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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Director of Water Resources
San Francisco Public Utilities Commission
Presentation Outline

• Overview of the SFPUC
• Approach to water reuse
• Building-scale reuse applications
• District-scale water sharing opportunities
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
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 on 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
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
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

- **Moscone Center**
  - Foundation drainage for *TBD*

- **Transbay Transit Center**
  - Rainwater & graywater for toilets

- **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?
<table>
<thead>
<tr>
<th>SFPUC</th>
<th>SFDPH</th>
<th>SFDBI</th>
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</thead>
<tbody>
<tr>
<td>Program Administration</td>
<td>Public Health</td>
<td>Construction</td>
</tr>
<tr>
<td>Review on-site non-potable</td>
<td>Issue water quality &amp;</td>
<td>Conduct Plumbing Plan check</td>
</tr>
<tr>
<td>water supplies &amp; demands</td>
<td>monitoring requirements</td>
<td>and issue Plumbing Permit</td>
</tr>
<tr>
<td>Administer citywide project</td>
<td>Review and approve non-potable</td>
<td>Inspect and approve system</td>
</tr>
<tr>
<td>tracking &amp; annual potable</td>
<td>engineering report</td>
<td>installations</td>
</tr>
<tr>
<td>offset achieved</td>
<td>Issue permit to operate on-site systems</td>
<td></td>
</tr>
<tr>
<td>Provide technical support &amp;</td>
<td>Review water quality reporting</td>
<td></td>
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<tr>
<td>outreach to developers</td>
<td></td>
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<tr>
<td>Provide financial incentives</td>
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<td>to developers</td>
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Overview of On-site Systems

Application

Non-potable Water Engineering Report

Plumbing Permit

Construction

Requirements

Construction Certification Letter

Cross Connection Inspection

Start-Up Permit (90 days)

Temporary Use Permit (9 months)

Final Use Permit (annual renewal)

Design

Construction

Operation
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

CAUTION:
ON-SITE TREATED NON-POTABLE WATER
USED FOR IRRIGATION
DO NOT DRINK
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

Recycled or Potable supplied by SFPUC

ON-SITE TREATED NON-POTABLE WATER
## Alternate Water Source

<table>
<thead>
<tr>
<th>Alternate Water Source</th>
<th>Proposed Regulations</th>
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<tbody>
<tr>
<td>Blackwater</td>
<td>Title 22</td>
</tr>
<tr>
<td>Graywater</td>
<td>California Plumbing Code - NSF-350</td>
</tr>
<tr>
<td>Rainwater</td>
<td>California Plumbing Code - Table</td>
</tr>
<tr>
<td>Stormwater</td>
<td>No state codes - SFDPH to establish</td>
</tr>
<tr>
<td>Foundation Drainage</td>
<td></td>
</tr>
</tbody>
</table>

- SFDPH will permit onsite systems and require monitoring and reporting
# SFDPH Monitoring and Reporting Frequency

<table>
<thead>
<tr>
<th></th>
<th>Rainwater</th>
<th>Stormwater</th>
<th>Foundation Drainage</th>
<th>Graywater</th>
<th>Blackwater</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start-Up Mode</strong></td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Red" /></td>
</tr>
<tr>
<td>(90 days)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Temporary Use Mode</strong></td>
<td><img src="#" alt="Gray" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Red" /></td>
</tr>
<tr>
<td>(9 months)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Final Use Mode</strong></td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Yellow" /></td>
<td><img src="#" alt="Red" /></td>
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- **Less Rigorous/Frequent**
- **More Rigorous/Frequent**
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:**

**NON-POTABLE WATER CALCULATOR**

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

**Step 6 of 7:** Summary of Building Potential

**Project Name:** ABC Building

**LEGEND:**

- User Input
- Default Value
- Auto-generated Value

**Instructions:**

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

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

<table>
<thead>
<tr>
<th>Demand Types</th>
<th>Average Monthly Demand (gal/day)</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APARTMENT</strong></td>
<td>1,957</td>
<td>734,775</td>
<td>43,524</td>
<td>44,464</td>
<td>55,045</td>
<td>55,045</td>
<td>61,200</td>
<td>61,200</td>
<td>61,200</td>
<td>61,200</td>
<td>61,200</td>
<td>61,200</td>
<td>61,200</td>
</tr>
<tr>
<td><strong>BUILDING TOTAL</strong></td>
<td>7,077</td>
<td>1,054,356</td>
<td>283,580</td>
<td>283,580</td>
<td>283,580</td>
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</tr>
</tbody>
</table>

**GRAND TOTAL:** 13,047, 4,056,700
## Estimated Costs for On-site Systems

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

- **Southeast False Creek**, Vancouver, Canada
- **Kwan Lamah Subdivision**, San Juan Island, WA
- **Dockside Green**, Victoria, Canada
- **Yesler Terrace Sustainable District Study**, Seattle, WA
- **Capitol Hill Eco District**, Seattle, WA
- **Grow Community**, Bainbridge Island, WA
- **Portland Ecodistrict—South Waterfront**, Portland, OR
- **Sonoma Mountain Village**, Rohnert Park, CA
- **Transbay Transit Center**, San Francisco, CA
- **Children’s Project Academy**, Los Alamos, CA
- **Tempe Transit Center**, Tempe, AZ
- **Serenbe Community**, Fulton County, GA
- **Petite Riviere**, Montréal, Canada
- **Port Whitby Sustainable Community Plan**, Port Whitby, Ontario, Canada
- **Cleveland EcoVillage**, Cleveland, OH
- **University of Connecticut (UCONN)**, Storrs, CT
- **Omega Center for Sustainable Living**, Rhinebeck, NY
- **Solaire Towers**, New York, NY
- **Paseo Verde**, Philadelphia, PA
- **SW Ecodistrict**, Washington, D.C.
- **London Olympics**, London, UK
- **South Bank Phase 1**, Peterborough, UK
- **Hanham Hall**, South Gloucestershire, UK
- **One Brighton**, Brighton, UK
- **One Gallions**, East London, UK
- **BedZED**, London, UK
- **Augustenborg**, Malmö, Sweden
- **Mata de Sesimbra**, Peninsula de Setubal, Portugal
- **Shopping Mall in São Paulo**, Brazil, São Paulo, Brazil
- **Sydney Olympics**, Sydney, Australia
Potable Offset Goals Vary

San Francisco Water Power Sewer

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

Graph showing the distribution of project roles:
- Emergency services only: 38%
- Public regulation only: 12%
- Public ownership / Private operation: 25%
- Public ownership AND operation: 25%
Projected Large-Scale Development in San Francisco (>100,000sf)

- Office: 73%
- MFR or Mixed Use Residential: 16%
- Industrial: 3%
- Retail: 1%
- Institutional: 7%
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?

- Watersheds
- Recycled Water Zone
- District Plans
Thank You

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