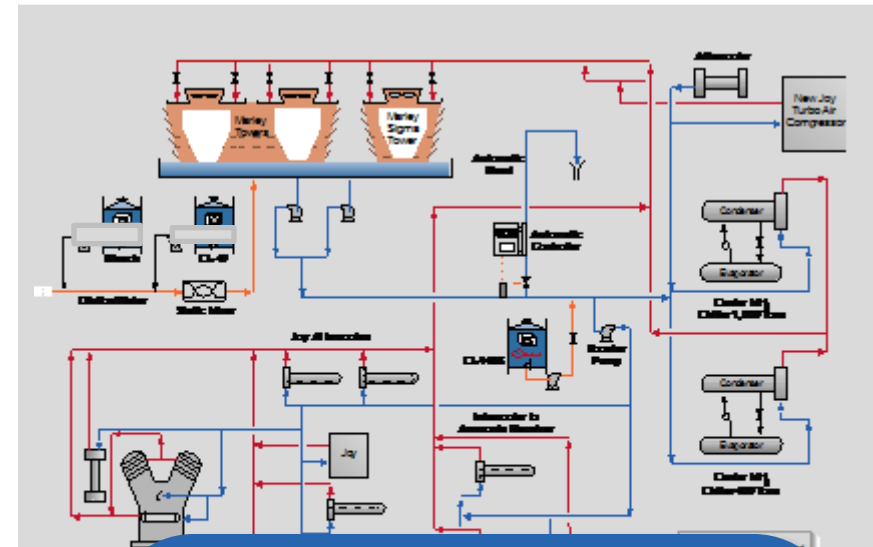
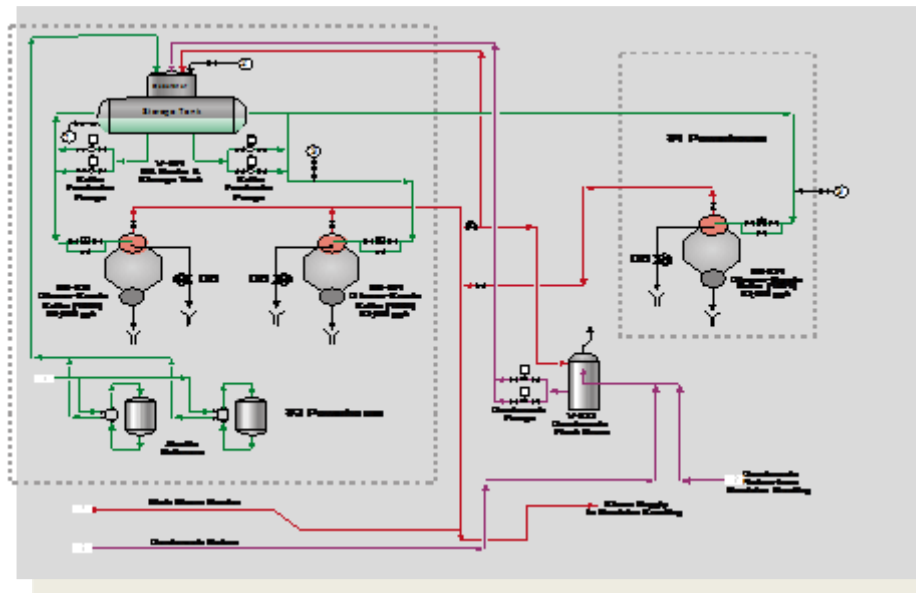
~10+ miles

End User



Municipal Solution: Impractical for Many Cities

Biological studies
Corrosion studies
Automation
Treatability studies
Equipment Integrity



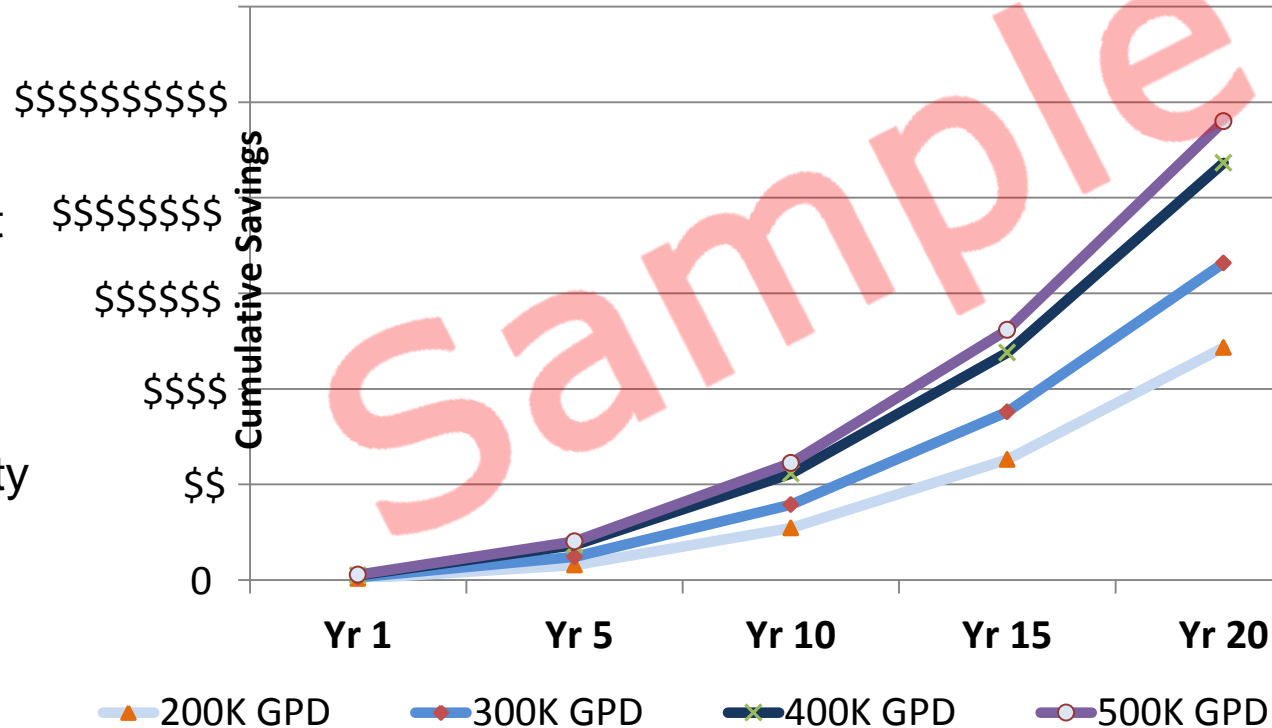
- Feasibility and treatability studies
- Scale inhibitors
- Sludge dispersants
- Treatment specifications
- Purity studies
- Corrosion studies
- Fuel conservation studies

Superior Program Oversight: Unparalleled Collaboration

Flexible project financing arrangements utilizing:
~ Performance Contracts ~ Operating Leases ~ Design-Build Agreements

Benefits

- No up-front capital
- Innovative Technologies
- Leverages superior credit rating
- Immediate, Guaranteed Savings
- Long Term Pricing Stability
- No O&M Responsibilities
- SW bares majority of risk



Water is Principal to Facility Operations

Treated WPCF Effluent enters
500-Micron Self-Cleaning Strainers



Chlorine &
Ammonia
Dosing



Microfiltration



UV Disinfection



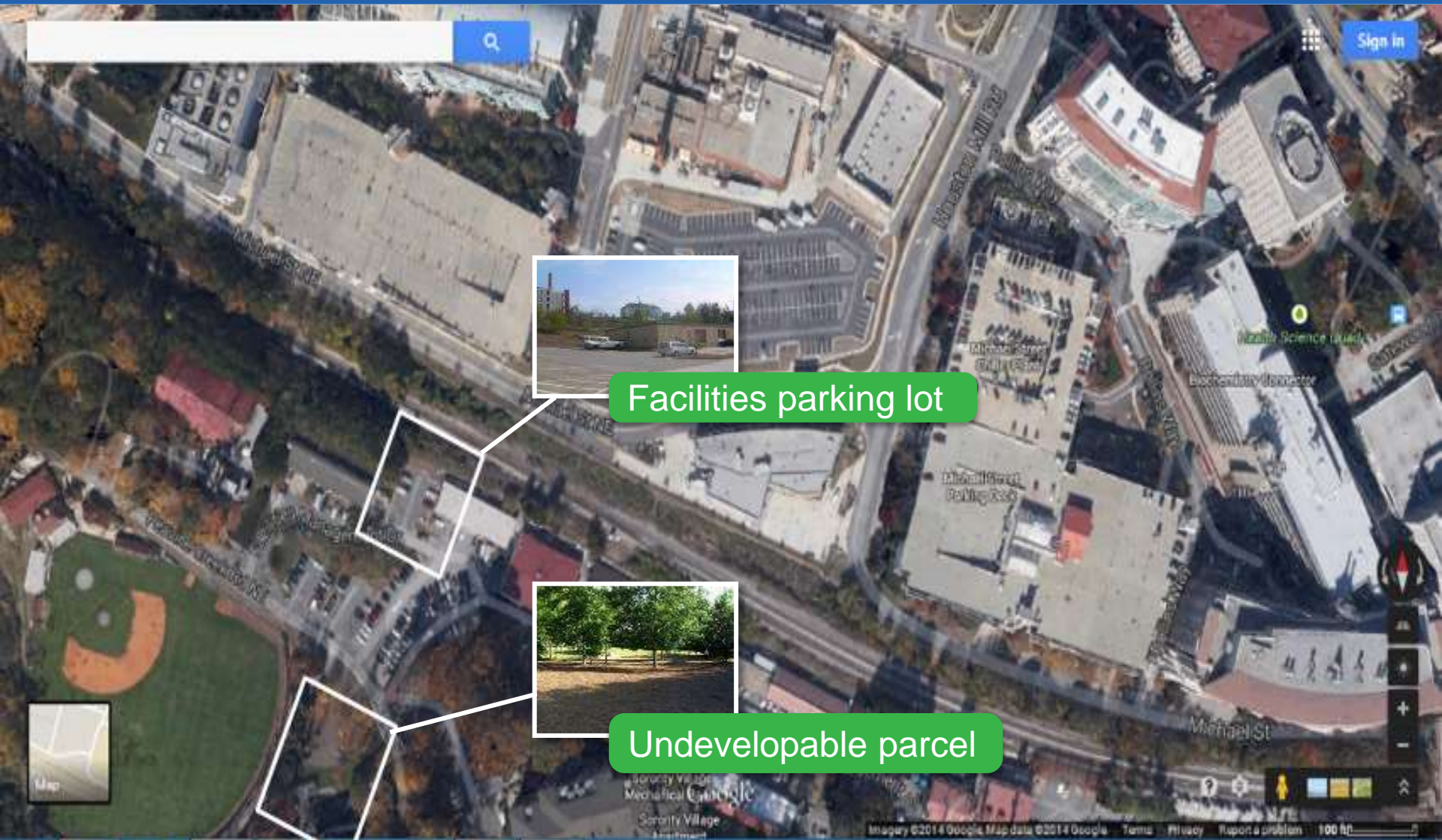
UConn WRF

250K – 450K GPD



UConn CUP

High Pressure Boilers
Cooling Towers
CHW Makeup



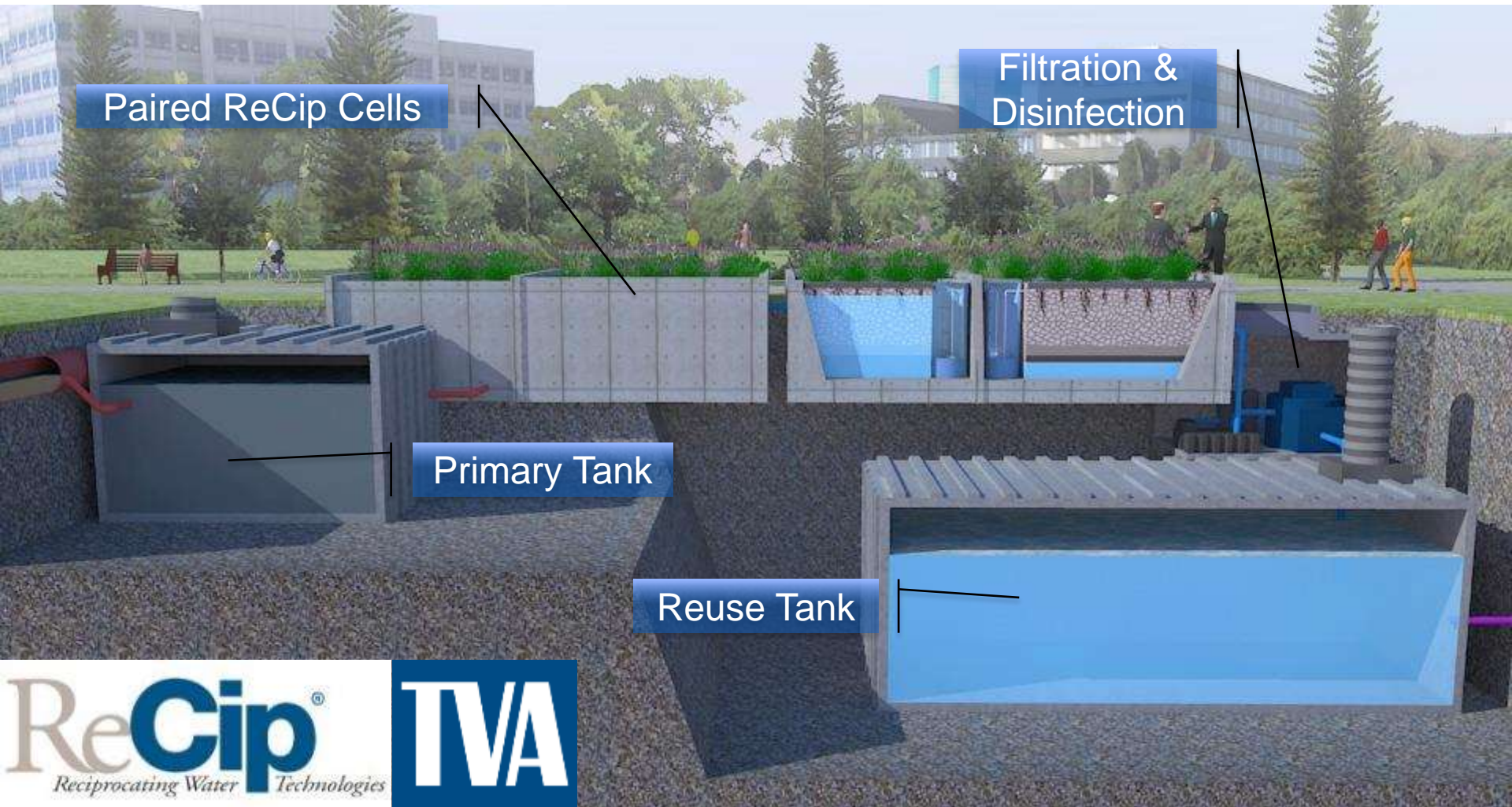
Integrated into the Existing Campus Fabric

Ecological Water Treatment Technologies



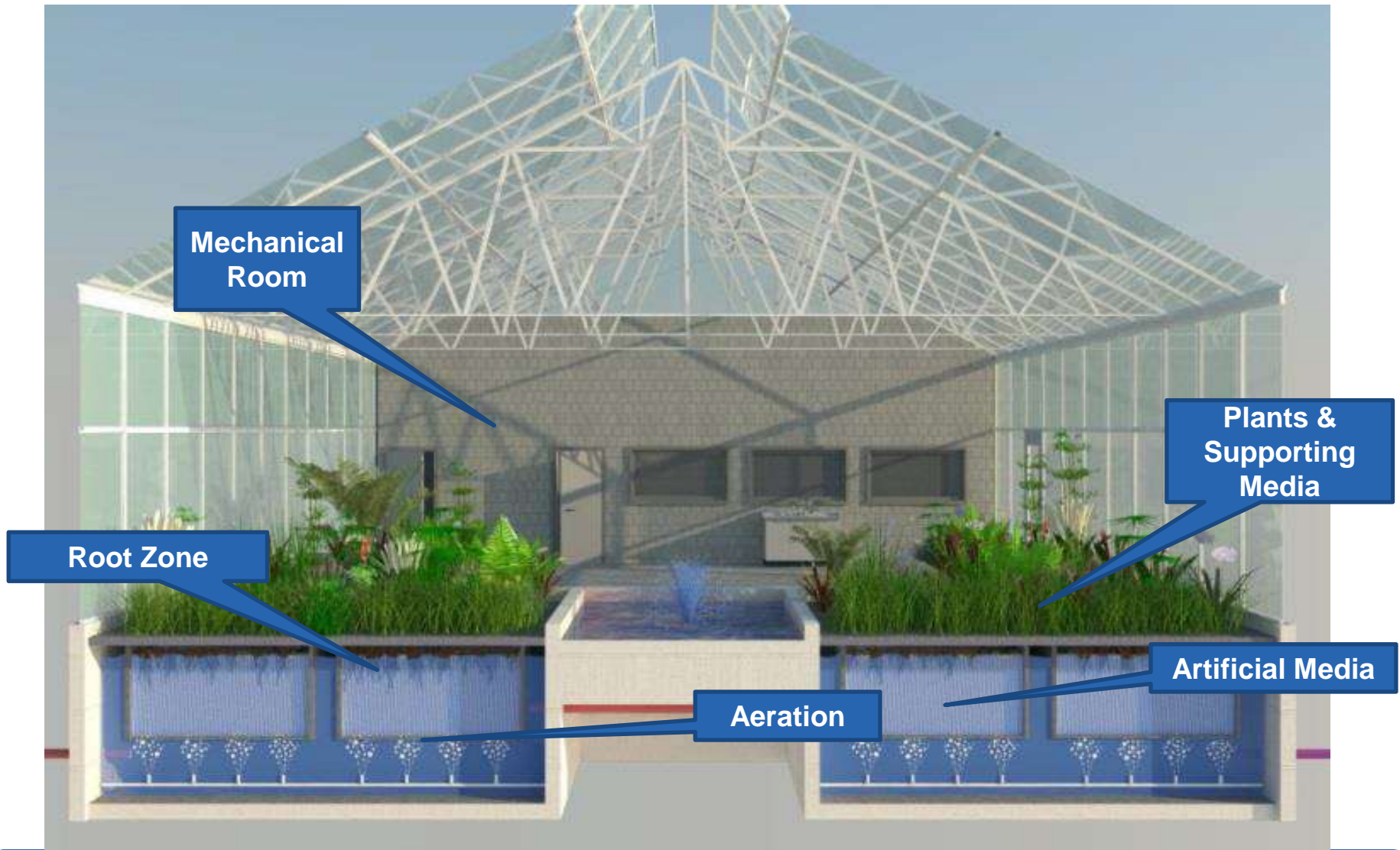
	ReCip® Tidal Wetlands	Hydroponic and Fixed Media	Moving Bed Bioreactor (MBBR)	Membrane Bioreactor (MBR)	Conventional Activated Sludge
Capital Expense	●	●	●	●	●
Operating Expense	●	●	●	●	●
Energy Efficiency	●	●	●	●	●
Effluent Quality	●	●	●	●	●
Footprint	●	●	●	●	●
Aesthetics	●	●	●	●	●

Increased Biodiversity, Reduced Energy Requirements



Water Reuse Integrated into the Landscape

Submerged Fixed-Film Hydroponic System



Sustainable Design for Large Flow Volumes

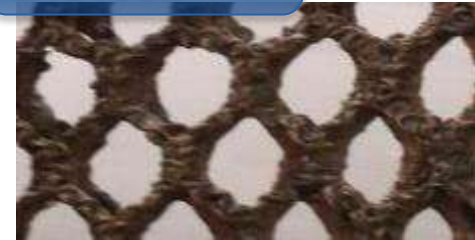
Moving-bed Bioreactors



BioPortz™



BioWeb™



Submerged Fixed Film Media

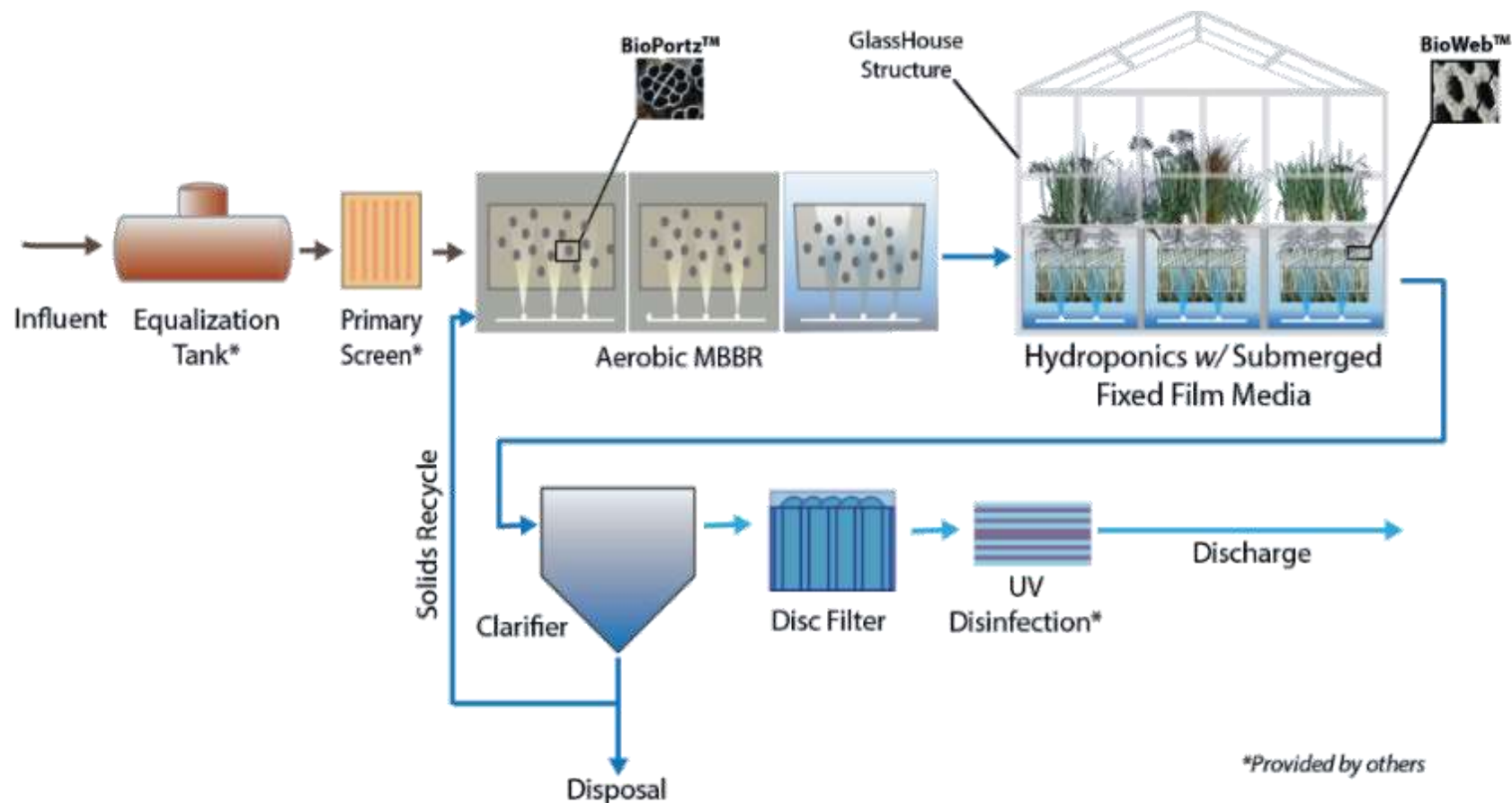


Biomimicry: Maximizing Treatment Capacity / Minimizing Energy and Space

120M GPY Displaced
35% of Total Campus Demand
90% of Utility Water Demand
3 Chiller Plants/1 Power Plant



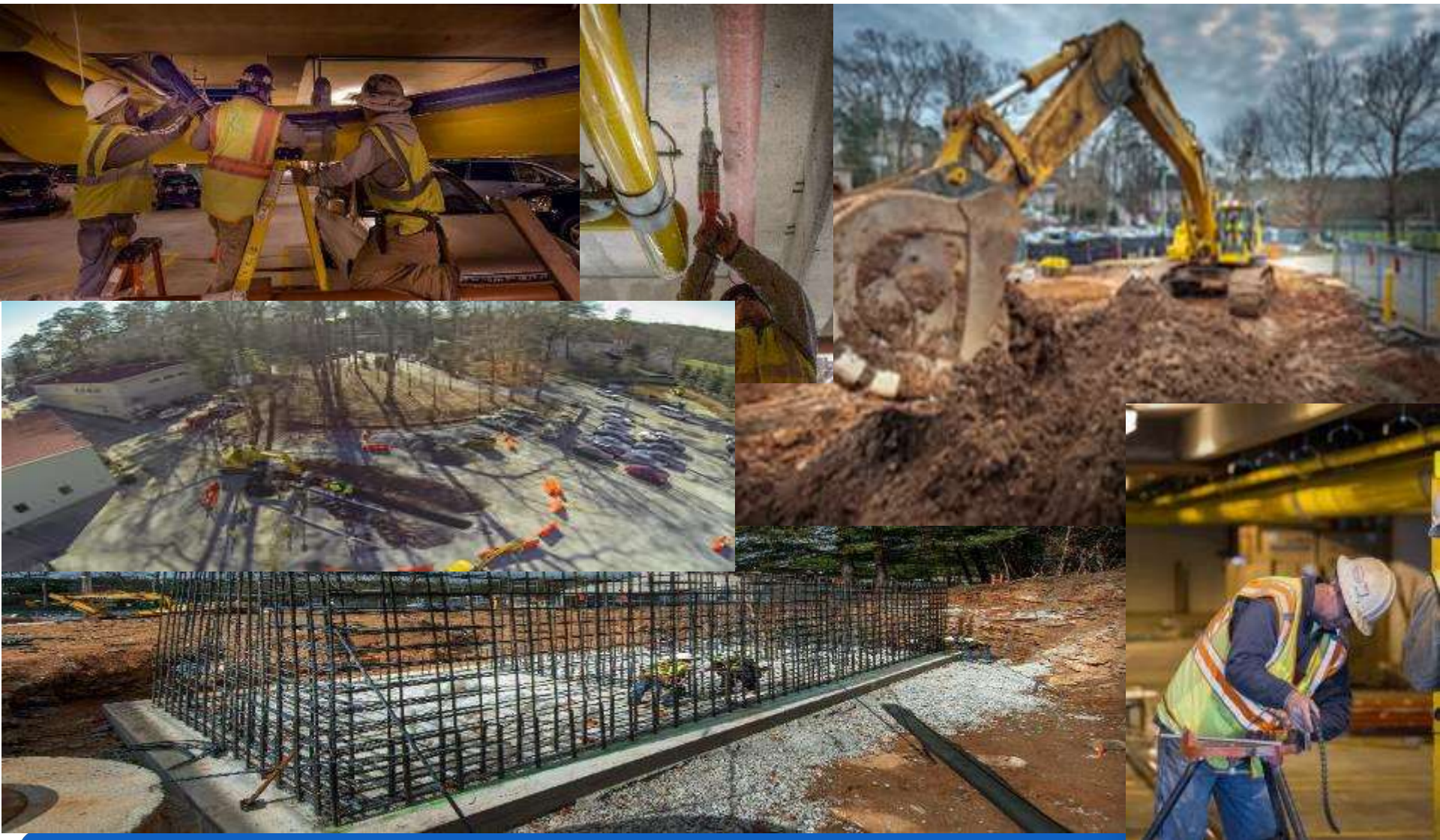
Process Diagram



Hydroponic-MBBR Hybrid Allows for a Compact Physical Footprint



Current Construction in Dense Campus Environment



Construction Optimized for Local Site Conditions



Knowledge, Know-How & Expertise

- Automated Treatment Process
- Climate Controlled
- Safe, Odor-Free Environment



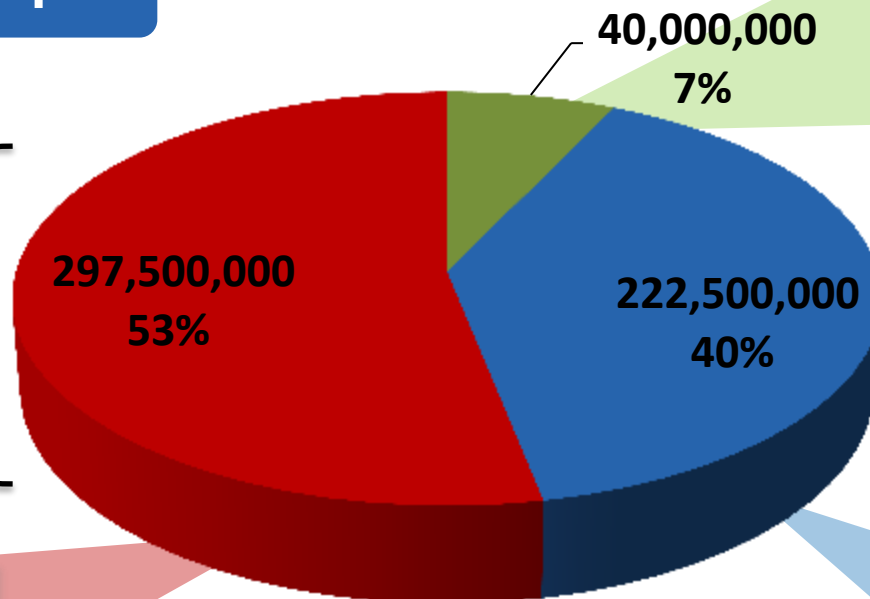
~Risk Management ~Cost Savings ~Environmental Responsibility



Design helps anchor the centerpiece of the eco-commons

560 M GPY

Includes: Main, Medical, & West



**Domestic/
Sanitary**

Irrigation

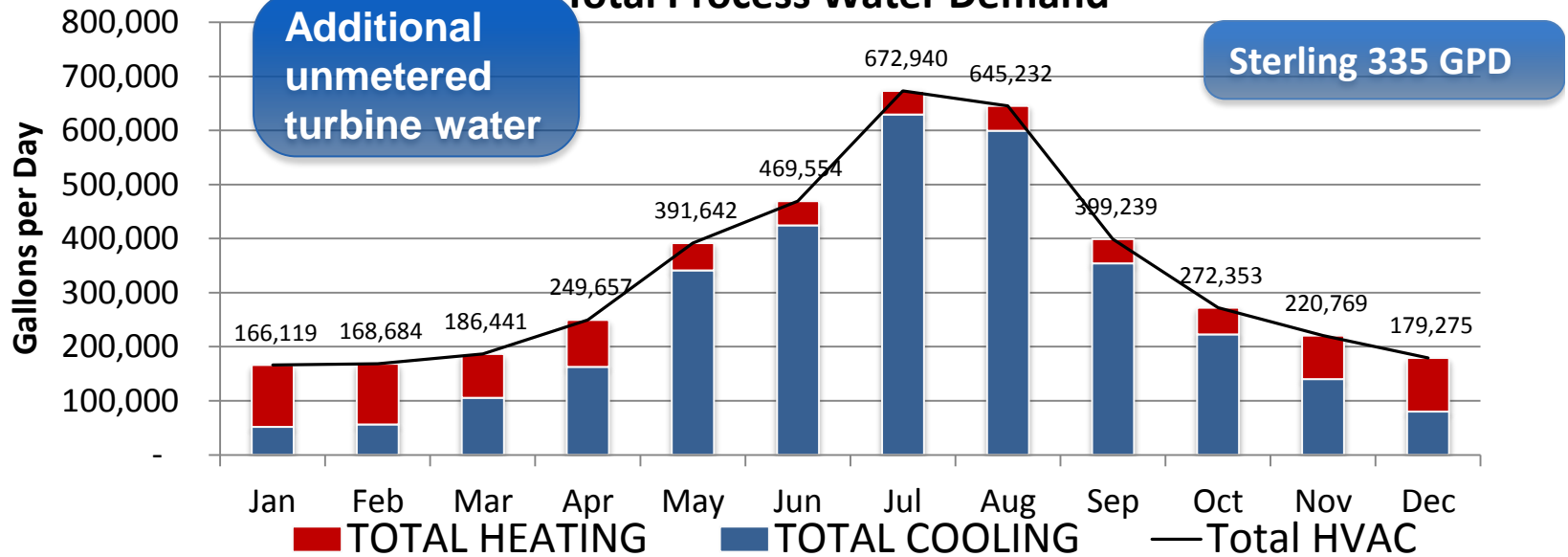
Utility Water

- Total Irrigation
- Utility/Process Water
- Domestic/Direct Uses

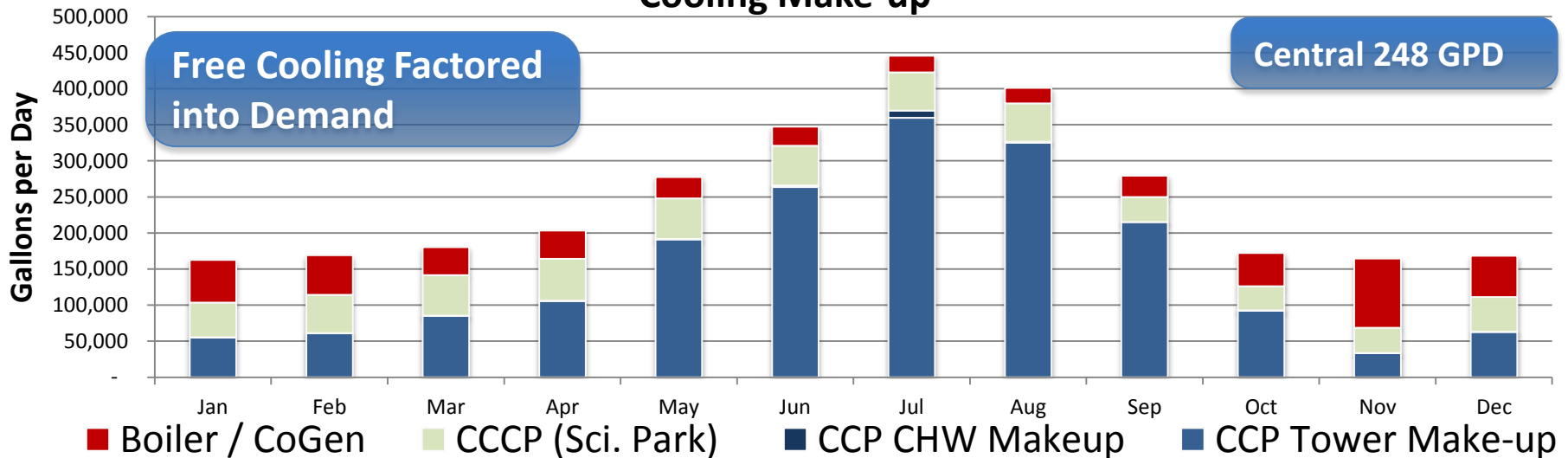
Consumptive Profile Validates Opportunity: 47% Non-potable Demand

Sterling and Central Chiller/Power Plant

Total Process Water Demand



Cooling Make-up



Yale

Yale University

New Haven, Connecticut

Water Use by Building

Building Water Use - Avg. GPD



Campus Boundary

0 1,000 2,000
ft

Scale 1:15,000

Coordinate System:
NAD 1983 StatePlane Connecticut FIPS 2000 East



Notes

UTILITY FEATURES PORTRAYED ON THIS MAP MAY NOT BE SURVEY VERIFIED.

SUSTAINABLE WATER

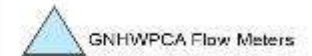
Sustainable Water Consultants LLC
Glen Allen, VA

Yale

Yale University Medical Campus

New Haven, Connecticut

Sewershed Areas for GNHWPCA Flow Meters



GNHWPCA Flow Meters



Utility Plants

Sewer - Pipe Size

- 0" - 10"
- 12" - 20"
- 21" - 36"
- 41" - 65"



Yale Buildings

- Sewershed Areas for Meter OF011631
- Sewershed Areas for Meter 1
- Sewershed Areas for Meter 2
- Sewershed Areas for Meter 3A
- Sewershed Areas for Meter 4A
- Sewershed Areas for Meter 4B
- Sewershed Areas for Meter 5A
- Sewershed Areas for Meter 5B

0 800 1,600
ft

Scale 1:12,000

Created with ArcView
X,Y: 1983 North Pole Coordinate EPS: 3000 Feet



Notes

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SUSTAINABLE WATER

Sustainable Water Consultants LLC
Glen Allen, VA

Canal &
Prospect

OF-011-631

2,679,600 GPD

S. Frontage &
Congress Ave.

236,000 GPD

209,300 GPD

168,200 GPD

856,900 GPD

724,200 GPD

2,288,900 GPD

1,022,700 GPD

Yale

Yale University Medical Campus

New Haven, Connecticut

Potential Siting Locations & Subsurface Infrastructure

-  Campus Boundary
-  Sterling Plant
-  Tunnels
-  Steam & Chill Condensate
-  Electric
-  Fire Protection Line
-  Gas
-  Irrigation
-  Lighting
-  Telecom
-  Water Main
-  Storm (Active)
-  Sewer (Active)
-  Investigated Siting Zones
-  Yale Buildings

0 200 400
ft

Scale 1:4,000

Geographic Position:
NAD 1983 StatePlane Connecticut FIPS 6000 Feet



Notes

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SUSTAINABLE WATER

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Amistad Park

SEAMCO Bldgs.

Yale

Yale University Medical Campus

New Haven, Connecticut

Proposed WaterHub™ Layout

- Extraction Pipe
- Distribution Pipe
- Proposed Footprint
- Construction Limit
- Investigated Siting Zones
- Steam & Chill Condensate
- Electric
- Fire Protection Line
- Gas
- Irrigation
- Lighting
- Telecom
- Sewer (Active)

0 40 80
ft

Scale 1:600

Coordinate System:
NAD 1983 StatePlane Connecticut FIPS 5003 Feet



Notes

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SURVEY VERIFIED.

SUSTAINABLE WATER

Sustainable Water Consultants LLC
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Yale University Concept



Interior



Pender County Concept



Campus Risk Minimization...



- Flow Monitoring
- Economic Impact
- Utility Water Assessments
- Site & Watershed Analysis
- Re-use Feasibility



You Can't Manage What You Don't Measure

Before



After



~Risk Management ~Cost Savings ~Environmental Responsibility

N+1 Redundancy:

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N+1: Reliable and Safe Alternatives to Potable Water



EXTENDING THE LIFECYCLE OF WATER.

Nature's Idea. Our Science.

QUESTIONS?

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