Implementing and Scaling Up Onsite Non-potable Water Systems

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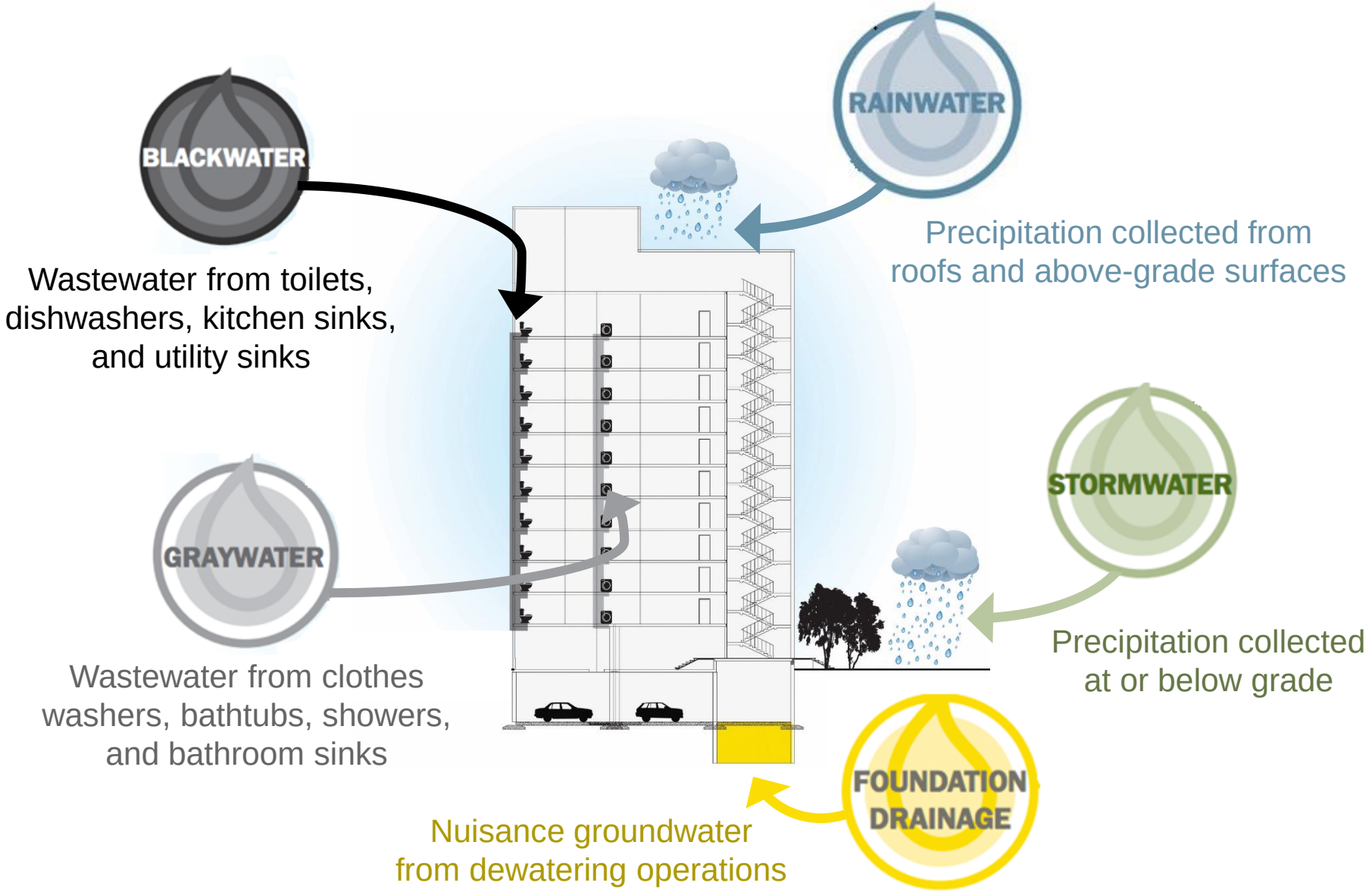
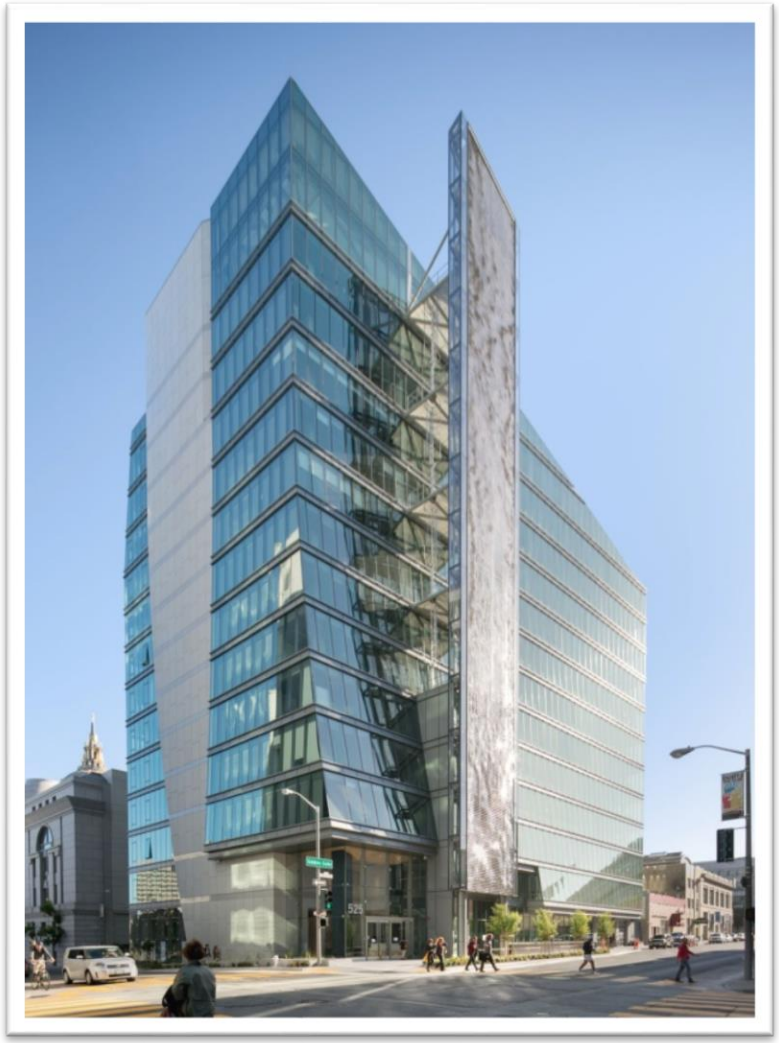
San Francisco Public Utilities Commission
SIWW, April 17, 2022

National Blue Ribbon Commission for Onsite Non-potable Water Systems

Adapt and Reimagine Our Water System with Onsite Water Systems



Pioneer Onsite Water Reuse at SFPUC Headquarters



Require New Large Developments to Treat Own Water Onsite

Mission Rock

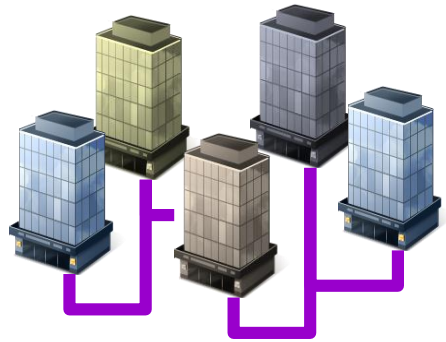
Fifteen Fifty Mission

Chase Center

Regulatory Questions Related to Onsite Water Systems

- Who should set water quality standards?
- Who should issue permits and provide operational oversight?
- What type of on-going monitoring and reporting should be implemented?

Single Building



District-Scale

Graywater Use to Flush Toilets
Varying Standards among US States

	BOD_5 (mg L^{-1})	TSS (mg L^{-1})	Turbidity (NTU)	Total Coliform (cfu/ 100ml)	*E. Coli* (cfu/ 100ml)	Disinfection
California	10	10	2	2.2	2.2	0.5 – 2.5 mg/L residual chlorine
New Mexico	30	30	-	-	200	-
Oregon	10	10	-	-	2.2	-
Georgia	-	-	10	500	100	-
Texas	-	-	-	-	20	-
Massachusetts	10	5	2	-	14	-
Wisconsin	200	5	-	-	-	0.1 – 4 mg L^{-1} residual chlorine
Colorado	10	10	2	-	2.2	0.5 – 2.5 mg/L residual chlorine
Typical Graywater	80 - 380	54 -280	28-1340	$10^{7.2} - 10^{8.8}$	$10^{5.4} - 10^{7.2}$	N/A

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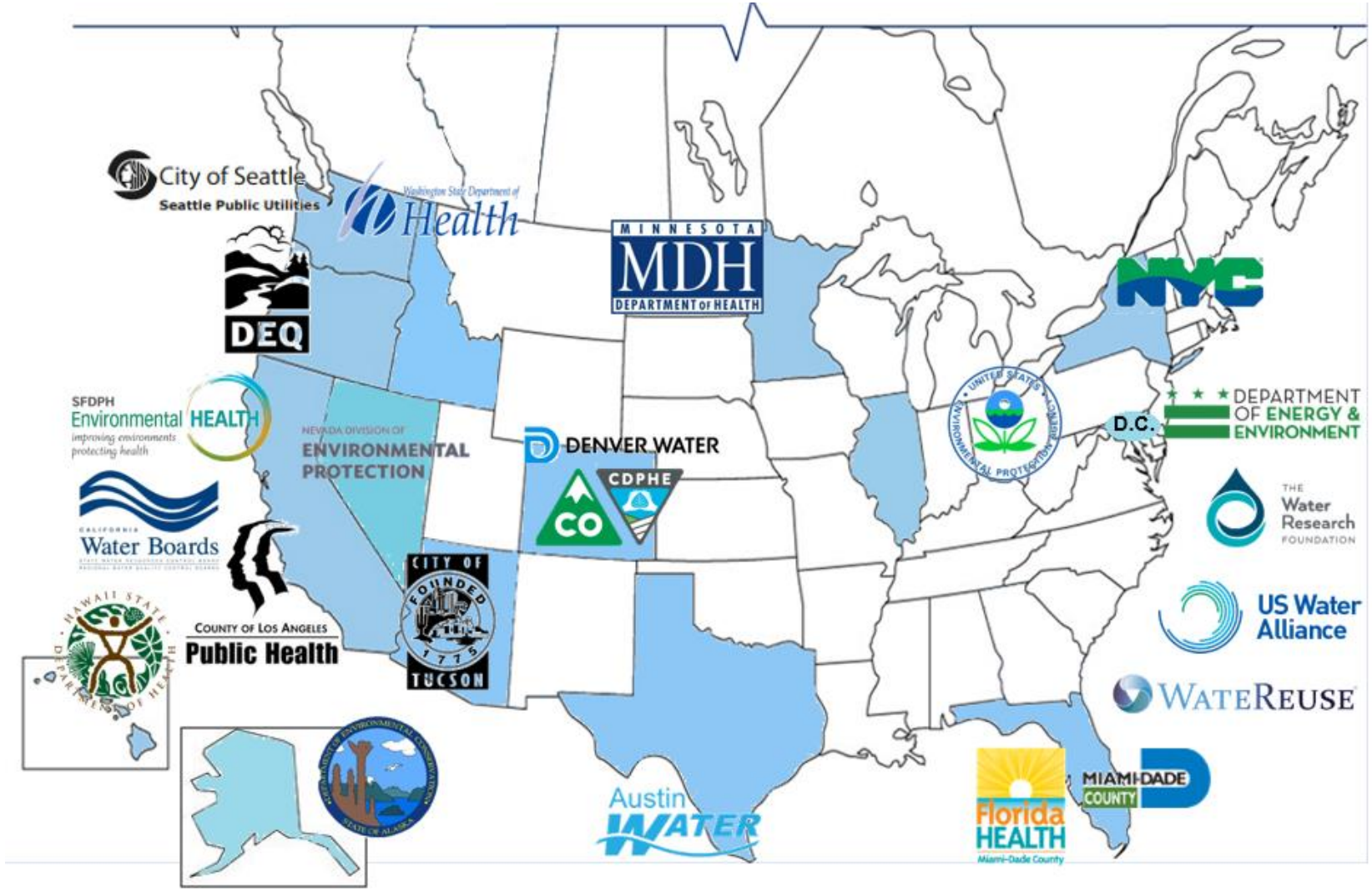

Unique Partnership:

- Public Health Regulators
- Water and Wastewater Utilities

Source: San Francisco Public Utilities Commission

NBRC Goals

- Create Consistent Water Quality Standards From State to State
- Promote Risk-Based Water Quality Standards
- Encourage Local Oversight and Management Programs
- Forum for Peer to Peer Learning

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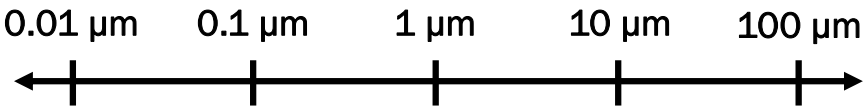
Risk-Based Water Quality Standards

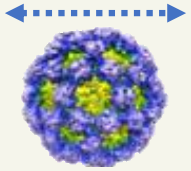
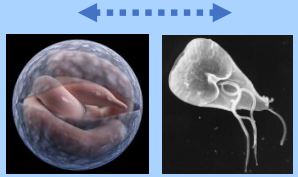
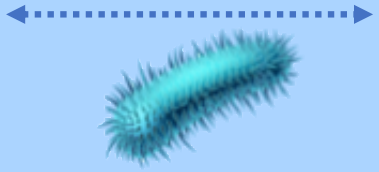
Risk-Based Treatment Requirements

Pathogen Log Reduction Targets (LRTs)

Continuous Online Monitoring

Pathogens Most Relevant with Onsite Water Treatment Systems



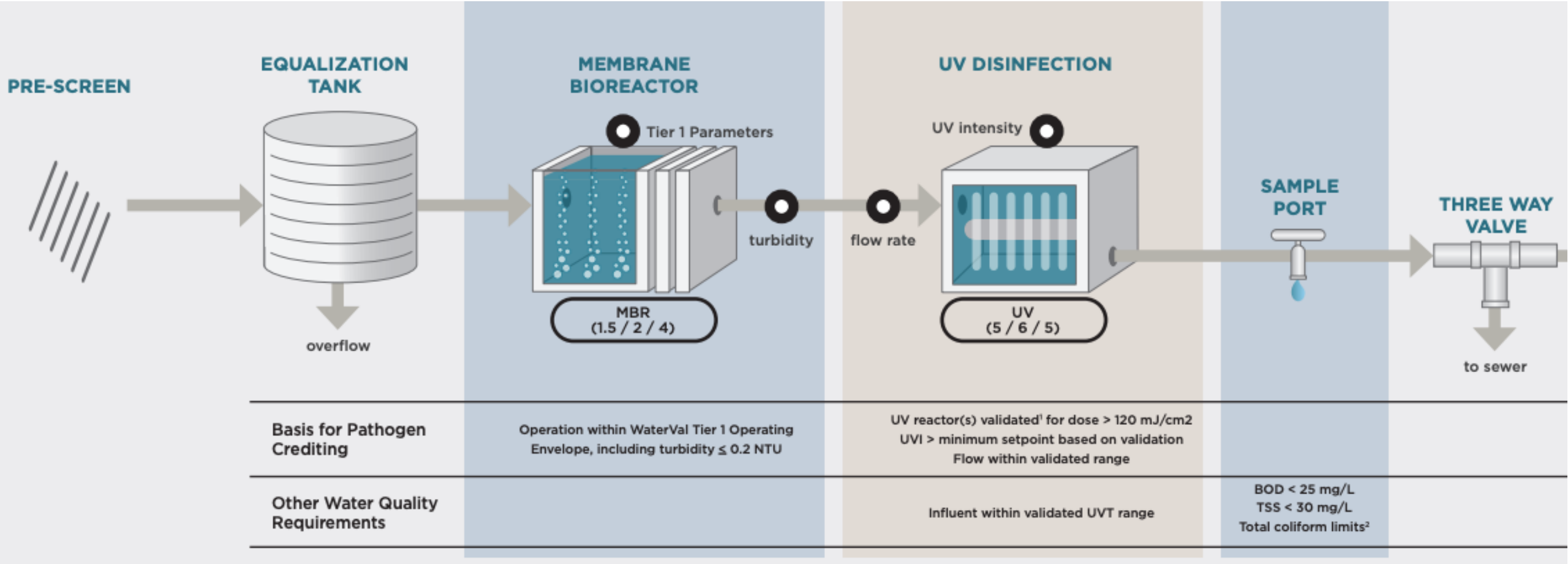
	Examples	Physical Removal?	Disinfection?
Enteric Virus 	Enterovirus Norovirus Hepatitis A	Small size makes physical removal challenging	Susceptible to chlorine, ozone, and UV disinfection
Parasitic Protozoa 	Crypto Giardia	Larger size allows for greater removal via physical processes	Less susceptible to chlorine; UV is effective
Enteric Bacteria 	E. Coli Salmonella Campylobacter	Intermediate size allows for moderate to high removal via filtration	Susceptible to chlorine, chloramine ozone, and UV

Differences important because it makes them more/less susceptible to various treatment options

Log Reduction Targets Table

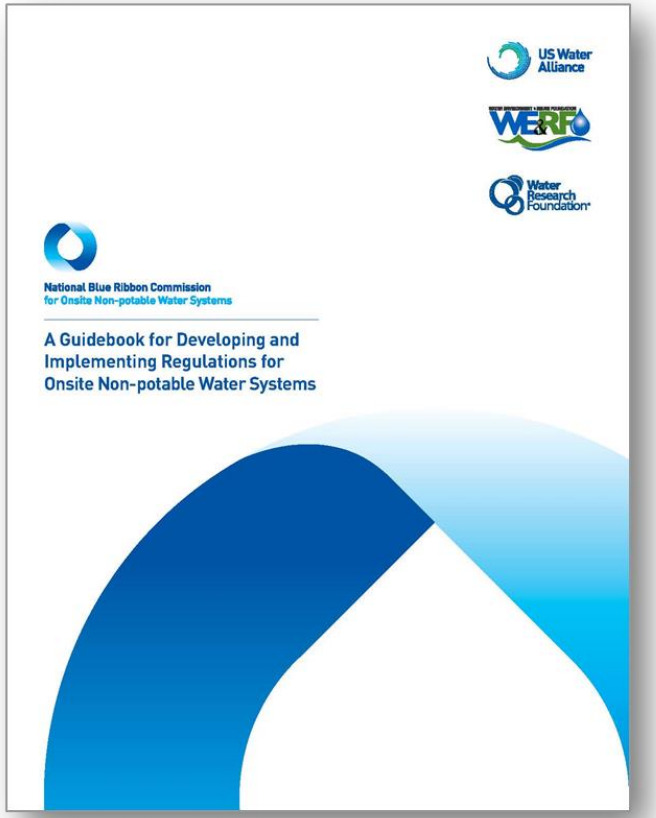
Log Reduction Targets			
Alternate Water Use Scenario	**Enteric Viruses**	**Parasitic Protozoa**	**Enteric Bacteria**
Blackwater			
Outdoor use	8.0	7.0	6.0
Indoor use	8.5	7.0	6.0
Graywater			
Outdoor use	5.5	4.5	3.5
Indoor use	6.0	4.5	3.5
Rainwater			
Outdoor use	N/A	N/A	3.5
Indoor use	N/A	N/A	3.5
Stormwater or Foundation Drainage			
Outdoor use	3.0	2.5	2.0
Indoor use	3.5	3.5	3.0

Example Treatment Train: Graywater

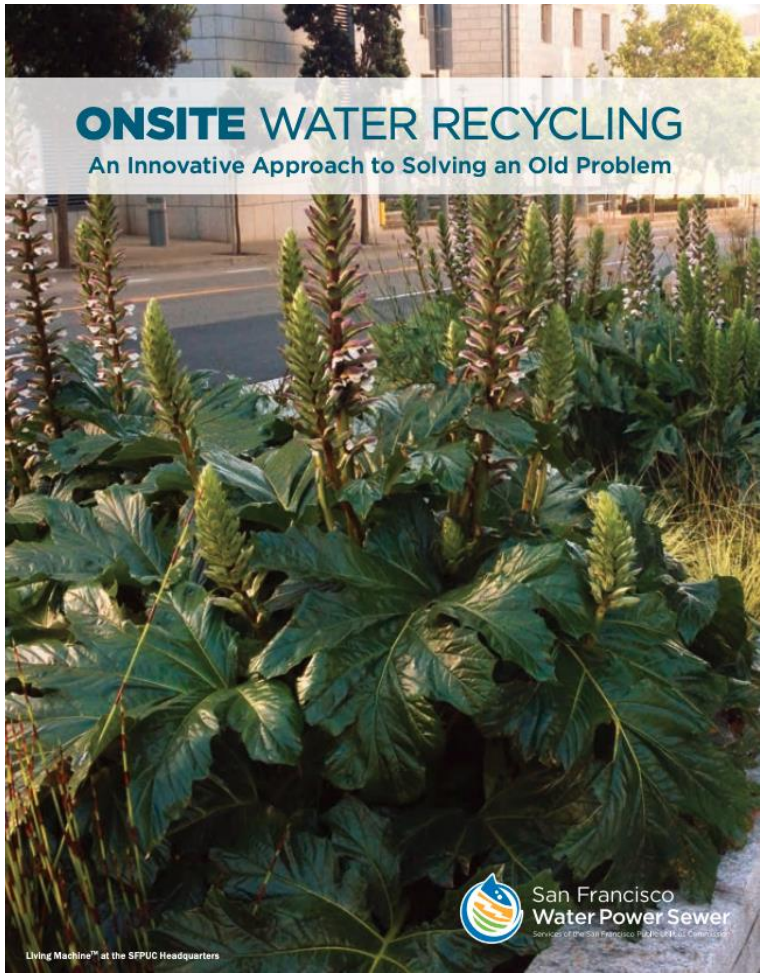


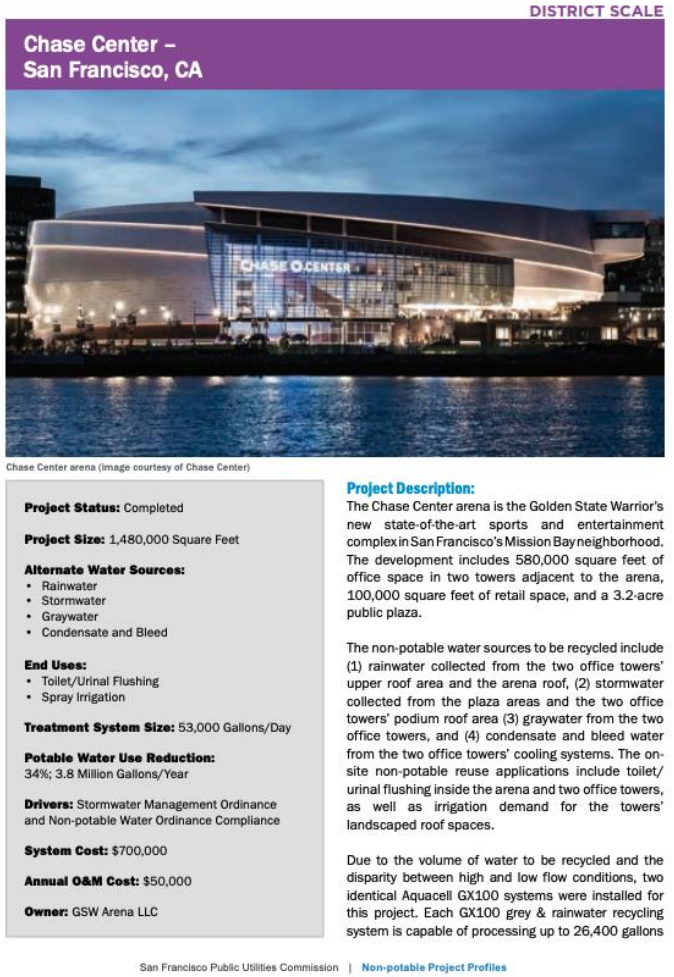
LRT Credits by Technology and Continuous Online Monitoring

Additional Tools for Developing Regulations and Oversight Programs



New E-Book on Onsite Water Recycling





DISTRICT SCALE

Chase Center – San Francisco, CA

Chase Center arena (image courtesy of Chase Center)

Project Status: Completed

Project Size: 1,480,000 Square Feet

Alternate Water Sources:
- Rainwater
- Stormwater
- Graywater
- Condensate and Bleed

End Uses:
- Toilet/Urinal Flushing
- Spray Irrigation

Treatment System Size: 53,000 Gallons/Day

Potable Water Use Reduction: 34%; 3.8 Million Gallons/Year

Drivers: Stormwater Management Ordinance and Non-potable Water Ordinance Compliance

System Cost: $700,000

Annual O&M Cost: $50,000

Owner: GSW Arena LLC

Project Description:
The Chase Center arena is the Golden State Warrior's new state-of-the-art sports and entertainment complex in San Francisco's Mission Bay neighborhood. The development includes 580,000 square feet of office space in two towers adjacent to the arena, 100,000 square feet of retail space, and a 3.2-acre public plaza.

The non-potable water sources to be recycled include (1) rainwater collected from the two office towers' upper roof area and the arena roof, (2) stormwater collected from the plaza areas and the two office towers' podium roof area (3) graywater from the two office towers, and (4) condensate and bleed water from the two office towers' cooling systems. The on-site non-potable reuse applications include toilet/urinal flushing inside the arena and two office towers, as well as irrigation demand for the towers' landscaped roof spaces.

Due to the volume of water to be recycled and the disparity between high and low flow conditions, two identical Aquacell GX100 systems were installed for this project. Each GX100 grey & rainwater recycling system is capable of processing up to 26,400 gallons

San Francisco Public Utilities Commission | Non-potable Project Profiles

https://www.sfpuc.org/sites/default/files/documents/Onsite_Water_Recycling_Ebook_2022.pdf

Collaboration Leads to New Opportunities

- Consensus among public health regulators and utilities for health risk-based approach for water quality
- Several US States have adopted health risk based approach
- National Blue Ribbon Commission research part of US EPA Water Reuse Action Plan
- Collaboration and sharing lessons learned leads to new opportunities

Photo: Phillip Morris Water Hub, Richmond, VA; Source: Sustainable Water

Thank You

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