San Francisco's Non-potable Water Programs

Technologies and Innovative Solutions for Harvesting and Non-Potable Use of Rain and Stormwater in Urban Settings
April 24-25, 2013

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San Francisco Public Utilities Commission

Presentation Outline

- Overview of the SFPUC
- Approach to water reuse
- Building-scale reuse applications
- District-scale water sharing opportunties

Services We Provide

Regional Water System

Responding to Aging and Vulnerable Infrastructure-70% Complete

- Water System Improvement Program (WSIP)
  - Repair, replace, and seismically upgrade the system's deteriorating pipelines, tunnels, reservoirs, pump stations, storage tanks, and dams
  - $4.6 billion
  - Water Supply Diversification

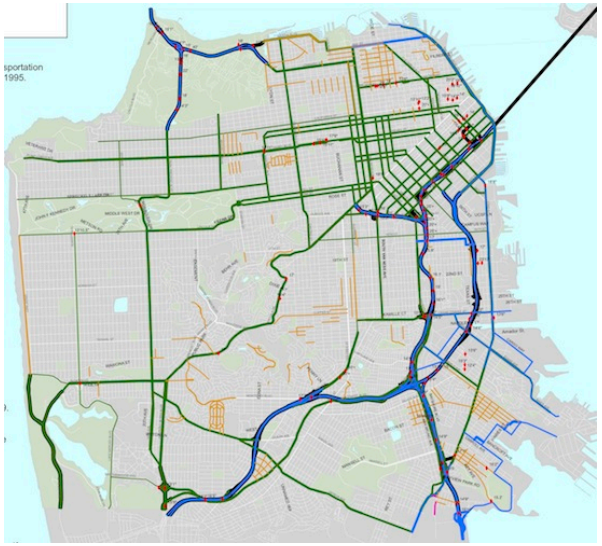
HETCH HETCHY
WATER SYSTEM
IMPROVEMENT
PROGRAM

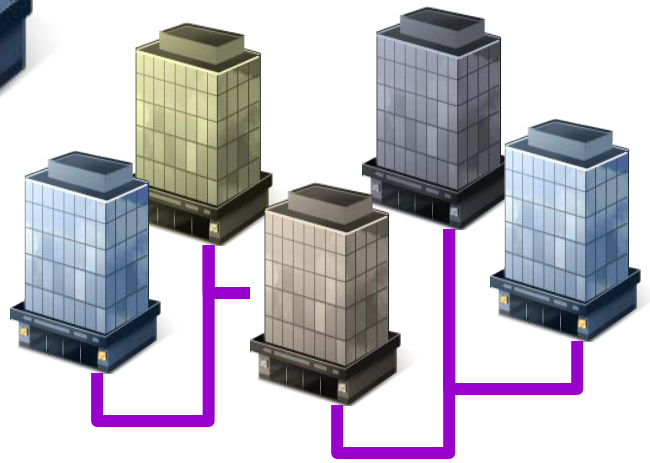
SFPUC is Embarking on Major Sewer System Improvements

- Sewer System Improvement Program (SSIP)
  - Capital improvements that will improve regulatory permit compliance, system reliability and functionality, and sustainable operations of our sewer system and wastewater treatment plants
  - Timeline 2012 – 2032
  - $6.9 billion projected (estimate of $400 million to green infrastructure)

Approach to Water Reuse: Multiple Scales

- Centralized facilities
- Building-scale
- District-scale





Implementation of Water Reuse

Requirements

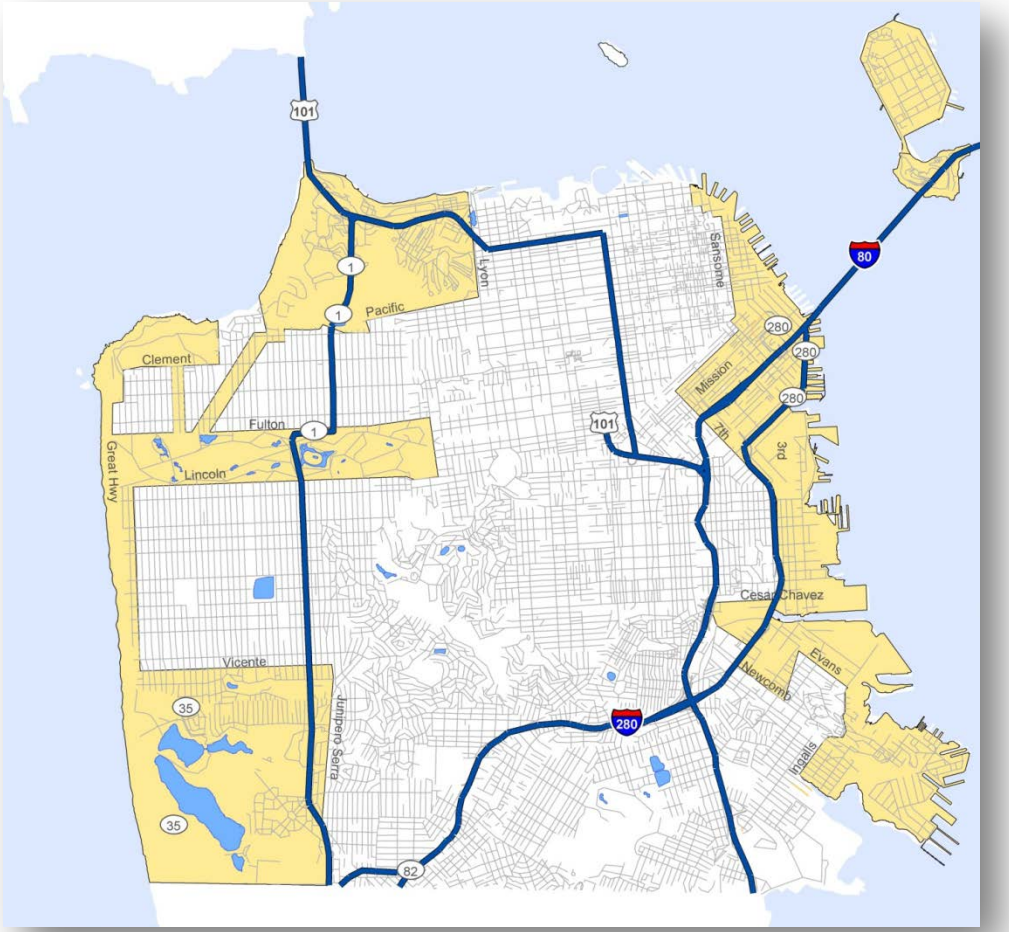
- Recycled Water Ordinance
- Stormwater Ordinance

Incentives

- Grants
- Subsidies

Recycled Water Ordinance

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



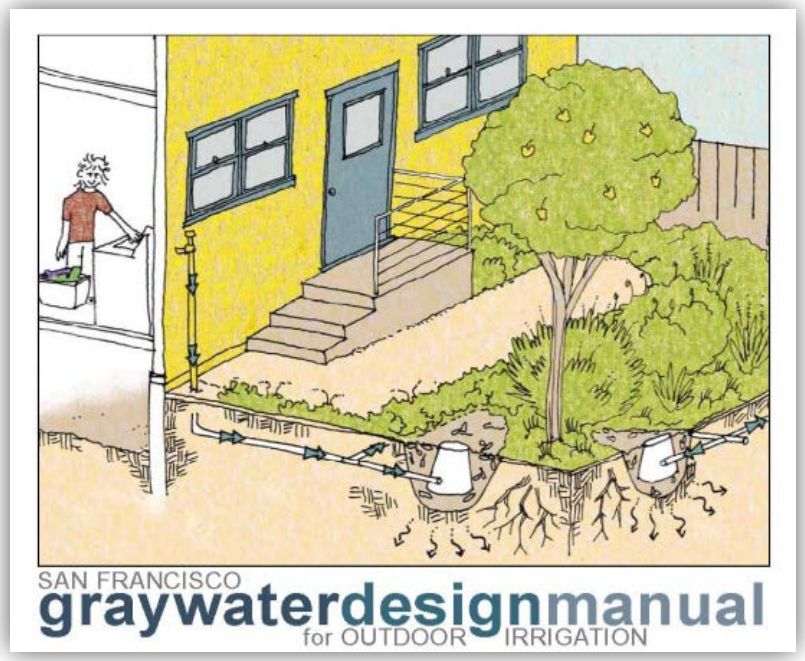
Stormwater Design Guidelines (SDG)

- Leads developers, engineers, and architects through the planning and design process
- Establishes performance measures, provides guidance and technical tools for compliance,
- Gives detailed instructions on how to develop a Stormwater Control Plan (SCP)
- Encourages the use of Green Infrastructure to meet the performance measures

Alternate Water Sources

Building-Scale: Residential Programs

- Rainwater Harvesting Program
- Residential Graywater Program



Rainwater Harvesting Program

- RWH Subsidy Program
  - $70,000 to SF residents for cisterns and rain barrels
  - Public Outreach:
    - Web page
    - Technical Workshop
    - Manual (in development)

Laundry-to-Landscape (L2L) Graywater Program

Purpose

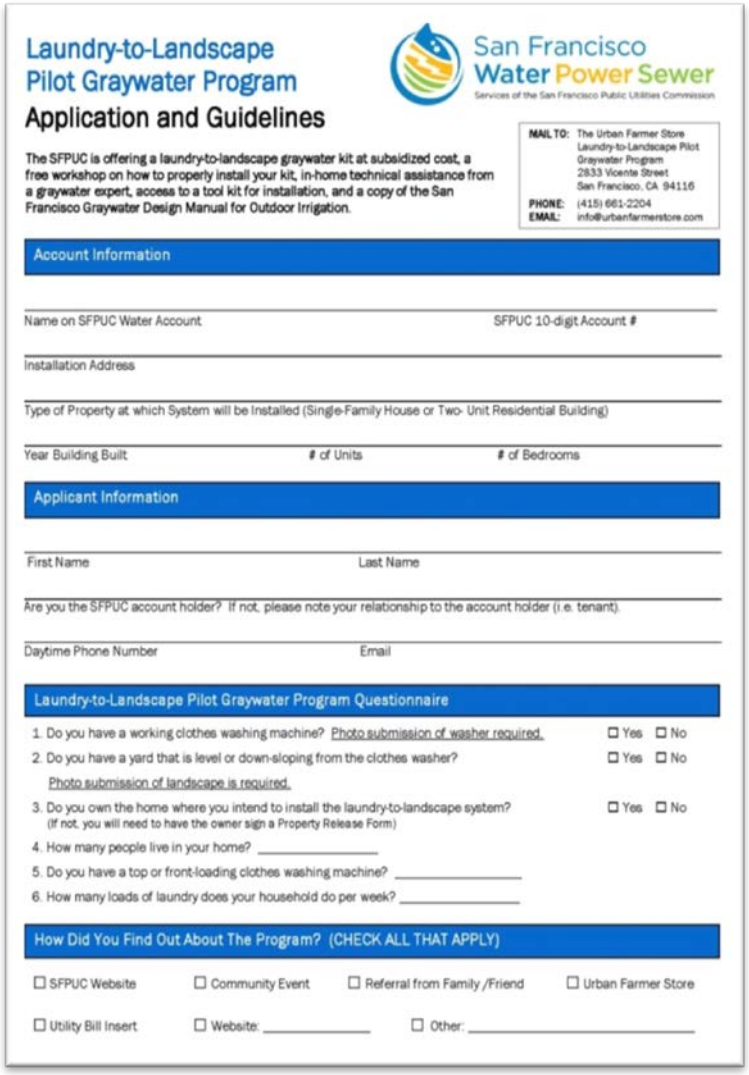
- Assess feasibility, collect data

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? _____

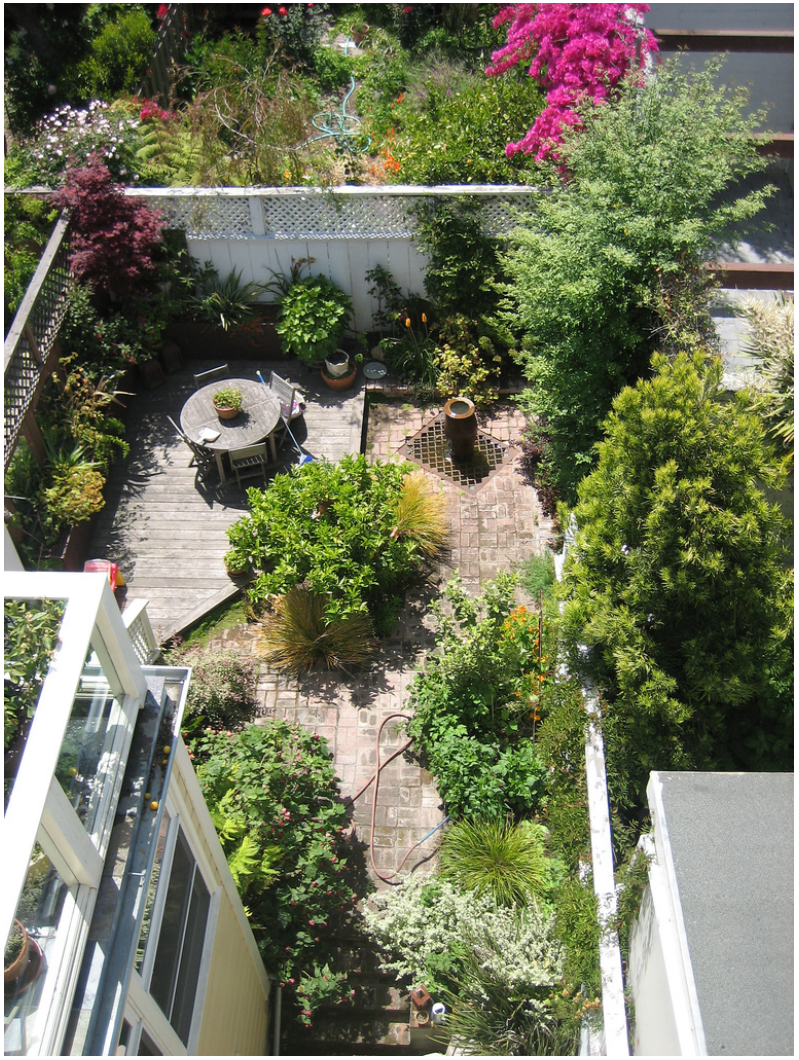
How Did You Find Out About The Program? (CHECK ALL THAT APPLY)

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

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

L2L Participant Water Use

- One year pre- and post-installation:
  - 16 sites increased water use
  - 8 sites reduced water use
- Challenges
  - Hard to pin point cause of change
  - Very small landscape areas
  - Less than 1 CCF (748 gallons) hard to measure
- Will continue to analyze



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

Watershed Stewardship Grant Program

- Over $1 million dollars given to grant winners

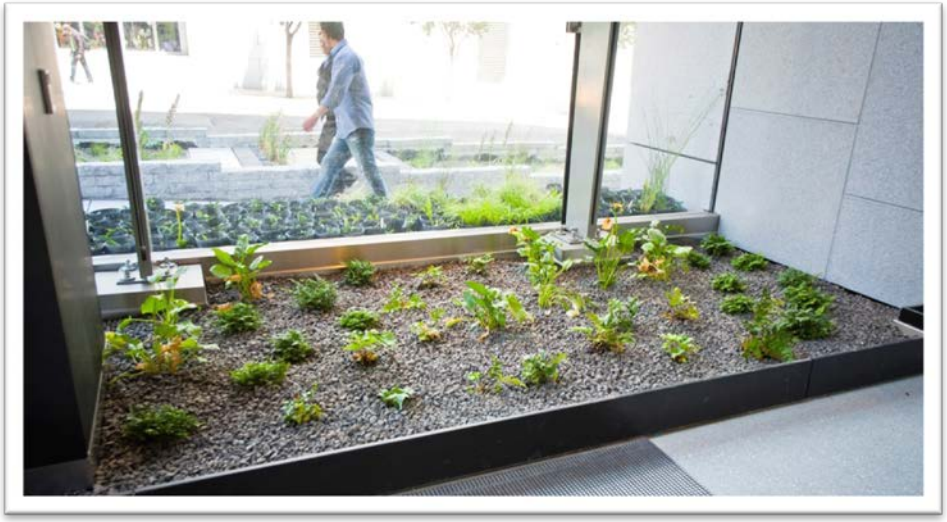
- Over $500K to San Francisco public schools for:
  - rainwater harvesting program
  - removal of impervious surfaces
  - the construction of outdoor classrooms

20 SFUSD schools have rainwater harvesting systems as a result.

Non-potable Water Use at SFPUC Headquarters

- Living Machine
  - Collects and treats buildings gray and blackwater
  - Reuse for toilet flushing
  - 5,000 gpd
- Rainwater Harvesting
  - 25,000 gallon cistern

Reduces water use in the building by 60%



Other On-site Non-potable Water Projects Proposed in SF

PG&E Building
Foundation drainage for toilets

Transbay Transit Center
Rainwater & graywater for toilets

Moscone Center
Foundation drainage for *TBD*

Public Safety Building
Graywater for irrigation

Integrating On-site Non-potable Water is Challenging

- Regulatory questions:
  - What permits are required to operate an on-site treatment and reuse system?
  - Who issues permits and oversees operations?
  - Who sets water quality standards?

Current oversight of alternate water use

- Current CA codes only cover 2 types:
  - Municipally-supplied recycled water – Title 22
  - Onsite graywater for residential subsurface irrigation applications – Chapter 16, CA Plumbing Code

- 2013 CA Plumbing Code Update:
  - Expands on-site graywater reuse standards
  - Includes on-site rainwater standards

Important Regulatory Oversight Still Unclear

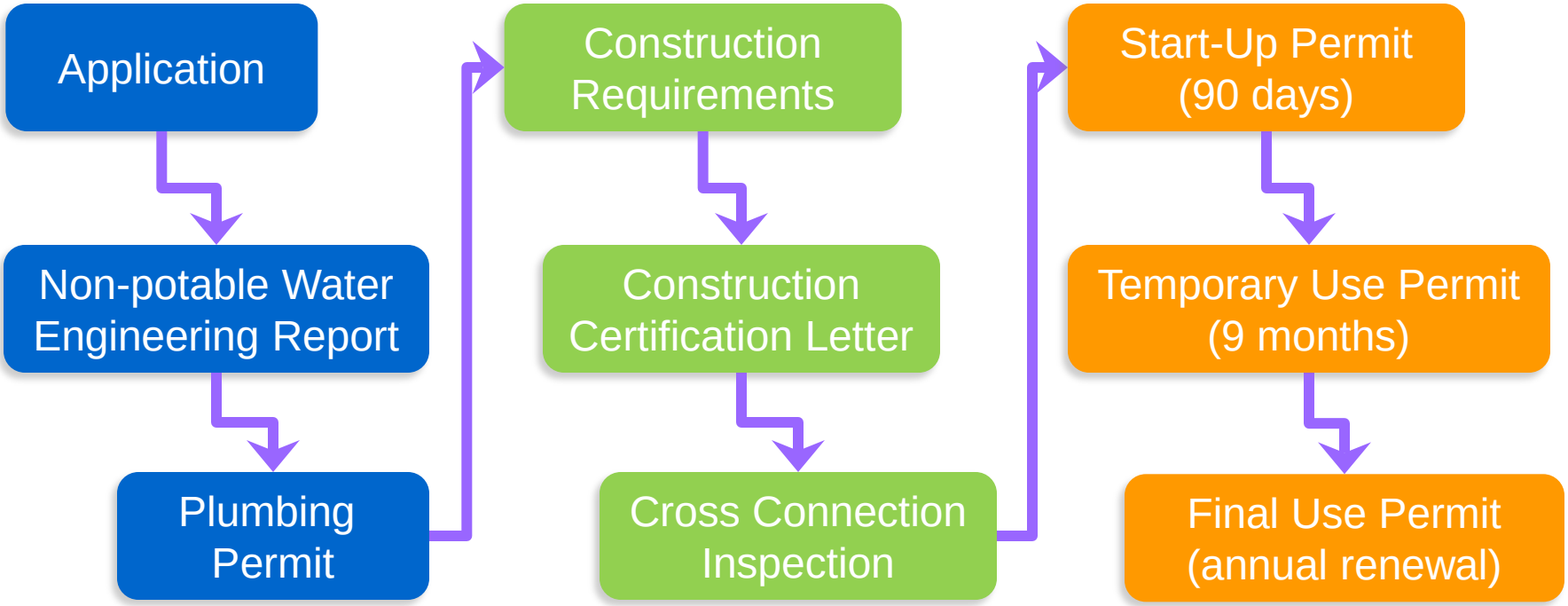
- CPC provides construction requirements
- Who provides ongoing operation and maintenance of alternate water source systems to ensure the protection of public health and the public water system post-construction?

CITY ORDINANCE

New City Ordinance to Streamline Permitting Process

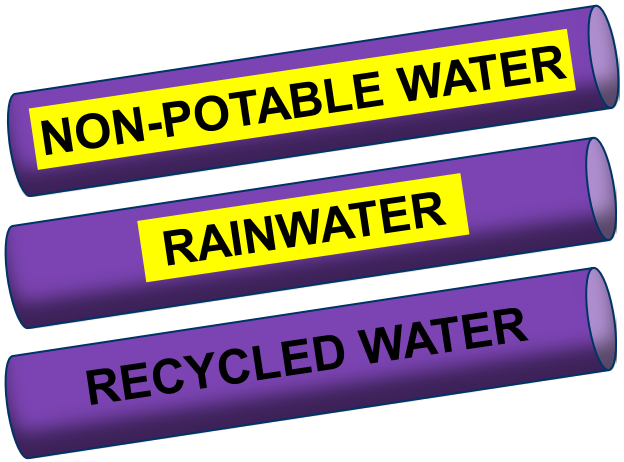
SFPUC	SFDPH	SFDBI
Program Administration	Public Health	Construction
Review on-site non-potable water supplies & demands Administer citywide project tracking & annual potable offset achieved Provide technical support & outreach to developers Provide financial incentives to developers	Issue water quality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

Overview of On-site Systems



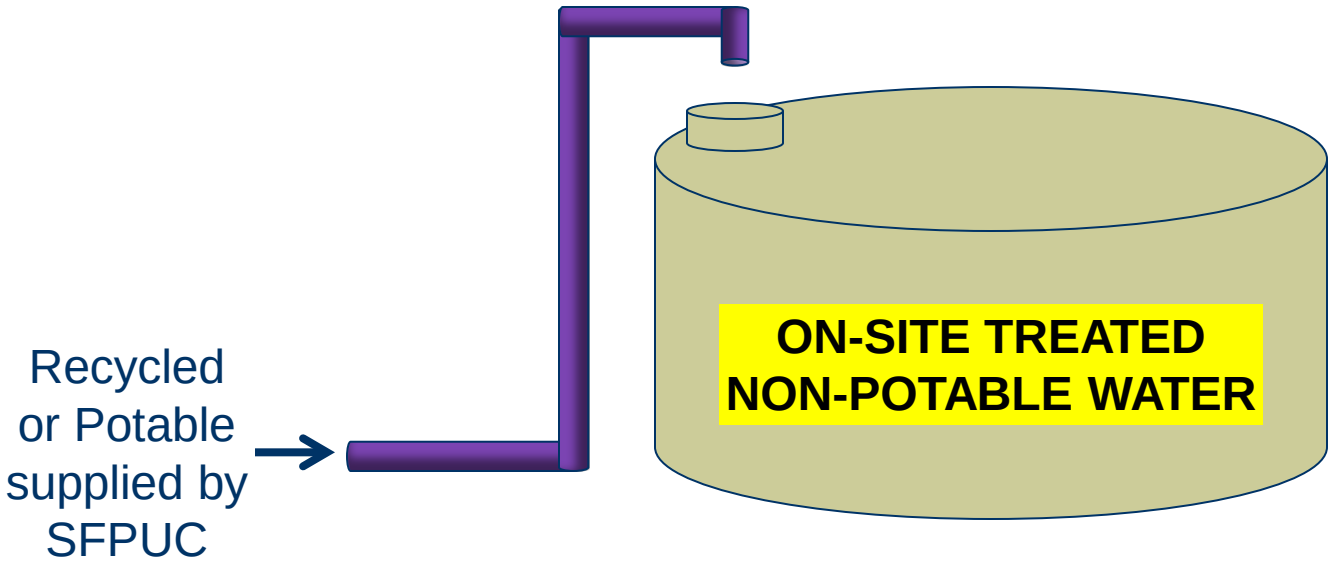
System Construction - Identification

- Purple pipe for all non-potable water
- Pipe labeling and signage will identify type
  - “On-site Treated Non-potable,” “Rainwater,” “Recycled,” etc.
  - Consistent with 2013 California Plumbing Code



System Construction – Make-Up Water

- Municipal recycled water as make-up/backup supply to on-site non-potable water systems:
  - If RW not available, potable water will be supplied
  - Same backflow protection requirements as potable



Water Quality Criteria – Consistent with State Codes

Alternate Water Source	Proposed Regulations
Blackwater	Title 22
Graywater	California Plumbing Code - NSF-350
Rainwater	California Plumbing Code - Table
Stormwater Foundation Drainage	No state codes - SFDPH to establish

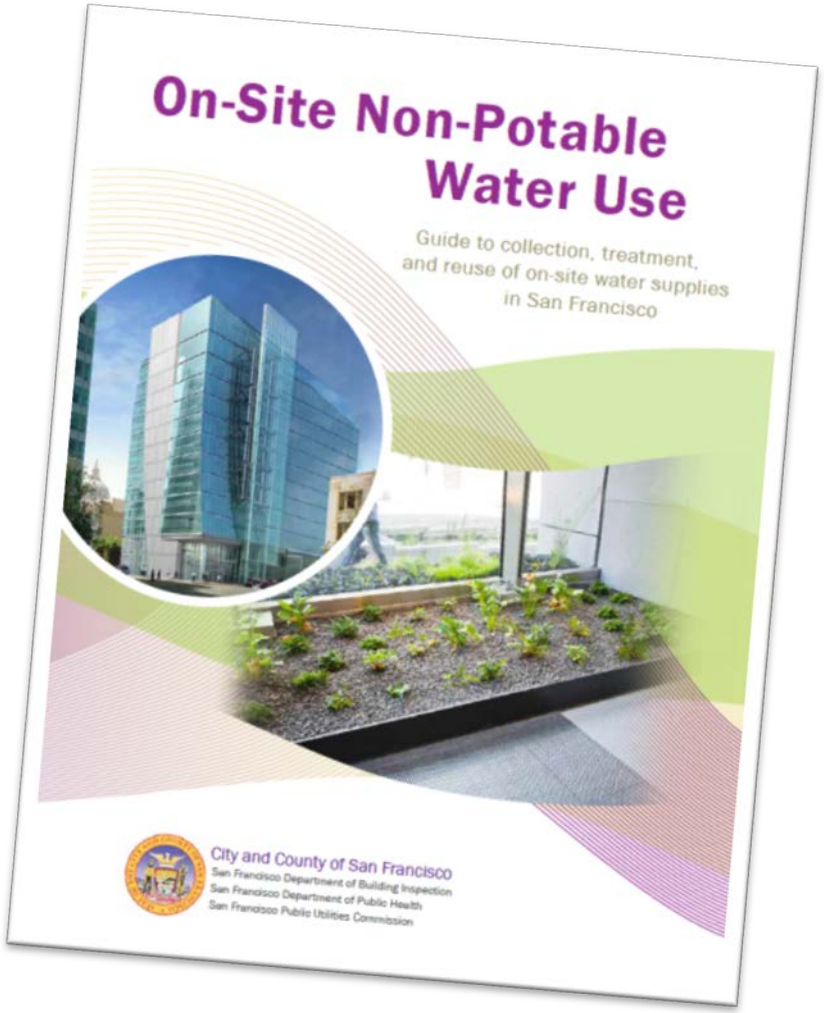
- SFDPH will permit onsite systems and require monitoring and reporting

SFDPH Monitoring and Reporting Frequency

	Rainwater	Stormwater	Foundation Drainage	Graywater	Blackwater
Start-Up Mode *(90 days)*					
Temporary Use Mode *(9 months)*					
Final Use Mode					

SFPUC Provides Technical Assistance and Financial Incentives

- On-site Non-potable Guidebook
- Water Use Calculator
- Grant program
- Project review meetings



Water Use Calculator

NON-POTABLE WATER CALCULATOR

Step 2 of 7:

Project Name:
ABC Building

NON-POTABLE WATER CALCULATOR

Step 4 of 7: Calculate Outdoor Water Demand (Landscape Irrigation, Outdoor Water Features)

NON-POTABLE WATER CALCULATOR

Step 6 of 7: Summary of Building Potential

Project Name:
ABC Building

LEGEND:

User Input	
Linked from User Input	
Default Value	
Autogenerated Value	

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

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

Demand Types	Ave 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	43,821	46,461	55,045	55,979	61,290	64,418	67,319	69,580	72,727	72,729	58,922	46,486
SUBTOTAL	1,957	714,800	43,900	46,500	55,100	56,000	61,300	64,500	67,400	69,600	72,800	72,800	59,000	46,500
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	1,768	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	24,817	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

Estimated Costs for On-site Systems

Bldg. Size (sf)	Treatment Systems ($M)	Dual-Collection System ($M)	Dual- Distribution System ($M)	Total Capital ($M)	% Constr. Cost
500K	0.3 - 0.4	1.1 – 1.8	1.6 –2.6	3.1 – 4.8	2.9% - 3.5%
200K	0.2 - 0.3	0.5 – 0.7	0.6—1.0	1.3 – 1.9	3.1% - 3.5%
100K	0.1 - 0.3	0.2 – 0.4	0.3—0.5	0.8 – 1.0	3.6% - 3.7%
40K	0.1 – 0.3	0.1 – 0.2	0.1—0.2	0.4 – 0.5	4.3% - 5.5%

Grant Program for Large Alternate Water Source Projects

- The SFPUC will offer financial incentives for new projects that replace potable water use with on-site alternate water sources

- Proposed projects shall be **100,000 sf or more**

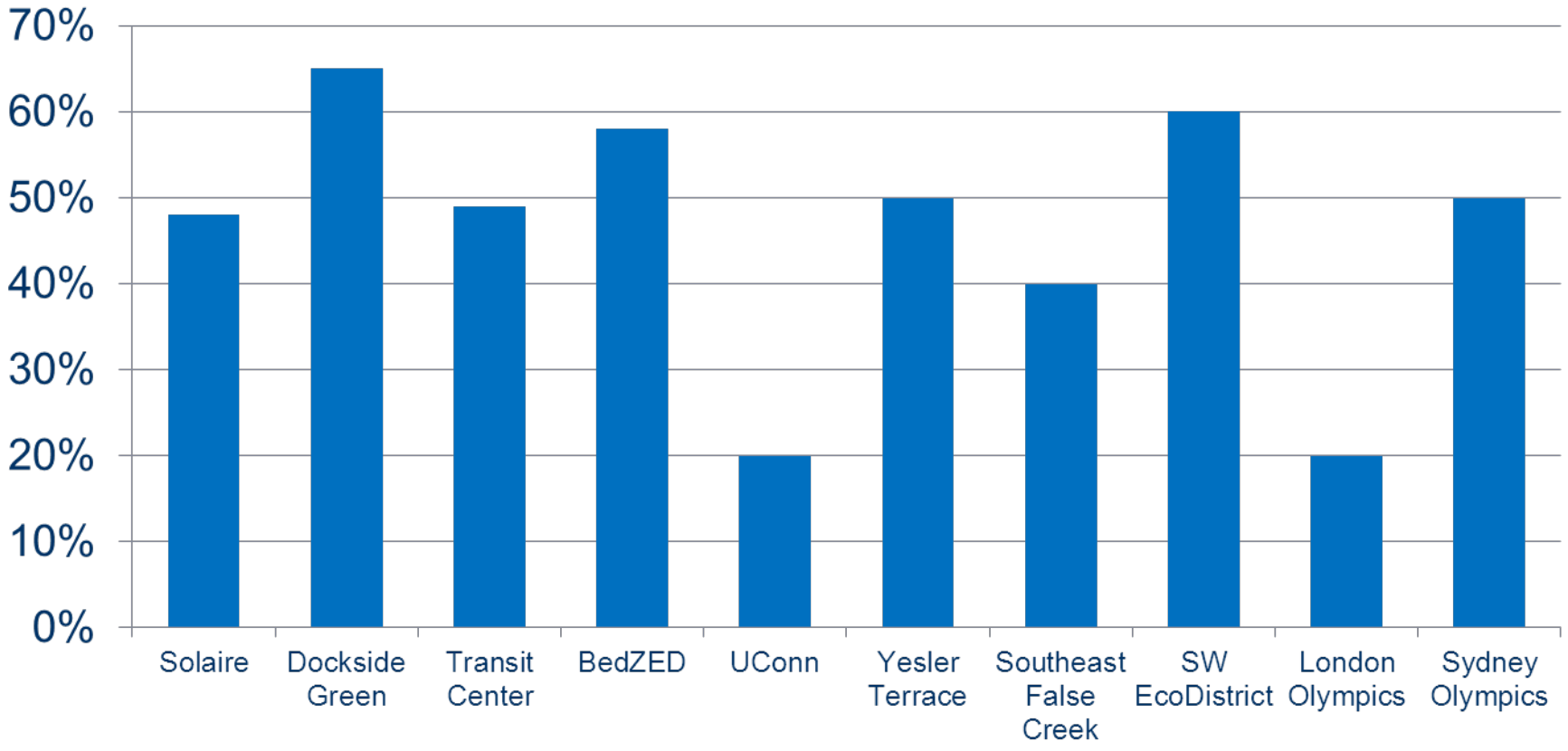
- Proposed projects shall replace potable water use for one of the following:
  - **All toilet flushing demands** or
  - **Reduce 40% of potable water use**

Evaluation of District-Scale

- Identifying regulatory hurdles
- Evaluating ownership models
  - 100% public
  - Public-private partnership (P3)
  - 100% private
- How we will do this in San Francisco?

District-scale Water Reuse is Taking Place Across U.S. and Abroad

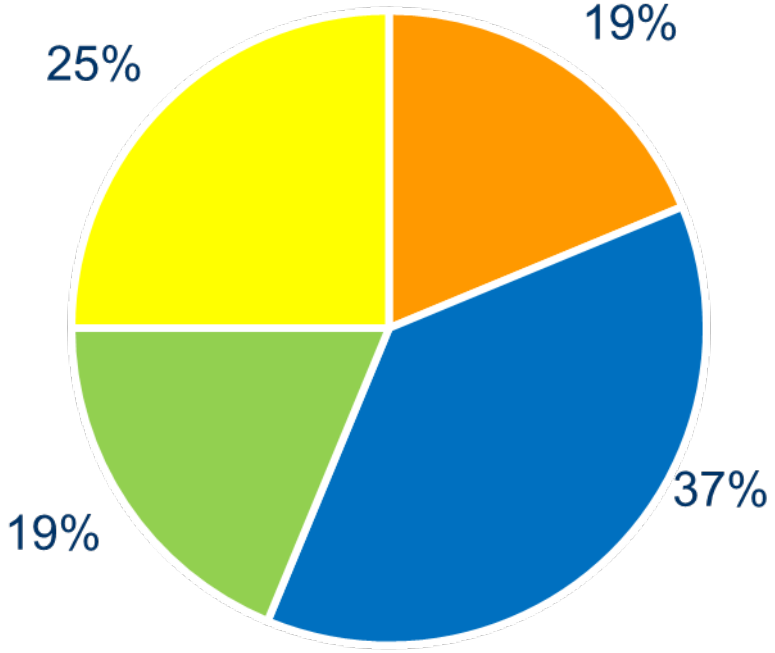
Potable Offset Goals Vary



Small (2 buildings) ← size → Large (1580 acres)

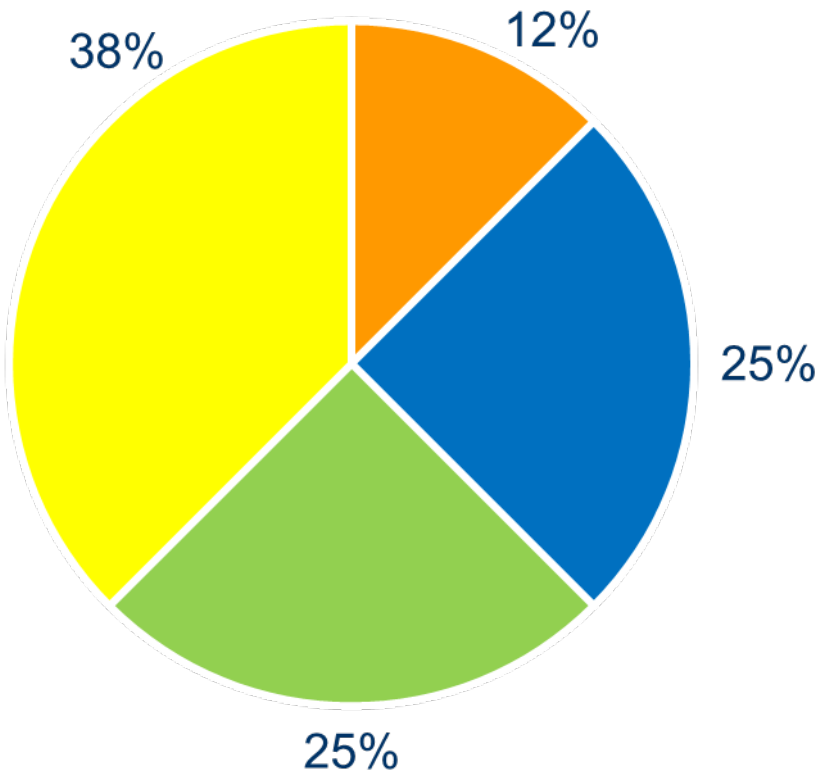
Drivers for District-scale Water Reuse

- Water Resource Need
- Government Mandate
  - Regulatory requirement
  - Redevelopment goal
- Marketability
  - Sustainable certification
  - Public perception
- Motivated Developer
  - Precedent/pilot project
  - Sustainable vision

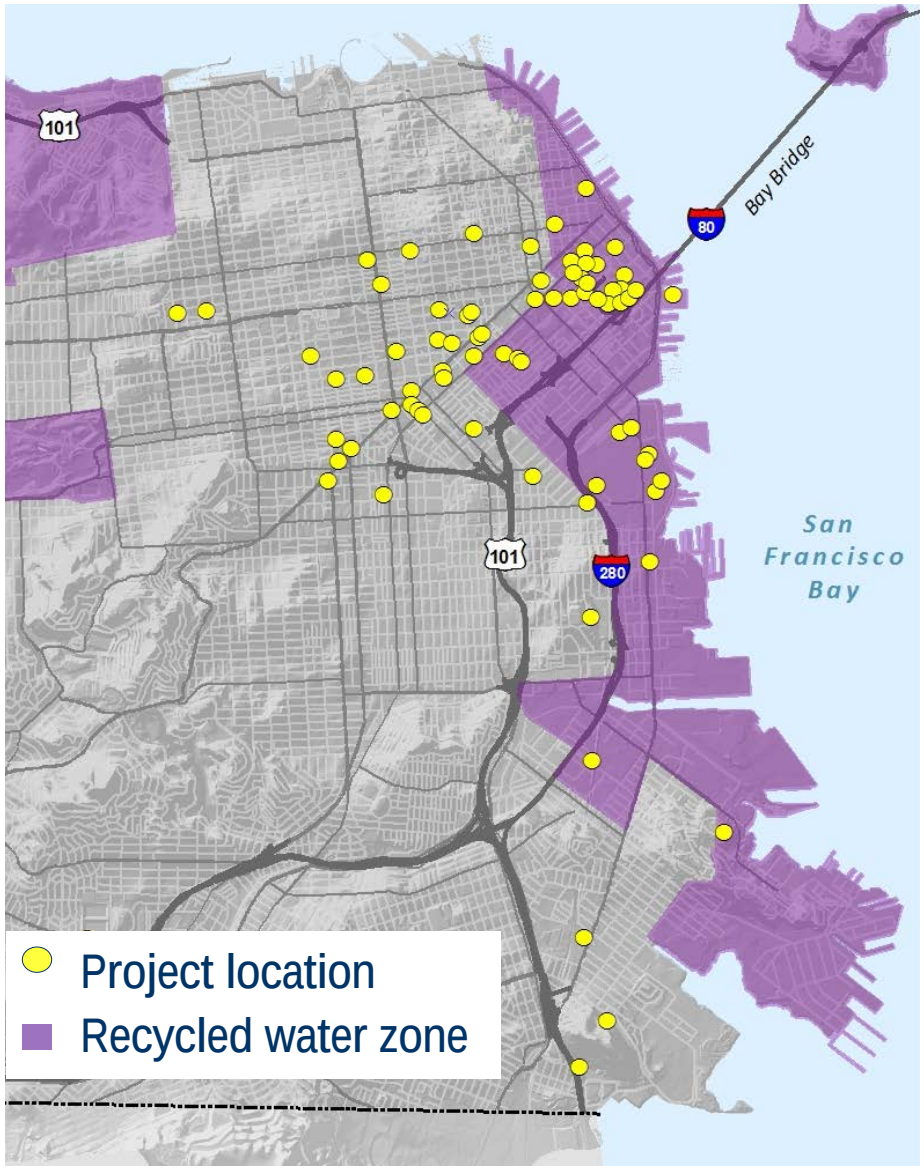


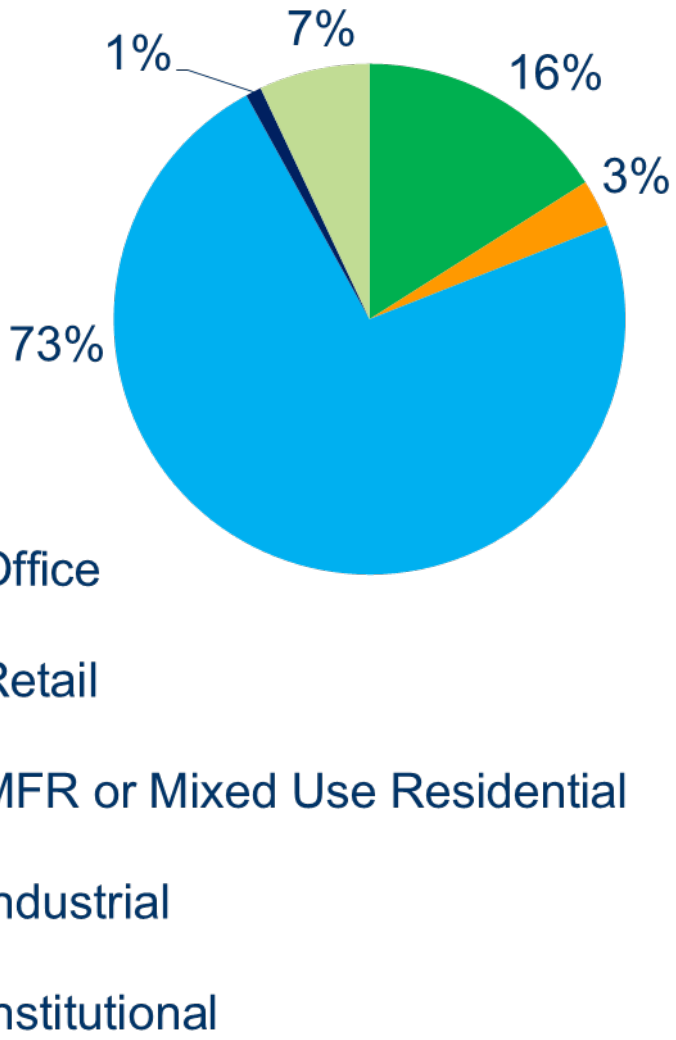
Public Utility's Project Role

- Emergency services only
  - Private ownership and operation
- Public regulation only
  - Private ownership and operation
- Public ownership / Private operation
- Public ownership AND operation



Projected Large-Scale Development in San Francisco (>100,000sf)





District- scale Study Findings

- Forthcoming plumbing code allows sharing of graywater if there is an agreement between adjacent property owners

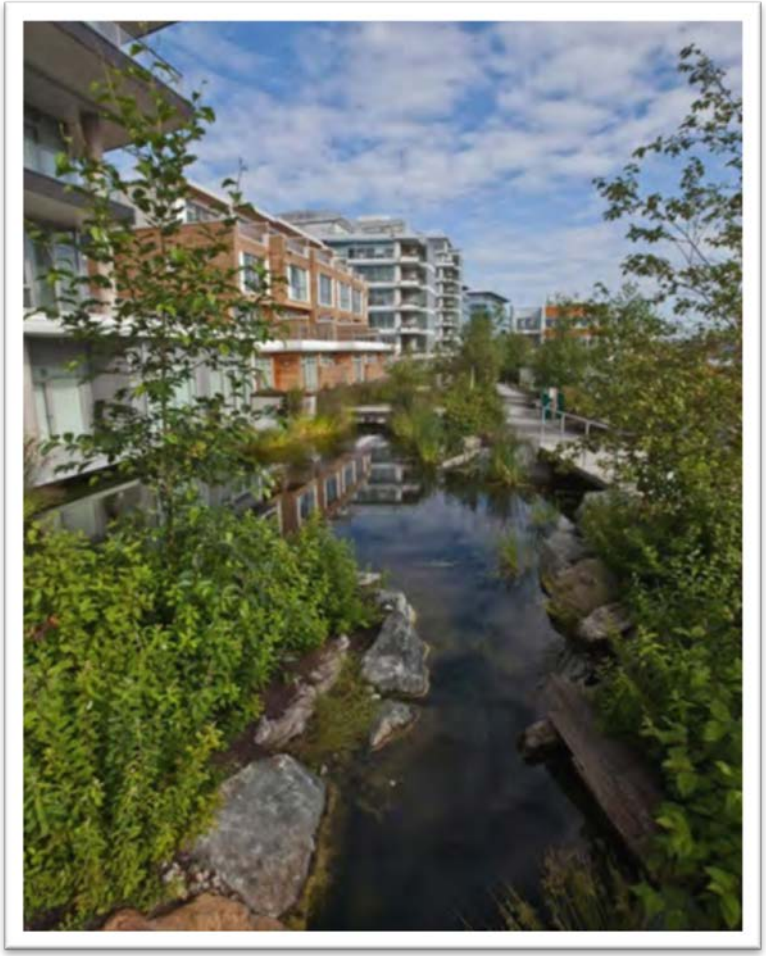
- Water rights not an issue; no downstream water users

- Need to work with state agency with jurisdiction on irrigation

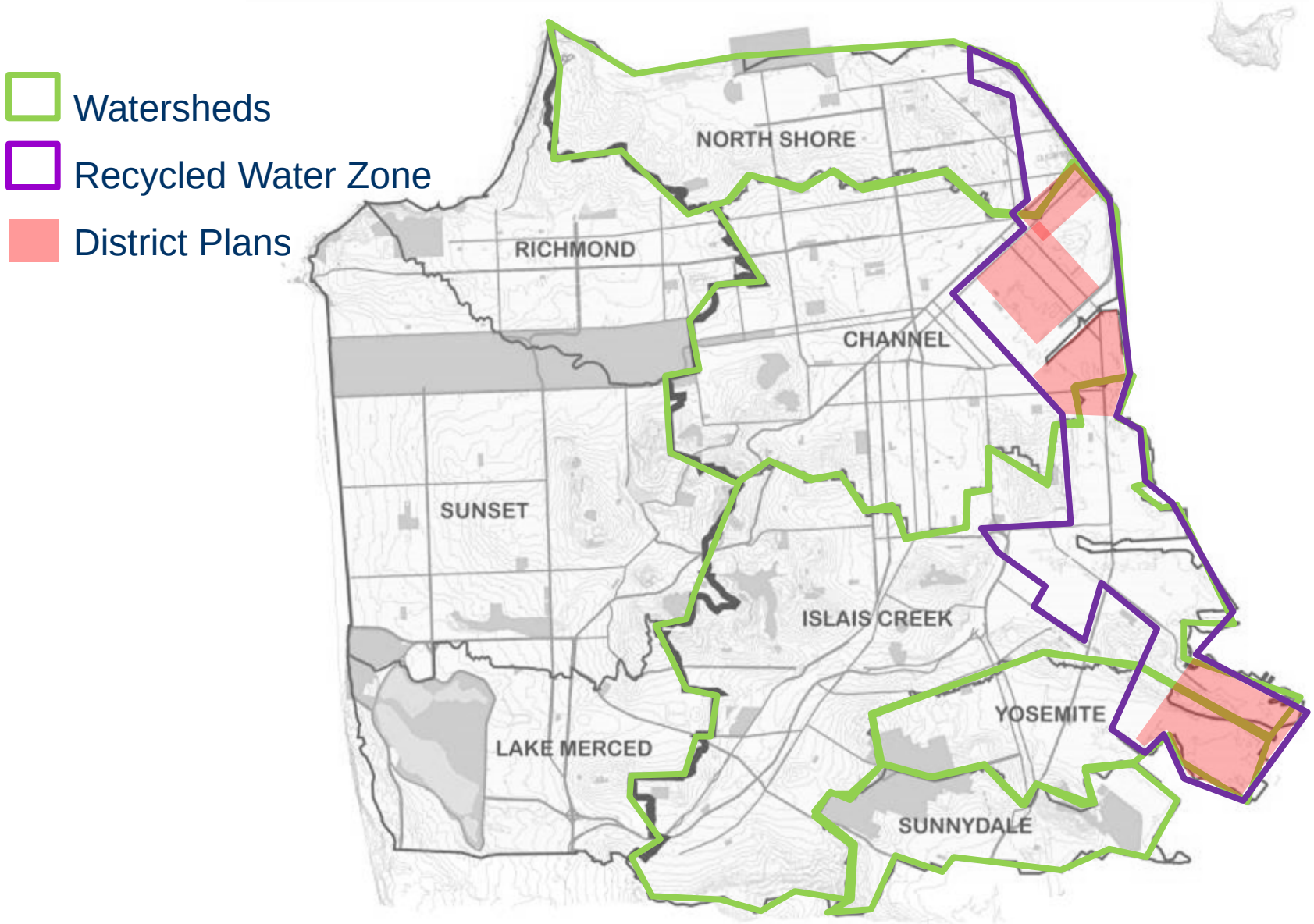
Next Steps

- Amend Non-potable Ordinance to cover district-scale water sharing opportunities

- Establish grant program to encourage district-scale applications



Future Planning: What Scale Works Best for Water Reuse?



Thank You

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