ONSITE WATER REUSE WORKSHOP

July 23rd, 2019

Austin Water Staff

OUTLINE

1. WATER FORWARD PLAN IMPLEMENTATION
2. NATIONAL BLUE RIBBON COMMISSION FRAMEWORK FOR IMPLEMENTING ONSITE NON-POTABLE WATER SYSTEMS
3. APPLYING THE NATIONAL BLUE RIBBON COMMISSION FRAMEWORK IN AUSTIN
4. ONSITE WATER REUSE ORDINANCE DEVELOPMENT APPROACH
5. BREAKOUT SESSIONS OVERVIEW

Water Forward

Austin's Integrated Water Resource Plan

- Austin Water-led interdepartmental effort to develop a 100 year water plan that:
  - Reflects our community's values
  - Ensures a diversified, sustainable, and resilient water future
  - Places strong emphasis on conservation
- Council-appointed Task Force met monthly
- Plan approved by Council in November 2018, with planned updates on a five year cycle

Water Forward Plan Strategies

Demand Management

- Implement Advanced Metering Infrastructure (AMI)
- Enhance distribution system water loss control
- Provide customer water use benchmarking information and implement water budgets
- Transform to regionally appropriate landscapes
- Expand irrigation efficiency incentives

Water Supply

- Store water for drought via Aquifer Storage and Recovery and a new Off Channel Reservoir
- Bring on additional supplies via Brackish Groundwater Desalination
- Expand the Centralized Reclaimed Water System
- Use Indirect Potable Reuse as a deep drought strategy
- Capture local inflows to Lady Bird Lake

Decentralized

Use on-site and neighborhood scale alternative water sources for non-potable end uses

Rainwater, Stormwater, Wastewater, Graywater, and AC Condensate

Direction from Council 5/2/19

"To ensure that the Land Development Codes and permitting process are streamlined to the greatest extent possible upon adoption of any revision to the Land Development Code, the regulatory requirements adopted as part of Water Forward, Austin's 100-year integrated water resource plan, that are related to the Land Development Code and are able to be accelerated and implemented this year should be codified and implemented as part of this comprehensive land development code revision process.

The staff should report back at least on the following areas if they were not able to accelerate and implement this year (especially as concerns commercial buildings larger than 250,000 square feet): water benchmarking, dual plumbing, landscape transformation, and alternative water."

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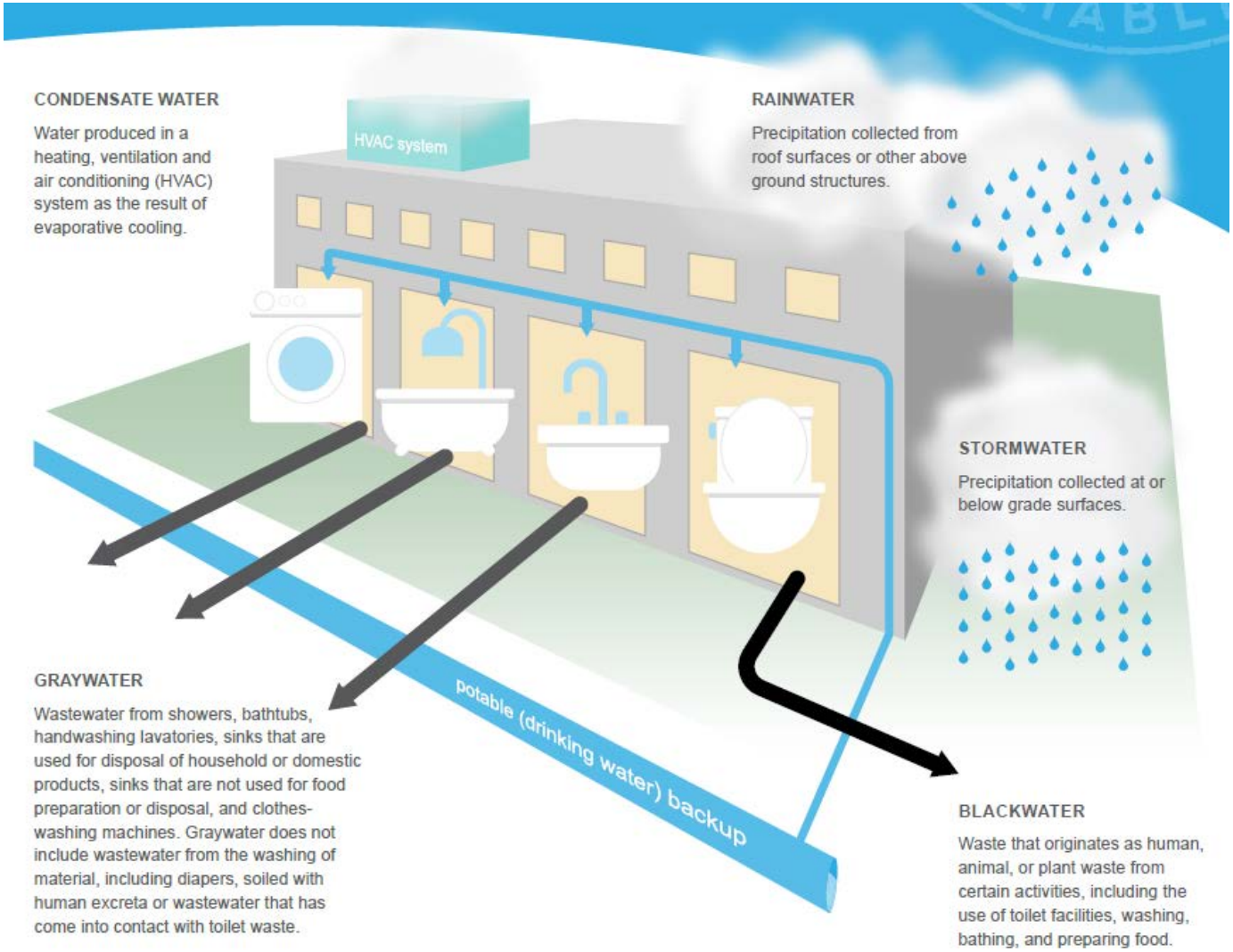
AUSTIN WATER AND THE BLUE RIBBON COMMISSION

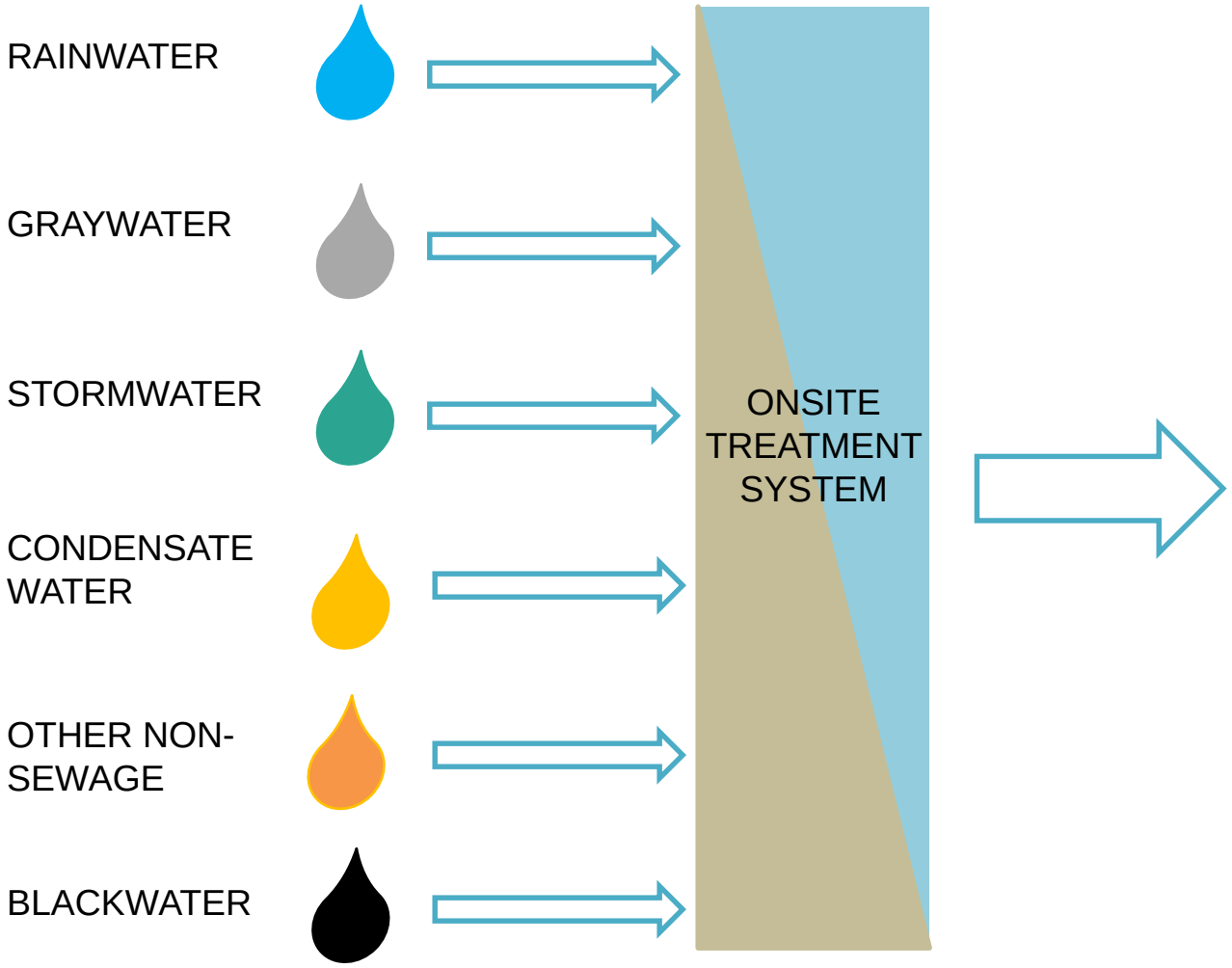
National Blue Ribbon Commission for Onsite Non-potable Water Systems

The National Blue Ribbon Commission advances best management practices to support the use of onsite non-potable water systems within individual buildings or at the local scale. We are committed to protecting public health and the environment, and sustainably managing water—now and for future generations.

DEFINITIONS: ALTERNATIVE WATER SOURCES



DEFINITIONS: ONSITE WATER REUSE SYSTEMS



REUSE WATER THAT IS TREATED FOR ITS INTENDED PURPOSE

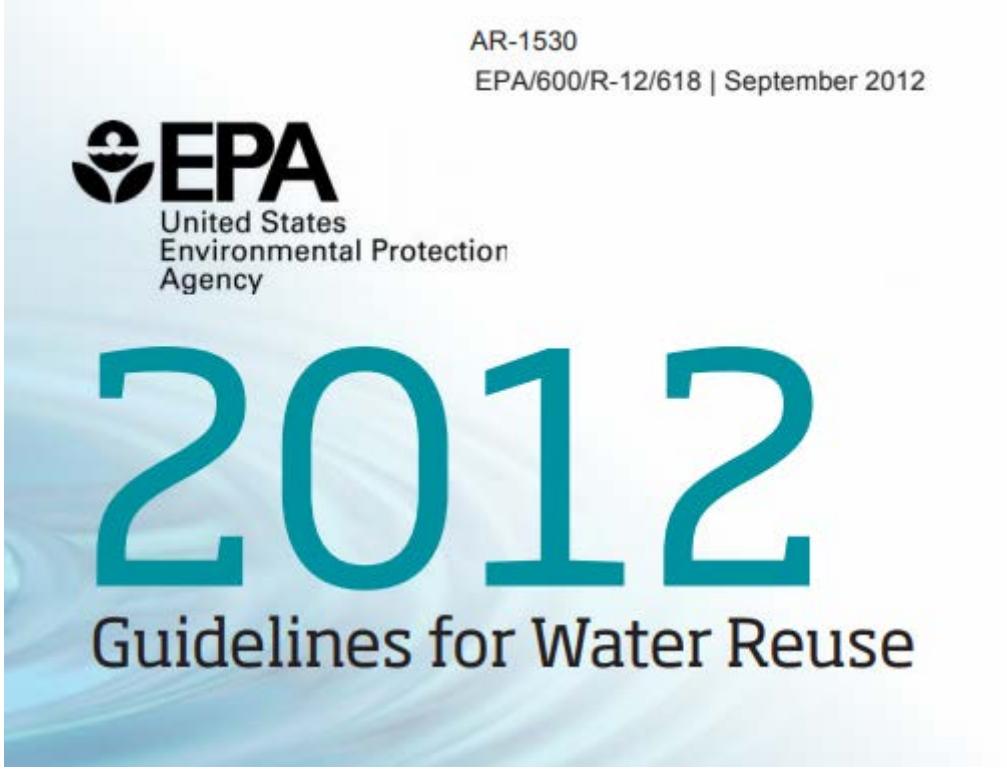
- IRRIGATION
- LANDSCAPE
- TOILET FLUSHING
- CLOTHES WASHING
- COOLING TOWERS
- PROCESS WATER

VARYING STANDARDS ACROSS THE U.S.

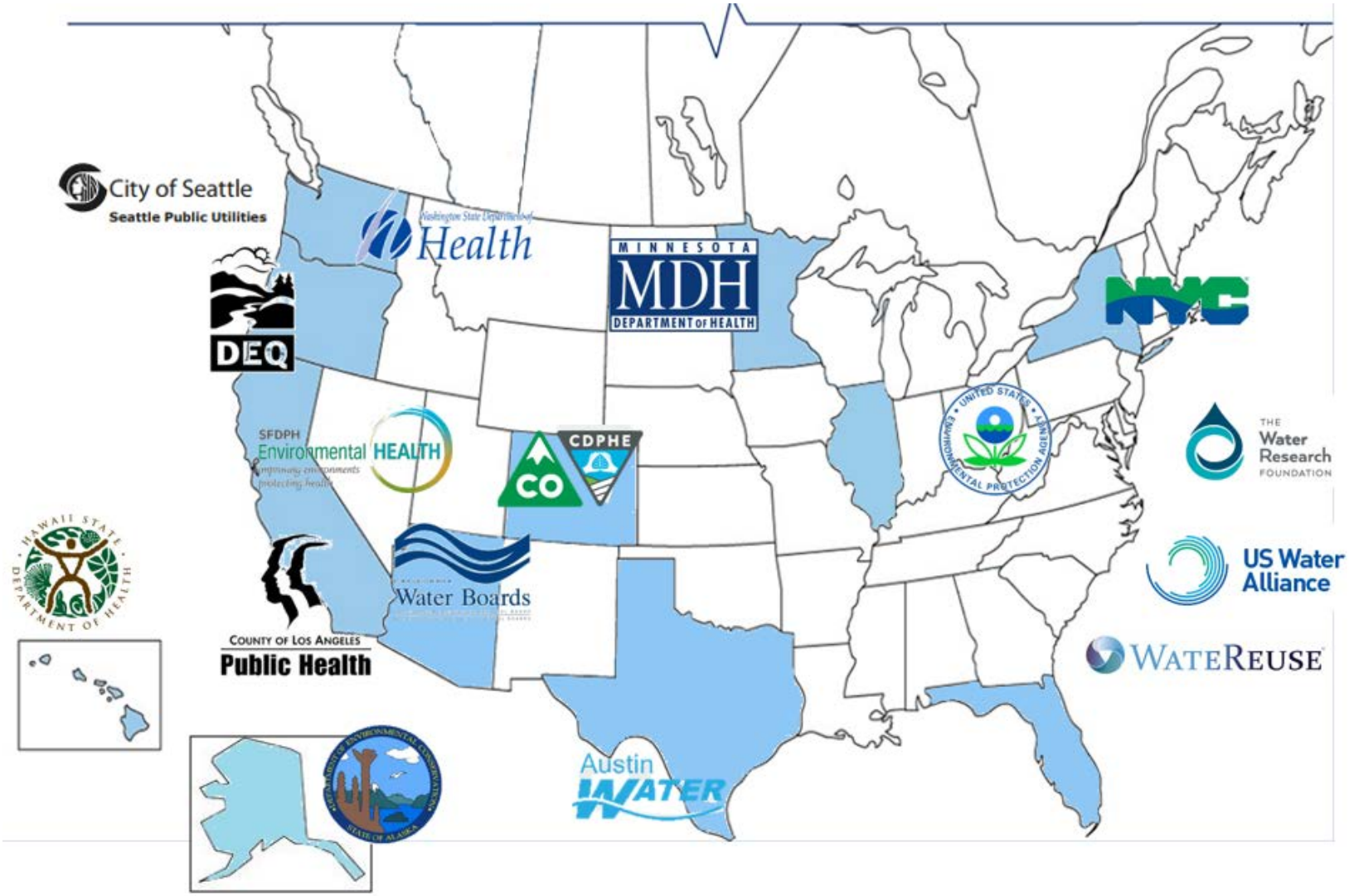
Graywater Use to Flush Toilets						
	BOD_5 ($mg\ L^{-1}$)	TSS ($mg\ L^{-1}$)	Turbidity (NTU)	Total Coliform (cfu/ 100ml)	*E. Coli* (cfu/ 100ml)	Disinfection
California	10	10	2	2.2	2.2	0.5 – 2.5 mg/L residual chlorine
New Mexico	30	30	-	-	200	-
Oregon	10	10	-	-	2.2	-
Georgia	-	-	10	500	100	-
Texas	-	-	-	-	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

LACKING GUIDANCE ON HOW TO MEET STANDARDS

NSF/ANSI 350 and 350-1: Onsite Water Reuse



LEADERS IN ADVANCING INNOVATIVE WATER SOLUTIONS



NBRC FRAMEWORK FOR DEVELOPING A LOCAL PROGRAM

Blueprint for Onsite Systems: A Step-by-Step Guide for Developing a Local Program to Manage Onsite Water Systems (2014)

Developing a local program to manage onsite water systems offers a proactive way to increase water resiliency and promote green building practices while protecting public health. The development of a program should follow a sequence of steps and associated actions, which will inform critical decisions regarding the scope, structure, and implementation of the program.

1 **Convene a Working Group**
Establish a small working group to guide the development of the local program.

2 **Select the Types of Alternate Water Sources**
Narrow the specific types of alternate water sources covered in the program.

3 **Identify End Uses**
Classify specific non-potable end uses for your program.

4 **Establish Water Quality Standards**
Establish water quality standards for each alternate water source and/or end use.

5 **Identify and Supplement Local Building Practices**
Integrate your program into local construction requirements and building permit processes.

6 **Establish Monitoring and Reporting Requirements**
Establish water quality monitoring and reporting requirements for ongoing operations.

7 **Prepare an Operating Permit Process**
Establish the permit process for initial and ongoing operations for onsite water systems.

8 **Implement Guidelines and the Program**
Publicize the program to provide clear direction for project sponsors and developers.

9 **Evaluate the Program**
Promote best practices for onsite water systems.

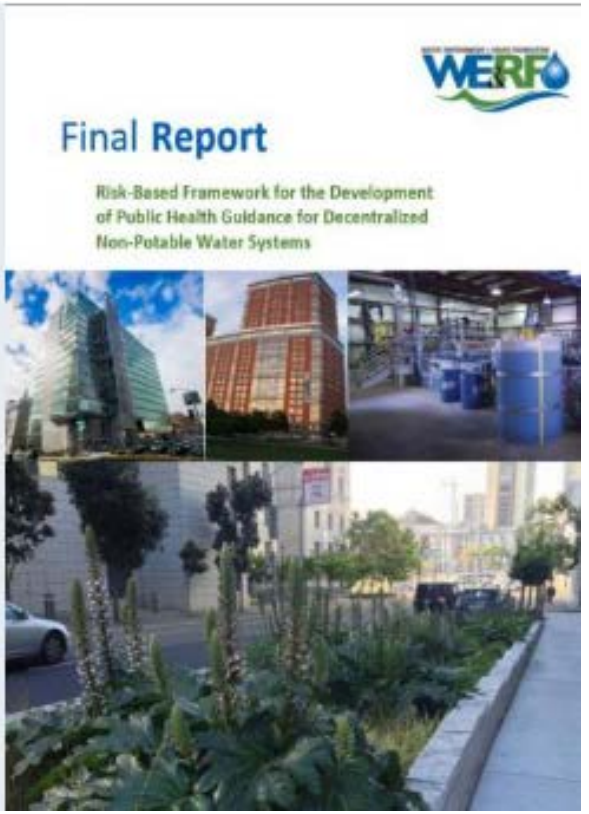
10 **Grow the Program**
Explore opportunities to expand and encourage onsite water systems.

Having a consistent policy framework across cities and states is one of the best ways that we can integrate onsite systems in a way that protects public health and meets our water needs.

ESTABLISHED WATER QUALITY STANDARDS FOR ONSITE NON-POTABLE REUSE SYSTEMS

Risk-Based Framework for the Development of Public Health Guidance for Decentralized Non-Potable Water Systems

March 2017: This panel report provides a risk-based framework to develop public health guidance for decentralized non-potable water systems. More >



GUIDEBOOK, MODEL ORDINANCE, AND RULESET

A Guidebook for Developing and Implementing Regulations for Onsite Non-potable Water Systems (2017) To help develop water quality criteria and standards for ONWS and present pathways for implementation and management of these systems at the local and/or state level.

Model Local Ordinance for Onsite Non-Potable Water Programs (2017) Provides template local ordinance for establishing regulatory programs for ONWS. To be used with the Guidebook.

Model Program Rules for Onsite Non-potable Water Systems (2017) Provides specific details on implementation of an ONWS, including system design criteria, permitting, cross-connection control, reporting, notification, and enforcement. To be used with the Guidebook.

Guidance Manual for Engineers, Operators, Utilities and Regulators (Anticipated 2019) Provides recommendations for how to implement the NBRC's public health recommendations in an Onsite Non-potable Water Systems program.

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THE NBRC FRAMEWORK IS A PARADIGM SHIFT

CURRENT REGULATORY FRAMEWORK & WATER QUALITY STANDARDS FOR ON-SITE NON-POTABLE WATER SYSTEMS

WATER SOURCE	STATE REVIEW	LOCAL REVIEW	END USES	WATER QUALITY LIMITS	MONITORING
RAINWATER STORMWATER CONDENSATE WATER GRAYWATER OTHER NON-SEWAGE	NONE	BUILDING/PLUMBING DESIGN, CROSS-CONNECTION CONTROL	TOILET/URINAL FLUSHING CLOTHES WASHING COOLING MAKEUP IRRIGATION & LANDSCAPE	TOTAL SUSPENDED SOLIDS E. COLI	MONTHLY E. COLI TESTING WITHOUT REPORTING
BLACKWATER	TREATMENT SYSTEM DESIGN & SOLIDS DISPOSAL PLAN	BUILDING/PLUMBING DESIGN, CROSS-CONNECTION CONTROL	TOILET/URINAL FLUSHING CLOTHES WASHING COOLING MAKEUP IRRIGATION & LANDSCAPE	BOD TOTAL SUSPENDED SOLIDS ENTEROCCOCI & E. COLI TURBIDITY PH	TWICE PER WEEK TESTING WITH MONTHLY REPORTING TO TCEQ

NATIONAL BLUE RIBBON COMMISSION RISK-BASED FRAMEWORK FOR ON-SITE NON-POTABLE WATER SYSTEMS

WATER SOURCE	STATE REVIEW	LOCAL REVIEW	END USES	WATER QUALITY LIMITS	MONITORING
RAINWATER STORMWATER CONDENSATE WATER GRAYWATER OTHER NON-SEWAGE **BLACKWATER**	NONE **(EXCEPT TCEQ HAS REGULATORY AUTHORITY OVER BLACKWATER)**	**TREATMENT SYSTEM DESIGN,** BUILDING/PLUMBING DESIGN, CROSS-CONNECTION CONTROL	TOILET/URINAL FLUSHING CLOTHES WASHING COOLING MAKEUP IRRIGATION & LANDSCAPE	**LOG REDUCTION TARGETS:** **VIRUS** **PROTOZOA** **BACTERIA**	**CONTINUOUS MONITORING OF SURROGATE PARAMETERS WITH ANNUAL REPORTING TO CITY OF AUSTIN**

STEPS TO DEVELOP A LOCAL PROGRAM

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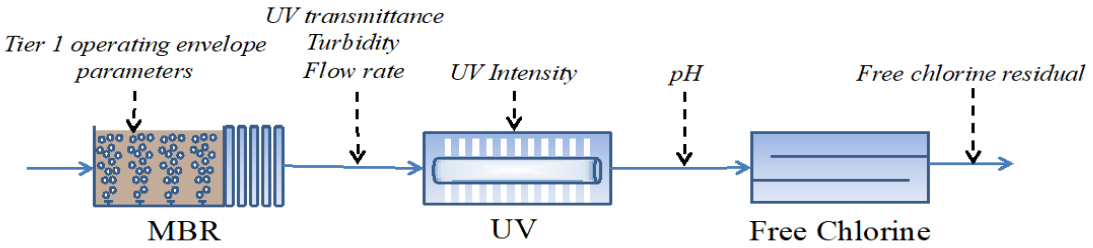
RISKS ASSOCIATED WITH PROGRAM IMPLEMENTATION

Examples of Risk-Based Considerations for Identifying the Management Category of the ONWS

Example	Number of Persons Exposed	Likelihood of Malfunction	Management Category and Considerations	Health Agency Role
Single-owner occupied system using roof runoff for irrigation	Small user base (<~20 pe/d[1])	Low—low pathogen content—simple process	Low Risk—Building owner serves as the Responsible Management Entity (RME) with full responsibility	Provides educational information to building owners and issues permit
Single-owner occupied system using graywater for toilet flushing and irrigation	Small user base (<~20 pe/d[1])	Moderate—equipment maintenance required	Low Risk—Building owner serves as RME with full responsibility	Requires manufacturer certification of equipment, operation and maintenance (O&M) manual and issues permit
Single-owner occupied system using roof runoff and treated wastewater for toilet flushing, laundry, and subsurface irrigation	Small user base (<~20 pe/d[1])	Considerable—complex equipment requires routine O&M by trained staff	Moderate Risk—Independent registered service agent provides O&M	Registers/licenses service agent, defines reporting of data and issues permit
Multi-user building with roof runoff system for irrigation	Moderate user base (20–100 pe/d[1])	Low—low pathogen content—simple process	Low Risk—Building owner or HOA serves as RME with full responsibility	Registers/licenses service agent, defines performance reporting and issues permit
Multi-user system using treated graywater for toilet flushing and irrigation	Large user base (100–1,000 pe/d[1])	Moderate—equipment and distribution system requires trained O&M staff oversight	High Risk—Qualified full service RME with financial security and routine reporting	Establishes RME qualifications, ensures financial guaranty, requires data reporting, and issues permit
District/multi-user system serving mixed uses, collecting roof runoff and treated wastewater sources for toilet flushing, laundry, cooling, and irrigation	Large user base (100–5,000 pe/d[1])	Significant—Complex process and distribution system requiring skilled O&M	High Risk—Qualified full service RME with financial security and routine reporting	Establishes RME qualifications, ensures financial guaranty, requires data reporting, and issues permit

THE NBRC FRAMEWORK ENSURES ONSITE TREATMENT SYSTEMS ARE ACHIEVING PUBLIC HEALTH GOALS

Unit Process	Pathogens: Virus	Pathogens: Protozoa	Pathogens: Bacteria	Water Quality: Particulates	Water Quality: Organics	Removal / Inactivation Mechanisms
Biological Treatment						
Non-membrane options						Biodegradation, adsorption, predation
MBR						Same as above plus size exclusion
Filtration						
Granular media filter						Physical removal (e.g., size exclusion, interception, diffusion)
Cartridge filter						
Membrane filter						Physical removal (e.g., size exclusion)
Reverse osmosis						
Disinfection						
UV						Physical degradation
Free chlorine						Chemical inactivation and oxidation
Chloramine						
Ozone						



SPECIFIC GUIDANCE ON MEETING WATER QUALITY STANDARDS

Table 1

Log reduction targets for 10^{-4} per person per year benchmarks for ONWS using blackwater, graywater, or roof runoff

Water Use Scenario	Enteric Viruses	Parasitic Protozoa	Enteric Bacteria
Domestic Wastewater or Blackwater			
Unrestricted Irrigation	8.0	7.0	6.0
Indoor Use	8.5	7.0	6.0
Graywater			
Unrestricted Irrigation	5.5	4.5	3.5
Indoor Use	6.0	4.5	3.5
Roof runoff			
Unrestricted Irrigation	Not applicable[1]	No data[1]	3.5
Indoor Use	Not applicable[1]	No data[1]	3.5

Notes:

1. States and/or local regulators can define the LRTs for virus and protozoa for roof runoff systems using one of the following suggested options:
   - Assign LRT values based on stormwater LRTs
   - Conduct research on the presence of virus and protozoa in roof runoff and assign LRT values based on research

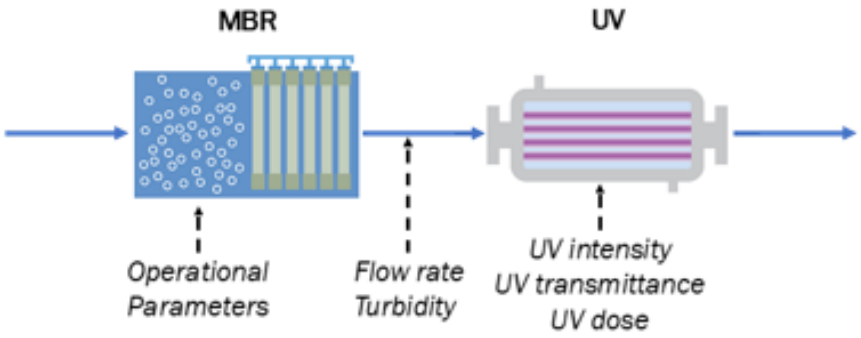
Source: Adapted from Sharvelle et al., 2017 (Table 3-3, page 26).

Table 3
Example Treatment Process Log_{10} Reduction Credits

Treatment Process	Log_{10} Reduction Credits Virus/Protozoa/Bacteria	Example Information to be Included in an Engineering Report
Microfiltration or Ultrafiltration	0/4/0	Manufacturer's informational sheet indicating ability to detect 0.3µm breach
Membrane Biological Reactor (MBR)	1.5/2/4	Operation with the Tier 1 operating envelope as defined in the AWRCE 2016, *Membrane bio-reactor*, WaterVal validation protocol[2]
Reverse Osmosis	Up to 2/2/2	Manufacturer's informational sheet indicating ability to reject sodium chloride. Allow pathogen removal credit with continuous monitoring of either electrical conductivity or total organic carbon
Ultraviolet (UV) Light Disinfection	Up to 6/6/6 (dose dependent)	UV reactor's Validation Report following state-approved procedures[3] or NSF/ANSI 55 Class A validated.
Chlorine Disinfection	Up to 5/0/5 (CT dependent)	Calculations demonstrating log inactivation using CT disinfection, where CT = Concentration of Chlorine x Contact Time
Ozone Disinfection	Up to 4/3/0 (CT dependent)	Calculations demonstrating log inactivation using CT disinfection, where CT = Concentration of Ozone x Contact Time

DESIGNING A MULTIPLE BARRIER TREATMENT SYSTEM

Graywater System for Toilet Flushing and Irrigation



Pathogen	Unit Process Pathogen Credits		Total Log Removal	LRT for Graywater
	MBR	UV		
Virus	1.5	6.0	7.5	6.0
Protozoa	2.0	6.0	8.0	4.5
Bacteria	4.0	6.0	10.0	3.5

ROLES & RESPONSIBILITIES MUST BE CLEARLY DEFINED

PROJECT TEAM	REGULATOR	DEVELOPMENT REVIEW
INITIAL PROJECT DEVELOPMENT		
• Prepare Project Application/Water Balance		
PRELIMINARY DESIGN		
• Preliminary design • Engineering Report (Preliminary)		
FINAL DESIGN, CONSTRUCTION AND INITIAL INSPECTIONS		
• 100% Design • Engineering Report (Final) • Operations & Maintenance Plan including Commissioning Plan • Construction • Cross-connection Inspection		
PROJECT STARTUP		
• Commissioning		
ON-GOING MONITORING AND REPORTING		
• On-going monitoring and reporting		

BUILDING A PROGRAM FROM SCRATCH REQUIRES INVOLVEMENT FROM MANY STAKEHOLDERS

Onsite Reuse System Professionals

The General Public/Users of Buildings

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THE SFPUC ORDINANCE APPROACH

San Francisco Water Power Sewer

2012
Single Building

2013
District-Scale

2015
Mandatory for projects ≥ 250,000 sf

AUSTIN WATER ORDINANCE APPROACH

Program & Grant Development	Program Implemented with Incentive	Mandate Implemented
• Establishes new rules/regulatory framework for Onsite Water Reuse Systems • Grant program developed to incentivize systems under new rules	• All new Onsite Systems required to meet new rules & obtain permit from Austin Water • Grants issued to large projects to incentivize program participation for non-mandated systems	• All new developments >250,000 square feet must incorporate Onsite Water Reuse & obtain permit from Austin Water

Mandatory Water Balance Submittal
• New developments submit water balance with site plan applications • >250,000 square feet developments meet with AW staff to discuss water balance results and grant program until mandate takes effect

- Water balance submittal and in-person staff meetings planned to coincide with opening of City's new Planning and Development Center (anticipated May/June 2020)

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Existing A/C Condensate Recovery Rules for Cooling Towers

- New facilities with 100 tons or more cooling capacity must offset at least 10% of make-up water with alternative water
- New facilities with 200 tons or more cooling capacity must reuse A/C condensate onsite

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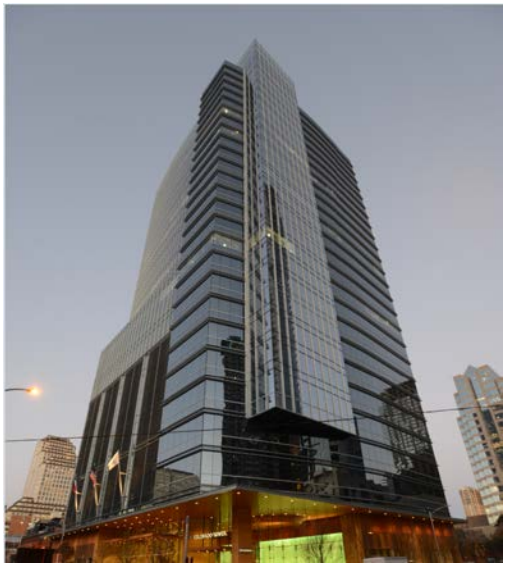
REVIEW THREE EXAMPLE PROJECTS

Mixed Use w/ Ground Floor Retail

Multi-family Suburban Complex



Commercial Office High-rise

- 3 groups working through the projects together at one station
- 30 minutes for each project with a 15-minute break after projects 2 & 3
- Report out and discussion on the ordinance approach at the end of workshop

BREAKOUT SESSION FORMAT

1. **Identify code applicability for each of the projects**
2. **Walk through the subsequent permitting steps for projects**
3. **Highlight and discuss any foreseeable issues to address with the ordinance approach**

Questions?

Austin
WATER