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Optimizing Your Water Harvesting System To Maximize Water Savings

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Session 11-W-1121

Wednesday 2:35 PM

wahaso

WATER HARVESTING SOLUTIONS

Learning Objectives

- Understand water harvesting terms & trends
- Understand the value of a multi-source, multi-use (MSMU) water harvesting system.
 - Viable sources and uses for on-site non-potable water
- Understand the major components of a MSMU system
- Understand how the principles are applied in MSMU systems to optimize water savings
- Address FAQ's

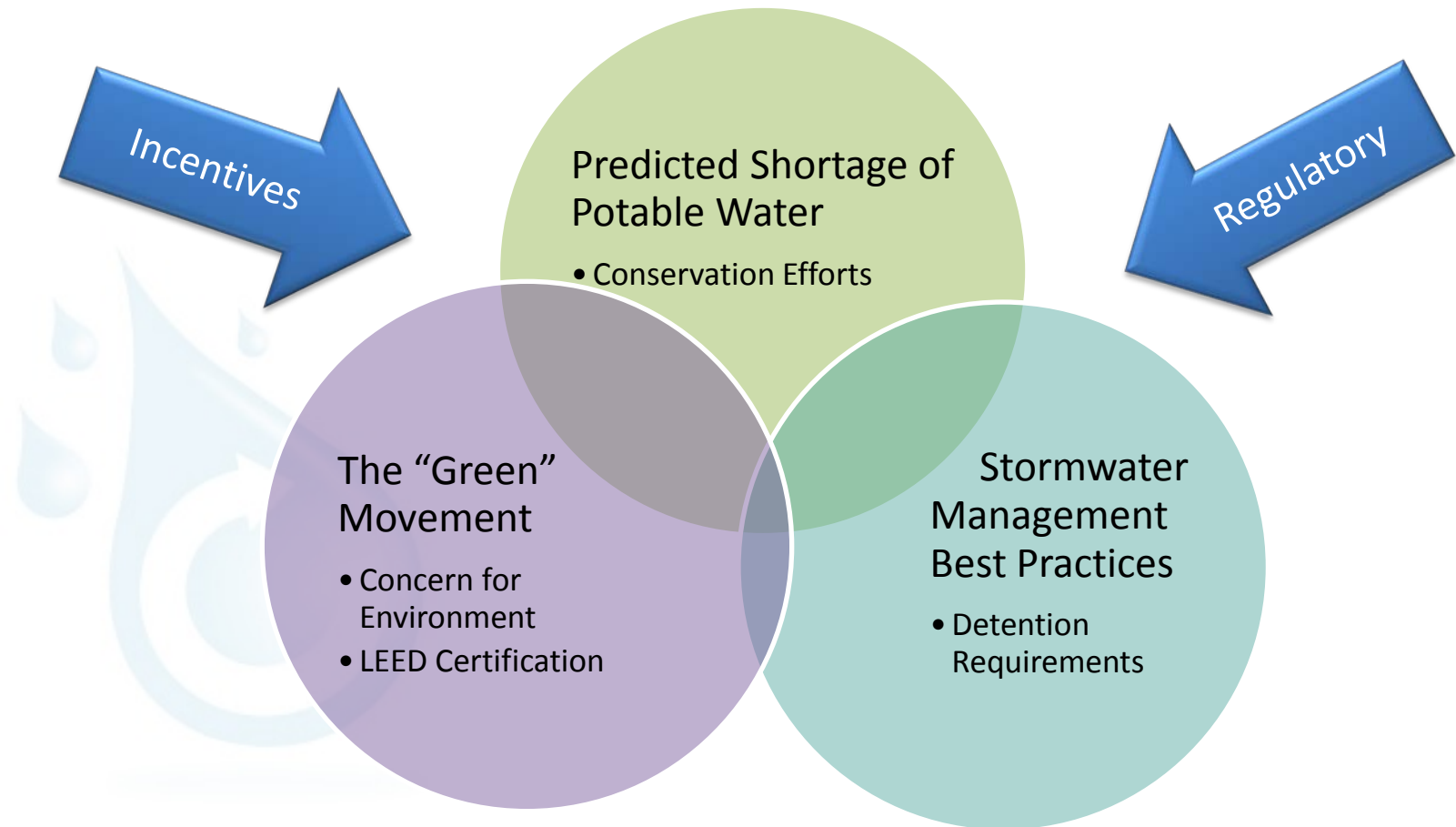
What is "Water Harvesting"?

Water Harvesting is the collection, cleaning, storage and pressurization of on-site water sources to replace or reduce the consumption of municipal potable water.

TERMS

Rainwater	From roofs and above-ground collectors
Stormwater	From ground surfaces – Parking lots, run-off
Greywater, Gray Water	Untreated waste water “gently used” in showers, sinks, processes
Groundwater	From below-grade sumps (around basements)
Condensate	Water condensed from air in cooling systems
Reclaimed Water	Municipally-treated sewage for reuse
On-Site Treated Non-Potable Water	Processed water from any source ready for non-potable reuse

Megatrends Suggest Strong Water Harvesting Industry Growth



But it is a New Industry With Challenges

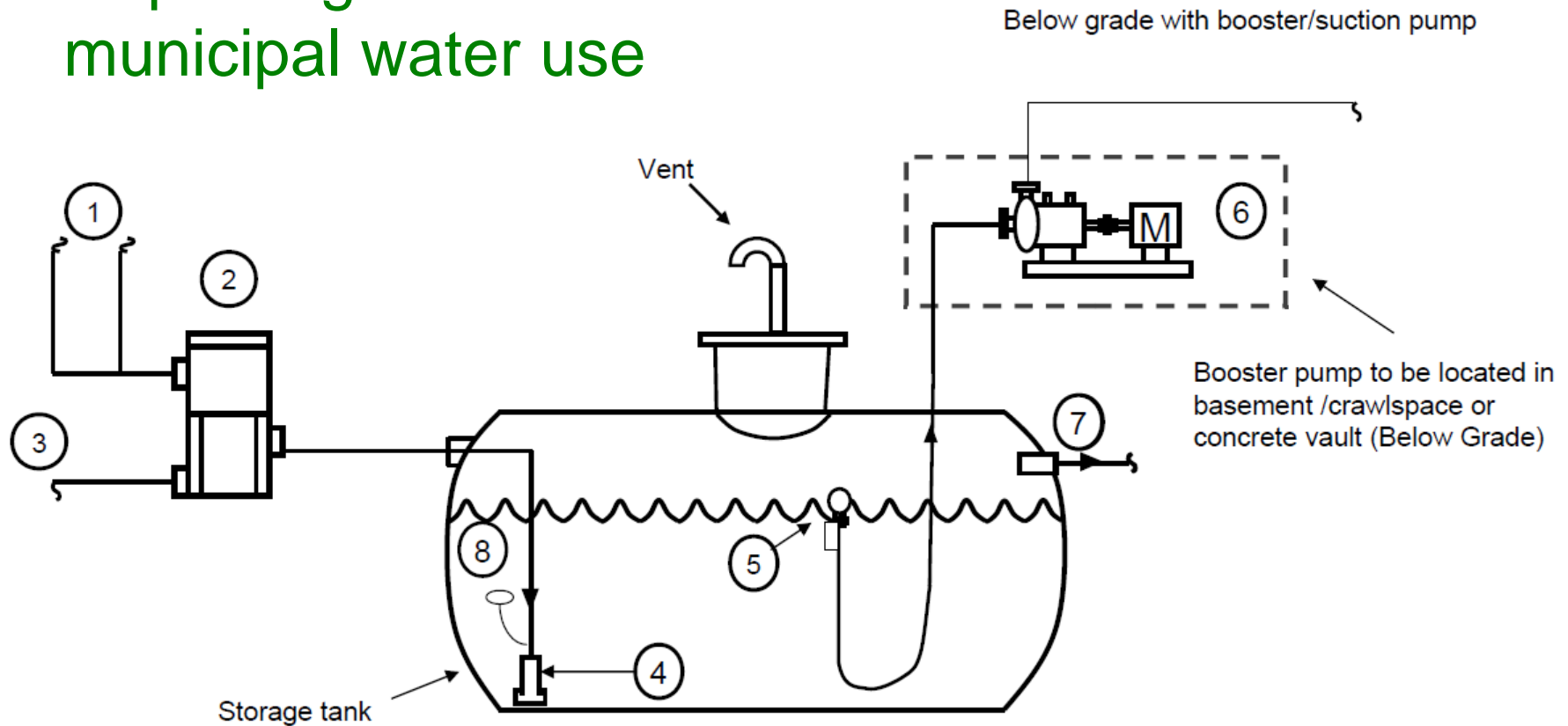
- Lack of public education and understanding
- Regulatory barriers
- Emerging industry standards – inconsistencies
- Undervalued cost for municipal water
 - System costs are high and R.O.I. tough to justify
- Emerging technologies and learning
 - System components, standards, reliability

Objectives for Any System

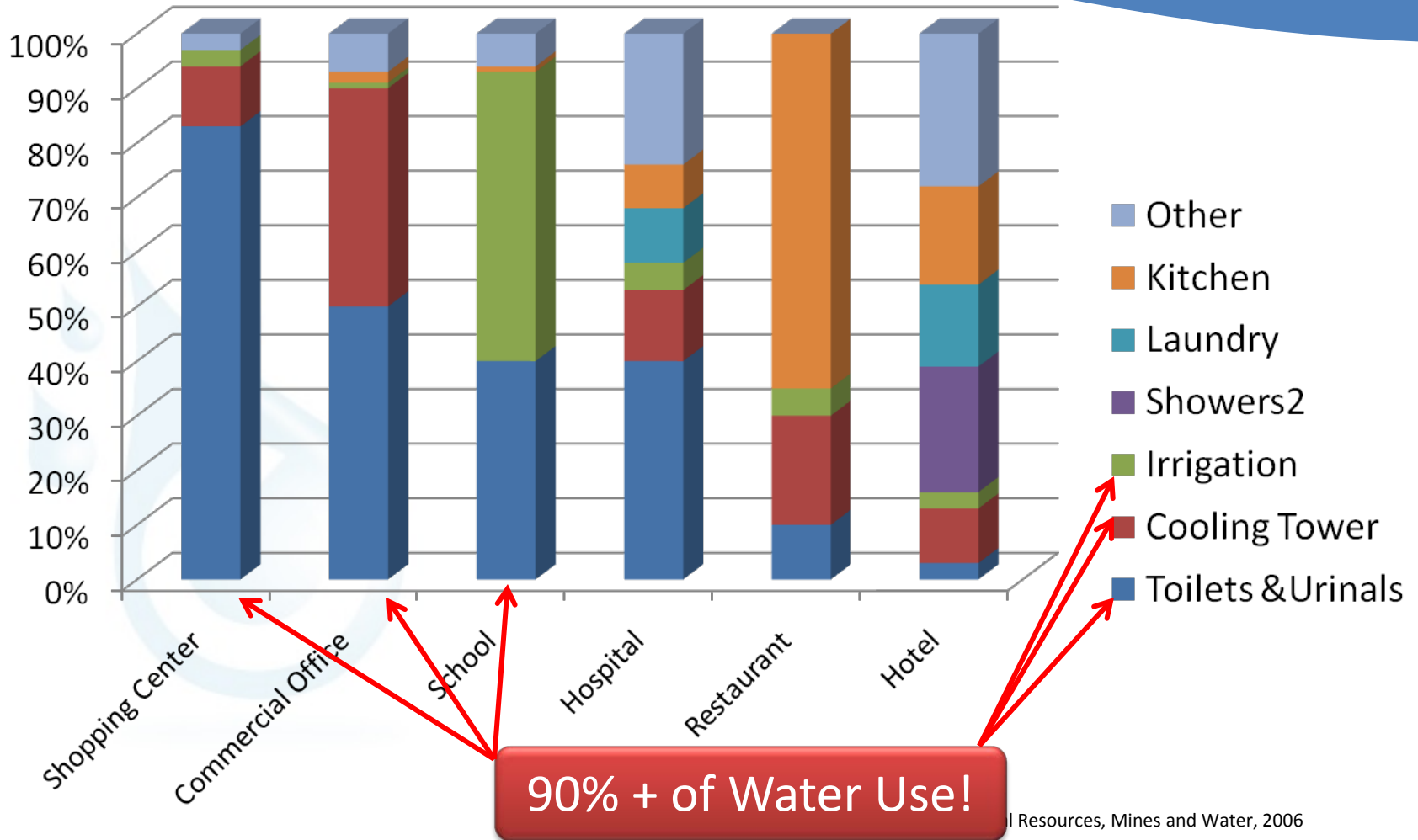
- Make a significant and meaningful impact on reducing the amount of municipal water use
- Match a system to meet the unique characteristics of the building
 - Location, use, opportunities, local codes
- Ensure that the water is safe for storage & application
- Keep the system as simple as possible
 - Complexity adds up-front cost, maintenance, risk
- Keep the system cost-per-gallon saved as low as possible

Typical Simple System Design: Rooftop Rainwater for Irrigation

Replacing 10-30% of
municipal water use



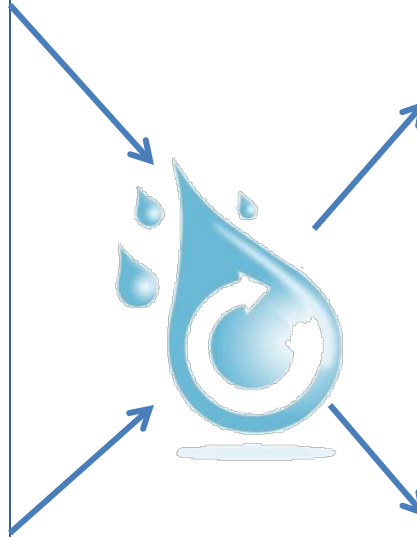
Most Water Use in Commercial Buildings can be Replaced with Harvested On-Site Water Sources



Use A Multi-Source, Multi-Use Approach to Optimize a System

Potential Sources

- Rooftop rainwater
- Surface stormwater
- Greywater from showers, sinks, washers
- Cooling condensate
- Steam condensate
- Groundwater ejectors
- Cooling tower “blow down”
- Process wastewater



Potential Uses

- Landscape irrigation
- Toilet flushing
- Cooling tower “make-up”
- Green roof irrigation
- Boiler “make-up”
- Truck washing
- Washing machines

The Harvesting Opportunity in Commercial Properties

Evaporative Cooling Tower
1,500,000 gallons annually

Toilet flushing
500,000 gallons annually

Landscape irrigation
750,000 gallons annually

Rooftop rainwater
500,000 gallons annually

Cooling coil condensation
200,000 gallons annually

Parking lot rainwater
2,000,000 gallons annually

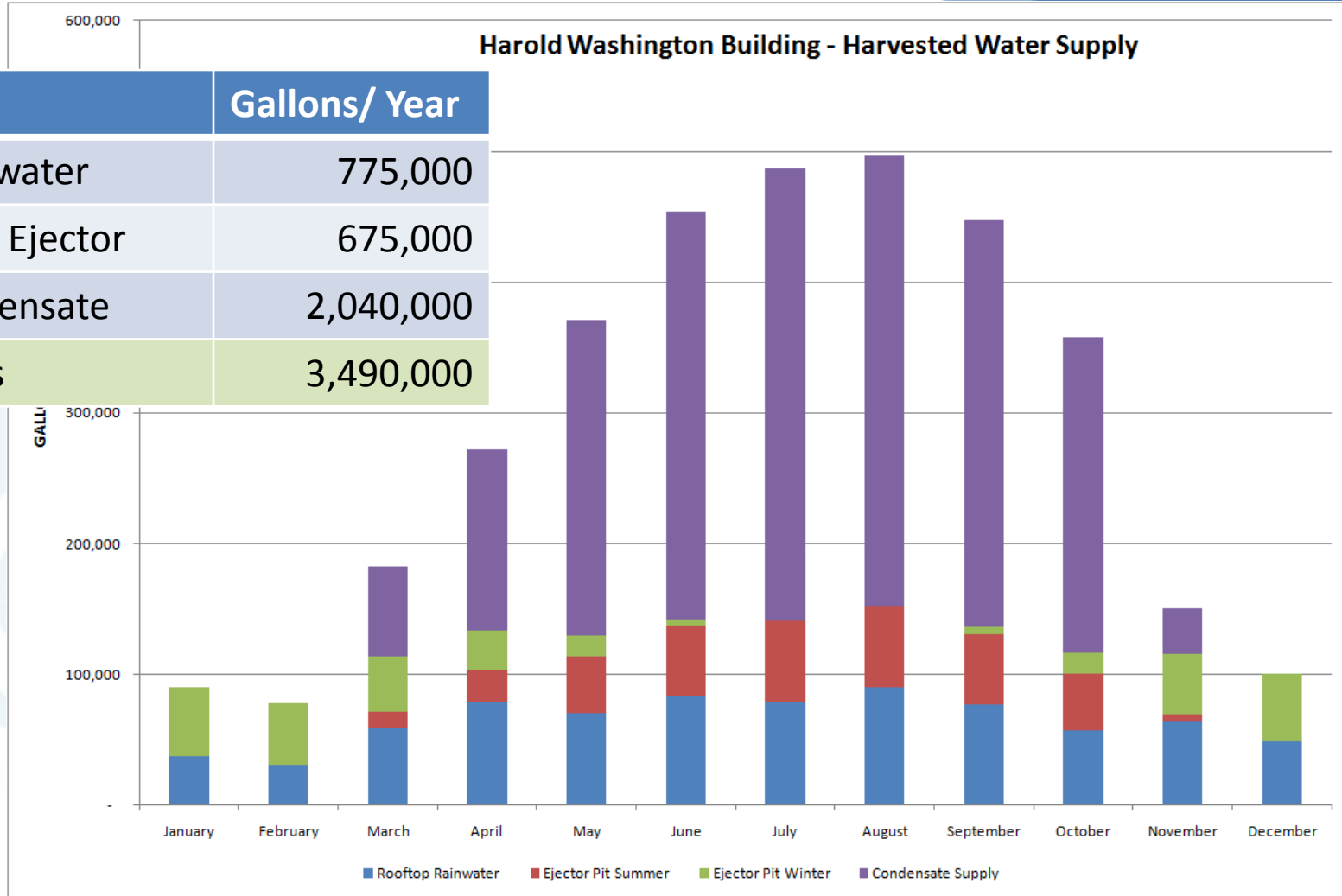


Case Study: Harold Washington Social Security Building - Chicago

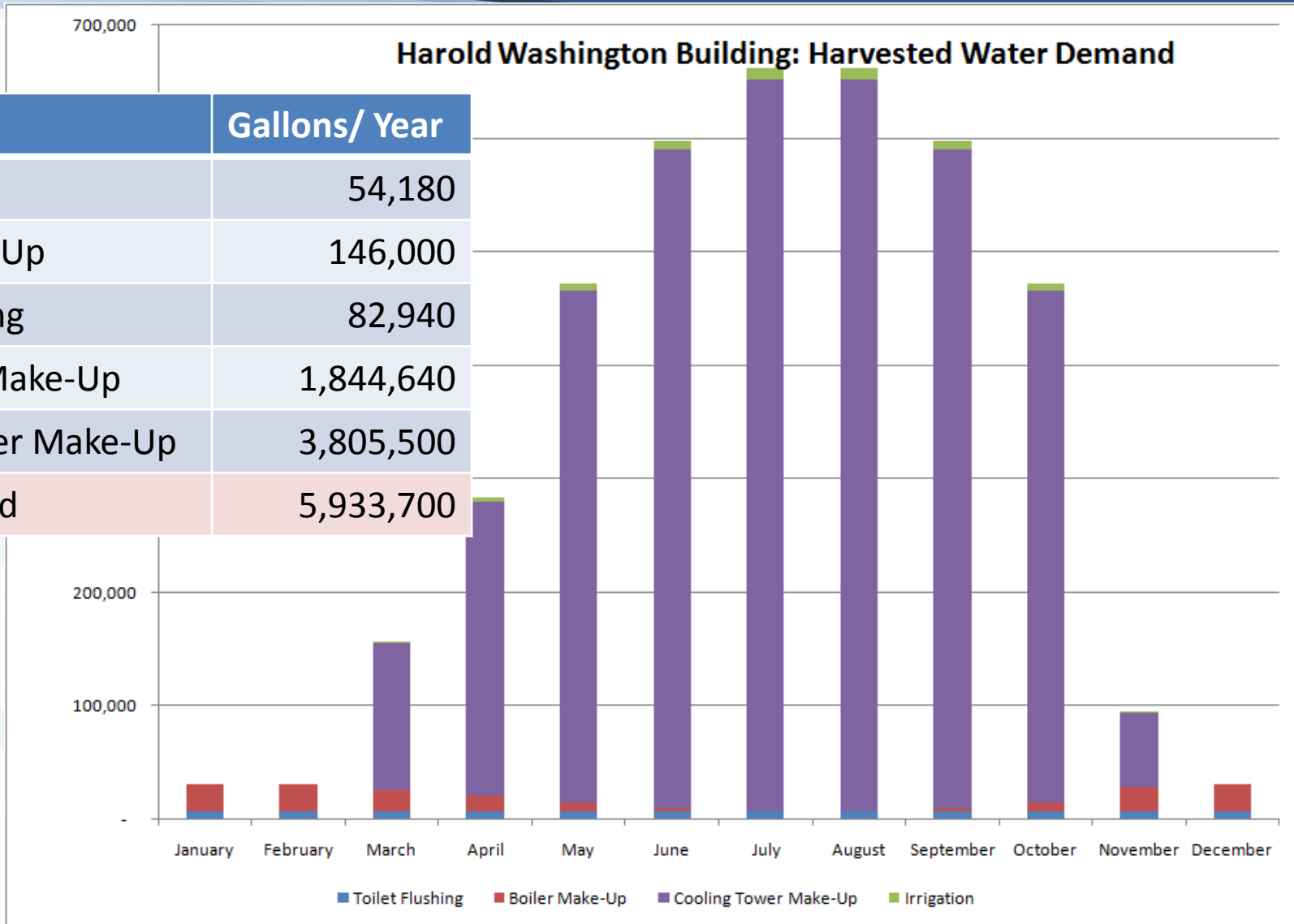


Multiple Supplies Identified - Condensate was the Driver

Supplies	Gallons/ Year
Rooftop Rainwater	775,000
Groundwater Ejector	675,000
Cooling Condensate	2,040,000
Total Supplies	3,490,000



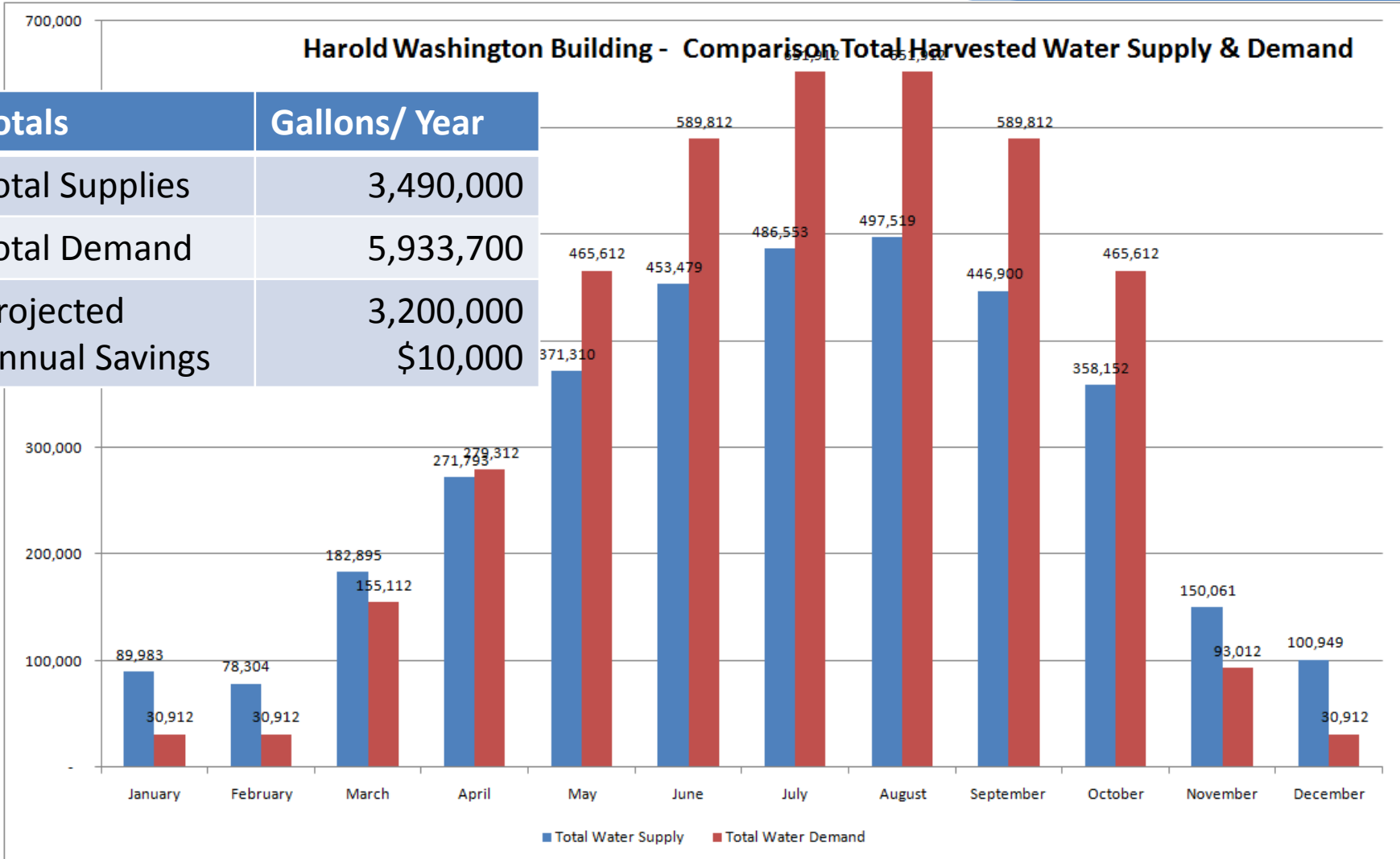
Cooling Towers Drove Demand



A Good Match of Supply & Demand

Harold Washington Building - Comparison Total Harvested Water Supply & Demand

Totals	Gallons/ Year
Total Supplies	3,490,000
Total Demand	5,933,700
Projected Annual Savings	\$10,000



Consider Seasonality of Sources & Uses in Balancing a System

	Warm Weather	Cool Weather	Non-Seasonal
Sources	Rainwater +	Rainwater -	Greywater
	Stormwater +	Stormwater-	Groundwater
	Cooling Condensate	Steam Condensate	
Uses	Irrigation	Boiler Make-Up	Toilet Flushing
	Cooling Tower M/U	Humidifier Make-Up	Laundry
			Vehicle Wash

The Greywater Conundrum

2011



2013

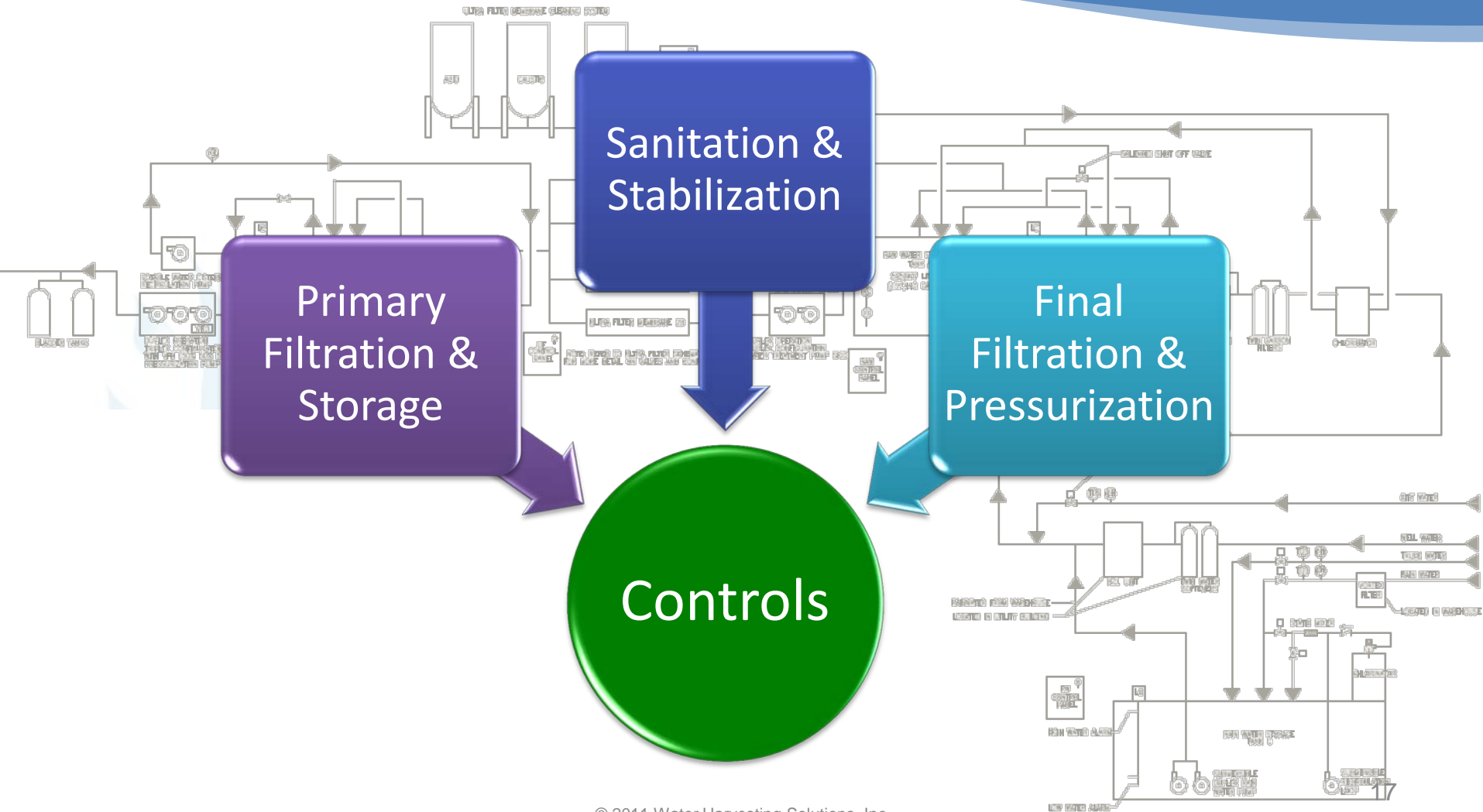


2050?

Typical Water Savings Using Harvested Water to Flush Toilets

- *Annually: 500,000 gallons*
- *Building Life Savings: 20 million gallons! (40 Years)*

System Design Must Support Supply & Demand Requirements

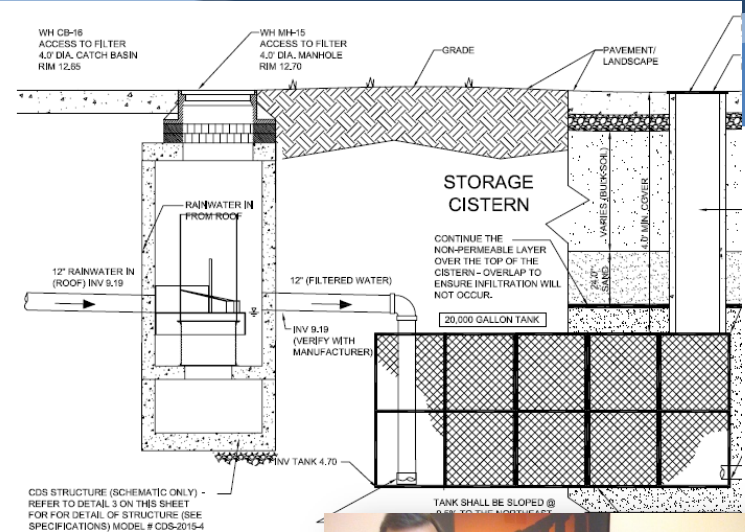


Primary Filtration & Storage

- Considerations
 - Initial filtration depends on sources
 - Mechanical & biological options



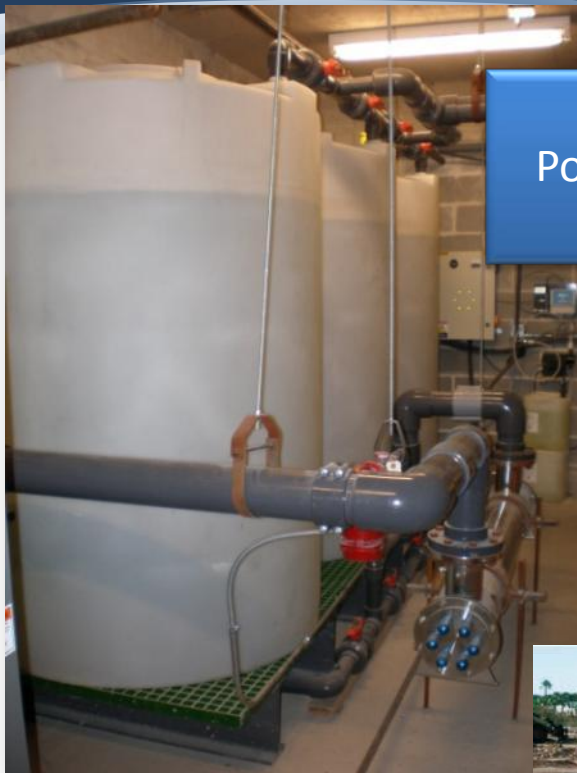
Natural Filtration Through Vegetated Swale



Mechanical Separators



Storage Method is a Key Variable



Internal
Polyethylene
Tanks



Concrete Vaults



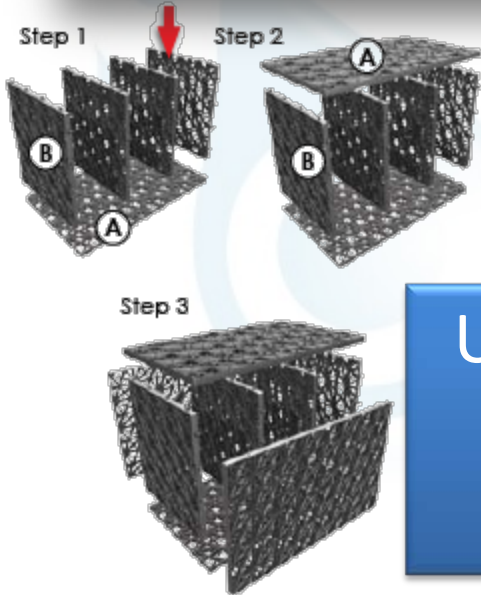
Underground
Fiberglass Tanks

Steel Tanks for Above Ground Storage - 700-600,000 Gallons



Diameters from 6' to 72'

Modular Polypropylene Tank Structure for Below-Grade Storage



Unlimited Cistern
Size and
Configuration

Water Sanitation and Stabilization

- Considerations
 - Water source quality
 - Application
 - Methodology: UV, Chlorine, Chlorine Dioxide, Ozone



Ultra-Violet Sterilization



Chlorine Dosing Systems

Final Filtration – "Polishing"

- Filtration Considerations

- Source and application of water
- Cost vs. maintenance trade-off
- Final filtration options: bag, sand, ultra, carbon, R/O

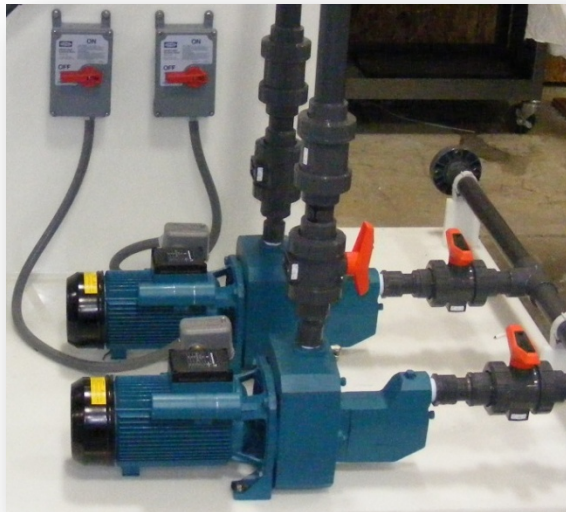
High Capacity Bag
Filtration



Pressurization

- Pressurization Considerations
 - Water use requirements – pressure & flow rates
 - Reliability importance – critical or non-critical use
 - Options: single – triplex; submersible; solar powered

Lower Volume Systems

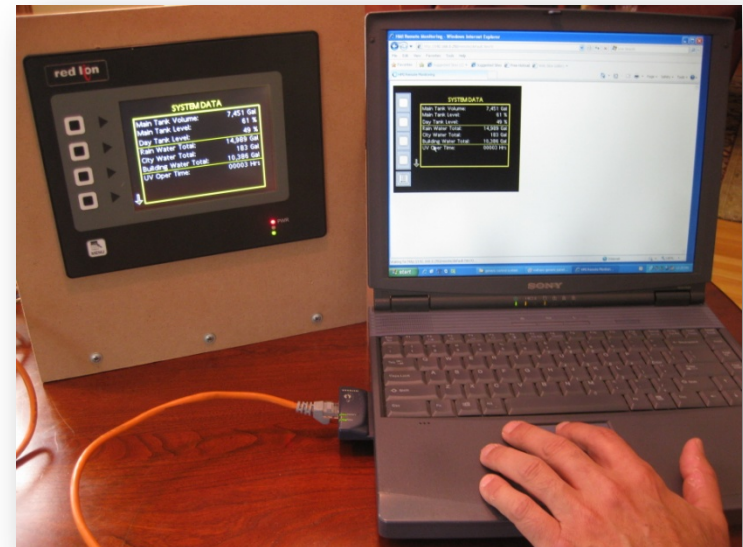
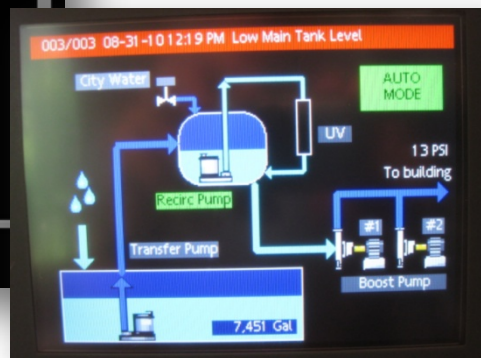


High Capacity Industrial-Grade Skid

Control System Manages & Monitors all System Activity

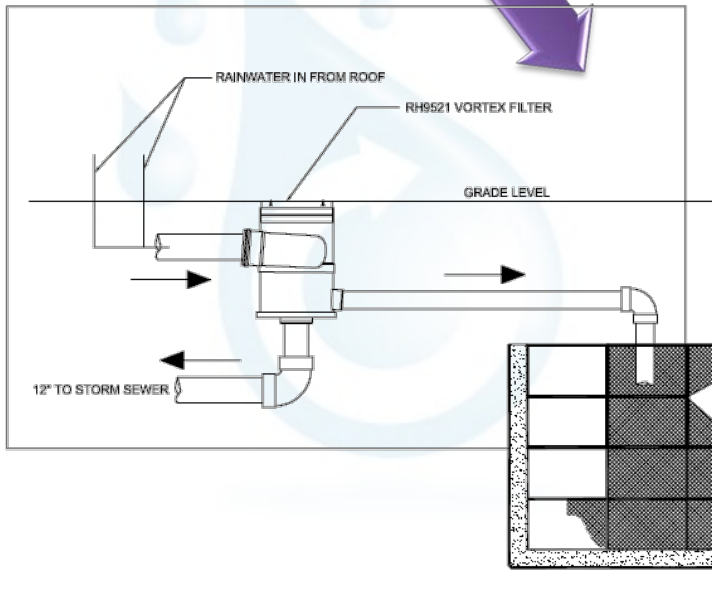
Considerations

- System complexity
- Connectivity to Building Automation System
- Data logging and reporting capabilities

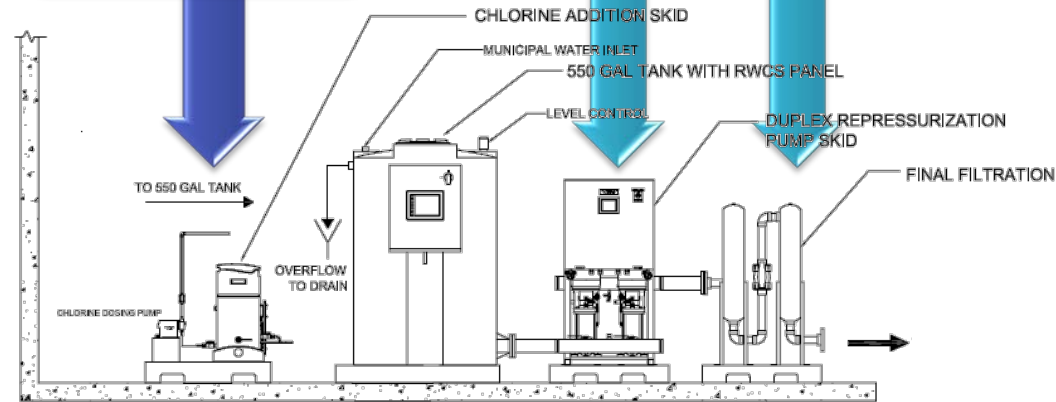


Typical System Design

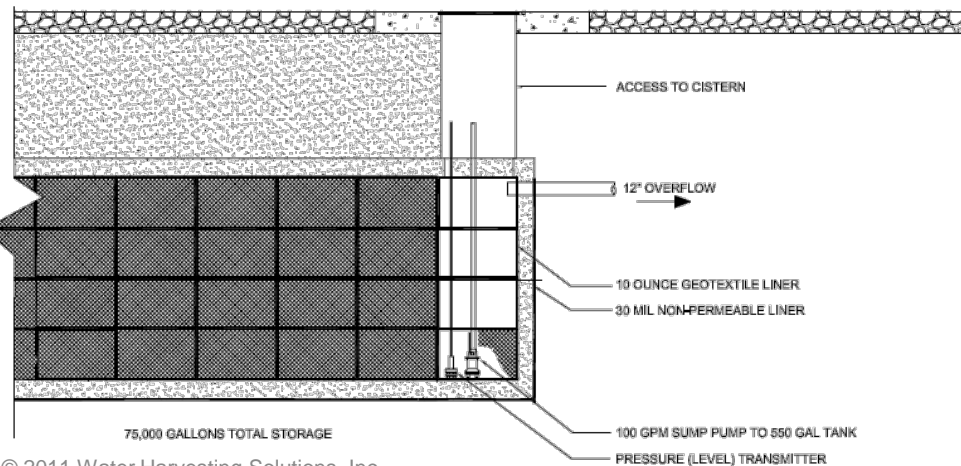
Primary Filtration & Storage



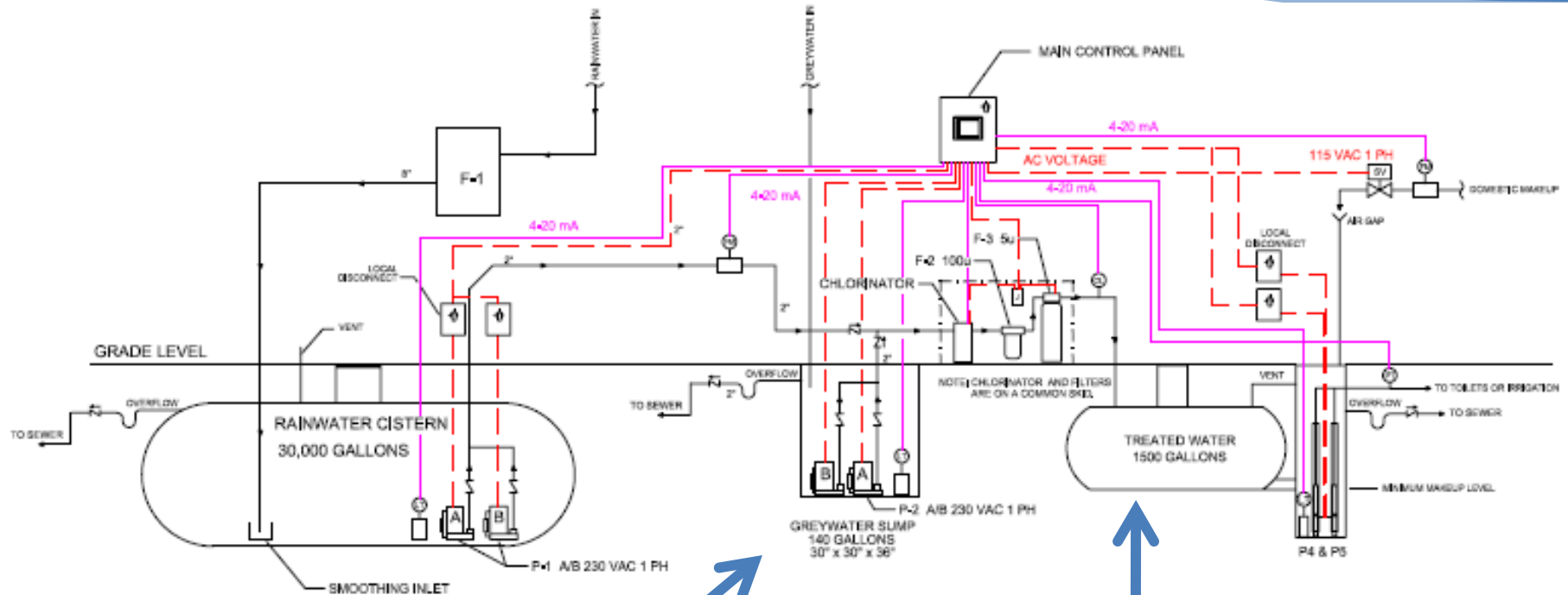
Sanitation & Stabilization



Final Filtration & Pressurization



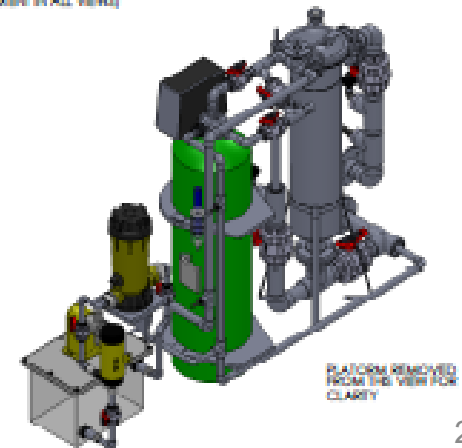
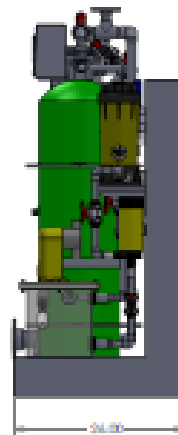
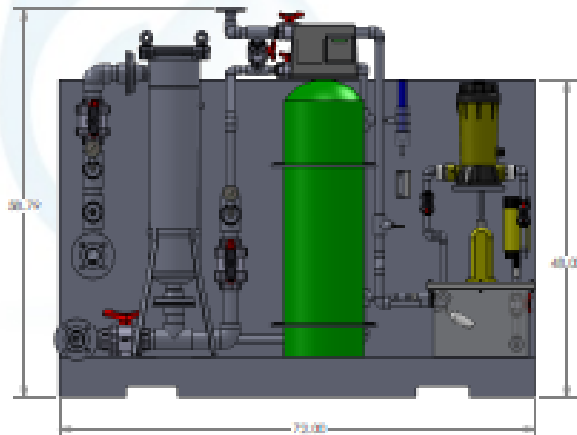
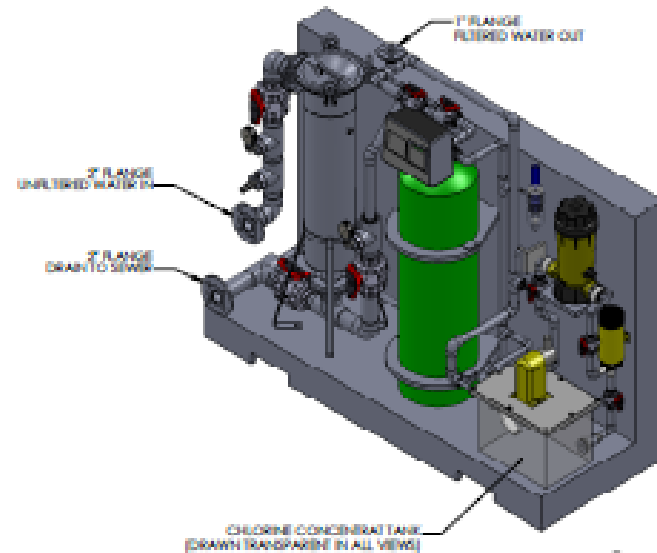
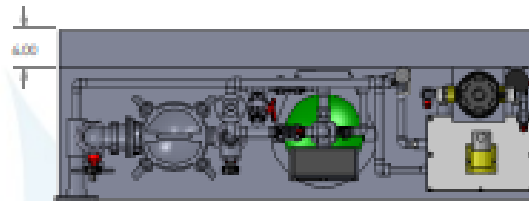
A Single System Can Process Multiple Sources for Multiple Uses



Untreated Water is Segregated By Quality

Treated Water is a Standard Quality & Stored in One Staging Tank Ready For Pressurization & Application

Filtration & Sanitation Designed to Handle Poorest Quality Water Source



Typical Skidded Systems Integrating Components



Recap

- Our objective is to maximize water savings with the simplest system possible
- The most efficient systems use multiple on-site sources of water for multiple uses
 - Over 90% of municipal water can be replaced in many building types
- Untreated sources are segregated by quality level
- Efficiencies are achieved with a single processing system
 - Single filtration & sanitation method
 - Single staging tank for treated water
 - One pressurization skid
 - One control system
- Output is safe standard of non-potable water for reuse



QUESTIONS?

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