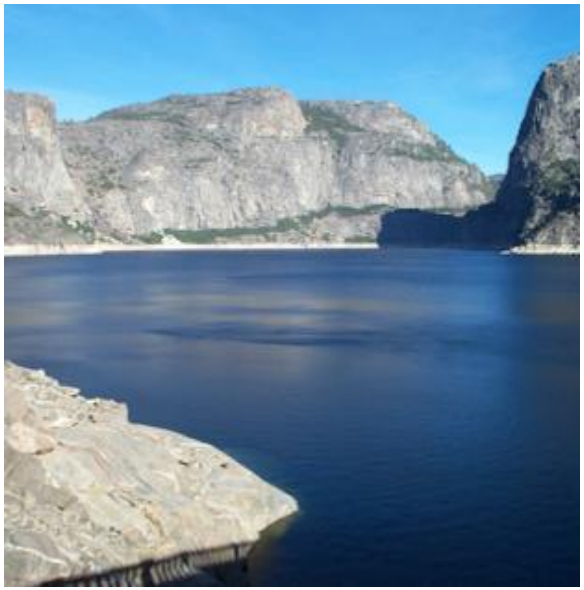
San Francisco's Non-Potable Water Program

Paula Kehoe
Director of Water Resources
San Francisco Public Utilities Commission
May 2, 2016

San Francisco Public Utilities Commission



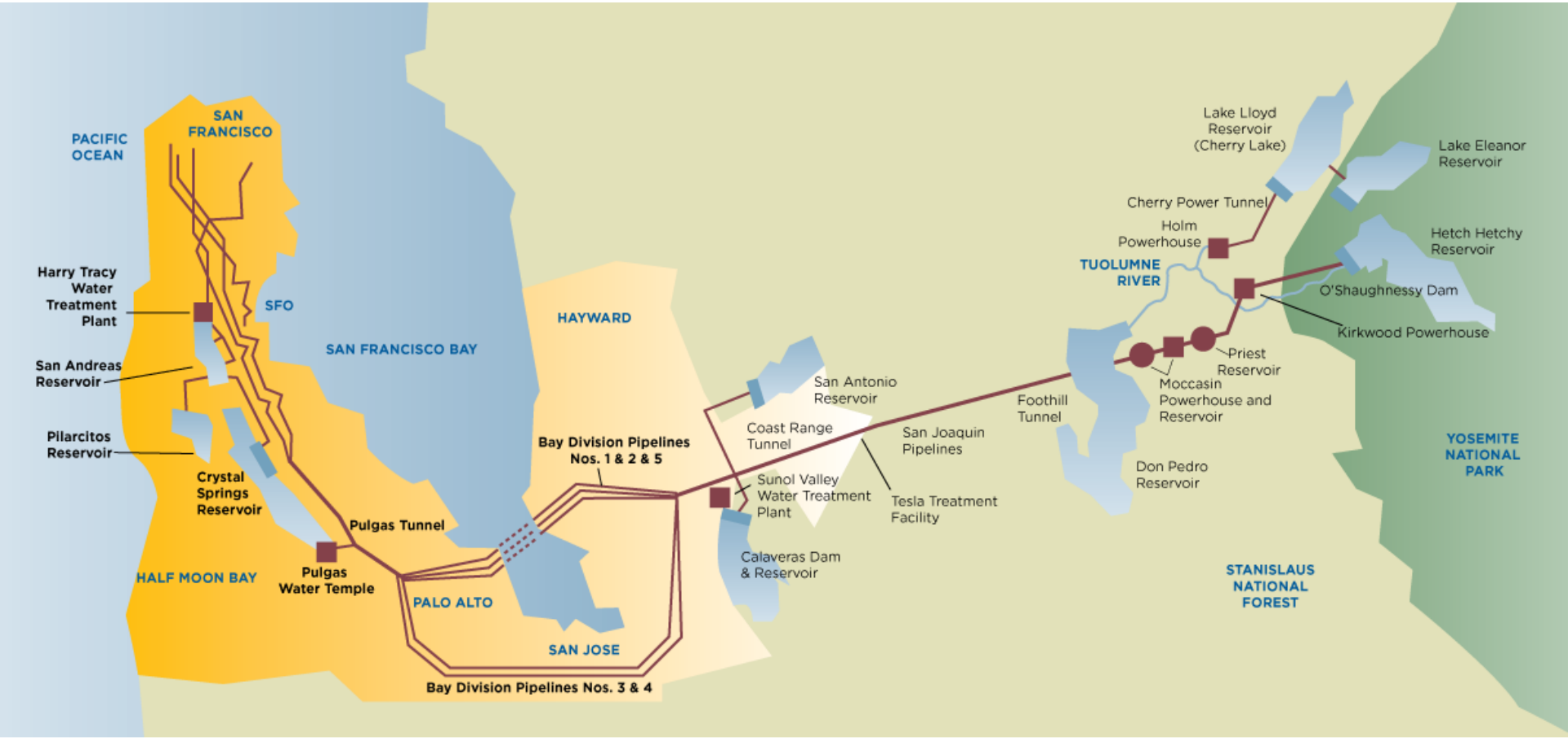
Water: delivering high quality water every day to 2.6 million people

Power: generating clean energy

Sewer: protecting public health and the environment

Hetch Hetchy Regional Water System

Provide Water to 2.6 Million People



Respond to Aging & Vulnerable Water Infrastructure

Water System Improvement Program

- Repair, replace, and seismically upgrade infrastructure
- $4.8 billion
- Over 90% Complete
- Diversify water supplies

San Francisco's Local Water Program

- **Conservation**: average residential 40 gpcd
- **Groundwater**: blend groundwater with surface water for potable purposes during normal and drought years
- **Recycled Water**: provide recycled water for irrigation of parks and golf courses
- **Non-potable Water**: collect and treat alternate water sources for non-potable applications within buildings

HETCH HETCHY
+ LOCAL WATER
Better together.

Approach to Water Reuse: Multiple Scales

San Francisco Chronicle

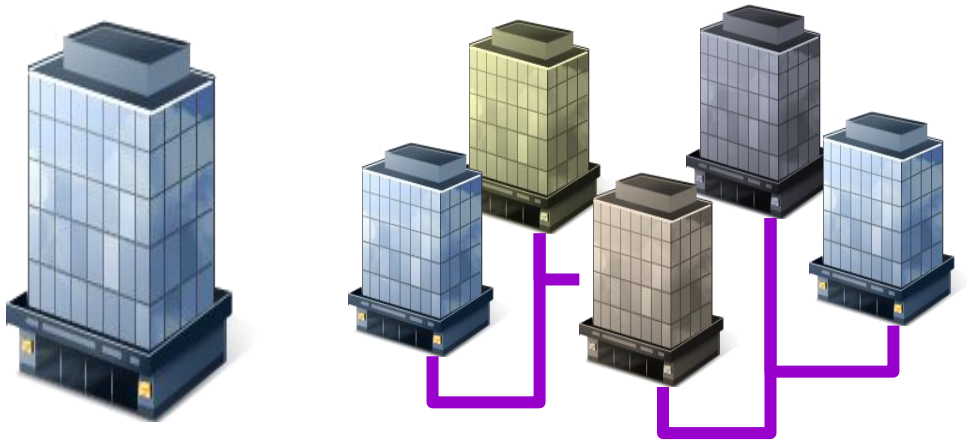
CONSERVATION

Green way to keep greens green

Harding Park golf course is using recycled wastewater — a 1st for S.F.

By Neal J. Riley

- Centralized
- Decentralized
  - Building scale
  - District-scale



Drivers for Water Reuse: Ordinances and Demand Management

Ordinances:

- Recycled Water Ordinance
- Non-potable Water Ordinance
- Stormwater Ordinance

Demand Management:

- Reduce use of potable water for non-potable uses such as toilet flushing, irrigation, etc.

Recycled Water Ordinance 1991

- New developments & major alterations over 40,000 SF
- Irrigated landscapes over 10,000 sf
- Requires recycled water systems for toilet/urinal flushing, irrigation, & cooling

Non-Potable Water Ordinance 2015

- Mandatory in 2015 (Voluntary 2012-2015)
- Requires onsite water systems in new buildings over 250,000 square feet
- Assessment of water sources and non-potable end uses in buildings over 40,000 square feet

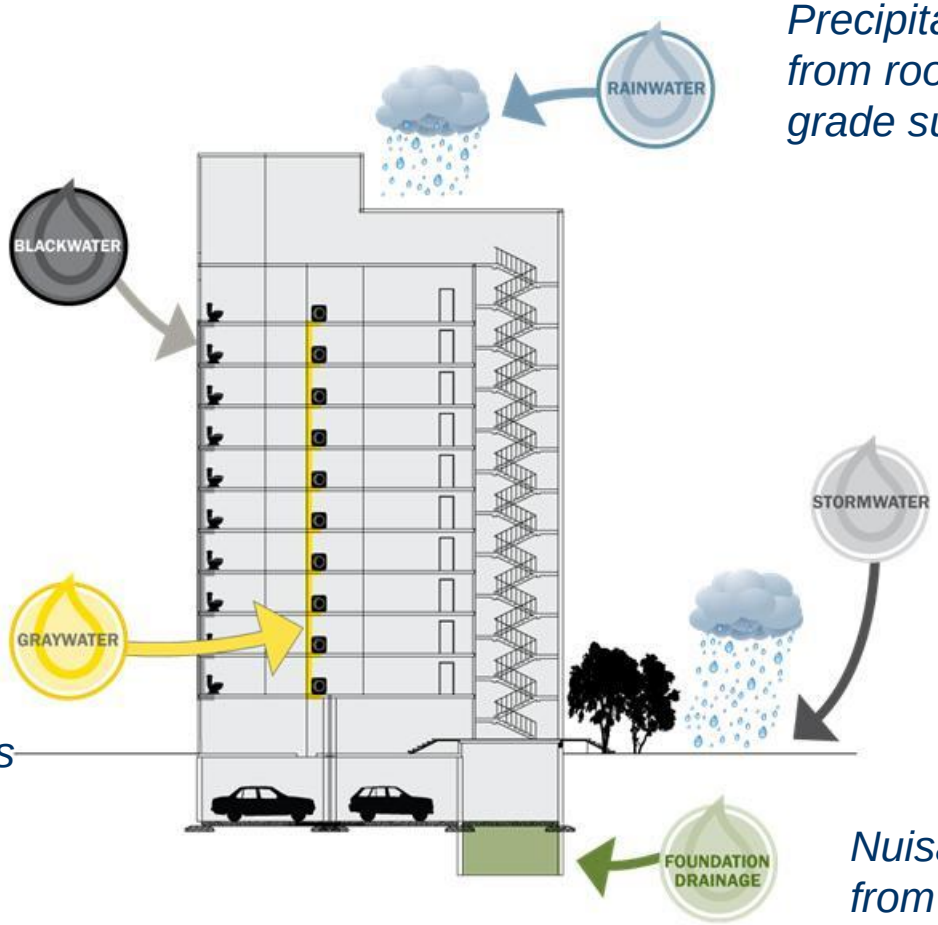
Stormwater Management Ordinance 2010

- Applies to any project that disturbs over 5,000 sf of ground surface
- Requires Stormwater Control Plan and retention or reuse of stormwater on-site
- Fulfills obligations of City's NPDES Permit

Opportunity to Reuse Water Onsite

Precipitation collected from roofs and above-grade surfaces

Wastewater from toilets, dishwashers, kitchen sinks, and utility sinks



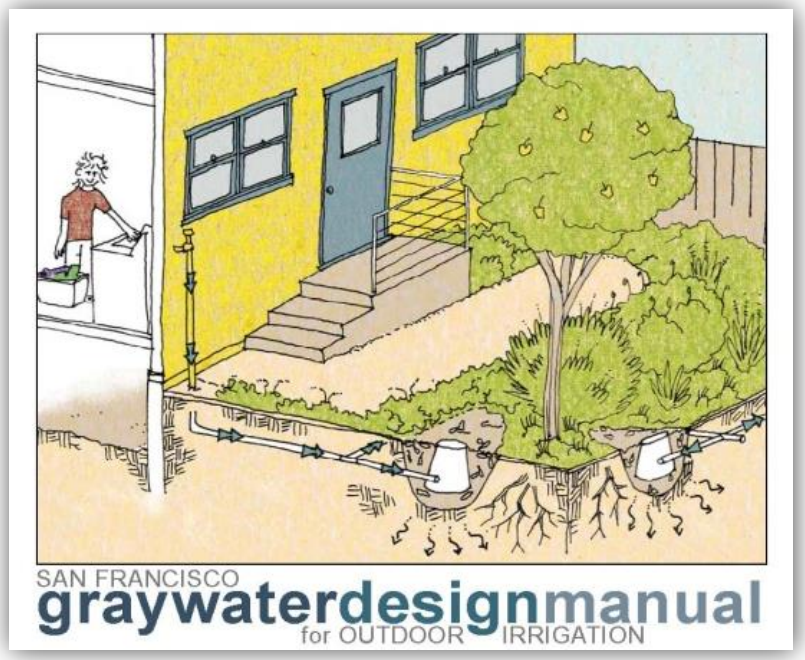
Precipitation collected at or below grade

Wastewater from clothes washers, bathtubs, showers, and bathroom sinks

Nuisance groundwater from dewatering operations

Residential Programs

- Rainwater Harvesting Program
- Residential Graywater Program



Rainwater Harvesting Program

Subsidy Program

- Cisterns and rain barrels for SF Residents

Public Outreach

- Web page
- Technical Workshop
- Fact Sheet

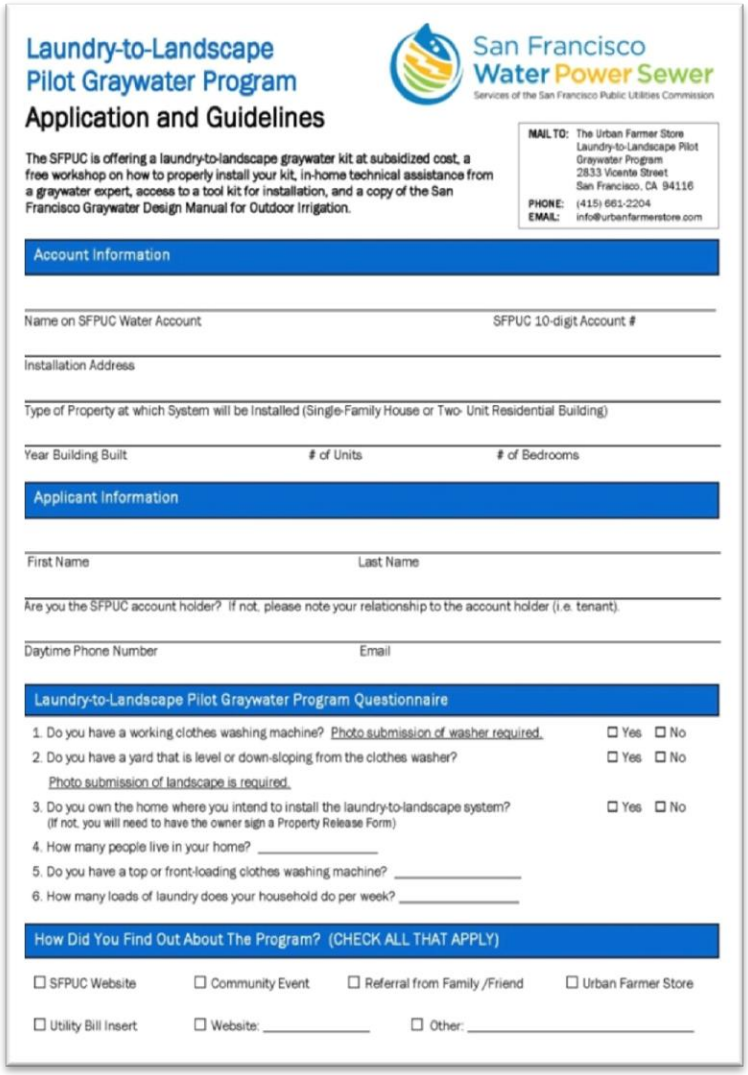
Laundry-to-Landscape (L2L) Graywater Program

1 and 2-unit homes

- $112 subsidy toward L2L kits
- Free training, manual, tech support
- Free tool lending

Requirements

- San Francisco resident
- Working laundry machine
- Flat or down sloping yard
- Install within 60 days
- Access for inspection
- Participation in survey



Laundry-to-Landscape
Pilot Graywater Program
Application and Guidelines

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission

The SFPUC is offering a laundry-to-landscape graywater kit at subsidized cost, a free workshop on how to properly install your kit, in-home technical assistance from a graywater expert, access to a tool kit for installation, and a copy of the San Francisco Graywater Design Manual for Outdoor Irrigation.

MAIL TO: The Urban Farmer Store
Laundry-to-Landscape Pilot Graywater Program
2833 Vicente Street
San Francisco, CA 94116
PHONE: (415) 661-2204
EMAIL: info@urbanfarmerstore.com

Account Information

Name on SFPUC Water Account — SFPUC 10-digit Account #

Installation Address

Type of Property at which System will be Installed (Single-Family House or Two- Unit Residential Building)

Year Building Built — # of Units — # of Bedrooms

Applicant Information

First Name — Last Name

Are you the SFPUC account holder? If not, please note your relationship to the account holder (i.e. tenant).

Daytime Phone Number — Email

Laundry-to-Landscape Pilot Graywater Program Questionnaire

1. Do you have a working clothes washing machine? Photo submission of washer required. ☐ Yes ☐ No
2. Do you have a yard that is level or down-sloping from the clothes washer? ☐ Yes ☐ No
   Photo submission of landscape is required.
3. Do you own the home where you intend to install the laundry-to-landscape system? ☐ Yes ☐ No
   (If not, you will need to have the owner sign a Property Release Form)
4. How many people live in your home? _____
5. Do you have a top or front-loading clothes washing machine? _____
6. How many loads of laundry does your household do per week? _____

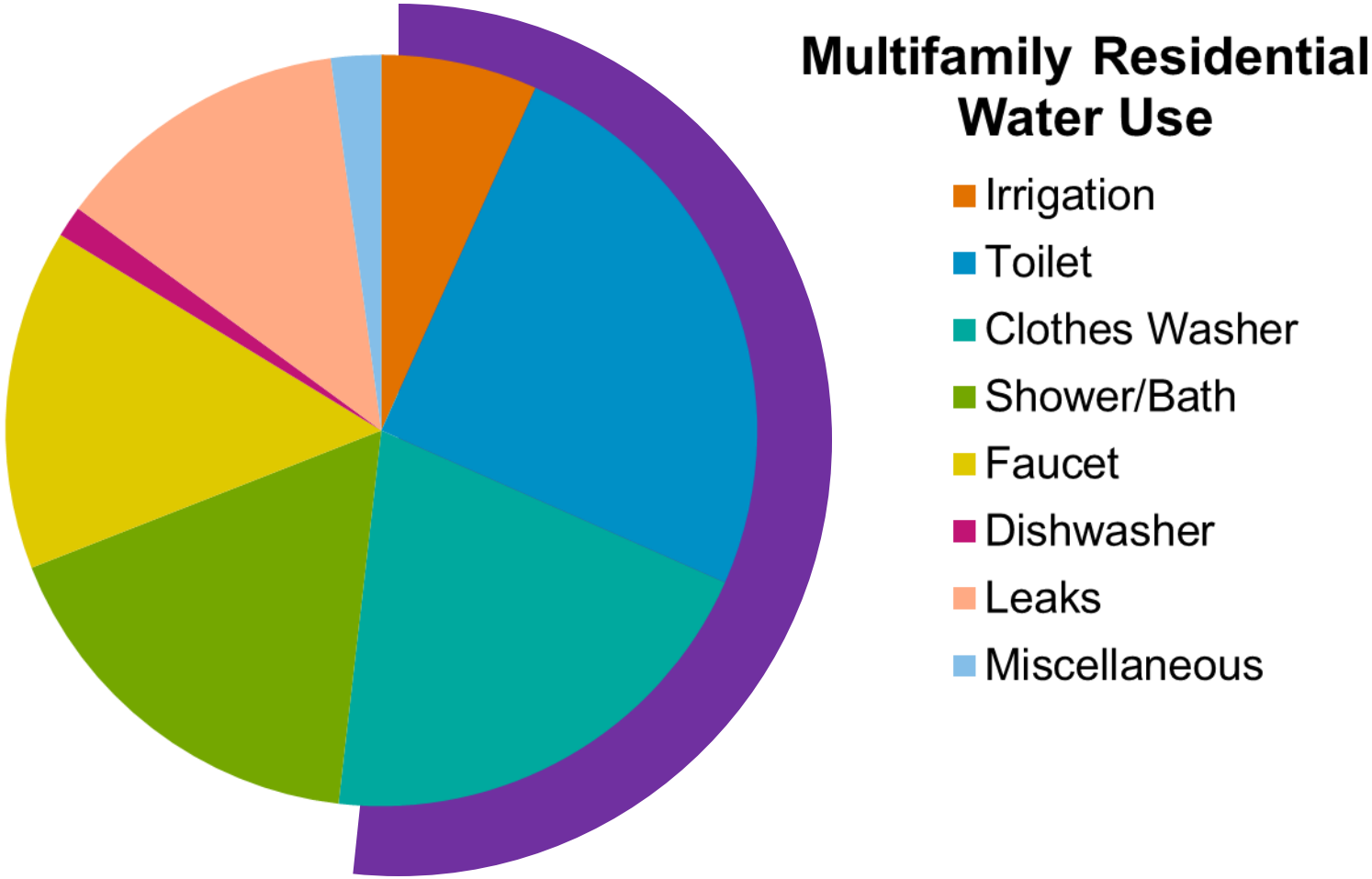
How Did You Find Out About The Program? (CHECK ALL THAT APPLY)

☐ SFPUC Website ☐ Community Event ☐ Referral from Family /Friend ☐ Urban Farmer Store

☐ Utility Bill Insert ☐ Website: _____ ☐ Other: _____

Water Reuse in Large Commercial, Multi-family and Mixed Use Buildings

Up to 50% of Demands are Non-potable in Multifamily Residential Buildings

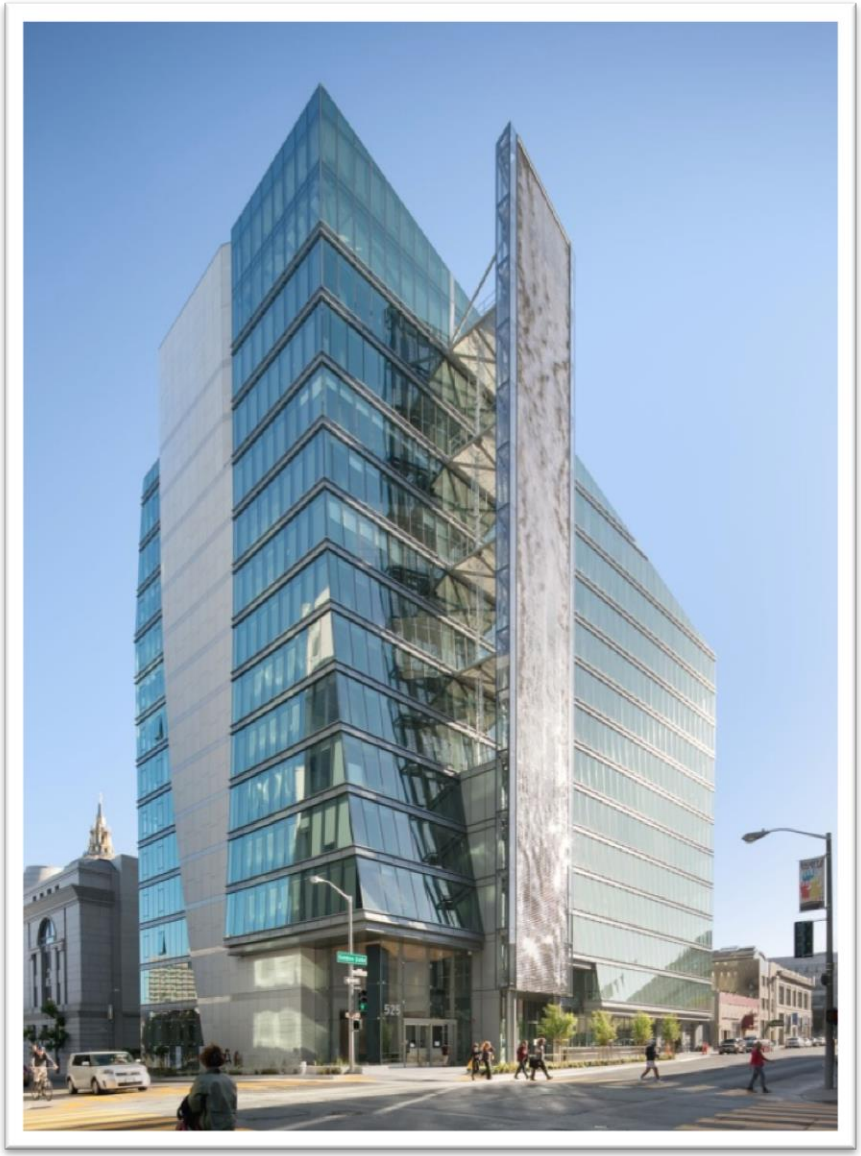


Source: adapted from Alliance for Water Efficiency

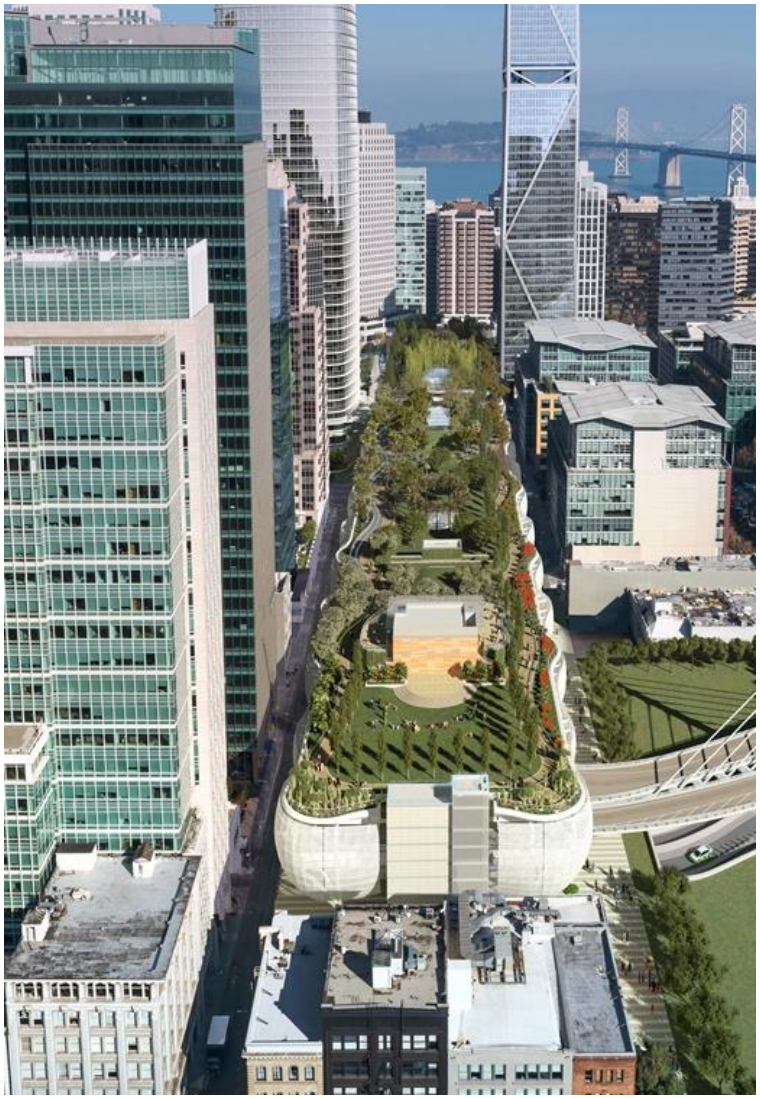
Up to 95% of Demands are Non-potable in Commercial Buildings

Source: USEPA

SFPUC Headquarters Incorporates Non-potable Water Systems



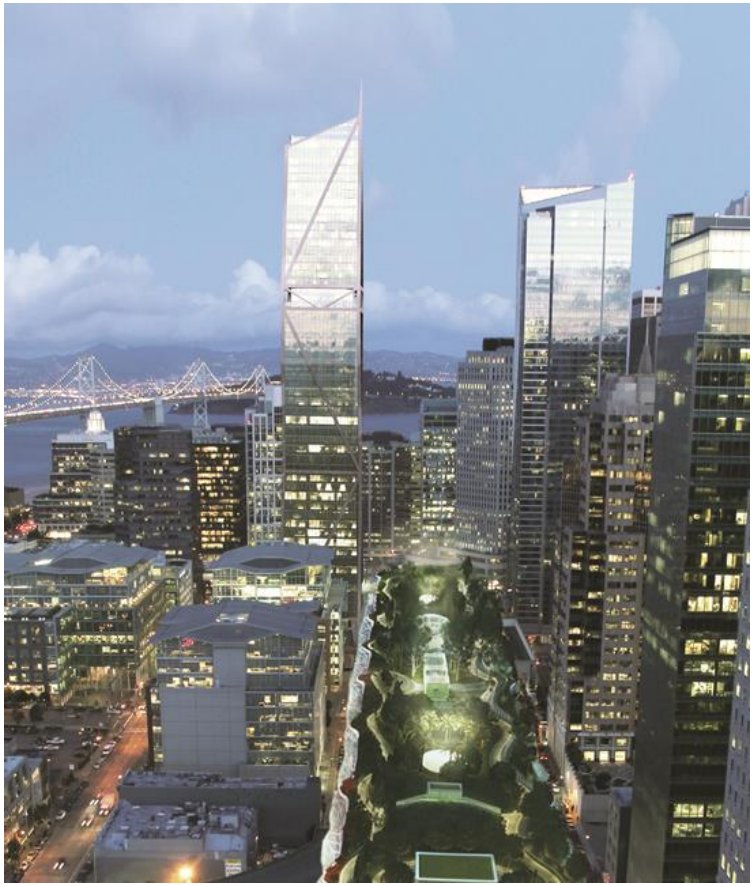
Interest from Developers to Collect & Treat Water Onsite



Barriers to Implementation

- 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?

Need for a Program on the Local Level



- Provide for Oversight and Management
- Establish Roles and Responsibilities
- Focus on Implementation
- Stakeholder Outreach

Limited Water Quality Guidance

2013 California Plumbing Code Updates

- Incorporated graywater and rainwater end uses & water quality standards
- Provided construction requirements
- Included purple and signage requirements

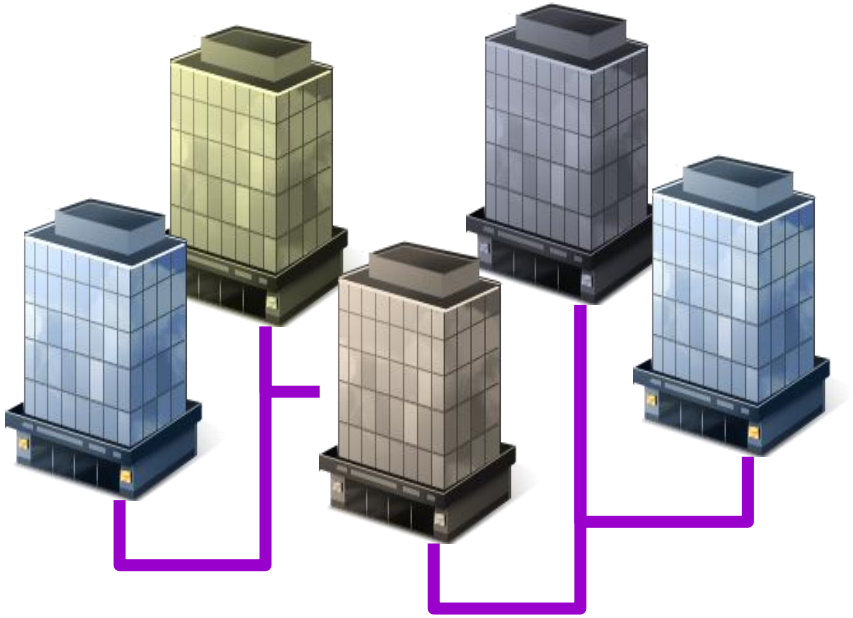
SF Non-potable Ordinance 2012

SFPUC	SFDPH	SFDBI
Program Administration	Public Health	Construction
Reviews Water Budget: non-potable water supplies & demands Provide technical support & outreach to developers Provide financial incentives to developers Cross connection test Administer citywide project tracking & annual potable offset achieved	Issue water quality & monitoring requirements Review and approve non-potable engineering report Issue permit to operate onsite systems Review water quality reporting	Conduct Plumbing Plan check and issue Plumbing Permit Inspect and approve system installations

Ordinance Amends SF Health Code

- Article 12C: establishes a regulatory structure that provides administrative and project approval process
- Sets application fees & annual fees for SFDPH
- Provides ability to impose penalties by SFDPH (Chapter 100 of Admin Code)

Amendments to 2012 Ordinance Include District Scale Systems



- District: 2 or more parcels that share water
- Must include permanent legal agreement between property owners
- Encroachment permit, if applicable

SF Non-potable Water Ordinance Amendments 2013

SFPUC	SFDPH	SFDBI	SFDPW
Program Administration	Public Health	Construction	Right of Way and Mapping
Review onsite non-potable water supplies & demands Administer citywide project tracking & annual potable offset achieved Provide technical support & outreach to developers Provide financial incentives to developers	Issue water quality & monitoring requirements Review and approve non-potable engineering report Issue permit to operate onsite systems Review water quality reporting	Conduct Plumbing Plan check and issue Plumbing Permit Inspect and approve system installations	Issue Encroachment Permits as needed for infrastructure in the Right-of-Way (if needed) Includes condition on a subdivision map or a parcel map requiring compliance with the Non-potable Ordinance prior to approval and issuance of said map (if applicable)

Water Quality Criteria Consistent with Existing State Codes

Alternate Water Source	Regulation Source
Blackwater	Title 22
Graywater	California Plumbing Code
Rainwater	California Plumbing Code
Stormwater Foundation Drainage	No state codes - SFDPH established

SFDPH issues permits to operate onsite water systems and requires ongoing monitoring and reporting

Water Quality Monitoring & Reporting

Water Source	Conditional Start-Up		Final Use	
	Monitoring	Reporting	Monitoring	Reporting
Rainwater	W/M*	M	M	Y
Stormwater	W	M	M	Y
Graywater	W	M	M	Y
Foundation Drainage	W	M	M	Y
Blackwater	D	M	D	M

D = daily
W = weekly
M = monthly
Y = yearly

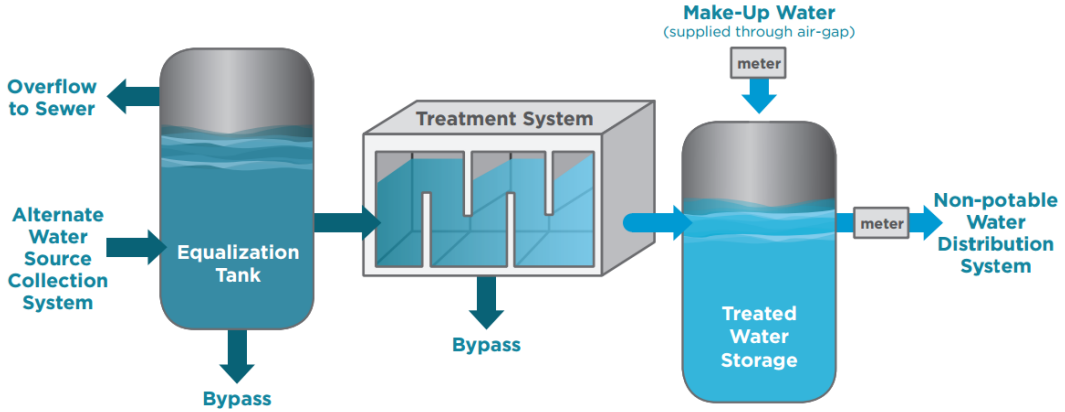
** Rainwater systems with a chlorine residual = monthly; Rainwater systems without a chlorine residual = weekly*

Estimated Monitoring Costs

Rainwater	Graywater	Blackwater
Start Up: $1,100	Start Up: $1,100	Start Up: $13,950
Ongoing: $420	Ongoing: $420	Ongoing: $13,500

Key Requirements for Onsite Systems

- Water and Sewer Connections
- Operations and Maintenance
- Backflow Protection Requirements
- Cross Connection Test Prior to Operation
- Operator Capacity



SFPUC Technical Assistance

NON-POTABLE WATER CALCULATOR

Step 6 of 7: Summary of Building Potential

Project Name:
ABC Building

Instructions:
An accounting of total demand and onsite supplies for the project are summarized below.
No user input is needed for this step.

LEGEND:

User Input	
Linked from User Input	
Default Value	
Autogenerated Value	

A. TOTAL DEMAND (No user input needed - auto-calculated)

Demand Types	Avg Daily Water Demand (gpd)	Annual Water Demand (gpy)	Average Monthly Demand (gal/mth)											
			January	February	March	April	May	June	July	August	September	October	November	December
DOMESTIC FIXTURES - Commercial														
Showerhead	13	4,745	395	395	395	395	395	395	395	395	395	395	395	395
Lavatory Faucet	120	43,800	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650	3,650
Urinals	174	63,510	5,293	5,293	5,293	5,293	5,293	5,293	5,293	5,293	5,293	5,293	5,293	5,293
Toilet (Water Closet)	891	325,171	27,098	27,098	27,098	27,098	27,098	27,098	27,098	27,098	27,098	27,098	27,098	27,098
Kitchen Faucet	180	65,700	5,475	5,475	5,475	5,475	5,475	5,475	5,475	5,475	5,475	5,475	5,475	5,475
Low Flow Sprayer - Restaurants	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	1,378	503,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000	42,000
DOMESTIC FIXTURES - Multi-Family Residential														
Showerhead	2,143	782,071	65,173	65,173	65,173	65,173	65,173	65,173	65,173	65,173	65,173	65,173	65,173	65,173
Bathroom Faucet	392	143,062	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922	11,922
Bath	503	183,413	15,284	15,284	15,284	15,284	15,284	15,284	15,284	15,284	15,284	15,284	15,284	15,284
Washing Machine	2,299	839,222	69,935	69,935	69,935	69,935	69,935	69,935	69,935	69,935	69,935	69,935	69,935	69,935
Toilet (Water Closet)	1,222	446,059	37,172	37,172	37,172	37,172	37,172	37,172	37,172	37,172	37,172	37,172	37,172	37,172
Kitchen Faucet	2,829	1,032,686	86,057	86,057	86,057	86,057	86,057	86,057	86,057	86,057	86,057	86,057	86,057	86,057
Dishwasher	90	32,721	2,727	2,727	2,727	2,727	2,727	2,727	2,727	2,727	2,727	2,727	2,727	2,727
SUBTOTAL	9,477	3,459,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300	288,300
HVAC/COOLING														
Conventional Cooling	1,957	714,775	43,621	48,461	55,045	55,979	61,290	64,418	67,319	69,500	72,727	72,729	58,922	48,486
SUBTOTAL	1,957	714,800	43,000	48,500	55,100	56,000	61,300	64,500	67,400	69,600	72,800	72,900	59,000	48,500
OTHER INDOOR DEMANDS THAT CAN BE MET WITH NON-POTABLE SUPPLIES														
Indoor Decorative Water Feature	100	25,000	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083
Commercial Laundry	34	1,760	147	147	147	147	147	147	147	147	147	147	147	147
<Please specify here>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	134	26,800	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
OUTDOOR DEMANDS														
Landscape Irrigation	N/A	106,727	0	0	0	0	13,999	25,093	27,823	24,017	14,995	0	0	0
Decorative Water Feature	100	25,000	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083	2,083
<Please specify here>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	100	131,800	2,100	2,100	2,100	2,100	16,100	27,200	30,000	27,000	17,100	2,100	2,100	2,100
GRAND TOTAL	13,047	4,835,700	378,600	381,200	389,800	390,700	410,000	424,300	430,000	429,200	422,500	407,500	393,700	381,200

6 Steps for Successful Implementation of Onsite Water Systems

1 **Submit a Water Budget Application and Non-potable Calculator to the SFPUC**

Assess water supplies and non-potable water demands

2 **Submit an Engineering Report to the SFDPH**

Provide detailed design and technical aspects of the onsite water system

3 **Obtain Permits from the DBI and Complete Construction**

Adhere to construction and plumbing code requirements to ensure proper installation

4 **Schedule a Cross Connection Test with the SFPUC**

Ensure separation of potable and non-potable water systems

5 **Obtain a Permit to Operate from the SFDPH**

Provide required documents to the SFDPH, pay first annual license fee to the Tax Collector, and begin operating the onsite water system with SFDPH oversight

6 **Conduct Ongoing Monitoring, Reporting, and Inspections**

Keep your system in compliance with water sample collection, ongoing maintenance, routine reporting to the SFDPH, and timely payment of the annual license fee

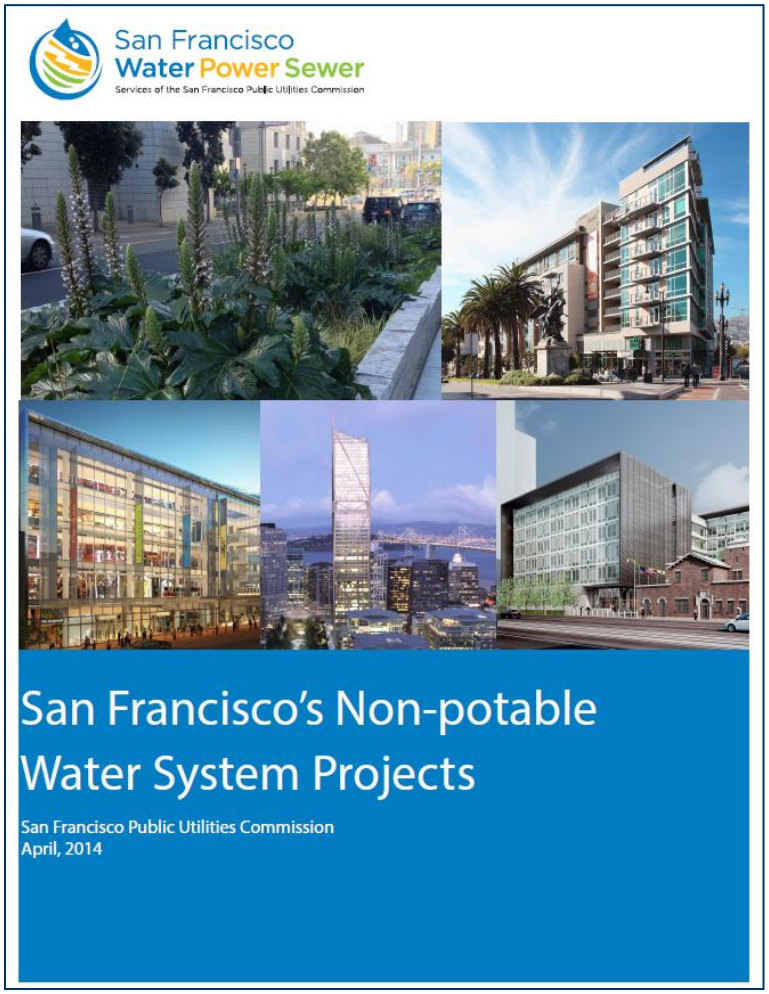
Market Street Place, a six-level retail center scheduled to open in 2016, plans to treat rainwater for cooling tower make-up and for toilet and urinal flushing.

Market Street Place (image courtesy of CRP/Cypress Market Street, LLC)

PG&E's San Francisco Service Center (image courtesy of Sherman Takata)

PG&E is treating foundation drainage to flush toilets and urinals at their San Francisco Service Center to reduce potable water consumption by approximately 80%.

SFPUC Track Projects



- Overview of onsite water system
- Water sources collected and treated
- End use applications
- Costs

St. Anthony's Building

- Source: Rainwater
- End Use: Toilet & Urinal Flushing
- Status: System Constructed

PG&E Office Building Retrofit

- Source: Foundation Drainage
- End Uses: Toilet & Urinal Flushing
- Status: System Constructed

San Francisco Public Safety Building

- Sources: Rainwater, Stormwater, & Graywater
- End Uses: Toilet & Urinal Flushing and Irrigation
- Status: System Constructed

181 Fremont Mixed Use Development

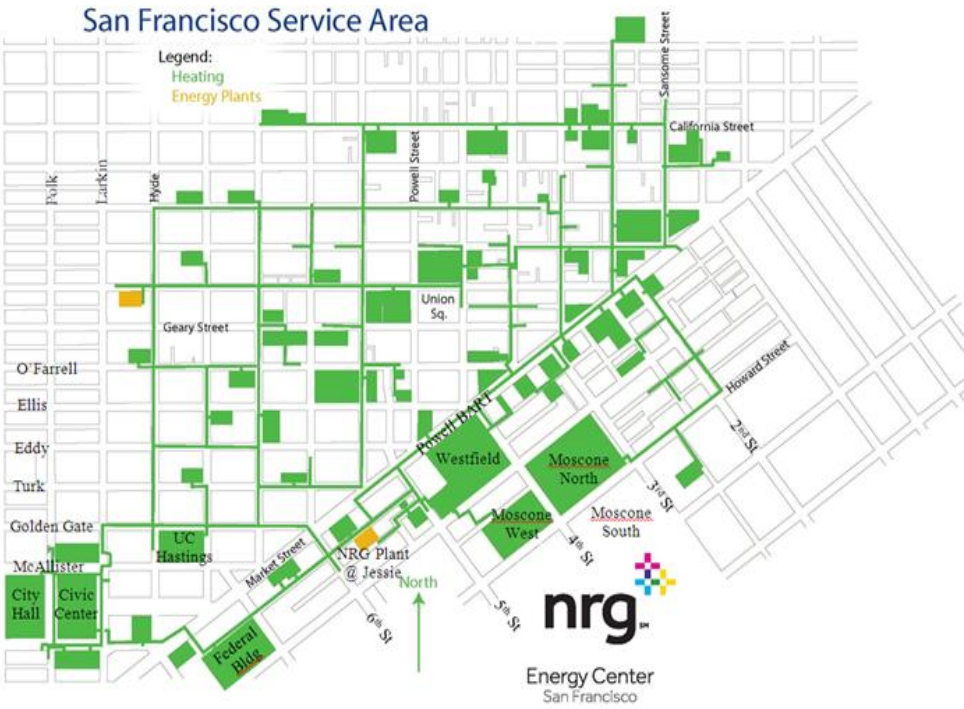
- Source: Graywater & Rainwater
- End Use: Toilets & Irrigation
- Status: Under Construction

Transbay Transit Center

- Sources: Rainwater & Graywater
- End Uses: Toilet & Urinal Flushing and Irrigation
- Status: Final Design

Downtown Steam Loop

- Sources: Foundation Drainage
- End Uses: Steam Loop
- Status: Final Design



Cost Estimates & ROI

Graywater Treatment Systems

- $250,000- $500,000 (1,200 gpd-5,000 gpd)

Blackwater Treatment Systems

- $400,000 - $2.3 M (5,000 gpd- 50,000gpd)

ROI: 6-15 years

SFPUC Financial Assistance

Grant Assistance for Large Alternate Water Source Projects

Grant Guidelines and Terms

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission

Grant Assistance Overview

The SFPUC's Grant Assistance for Alternate Water Source Projects (Grant Assistance) is a program designed to encourage retail water users to implement the on-site treatment and use of non-potable water including but not limited to rainwater, stormwater, graywater, foundation drainage, and blackwater. The goal is to maximize the use of nonpotable water for toilet flushing, irrigation, and other non-potable uses. The SFPUC has approximately $1,000,000 in funding available for two types of non-potable water projects: 1) district-scale projects that consist of two or more parcels that share treated alternate water sources *or* 2) building-scale projects that include any residential or non-residential building of at least 100,000 square feet or more. Grants will be awarded to those applicants who demonstrate they will significantly and permanently reduce or offset the use of existing drinking water supplies for non-potable applications.

Types of activities considered for funding include the installation of harvesting or collection systems for on-site sources, treatment systems to improve the water quality of on-site sources for beneficial reuse, and/or storage of the treated water. The SFPUC anticipates funding multiple projects. The deadline for applications for Calendar Year 2014 is December 31, 2014. Provision of grant funding is based on the eligibility of the proposed activity and availability of funds. Each application will be reviewed and evaluated on a case-by-case basis. Grant funding is available on a first come, first serve basis and is limited to $250,000 per on-site project and $500,000 per district-scale project. Projects that meet the Grant eligibility criteria for District-scale Grant Assistance may not apply for Building-scale Grant Assistance.

Grant assistance will support customer efforts to implement sustainable water use practices in San Francisco. In addition to advancing water supply reliability, this grant assistance will support the SFPUC's Phased Water System Improvement Program Variant (WSIP) goals adopted by Resolution No. 08-200 on October 30, 2008. The WSIP included a goal of developing an additional 10 million gallons per day (mgd) of locally available water resources.

Definitions

Terms used in this grant application package have the meanings described below:

Alternate Water Source – Non-potable source of water that includes graywater, rainwater, stormwater, foundation drainage, and blackwater. The level of treatment and quality of the alternate water source shall be approved by the City's Department of Public Health and comply with all applicable federal, state, and local regulations.

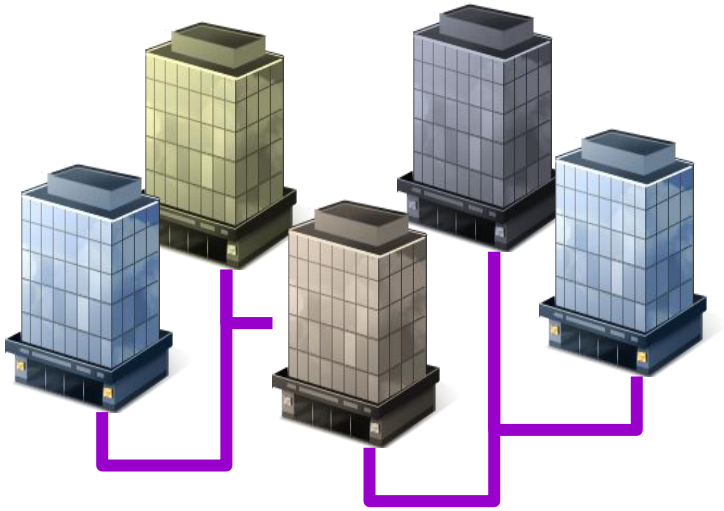
Applicant – property owner that is a retail water customer of the SFPUC, proposing the installation of a building-scale or district-scale treatment system on their property, and is seeking grant funds from the SFPUC for an alternate water source project, pursuant to the instructions and guidelines set forth in this application package.

Award – the decision by the SFPUC to provide grant funds, following the review and evaluation of a completed application. An award is made through a Grant agreement.

Blackwater – wastewater containing bodily or other biological wastes, as from toilets, dishwashers, kitchen sinks and utility sinks. Because of plumbing configurations, blackwater leaving a building generally includes graywater.

Non-Potable Water Program Timeline

- 2010-2012: Develop Program
- 2012: Single Building
- 2013: District Scale Systems
- 2015: Mandatory for projects over 250,000 square feet



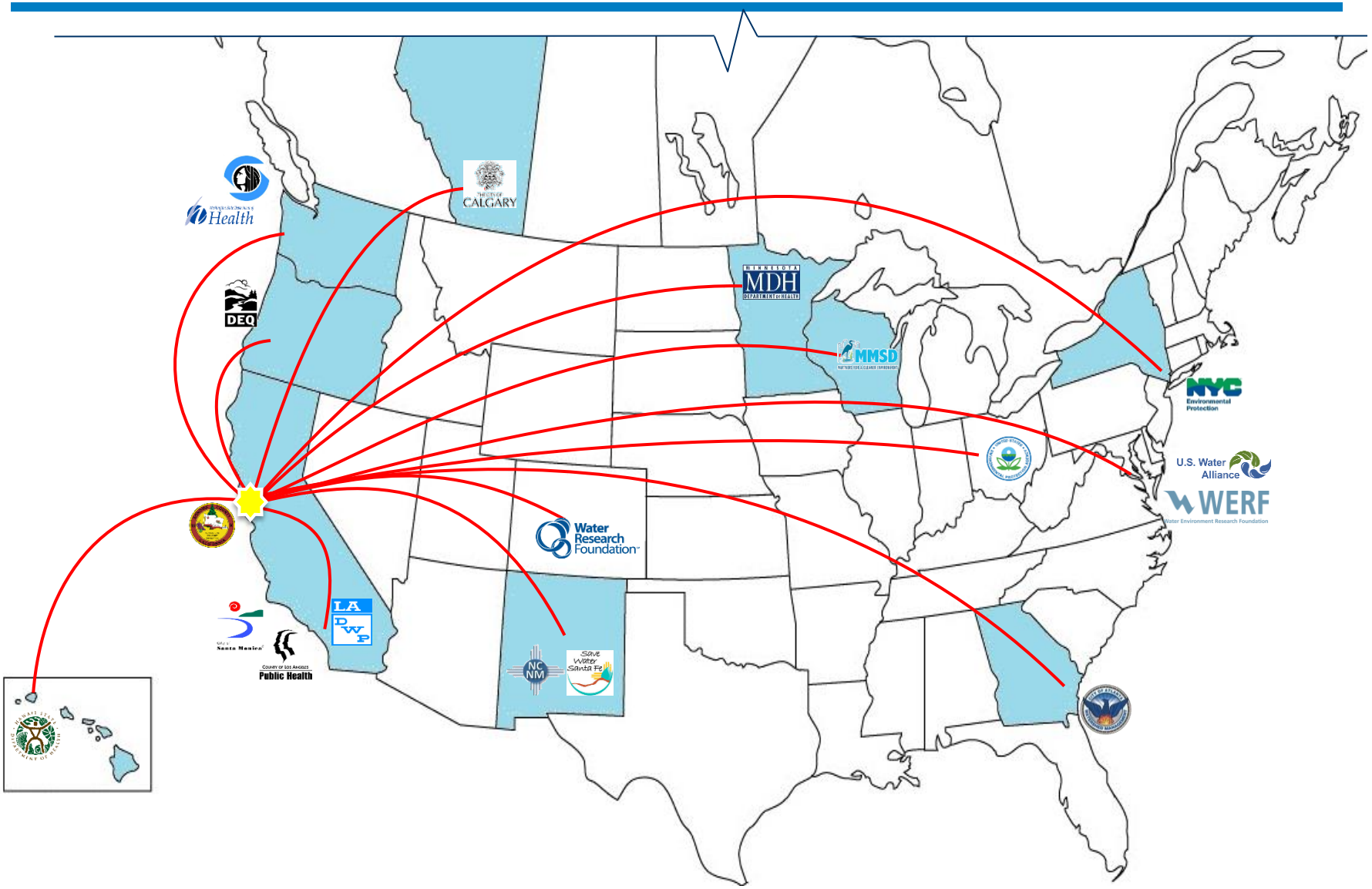
New Water Paradigm

- Decentralized systems integrated with centralized infrastructure
- Need for new utility business models
- Future innovative technologies

Pilot New Innovations

- Rainwater for potable purposes
- Conduct R&D for potable reuse
- Urine diverter to produce fertilizer
- Resource recovery, such as thermal energy

Onsite Water Systems Summit
San Francisco May 2014



Key Outcomes from Summit

- Management and oversight programs are needed

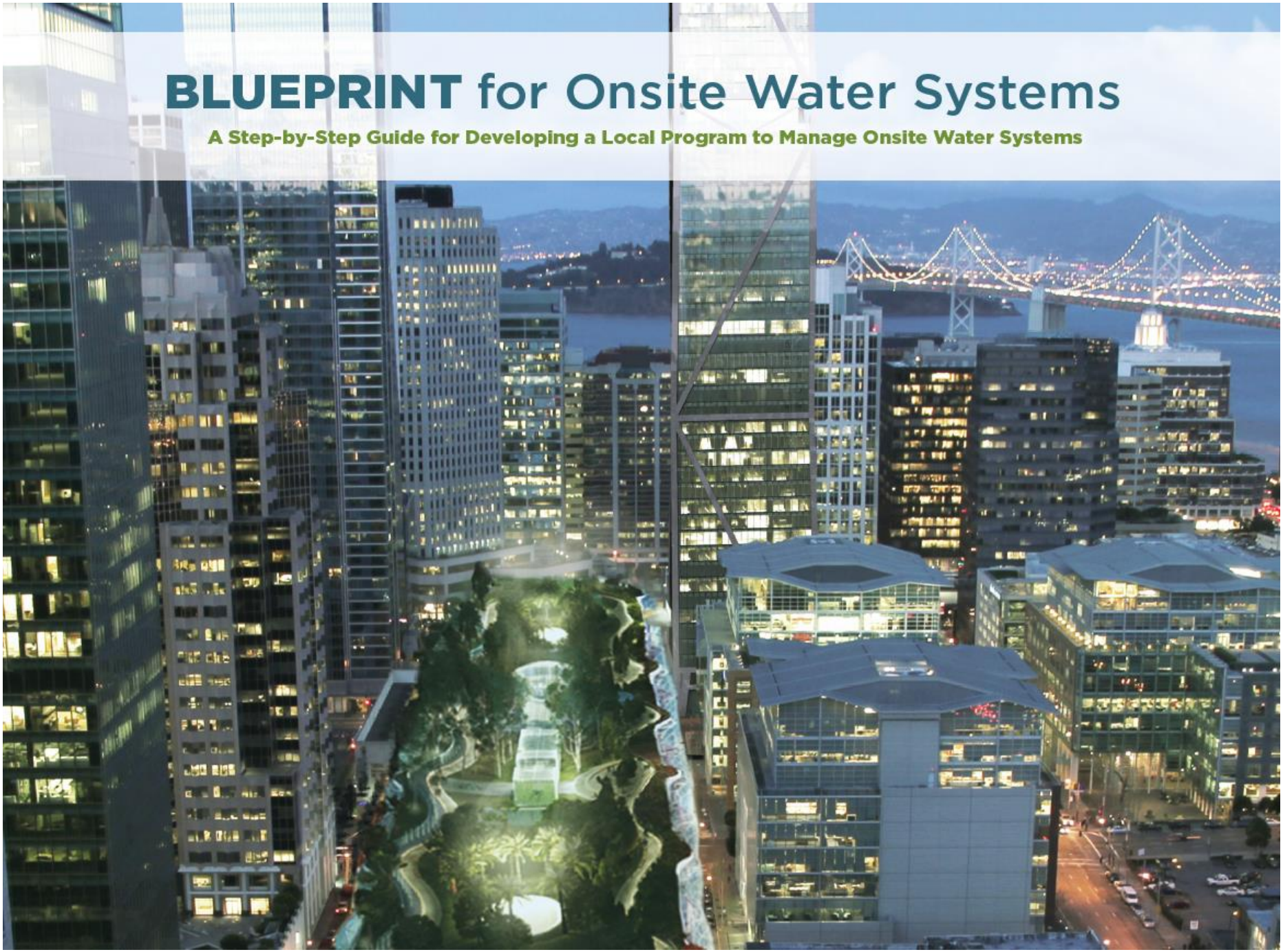
- Lack of consistent water quality criteria and monitoring to protect public health

Innovation in Urban Water Systems

San Francisco • May 2014

BLUEPRINT for Onsite Water Systems

A Step-by-Step Guide for Developing a Local Program to Manage Onsite Water Systems



Public Health Collaborative

Development of Public Health Standards

Health risk based approach to develop recommendations for:

- Performance criteria for treated alternate water sources
- End use applications (toilet/urinal flushing, irrigation and clothes washers)
- Monitoring and reporting
- Operational requirements and permitting

Project Structure and Timeline

- 5 Member Independent Expert Panel
- Stakeholder Advisory Committee (comprised of local, state and federal public health officials)
- Interactive workshops
- Final report available September 2016

Draft Policy for CA

IMAGINE H2O
WINNER

National Blue Ribbon Commission

- Collaborate with state public health + water utilities

- Develop consistent state policies

- Engage EPA

- Two year effort starting Fall 2016

THANK YOU

sfwater.org/np

sfwater.org/np/iuws

SFDPH Rainwater Water Quality Requirements

Measure	Maximum
Turbidity	10 NTU
E. Coli	≤ 100 MPN/100 mL
Chlorine Residual[1]	0.5 – 2.5 mg/L
Odor	Non-Offensive

1. A Chlorine Residual is not required for rainwater systems- use of uv or ozone can meet requirement.

SFDPH Stormwater Water Quality Requirements

Measure	Maximum
Turbidity	10 NTU
E. Coli	≤ 100 MPN/100 mL
Chlorine Residual	0.5 – 2.5 mg/L
Volatile Organic Compounds (VOC)	Depends on specific VOC[1]
Odor	Non-Offensive

1. Stormwater systems require quarterly testing for VOCs to meet acceptable maximum concentration levels (MCLs).

SFDPH Graywater Water Quality Requirements

Measure	Average	Maximum
pH	6.0 – 9.0	
Turbidity	2 NTU	10 NTU
Chlorine Residual	0.5 – 2.5 mg/L	
Total Coliform	≤ 2.2 MPN/100 mL	≤ 200 MPN/100 mL
Odor	Non-Offensive	

SFDPH Foundation Drainage Water Quality Requirements

Measure	Average	Maximum
Turbidity	2 NTU	10 NTU
Chlorine Residual	0.5 – 2.5 mg/L	
E. Coli	≤ 2.2 MPN/100 mL	≤ 200 MPN/100 mL
Volatile Organic Compounds (VOC)	N/A	Depends on specific VOC[1]
Odor	Non-Offensive	

1. Foundation drainage systems require quarterly testing for VOCs to meet acceptable maximum concentration levels (MCLs).

SFDPH Blackwater Water Quality Requirements

Measure	Minimum	Average	Maximum
BOD_5	≥ 85% removal	≤ 10 mg/L	≤ 25 mg/L
Suspended Solids	≥ 85% removal	≤ 10 mg/L	≤ 30 mg/L
pH	6.0 – 9.0		
Turbidity	n/a	2 NTU	10 NTU
Chlorine Residual	0.5 – 2.5 mg/L		
Total Coliform	n/a	≤ 2.2 MPN/100 mL	≤ 23 MPN/100 mL ≤ 240 MPN/100 mL
Odor	Non-Offensive		

Watershed Stewardship Grant Program

- Funds sidewalk landscaping, rainwater harvesting and green infrastructure projects in the public realm
- Engages community and provides opportunities for education & outreach

before

after

PROJECT PROFILES

Lafayette Elementary

Rainwater Harvesting System (large cistern)

PROJECT PROFILES

Cesar Chavez Elementary

Rainwater Harvesting System & Educational Garden

PROJECT PROFILES

Miraloma Elementary

Rainwater Harvesting System & Outdoor Classroom