San Francisco’s Non-potable Water System Projects

San Francisco Public Utilities Commission
May, 2014
San Francisco’s Non-potable Water Program creates a regulatory framework and streamlined permitting process for commercial, multi-family, and mixed-use developments in San Francisco to collect, treat, and reuse alternate water sources for toilet flushing, irrigation, and other non-potable uses. Established through Ordinance 195-12, adopted by the San Francisco Board of Supervisors in September 2012, this program establishes guidelines for developers interested in installing non-potable water systems in buildings and local regulations to ensure appropriate water quality standards. In October 2013, the Ordinance was amended to allow for buildings to share treated alternate water sources for non-potable applications.

In dense, urban centers like San Francisco, the use of on-site alternate water sources is a key strategy for expanding potable water savings. Alternate sources of water that can be used in a non-potable water system are:

- Rainwater – precipitation collected from roofs or other manmade above grade surfaces
- Stormwater – precipitation collected from at or below grade surfaces
- Graywater – wastewater from bathroom sinks, showers, and washing machines
- Blackwater – graywater and wastewater from kitchen sinks and toilets
- Foundation Drainage – nuisance groundwater that floods basements
- Other sources as approved by the San Francisco Department of Public Health (SFDPH)

San Francisco’s Non-potable Water Program is a collaborative program involving three San Francisco agencies: San Francisco Public Utilities Commission (SFPUC), San Francisco Department of Public Health (SFDPH), and San Francisco Department of Building Inspection (SFDBI). The SFPUC provides technical and financial assistance to assist developers through the processes for permitting, installing, and operating non-potable water systems. SFDPH regulates the water quality and monitoring requirements. SFDPH also issues operating permits and establishes reporting requirements for on-site treatment systems. SFDBI oversees the design and construction of non-potable water systems, and issues final approvals for building occupancy. Each project proponent must ensure that the project is designed and installed safely, complies with applicable laws and regulations, and is operated in a manner that causes no harm or damage to building occupants or others.

This report details developments in San Francisco that are currently operating or are in the process of installing a non-potable water system. As more of these systems are installed in San Francisco, they will be added to this report.

More information about San Francisco’s Non-potable Water Program, including a developers guidebook, is available at: www.sfwater.org/np.

If you have questions or need additional assistance, please email nonpotable@sfwater.org.
In the summer of 2012, the San Francisco Public Utilities Commission (SFPUC) completed construction of its new, 277,500 square-foot headquarters at 525 Golden Gate Avenue in San Francisco's Civic Center District. The LEED Platinum building, housing approximately 950 employees, contains two non-potable water systems – a Living Machine® and a rainwater harvesting system.

The Living Machine®, treats all of the building’s wastewater, up to 5,000 gallons per day, and then distributes the treated water for toilet flushing. The system reduces the building’s potable water consumption by approximately 65% and provides an annual potable offset of approximately 1,500,000 gallons. The system utilizes a series of diverse ecologically engineered wetlands, located in the sidewalks surrounding the headquarters and in the building lobby, to treat the wastewater. This unique treatment process blends function and aesthetics – the wastewater is treated to San Francisco Department of Public Health (SFDPH) reuse standards while providing a high-profile pilot project for on-site water reuse.

The building also has a 25,000 gallon cistern to capture rainwater from the building’s roof and children day care center’s play area. The water is treated and distributed to nine irrigation zones around the building where it is used for subsurface irrigation for non-Living Machine plantings and street trees. Due to the use of water-efficient landscaping, the rainwater cistern provides more than enough non-potable water to meet all of the building’s annual irrigation demands. The rainwater harvesting system provides an annual potable offset of approximately 8,000 gallons.

Drivers for Non-potable Water Reuse:
From the beginning of the planning stage for the building, the SFPUC’s goal was to have a headquarters that demonstrated the agency’s ambitious sustainability goals and served as an example for building smart, efficient, and sustainable buildings. As a water, wastewater, and power utility, the SFPUC recognized an opportunity to demonstrate its commitment to sustainable and innovative practices in water treatment and reuse by installing low-energy, high-profile non-potable water systems at its headquarters.

Installing the Living Machine also provided a pilot project for the San Francisco Non-potable Program, which was created by an ordinance adopted by the San Francisco Board of Supervisors in September 2012. The Living Machine became the test case for the program, providing the SFPUC, SFDPH, and San Francisco...
Department of Building Inspection (SFDBI) with a project for the agencies to test and demonstrate the ideal methods for installing, permitting, and regulating non-potable water systems.

Implementing the non-potable water systems also allowed the headquarters to obtain additional LEED points towards LEED Platinum certification. The project received an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the systems.

Finally, the rainwater harvesting system allows SFPUC headquarters to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

Ownership Model:
The Living Machine and rainwater harvesting system are owned, operated, and maintained by the SFPUC. The SFPUC’s lead operator for the systems is a State of California Certified Grade V Wastewater Treatment Plant Operator. The operator has received extensive training on how to operate and maintain both systems.

Project Cost:
The Living Machine, rainwater harvesting system, and their distribution piping cost approximately $1,000,000. The non-potable water systems increased the building’s total construction costs of $146.5 million by less than 1%.

Annual Operations & Maintenance Cost: TBD

Service Costs to Residents or Tenants: Not applicable

Reference: John Scarpulla, San Francisco Public Utilities Commission (jscarpulla@sfwater.org)
The Exploratorium — Pier 15

Project Status: Online
SFDPH Permit Issued: Pending. NPDES Permit received from Water Quality Control Board.
Size: 333,000 square feet
Alternate Water Sources:
• Rainwater
• Bay water
End Uses:
• Toilet flushing
• Heating and cooling
Volume: Up to 2,364,000 gallons/year (rainwater harvesting system and Bay water heating and cooling system)
Potable Water Use Reduction: 30% (rainwater harvesting system only)
Driver(s): Project sustainability goals, public education, LEED Platinum Certification, and mandate (San Francisco Stormwater Management Ordinance)
System Cost: Not available
Annual O&M Cost: TBD
Owner: The Exploratorium

Project Description:
After spending 44 years at the Palace of Fine Arts, in April of 2013, the internationally renowned Exploratorium moved to its new 330,000 square feet of indoor and outdoor exhibit space on Pier 15. The LEED Platinum museum, host to over 1,000,000 visitors in its first year, houses more than 600 exhibits and experiences for guests to explore and tinker. The new location, literally on top of San Francisco Bay, is being called a twenty-first-century learning laboratory, and is equipped with oceanographic equipment, which measures the height and direction of tides, pollutants in the air, and the weather.

One of the core goals of the Exploratorium is sustainability. This goal is showcased throughout the museum, and has been validated with the building’s LEED Platinum designation. A major goal the museum is working towards is to become the largest net-zero energy use museum in the United States. Water conservation is also a goal of the museum. In addition to the over 78,000 square feet of solar panels, the Exploratorium utilizes Bay water in its heating and cooling system, eliminating the need for a cooling tower, thereby saving an annual 2,000,000 gallons of water. To install the Bay water system, the Exploratorium had to obtain a National Pollutant Discharge Elimination System (NPDES) Permit from the local State of California Regional Water Quality Control Board to ensure that the system would not negatively impact the aquatic life and water quality of the Bay. The Exploratorium also has to provide annual reports to the
State to show compliance with their NPDES permit requirements.
The Exploratorium also has a 38,600-gallon cistern, which captures rainwater from the roof for toilet flushing purposes. The rainwater harvesting system can save up to 364,000 gallons annually, reducing water usage by approximately 30% in a year of average rainfall. Finally, the building is equipped with high-efficiency dual-flush toilets, waterless urinals, and low-flow sensor-operated faucets—reducing water consumption by another 30%.

Drivers for Non-potable Water Reuse:
From the beginning of the design stages for the Exploratorium, two primary objectives were to have a building that demonstrated the museum’s ambitious sustainability goals and served as a localized example of how buildings can be built in response to climate change. Incorporating the Bay water heating and cooling system and the rainwater harvesting system helped to achieve these objectives.

Implementing the alternate water systems also allowed the Exploratorium to obtain additional LEED points to help the project achieve LEED Platinum certification. The project received an additional six Water Efficiency (WE) points and two Regional Priority (RP) points by implementing the systems.

Finally, the rainwater harvesting system also allows the Exploratorium to fulfill the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

Ownership Model:
The Bay water cooling and heating system and rainwater harvesting system are owned, operated, and maintained by the Exploratorium.

Project Cost:
The new Exploratorium cost $220 million to build. The specific costs for the Bay water cooling and heating system cost and the rainwater harvesting system are not available. The NPDES permit from the Regional Water Quality Control Board for the Bay water heating and cooling system cost $1,943 in 2011.

Annual Operations & Maintenance Cost: TBD

Service Costs to Residents or Tenants: Not applicable

Reference: Jennifer Fragomeni, The Exploratorium (jfragomeni@exploratorium.edu)
Whole Foods Mixed-use Development — 38 Dolores Street

38 Dolores Street (image courtesy of BAR Architects)

Project Status: Online
SFDPH Permit Issued: N/A (a rainwater harvesting project for non-spray irrigation does not need a permit)
Size: 195,000 square feet
Alternate Water Sources: • Rainwater
End Uses: • Subsurface irrigation • Drip irrigation
Volume: 26,000 gallons/year
Potable Water Use Reduction: 26% for irrigation; 1.3% total project reduction
Driver(s): LEED Points, Sustainable SITES Pilot Project Certification, and mandate (San Francisco Stormwater Management Ordinance)
System Cost: Not available
Annual O&M Cost: Negligible
Owner: The Prado Group (Market Dolores LLC)

Project Description:
In fall 2013, the Prado Group (Market Dolores LLC) completed construction on a new 195,000 square-foot mixed-use development containing 81 residential rental units and a 30,000 square-foot Whole Foods grocery store on the ground level. Targeted for LEED Gold, the development – located between Market Street, Dolores Street, and 14th Street – contains a 16,200 gallon cistern that collects rainwater from all rooftop surfaces (traditional roofs, green roof, and flow-through planters). The harvested rainwater is used to irrigate all landscaping within the development via subsurface and drip irrigation systems. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event, while also taking into consideration the project’s monthly irrigation demand. The project will offset an estimated 26,000 gallons of potable water annually.

The project does not have a permit from the San Francisco Department of Public Health because rainwater systems that, at a minimum, include both a first flush diverter and a 100 micron filter, and are used for subsurface irrigation, drip irrigation, or non-spray surface irrigation, do not need one.
Drivers for Non-potable Water Reuse:
The project team installed the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 16,200 gallon cistern enabled the project to meet these requirements.

The project also installed the rainwater harvesting system to obtain LEED points to help the project achieve LEED Gold Certification. Additionally, the project was designed and certified as a Sustainable SITES Pilot Project, which also was a driver for installing the system. Sustainable SITES certification is given to projects that use sustainable practices that enable built landscapes to support natural ecological functions by protecting existing ecosystems and regenerating ecological capacity where it has been lost.

Ownership Model:
The rainwater harvesting system is owned, operated, and maintained by the Prado Group (Market Dolores LLC), which owns the development and leases the commercial spaces and residential units to tenants.

Project Cost:
The total hard cost for the project was $48 million. The contractor did not break out the cost of the rainwater harvesting system as a discrete item.

Annual Operations & Maintenance Cost:
The cost to operate and maintain the rainwater harvesting system is negligible.

Service Costs to Residents or Tenants:
There are no service costs to the commercial or residential tenants for use of the rainwater.

Reference: Jon Yolles, The Prado Group (jyolles@pradogroup.com); Eric Girod, BKF Engineers (egirod@bkf.com)
PG&E Service Center — 2270 Folsom Street

Project Description:
PG&E’s recently remodeled San Francisco Service Center Garage is the first PG&E building to earn LEED Platinum certification. The 145,000 square-foot facility, located at 2270 Folsom Street, was originally constructed in 1929. It is primarily used to house gas and electric service vehicles, with some office and shop space. PG&E remodeled the building to improve customer safety and to transform the building into a modern, environmentally-sustainable facility.

One unique challenge that the project design team and general contractor, CB2 Builders, dealt with was how to sustainably manage nuisance groundwater from a nearby underground stream. Understanding that the building is located in an area with high groundwater and had been ejecting nuisance foundation drainage to the sewer to maintain structural integrity, the design team proposed to capture and treat this water for toilet flushing purposes instead of diverting it to the sewer. By using foundation drainage to flush toilets, the project reduces potable water consumption by approximately 81% and provides an annual potable offset of 170,000 gallons.

Project Status: Under construction (estimated completion spring 2014)
SFDPH Permit Issued: No
Size: 145,000 square feet
Alternate Water Sources:
- Foundation drainage

End Uses:
- Toilet flushing

Volume: 170,000 gallons/year
Potable Water Use Reduction: 81%
Driver(s): Manage nuisance groundwater
System Cost: TBD
Annual O&M Cost: TBD
Owner: PG&E
Drivers for Non-potable Water Reuse:
Managing the nuisance groundwater in a sustainable manner was the primary driver for installing the non-potable water system. The system also contributed eight LEED points towards the LEED Platinum certification: six Water Efficiency (WE) points and two Regional Priority (RP) points.

Ownership Model:
The entire facility, including the foundation drainage treatment and reuse system, is owned, operated, and maintained by PG&E.

Project Cost:
TBD

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
Not applicable

Reference: Nick LaFollette, CB2 Builders
(nick@cb2builders.com)
Project Description:
The 300,000 square-foot Public Safety Building (PSB) project is a City and County of San Francisco facility that consists of a new six-story building and the rehabilitation of Fire Station #30. The PSB facility will house the Police Headquarters, the relocated Southern Police Station, and the new Fire Station #4. The renovated space in the former Fire Station #30 will provide a community meeting space and offices for the San Francisco Fire Department (SFFD) Arson Task Force.

The PSB will be capturing, treating, and reusing multiple alternate water sources using two separate non-potable water systems. The first non-potable water system will treat a combined flow of graywater and condensate drainage for toilet flushing purposes. The proposed system will provide enough treated non-potable water to cover all of the building’s toilet flushing demand, reducing the building’s annual potable water demand by approximately 333,000 gallons.

The building will also have a rainwater harvesting system that will collect rainwater from the building’s roofs and convey it to a 44,500 gallon cistern in the basement. The rainwater will be filtered and disinfected, then used for subsurface irrigation and as make-up water for the closed-loop cooling tower system. The cistern will always maintain a minimum...
water volume of 24,000 gallons in order to ensure a 96-hour emergency reservoir for cooling tower make-up. The system will offset an estimated 415,000 gallons of potable water annually.

**Drivers for Non-potable Water Reuse:**
The City and County of San Francisco requires all new public buildings to achieve LEED Gold certification. Installing the two non-potable water systems provides the PSB project an additional eight LEED points, thus helping the project achieve LEED Gold certification. The project team is also installing the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm.

**Ownership Model:**
The City and County of San Francisco is the owner of the non-potable water systems and will be responsible for assigning appropriate personnel to operate and maintain them.

**Project Cost:**
The construction cost for the two systems is still being determined by the PSB project team. The total cost for the PSB project is $239 million. The Earthquake Safety and Emergency Response Bond which was passed by voters in June 2010, is funding the project.

**Annual Operations & Maintenance Cost:**
TBD

**Service Costs to Residents or Tenants:**
Not applicable

Reference: Samuel Chui, Department of Public Works (samuel.chui@sfdpw.org)
Market Street Place — 945 Market Street

Project Status: Under construction (estimated completion spring 2015)
SFDPH Permit Issued: No
Size: 283,940 square feet with 91,870 square feet of sub-grade parking.
Alternate Water Sources:
- Rainwater
End Uses:
- Toilet flushing
- Cooling tower make-up
Volume: 446,000 gallons/year
Potable Water Use Reduction: 12%
Driver(s): LEED points and mandate (San Francisco Stormwater Management Ordinance)
System Cost: TBD
Annual O&M Cost: TBD
Owner: CRP/Cypress Market Street LLC

Project Description:
The 283,940 square-foot Market Street Place, scheduled to open in 2015, is a brand new, six-level retail center with 91,870 square feet of subgrade parking located at 945 Market Street. Situated between 5th and 6th Streets, the center contains an 18,300 gallon cistern which collects rainwater from a 48,000 square-foot roof. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event. Treatment for the rainwater will be provided by a Water Control Corporation RW-Series Skid Mounted Water Reclamation Packaged System consisting of 25 and 5 micron filtration followed by ultraviolet (UV) disinfection. After treatment and disinfection, the harvested rainwater will be used for cooling tower make-up and to flush 54 toilets and 18 urinals. The system will offset an estimated 446,000 gallons of potable water annually, reducing the project’s potable water use by approximately 12%.

Drivers for Non-potable Water Reuse:
The project team installed the rainwater harvesting system to obtain the LEED innovation in design credit of 40% potable water use reduction.
The project team is also installing the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with an 18,300 gallon cistern enables the project to meet these requirements.

**Ownership Model:**
The rainwater harvesting system is owned by CRP/Cypress Market Street LLC, who will contract a building management firm for operation. The contracted building operator will operate and maintain the system.

**Project Cost:**
TBD

**Annual Operations & Maintenance Cost:**
TBD

**Service Costs to Residents or Tenants:**
There are no service costs to the commercial tenants for use of the rainwater.

Reference: Phillip Alexander, Randall Lamb (PAlexander@RandallLamb.com); and Kathy Kwong, Gensler (Kathy_Kwong@Gensler.com)
Project Status: In predevelopment (demolition of the existing structure is anticipated to start in September 2014 and completion of construction is anticipated by fall 2016)

SFDPH Permit Issued: No

Size: 69,000 square feet

Alternate Water Sources:
• Rainwater

End Uses:
• Toilet flushing

Volume: 45,000 gallons/year

Potable Water Use Reduction: 10%

Driver(s): Project sustainability goals and mandate (San Francisco Stormwater Management Ordinance)

System Cost: $280,000 (estimated)

Annual O&M Cost: TBD

Owner: Mercy Housing California

Project Description:
Located in the South of Market neighborhood in San Francisco, the 69,000 square-foot Bill Sorro Community, is a 100% affordable housing development. The project will demolish an existing building in favor of a nine-story, 85 foot tower with 67 affordable family apartments, restaurant, retail, and community space. Scheduled to open in 2016, the new project is proposing to install a 3,000 gallon cistern to collect rainwater from an 8,800 square-foot roof. The cistern is sized to hold the required average annual detention volume associated with the San Francisco Stormwater Management Ordinance design storm event. Treatment for the rainwater will consist of particulate filters to remove the suspended solids and ultraviolet (UV) disinfection prior to being distributed throughout the building for toilet flushing purposes. The system will offset an estimated 45,000 gallons of potable water annually, reducing the project’s potable water use by approximately 10%.

The project is also located in a designated recycled water use area under San Francisco’s Recycled Water Use Ordinance, and therefore will be plumbed to be ready for the eventual use of SFPUC recycled water for toilet flushing when rainwater is not available.
Drivers for Non-potable Water Reuse:
The project team will install the rainwater harvesting system to meet the requirements of the San Francisco Stormwater Management Ordinance. The Stormwater Management Ordinance requires projects disturbing 5,000 square feet or more of the ground surface to decrease the project’s post-construction stormwater runoff rate and volume by 25% for the 2-year 24-hour design storm. Installing a rainwater harvesting system with a 3,000 gallon cistern enables the project to meet these requirements. Another driver for implementing the rainwater harvesting system is to meet project sustainability goals, include exceeding the San Francisco Green Building Ordinance GreenPoint Rated system for multi-family buildings.

Ownership Model:
Mercy Housing California (MHC) is the owner/developer of the Bill Sorro Community. The City and County of San Francisco owns the land under the building, so there will be a ground lease for the land with the City and County of San Francisco. MHC will assign staff with the appropriate backgrounds from their maintenance team to be responsible for operating and maintaining the rainwater harvesting system. Maintenance staff will be trained by the system manufacturer at the completion of the construction for continued operation and maintenance. The basic operations, inspection schedule, and routine preventative maintenance of the non-potable rainwater collection system will be covered during this initial training.

Project Cost:
The total cost for the rainwater harvesting system is estimated to be approximately $280,000.

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
There are no service costs to the tenants for the use of the rainwater.

Reference: Sharon Christen, Mercy Housing California (schristen@mercyhousing.org)
Project Description:
The Transbay Transit Center plans to capture, filter, and reuse graywater and stormwater through green infrastructure systems. Treated stormwater and graywater will supply about 3.5 million gallons of non-potable water for toilet flushing each year and will meet 25% of the building’s annual flushing demand. While the actual volume of non-potable water will vary seasonally depending on available stormwater, the water reuse system in combination with water-efficient fixtures is expected to reduce annual potable water demand by 49%, or about 12 million gallons (33,000 gallons per day), and sewage conveyance by 50% over a LEED baseline building.

Given that the project is located in a designated recycled water use area under the City’s Recycled Water Use Ordinance, dual-plumbing will be required for eventual use of SFPUC recycled water. Irrigation uses at the Transbay Transit Center will be supplied with potable water from the SFPUC until municipal recycled water becomes available.
Drivers for Non-potable Water Reuse:

Pelli Clarke Pelli Architects submitted the winning proposal in a design competition held by the Transbay Joint Powers Authority for the Transbay Transit Center project. Pelli Clarke Pelli pursued a unique design that included elements such as reduced water use and a vegetated 5-acre Roof Park. Regulatory requirements were implemented at the time of design development, notably the SFPUC’s Stormwater Design Guidelines (SDG), which require the project to manage a portion of stormwater runoff on site. Complying with the SDG meant that the project would need to incorporate stormwater storage, and using this storage for a water reuse system helped make the SDG requirements more achievable. Although the vegetated Roof Park was conceived as a community amenity, the design team looked for opportunities to utilize it more effectively as green infrastructure to capture, retain, and use stormwater.

Ownership Model:
The Transbay Joint Powers Authority (TJPA) is responsible for the design, development, construction, and operation of the new Transbay Transit Center and its associated facilities. The TJPA is a regional government entity created by state law to exercise the joint powers of its authority members: the City and County of San Francisco, the Alameda–Contra Costa Transit District, the Peninsula Corridor Joint Powers Board, and the California Department of Transportation.

Project Cost:
The water reuse system is being funded as part of the larger Transbay Transit Center Program. As a large public project, the Program receives funding from diverse local, regional, state, and federal sources. The first phase of the Program is fully funded at a cost of $1.89 billion. Federal funding includes a $171 million Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, in addition to a $400 million federal economic stimulus grant. The TIFIA loan will be repaid by a variety of grants, land sale proceeds, lease income from acquired right-of-way parcels, and other one-time revenue generation opportunities.

Annual Operations & Maintenance Cost:
TBD

Service Costs to Residents or Tenants:
Tenants of the Transbay Transit Center will not have access to non-potable water for reuse, as all of the graywater and stormwater captured will be treated and used for toilet flushing in the public spaces of the Transbay Transit Center terminal, which are operated by the owner (TJPA). Because the TJPA will use all of the treated graywater and stormwater, there is no pricing structure.

Reference: Claire Maxfield, Atelier Ten (Claire.Johnson@AtelierTen.com)
**Future Non-potable Projects in San Francisco**

**Future Projects:**
SFPUC staff continues to receive applications from developments proposing to implement non-potable water systems. Staff also regularly meets with project teams interested in integrating systems into future developments. The following is a list of projects in San Francisco that are proposing to implement non-potable water systems in the future:

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<th>End Use(s)</th>
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<td>45 Lansing</td>
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<td>NRG</td>
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<td>333 Brannan</td>
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<td>Pier 27</td>
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<td>Mission Street Hotel</td>
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<td>Mission Street Movie Theatre</td>
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<td>Botanical Garden Nursey Center</td>
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<td>Hunters View (Phase 3)</td>
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<td>CPMC: St. Luke’s</td>
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<td>CPMC: Cathedral Hill</td>
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<td>Irrigation, Cooling</td>
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<td>CPC: Van Ness MOB</td>
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<tr>
<td>535 Mission Street</td>
<td>Rainwater</td>
<td>Irrigation</td>
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The 181 Fremont Street project is proposing to install a graywater system for toilet flushing (image courtesy of Heller Manus Architects).

The Alta Laguna project is proposing to capture and treat rainwater for irrigation (image courtesy of BAR Architects).
District-Scale Water Reuse Case Studies

San Francisco Public Utilities Commission
October, 2013
San Francisco’s Non-potable Water Program creates a regulatory framework and streamlined permitting process for commercial, multi-family, and mixed-use developments in San Francisco to collect, treat, and reuse alternate water sources for toilet flushing, irrigation, and other non-potable uses. Established through an ordinance adopted by the San Francisco Board of Supervisors in September 2012, this program establishes guidelines for developers interested in installing non-potable water systems in buildings and local regulations to ensure appropriate water quality standards.

In dense, urban centers like San Francisco, the use of on-site alternate water sources is a key strategy for expanding potable water savings. Alternate sources of water that can be used in a non-potable water system are:

- Rainwater – precipitation collected from roofs or other manmade above grade surfaces
- Stormwater – precipitation collected from at or below grade surfaces
- Graywater – wastewater from bathroom sinks, showers, and washing machines
- Blackwater – graywater, and wastewater kitchen sinks and toilets
- Foundation Drainage – nuisance groundwater that floods basements
- Other sources as approved by the San Francisco Department of Public Health (SFDPH)

The San Francisco Public Utilities Commission provides technical and financial assistance to assist developers through the processes for the permitting, installing, and operating a non-potable water systems. Each project proponent must ensure that the project is designed and installed safely, complies with applicable laws and regulations, and is operated in a manner that causes no harm or damage to building occupants, or others.

Beyond the building-scale, there has been increasing interest from customers, the design and development community, and other City departments to encourage neighborhood or “district-scale” approaches to water reuse. In early 2013, SFPUC staff compiled international case studies around pooling and/or sharing non-potable water resources across property lines and the public right of way, with a “district” simply defined as more than one property. This report details these case studies of projects that are currently operating or are in the process of installing a district-scale non-potable water system.

In October 2013, the San Francisco Non-potable Ordinance was amended to allow multiple buildings to share treated alternate water sources for non-potable applications.

More information about San Francisco’s Non-potable Water Program, including a developers guidebook, is available at: [www.sfwater.org/np](http://www.sfwater.org/np).

If you have questions or need additional assistance, please email nonpotable@sfwater.org.
**Solaire Tower (Battery Park City) — New York, NY**

**Project Description:**
Construction of The Solaire was completed in August 2003 and 100% of blackwater from the building is treated on-site for toilet flushing, cooling tower make-up water, and landscape irrigation. In addition to on-site reuse, a more recently constructed building (2006) in the Battery Park City community, The Verdesian, shares the treated wastewater from The Solaire through a one-way connection. Treated wastewater from The Solaire’s on-site wastewater reclamation system is also used for drip-irrigation at the adjacent Teardrop Park. Rainwater that is not absorbed by roof vegetation is channeled to a basement cistern where it is filtered and then reused for irrigation. Natural Systems Utilities, a private utility, operates the on-site system at The Solaire. The system has a treatment capacity of 25,000 gpd and is operated close to design capacity all year long.

**Drivers for Incorporating District-Scale Utilities:**
The Battery Park City Authority (BPCA) requires that all buildings in their domain be sustainable, and that each successive one be greener than its predecessor. Water reuse was a starting component of the approach for this project, and was used for marketing to prospective residents. The use of on-site wastewater treatment was required in order for the development to be in compliance with the BPCA environmental regulations. These regulations were put in place to help the New York City wastewater management system meet stringent combined sewer overflow (CSO) standards.

**Ownership Model:**
It was decided at the outset that the New York City Department of Environmental Protection (DEP) would oversee performance of the systems in Battery Park City, but in no way own or manage them. The Solaire and The Verdesian are adjoining rental properties under common ownership that share one common wastewater reuse system.

BPCA owns and manages all of the land in Battery Park City. The BPCA is a state authority that was created in 1970 to develop this area of New York City. Developers competed for long-term land leases to build and operate various buildings in accordance with the Battery Park City Residential Environmental Guidelines. The wastewater reuse system in The Solaire is owned by the building owner/developer and is operated by a private utility company, Natural Systems Utilities. The system is not codified as a utility because it does not sell water to any other users.

**Project Status:** Construction completed in 2003 (Solaire) and 2006 (Verdesian)

**Size:** Two Buildings and a Park (approximately 3 acres)

**Volume:** 25,000 gallons per day (gpd)

**Alternate Water Sources:**
- Wastewater
- Rainwater

**End Uses:**
- Toilet flushing
- Cooling tower make-up water
- Landscape irrigation

**Potable Water Use Reduction:** 48%

**Driver:** Mandate

**Cost:** $563,870 (wastewater treatment system cost)

**Owner:** Albanese Organization and Northwestern Mutual Life Insurance Company joint venture (Private Developers)

**Role of Public Utility:** New York City Department of Environmental Protection - Backup and excess services
The Battery Park Conservancy operates the parkland in Battery Park City.

Role of Public Utility in Project:
The Solaire and The Verdesian are connected to both New York City’s potable water and sanitary sewer systems to allow normal functionality if the water reuse systems are offline for any reason. The wastewater reuse systems only treat the quantity of wastewater needed to satisfy the non-potable demand. Excess wastewater is discharged to the sanitary sewer.

In addition, wastewater residuals (sludge and biosolids) are only discharged to the sanitary sewer when it is not raining so as to not contribute to potential CSOs. Flushing of the wastewater treatment system is performed manually by the operators of the system during dry weather conditions also to not contribute to a CSO event.

Project Cost and Funding:
The wastewater treatment system at The Solaire cost $563,870 (designed in 1999 and began operating in 2003). The reuse distribution piping at The Verdesian increased the building’s total plumbing costs by 5%. The Solaire was initially financed through a traditional construction loan and long-term financing, but post-September 11th, the financing was restructured and used public-sector participation that was subsequently replaced by economic incentive Liberty Bonds issued by the State of New York Housing Finance Authority. These bonds were combined with permanent credit enhancement through a private bank. The Solaire also qualified for the New York State Green Buildings Tax Credit, which provided $2,800,000 in tax credit over five years.

Rate Structure for Water and Sewer Services from Public Utility:
Water and sewer fees are charged at The Solaire and The Verdesian using water meters. Metered potable water rates are set at $3.39/CCF. Unmetered users are charged annually based on the frontage width of the building (e.g., 16 feet and under is $142.16), as well as specific charges for particular items within each unit (e.g., laundry machine = $54.20/year). Sewer is not separately metered; it is charged at 159% of the building water charge. An annual wastewater charge for stormwater of $0.0567/square foot is applied to parking lots where stormwater may enter the wastewater system.

DEP, which owns the wastewater and water system in the public right-of-way, created the Comprehensive Water Reuse Program (CWRP) rate in 2004, which provides for a discounted water and sewer rate for mixed use or residential buildings that recycle water using a blackwater or graywater recycling system, as well as meeting fixture and appliance efficiency requirements. The program offers a 25% rate reduction on water and sewer charges for buildings in New York City that maintain a Comprehensive Water Reuse System that meet the target 25% reduction. The Solaire and The Verdesian have taken advantage of this water rate incentive.

One criticism of this rate program is that even if the building achieves a higher water use reduction than 25%, the incentive presently remains at 25% of the actual water bills, which discourages larger water reuse systems (incentives are not commensurate with the percentage of reuse). DEP is considering discontinuing this rate and creating an incentive program that would allow the owner to take advantage of more near-term return on their investment in reuse technologies.

DEP also allows for a sewer allowance where buildings get credit for water use which does not contribute to sewer flow. There are two approaches to the sewer allowance: 1) a direct sewer allowance approach involves use of a potable water meter on line supplying water that will not contribute to sewer flow (e.g., a meter on the cooling line), or 2) an exceptions based approach with internal metering justifying what percentage of water is not contributing to sewer flow. Buildings with reuse systems in New York City typically use the exceptions based approach for sewer allowance.

Under the NYC Department of Environmental Protection water and sewer charge system, customers pay for sewer services based on indoor water consumption, so separating the indoor and outdoor water uses is economically beneficial.

Service Costs to Residents or Tenants:
Water service fees are included with the overall maintenance fees for the building.

Incentives Provided to Promote District Utilities:
As described previously, The Solaire/Verdesian receives a 25% rate reduction on water and sewer charges because they have a Comprehensive Water Reuse System that meets the 25% potable water reduction target.

Reference: Zach Gallagher, Vice President, Natural Systems Utilities (zgallagher@naturalsystemsutilities.com; 908.359.5129)
**Project Status:** Construction completed in 2002

**Size:** Group of Buildings (3.5 acres)

**Volume:** Unknown

**Alternate Water Sources:**
- Wastewater
- Rainwater (initially used)

**End Uses:**
- Toilet flushing
- Irrigation

**Potable Water Use Reduction:** 58%

**Driver:** Motivated developer

**Cost:** Rainwater and Living Machine facilities ~US$860,000

**Owner:** Peabody Trust (Private, non-profit)

**Role of Public Utility:** Thames Water - Backup services

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**Project Description:**
The BedZED community, completed in 2002, originally used a modified “Living Machine” design to treat wastewater on-site; however, this system is no longer operating due to the high costs of O&M. Beginning in June of 2008, BedZED again started using recycled water for toilet flushing and irrigation as part of a research study involving a use of a membrane bioreactor (MBR). Rainwater was also initially used for on-site toilet flushing after being collected from roofs; however, rainwater is no longer reused on site for anything except groundwater recharge.

**Drivers for Incorporating District-Scale Utilities:**
BedZED was initiated by BioRegional (One Planet Living entrepreneurial charity) to be the prototype for the One Planet Communities program, through which BioRegional works with developers to create sustainable developments and promote sustainable construction practices.

**Ownership Model:**
The BedZED community is owned and managed by the Peabody Trust (Peabody), one of the largest housing...
associations in London. The community was initiated by BioRegional and was developed in partnership with Peabody. The original Living Machine system was designed, installed, operated, and maintained by Albion Water under contract with Peabody. The MBR was originally operated by Thames Water, but is now operated by a private firm under contract with Peabody.

Role of Public Utility in Project:
Albion Water, a local private water and sewerage service company, designed, installed, operated, and maintained the initial on-site water treatment plant and associated infrastructure until the system proved to not be economically viable and was therefore taken out of service. The developer subsequently worked with a different private water utility company, Thames Water, to introduce a Wastewater Reclamation Plant to provide a non-potable supply as well as research options for wider implementation of augmenting water supplies throughout London. This plant is now operated by another private firm, under contract with Peabody, and Thames Water is no longer involved.

Project Cost and Funding:
The rainwater collection, distribution, and storage system cost US$392,137 (£244,200) to construct; however, this system is not currently in use. The initial Green Water Treatment Plant (GWTP), which includes some “Living Machine” features, and distribution infrastructure cost US$468,894 (£292,000).

Rate Structure for Water and Sewer Services from Public Utility:
OFWAT, the regulator that sets Thames Water’s charging limits, established the most recent charging limits on April 1, 2012. All new and converted properties in areas served by Thames Water have to be fitted with meters and all sprinkler users and swimming pool owners are to be metered. The volume-based water charge for potable water is $4.64/CCF (122.63 pence/cubic meter) and wastewater services are $2.45/CCF (64.73 pence/cubic meter). A fixed charge per year is also billed to customers based on their pipe size (e.g., all individually metered domestic properties pay the 15mm fixed charge, which is US$44.30 (£28) for potable water and US $82.28 (£52) for wastewater). Intermediate, large, and super large volume users are charged the fixed charge, an additional tariff, as well as a higher volume charge for all use. Households that are not connected to Thames Water sewers for discharge of surface water (stormwater) get a wastewater bill reduction of US$36.39 (£23). Thames Water will consider reducing the wastewater charge if a user can prove that they return less than 90% of the potable water supplied to the public wastewater system.

Unmetered customers within Thames Water’s service area are charged a ‘rate per pound’ based on which local authority area they live in and the taxable value of their home. In addition, a yearly fixed charge is required for household properties: US $47.47 (£30) for potable water and US $66.46 (£42) for wastewater. Fixed charges for business customers are based on the size of their supply pipe.

For the original GWTP system, BedZED residents were charged metered unit rates for potable water, while “greenwater”1 and sewerage were charged according to a formula based on the metered potable water consumption and the size of the property. Residents were charged for rainwater at about 90% of the rate of potable water. BedZED households saved US$167 (£104) per year per household on their water and sewerage bills as compared to average UK customers, a savings of approximately 47%.

Service Costs to Residents or Tenants:
Standing charges per household for the original GWTP system included a US$31 (£19) potable water charge and a US$61 (£38) sewerage charge.

Incentives Provided to Promote District Utilities:
Recycled water is supplied to residents at a reduced rate.

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1 “Greenwater” is a mixture of rainwater and recycled, treated wastewater.
**Project Status:** WRAMS became operational in July 2000; new developments are built and planned (Master Plan completion estimated in 2030)

**Size:** Area (1,581 acres)

**Volume:** up to 1.8 million gallons per day (MGD)

**Alternate Water Sources:**
- Wastewater
- Stormwater

**End Uses:**
- Toilet flushing
- Irrigation
- Water features

**Potable Water Use Reduction:** 50%

**Driver:** Marketability and Mandate (redevelopment)

**Cost:** US$16.6 million

**Owner:** Sydney Olympic Park Authority (Public)

**Role of Public Utility:** Sydney Water Corporation – Source of raw sewage, backup services, and billing administration

**Project Description:**
As part of the Sydney Summer Olympics in 2000, the Water Reclamation and Management Scheme (WRAMS) was developed and includes a water reclamation plant, a water treatment plant, stormwater collection, clean water storage, and recycled water delivery systems. The water treatment plant, which treats a combination of secondary effluent and stormwater, has a maximum capacity of 1.8 MGD. The Water Reclamation Plant supplies various non-potable uses within the park, as well as in the suburb of Newington. Three on-site water quality control ponds at the Sydney Olympic Park also collect stormwater runoff, which is then either re-used for irrigation, used in the production of recycled water, or overflows into local creeks and wetlands.

**Drivers for Incorporating District-Scale Utilities:**
The Sydney Olympic Park Master Plan (2002) requires all new developments to connect to WRAMS.

**Ownership Model:**
WRAMS was developed and is owned by the Sydney Olympic Park Authority (SOPA) and is operated by a third party contractor (Kilpatrick Green, a.k.a. United KG). The implementation process included a competitive public tender process for design, construction, and operation. Currently SOPA has a 25 year operating agreement in place with United KG, who
also designed and built the treatment plants and stormwater reservoir. For the purpose of WRAMS, SOPA is a Water Supply Authority under the New South Wales (NSW) Government’s Water Management Act of 2000 and is responsible for managing the scheme including compliance with regulatory and statutory Authorities. The NSW Minister for Planning is the consent authority for all development within Sydney Olympic Park.

Role of Public Utility in Project:
WRAMS sources its sewage supply from Sydney Water Corporation’s (SWC) sewage network utilizing the concept of sewer mining. SWC and SOPA jointly developed a formal sewer mining agreement in 2000 to enable SOPA to source sewage from SWC’s sewer system. Infrequent surplus sewage is sent to Sydney’s sewage system and SWC also provides potable water.

In addition, meter reading and customer billing functions, recycled water pipeline maintenance, plumbing inspections and certifications have been outsourced and are being performed by SWC on behalf of SOPA.

Project Cost and Funding:
WRAMS at Sydney Olympic Park had a capital cost of US$16.6 million (Australian $15.88 million). Actual costs of WRAMS operation (excluding capital investment) is on the order of US$6/CCF (Australian $2.00 per kilolitre (kL)).

Rate Structure for Water and Sewer Services from Public Utility:
SWC charges homes, apartments, dual occupancies, and mixed use development water users with a meter at a rate of US$6.33/CCF (Australian $2.13/kL) for potable water and a fixed charge of US$146.40 (Australian $138.77) each quarter for wastewater (prices apply from July 1, 2012 to June 30, 2013 and are set by IPART). The Independent Pricing and Regulatory Tribunal of NSW (IPART) is a government agency that determines the maximum water, wastewater, and stormwater prices that declared water utilities can charge. A fixed water service charge each quarter is set at US$35.64 (Australian $33.78) if you have your own meter, US$18.76 (Australian $17.78) if you share a meter. If you don’t have a meter, you pay US$136.76 (Australian $129.63).

Residents of Homebush Bay (which is a Sydney suburb that includes Sydney Olympic Park) who have recycled water pay a fixed charge each quarter to SWC for their connection of US$9.36 (Australian $8.87) (July-September quarters) and US$9.24 (Australian $8.76) (October-June quarters). The recycled water price is set at US$0.45/CFF (Australian 15 cents/kL) below Sydney’s drinking water price of US$5.89 (Australian $1.98/kL). This recycled water price does not reflect its true cost or value. SWC collects the service charge and per kiloliter charges for SOPA.

Service Costs to Residents or Tenants:
A small connection charge is applicable on a quarterly basis.

Incentives Provided to Promote District Utilities:
Discounted water rates.
**Project Status:** Under construction (anticipated to be operational in 2013)

**Size:** Campus (3,000 acres)

**Volume:** up to 1 MGD

**Alternate Water Sources:**
- Wastewater
- Rainwater

**End Uses:**
- Feedwater for the Central Utilities Plant (boiler and cooling tower water)
- Irrigation (future)

**Potable Water Use Reduction:** 20%

**Driver:** Water resources

**Cost:** $20 - 26 million

**Owner:** UCONN (Private)

**Role of Public Utility:** NA

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**Project Description:**
A water reclamation facility is being constructed to treat wastewater which will be blended with captured rainwater for redistribution on-site to satisfy campus non-potable water demands (cogeneration power plant and irrigation). Recycled water is being developed for non-potable uses due to a lack of additional water supplies in the area. There is also potential for future system expansion to supply non-potable water to the adjacent Town of Mansfield (total system capacity up to 1 MGD).

**Drivers for Incorporating District-Scale Utilities:**
The University of Connecticut (UConn, the University) anticipated increasing potable water needs on campus due to growing population. This need could not be met by the limited capacity of UConn’s existing water sources, two permitted groundwater supplies, and there was a lack of additional conventional water supplies available. This need for a new source of water, along with the University’s focus on sustainability, prompted the decision to implement a recycled water program.
Ownership Model:
The University owns and operates the water system which serves the campus; therefore they are the owner, operator, and consumer of the district water system. UConn also provides water to more than 100 users across parts of Mansfield, including Town Hall, E.O. Smith High School, and the emerging downtown Storrs Center.

Role of Public Utility in Project:
NA

Project Cost and Funding:
The project will cost between $20 and $26 million. The University water system is funded through operating and capital funds. Operating funds are taken from the Facilities Operations budget which is generated from tuition. Capital funds include funding from the “UConn 2000 Program” and “21st Century UConn Initiative” are used for particular water-related projects, including the water reclamation facility. The University water system is also partially funded by water revenues from its off-campus customers.

Rate Structure for Water and Sewer Services from Public Utility:
The University does not bill any on-campus users for water, but historically utilized a declining block structure\(^2\) for off-campus commercial customers and a flat rate for unmetered residential customers. This policy did not encourage conservation, so a uniform rate structure\(^3\) was adopted for commercial and metered residential customers in 2006. The change was made in part to encourage conservation. An inclining block pricing structure\(^4\) may be considered in the future if necessary to reduce wasteful consumption and encourage maximum conservation.

Although on-campus users are not billed for water, on-campus meters are recorded continuously and reviewed on a daily basis, while off-campus meters are read quarterly. Meter reading of on-campus users serves an important function with regard to leak detection. Metered residential and commercial customers are charged at a uniform rate of $3.05/CCF.

Service Costs to Residents or Tenants:
The basic service fee for off-campus customers ($100 per year) covers meter reading, billing expenses, and administrative costs related to overseeing the customer metering program.

Incentives Provided to Promote District Utilities:
None currently, as the system will only serve the campus initially. In the future, the University may develop incentives to spur buy-in from off-campus customers.

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\(^{2}\) With a declining block structure, water is priced in blocks of consumption with a decrease in unit price as the user enters a larger consumption block.

\(^{3}\) Uniform rates are based on the assumption that every unit of water is of equal value; the unit price of water is constant.

\(^{4}\) With an inclining block pricing structure, water becomes more expensive as consumption increases; the unit price increases as the user enters increasing volume blocks.
Project Status: Phase 1 Built (completed December 2007, first residents moved in May 2008); two additional neighborhoods intended to be built in phases over 10 years. Construction of the wastewater treatment plant was completed in early 2008.

Size: Group of Buildings (15 acres)
Volume: 50,000 gpd; a future plant expansion can increase the capacity to 100,000 gpd

Alternate Water Sources:
- Wastewater
- Stormwater

End Uses:
- Toilet flushing
- Irrigation
- Water features

Potable Water Use Reduction: 65%

Driver: Marketability

Cost: $4 million

Owner: Windmill West Development and Three Point Properties with Vancity (Private) built the development, but the wastewater treatment plant is owned by the Dockside Green community (Private)

Role of Public Utility: City of Victoria – Backup services

Project Description:
This former industrial redevelopment site treats 100% of its sewage and the recycled effluent is used on-site for toilet flushing, irrigation, and water features. The wastewater system is currently operated by Corix Utilities, a private utility operator. The wastewater treatment plant has a capacity of 50,000 gpd and it recovers heat from wastewater. There is potential for 18,000 gallons of treated water to be available for sale off-site. A future plant expansion can increase the average daily flow to 100,000 gpd by adding additional membranes and ancillary equipment.

Dockside Green also uses an on-site naturalized creek and pond system, along with underground storage, to treat and control stormwater flows, which avoids the need to connect to the municipal storm drain system.

Drivers for Incorporating District-Scale Utilities:
The decision to incorporate sustainable district-scale utilities into the project were developer and market driven. The site was heavily contaminated from industrial use, but has a desirable waterfront location. The developer bidding for the brownfield redevelopment proposed a sustainable vision for the development and the community, projecting high market demand for this type of product. The system cost more to install, but premium prices on the homes may recoup the investment. The project received a record number of LEED ND points and was recognized by the Clinton Foundation for its achievements with regard to sustainability, in large part due to the on-site water treatment and reclamation.
Ownership Model:
The system is owned by the Dockside Green community (administered by the condominium board).

Role of Public Utility in Project:
The municipal water utility has no role in the water recycling activities. All oversight and operations are provided by Corix Utilities under federal and provincial regulation. Dockside Green has its own collection system, treatment plant, and point of discharge to the harbor. Once the development achieves build out, it is contemplated that Corix may acquire the system from the Dockside Green community. Corix also operates and is a part-owner in the on-site biomass-based district energy system. The City of Victoria provides emergency backup to the system which is metered, but not billed at this time.

Project Cost and Funding:
The wastewater treatment plant cost $4 million to construct. Most of the capital for the project (75%) was provided by Canada’s largest credit union, Vancity, which became a co-developer of the project in a partnership called Dockside Green Limited. A key early contributor to the project’s success was the city’s willingness to allow the developers to defer payment for the land, which freed up enough cash for quick construction of the project’s infrastructure without significant bridge financing.

The Federation of Canadian Municipalities provided $350,000 to support the development of innovative infrastructure, including part of the costs associated with developing and obtaining approval for the unprecedented wastewater treatment system.

Rate Structure for Water and Sewer Services from Public Utility:
The City of Victoria charges a service charge every 4 months based on the size of service connection (e.g., ¾” for $36.63). Potable water is billed at a rate of $3.25/CCF. The sewer rate is $1.92/CCF and is based on metered water consumption. In addition, there is a Capital Regional District (CRD) sewer charge of $1.57/CCF.

Residents of Dockside Green are not charged for the use of recycled water (no metering) and there are no sewage charges paid to the City of Victoria.

Service Costs to Residents or Tenants:
Residents of Dockside Green pay for the wastewater treatment system based on the square footage of their unit in the form of strata fees. This charge covers maintenance, operational, capital, and contingency costs of the system. Residents are charged at a rate of 2 cents per square foot of their unit, per month (e.g., a 600 square foot unit would be charge $12/month).

Incentives Provided to Promote District Utilities:
Through negotiations with the developer, concessions were provided on sewer development charges and sewer usage fees. The City does not bill residents for the sewage component charge of the water bill; they are only charged for potable water at the metered rate. Development cost charges (DCC’s) for sewage were waved for the developer.

Reference: Eric van Roon, Vice President and COO, Corix Utilities (eric.vanroon@corix.com; 604.697.6712)

5 “Strata fees” is a Canadian term, roughly equivalent to homeowners’ association fees.
6 Development cost charges (DCC’s) are monies that municipalities and regional districts collect from land developers to offset that portion of the costs related to these services that are incurred as a direct result of this new development.
London Olympics — London, UK

Project Status: Built/planned
Size: Area (618 acres)
Volume: up to 150,000 gpd
Alternate Water Sources:
- Wastewater
- Rainwater

End Uses:
- Toilet flushing
- Irrigation
- Cooling water

Potable Water Use Reduction: 20% for residential development; 40% reduction for Olympic park use [58% reduction achieved to date]

Driver: Marketability and Water Conservation

Cost: Old Ford Water Recycling Plant US$11.2 million (£7 million)

Owner: Olympic Park Legacy Company (Public)

Role of Public Utility: Thames Water - Built, owns, and operates the recycled water treatment plant

Project Description:
The 2012 London Summer Olympics infrastructure has been built; legacy development is still in the planning stage. The non-potable network currently extends three-quarters of the way around the Olympic Park and can be extended into planned housing developments once the Olympic Park landscape has been established and if the treatment plant proves technically and commercially viable.

Recycled wastewater is currently used at the Olympic venues for toilet flushing, irrigation, and to provide cooling water. The Aquatics Centre has an independent water recycling system that uses the pools’ filter backwash water. The source of sewage for the recycled water system is the main sewer line running from homes in north London, not from the Olympic venues or athlete's village. Roofs and gardens in legacy housing developments are proposed to be irrigated by water from rainwater harvesting.

Drivers for Incorporating District-Scale Utilities:
At the core of London’s bid to host the 2012 Olympics was a pledge to achieve an outstanding example of sustainable development. The ‘London Plan’, ‘The Mayor’s draft water strategy’, planning authorities and Building Regulations all have requirements to conserve water. Large-scale non-potable water reuse was needed to meet the Olympic Delivery Authority (ODA)’s established 40% potable water use reduction target. In addition, London is a water stressed area.
Ownership Model:
The ODA and Thames Water, a large public utility in the UK, partnered on the project; previous to Thames Water agreeing to partner, ODA had ruled out wastewater reuse because of risk and cost constraints. Thames Water managed construction of the treatment plant (Old Ford Water Recycling Plant (WRP)) and ODA managed construction of the pipe network.

Role of Public Utility in Project:
Thames Water developed the recycled water treatment plant under a seven-year build-own-operate contract with the Olympic Park Legacy Company. The Legacy Company will seek to work with Thames Water to supply the non-potable water network to monitor the technical and commercial viability of the Old Ford WRP. After 7 years, Thames Water will examine operational costs, conduct cost-effectiveness studies, and review the operational process of the technology to decide whether or not they want to upgrade it, close the plant down, or switch to a different type of treatment.

The non-potable water distribution network distributes recycled wastewater from the Old Ford WRP around the Park to end-use customers. The interface for connections to end-use customers is at metered connection pits, which are located outside the customer’s premises and provided the delineation of ownership. Thames Water owns the non-potable water distribution network up to the revenue meter (under the terms of a self-lay agreement with the ODA) and the customer owns the pipework downstream of the revenue meter (similar to the standard potable water arrangement).

Project Cost and Funding:
ODA and Thames Water partnered on funding the project, with Thames Water investing approximately US$8 million (£5 million). The total cost of the Old Ford WRP was US$11.2 million (£7 million). The ODA is funded by the Department for Culture, Media and Sport; the Greater London Authority; and the Olympic Lottery Distributor.

The initial system was sized to meet the non-potable water requirements of the Park only (not the Park’s long-term legacy community) in order to optimize the infrastructure without the consequences of an oversized network. The additional requirements of implementing a system that could meet the long-term legacy community, when added to the uncertain timeframe and size of future developments, were considered unacceptable to Thames Water who would need to adopt the network and operate the Water Recycling Plant after the Games.

Rate Structure for Water and Sewer Services from Public Utility:
See previous discussion of Thames Water water and sewer pricing presented for the BedZED case study.

Service Costs to Residents or Tenants: Unknown.

Incentives Provided to Promote District Utilities: Information currently unavailable.

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7 The ODA is the public sector body responsible for developing and building the new venues and infrastructure for London 2012, and their use afterwards.
8 Thames Water, London’s main water supplier, recognized this in their Water Resources Management Plan, identifying London’s limited access to new fresh water supplies to support its expanding population.
Southeast False Creek — Vancouver, Canada

**Project Status:** Under construction (Olympics in 2010, build out of legacy community expected in 2020)

**Size:** Area (38 acres)

**Volume:** Unknown

**Alternate Water Sources:**
- Rainwater

**End Uses:**
- Toilet flushing
- Irrigation
- Water features

**Potable Water Use Reduction:** 40% goal; 50% reduction achieved at this time

**Driver:** Mandate (redevelopment agency)

**Cost:** Unknown

**Owner:** City of Vancouver (Public)

**Role of Public Utility:** City of Vancouver – Backup services, potable water, and wastewater treatment

**Project Description:**
The Vancouver Winter Olympics was located in a former industrial area of Vancouver. Following the Olympic Games in 2010, the Olympic accommodations became permanent residential housing and the area surrounding the Olympic Village is being developed into a mixed use community (build out expected in 2020). The Olympic Village itself collects rainwater into basement cisterns for use in toilet flushing, irrigation, and water features. Collected rainwater is continuously pumped through courtyard water features to provide aeration. The Olympic Village was the first in North America to use recovered heat from wastewater to provide a primary source of energy for an urban neighborhood. The Southeast False Creek (SEFC) neighborhood may similarly use collected rainwater for irrigation, as well as maintenance of green roofs. SEFC became the second neighborhood in the world to meet the LEED platinum standard in 2011.

**Drivers for Incorporating District-Scale Utilities:**
The City council determined that SEFC should be redeveloped into a residential neighborhood that would be a model sustainable community. The City commissioned studies that would determine the most economically feasible and socially and environmentally sustainable use of the land. A requirement laid out in the official development plan was that no potable water was to be used for irrigation. As the integrated design process took hold, however, the team pushed well beyond this simple water-saving concept. The development of a Green Building Strategy to guide the development of SEFC led to the creation of a city-wide...
green building strategy and ultimately to the creation of the City of Vancouver’s Office of Sustainability.

Ownership Model:
The City of Vancouver is the owner of the land at Southeast False Creek. Millennium SEFC Properties Ltd. (MSEFC) was selected as the developer of the Olympic Village, which is also known as “Millennium Water” (17 acres at the center of SEFC). MSEFC developed the market residential and commercial areas and designed and built both the community center and affordable housing for the City, while the City undertook to develop the public realm and parks. Following the economic downturn in 2008, the City of Vancouver took over development of the project and MSEFC is no longer involved; the City now is in charge of selling off the residential units.

Other private developers (e.g., Pinnacle, Onni, Cressey Developments) are developing residential buildings in other parts of the SEFC community outside of the Olympic Village; however, any water reuse will have its own system unassociated with the rainwater capture system at the Olympic Village. This is in contrast to energy use at SEFC where all projects are required to connect to and utilize the SEFC Neighborhood Energy Utility for space heating and domestic hot water. Many of the private development projects at SEFC include efficient irrigation, drought tolerant landscaping, and water conserving fixtures; however most have incorporated minimal on-site water reuse for irrigation of rooftop vegetation.

Role of Public Utility in Project:
The City of Vancouver provides potable water as well as wastewater treatment for SEFC. Each building in the Olympic Village is also able to draw make-up water for summertime irrigation and toilet flushing from the municipal system. During times of heavy rainfall when cisterns are full, the buildings shed excess water to the first tier of the Village’s two-tier stormwater system. When the cisterns are full, the rainwater is discharged directly into False Creek.

Project Cost and Funding:
MSEFC required financing to fund the construction of Millennium Water. The first $80 million was provided by a Canadian chartered bank and a private investment fund, to which the City subordinated its position in accordance with the lease terms. However, these parties did not advance further monies beyond the initial pre-development loan of $80 million.

MSEFC made subsequent arrangements with Fortress Credit Corporation (Fortress) in September 2007 for $750 million. To enable MSEFC to obtain financing, it became necessary for the City to provide initially both a completion guarantee as well as a payment guarantee of $190 million to Fortress. The City ultimately took over ownership of the project.

The cost of the rainwater reuse system is unknown and was ‘lost’ in the overall cost of the Olympic Village. Had the cost of the system been isolated, it likely would not have been implemented (Roger Bayley, The Challenge Series, SEFC Design Manager). The system added an additional $400 cost for each residential unit.

Rate Structure for Water and Sewer Services from Public Utility:
The City of Vancouver has seasonal water rates for metered water customers. During the rainy season (November through May), residents and commercial businesses have a low off-peak rate. During the drier months, rates increase by about 25% (summer surcharge) to reflect the added cost of supplying water to the city. The summer surcharge helps the city to meet their Greenest City 2020 goal of reducing water consumption by 33%. The metered water rates for 2013 are $2.304/CCF (October 1 – May 31) and $2.877/CCF (June 1 – September 30). The metered sewer rate for 2013 is $1.842/CCF year-round.

The rainwater used for toilet flushing is not charged as additional sewer inflow.

When flat utility rates are set, they are charged annually and vary by customer class (single family dwelling, single family dwelling with suite, duplex). For a single family dwelling, for example, flat rates for 2013 are $528 for water and $287 for sewer.

Service Costs to Residents or Tenants:
The public utility charges a thrice-yearly meter service charge based on the size of pipe (e.g., the rate for a 3/4” pipe is $84/year).

IncentivesProvidedtoPromoteDistrictUtilities: None.
Yesler Terrace — Seattle, WA

Project Status: Planned (proposed to be implemented over the course of 15 to 20 years)

Size: Area (38 acres)
Volume: Unknown

Alternate Water Sources:
• Combined wastewater/ graywater
• Rainwater (building scale)

End Uses:
• Toilet flushing
• Irrigation
• Make-up water for combined cooling, heating and power plant

Potable Water Use Reduction: 50%

Driver: Mandate (redevelopment agency)

Cost: $13.5 million

Owner: Seattle Housing Authority (Public)

Role of Public Utility: Seattle Public Utilities - Backup services

Project Description:
The Yesler Terrace redevelopment project will be implemented over the course of 15 to 20 years. On-site wastewater reuse, as well as potential building-scale rainwater collection systems, will be used for toilet flushing and irrigation. If the total wastewater option is chosen, it would likely require several sub-area membrane bioreactor (MBR) water reuse treatment plants. The phasing of work over 15 to 20 years may involve designing modular systems that can be replicated as needed through the site, or extending a system over time.

Drivers for Incorporating District-Scale Utilities:
The Seattle Housing Authority (SHA) proposed redevelopment of the community, establishing sustainability as a guiding principle. The initial economic analysis indicated that the recommended district integrated water reuse system would be cost-effective relative to the baseline. The City of Seattle has indicated that plans for aggressive sustainability performance by the redevelopment would be welcome. SHA, with support and participation from the City of Seattle, and partner funding from Seattle Public Utilities (SPU), has responded by sponsoring research of the feasibility of sustainable district infrastructure option at Yesler Terrace.
Ownership Model:
Yesler Terrace is a public housing community that has been owned and operated by SHA since 1939. SHA is a public corporation that owns and operates buildings on more than 400 sites throughout Seattle and provides affordable housing. In June 2012, SHA issued a formal Request for Qualifications to identify firms interested in becoming a master development partner for Yesler Terrace. The master development partner is expected to contribute expertise in developing communities of the scale and scope of Yesler Terrace, access to capital, and financial and project management.

The approach being given the most consideration in regards to the water system is to have a third party firm design, build, and operate the district water systems (design-build-operate (DBO)). The SHA may need to tailor ownership and infrastructure transfer terms with SPU for the new on-site sewer collection system to conform to SPU’s existing wastewater treatment contract.

Role of Public Utility in Project:
SPU would provide backup services and potable water supply. SPU would also likely treat return solids.

Project Cost and Funding:
The layout and development phasing of Yesler Terrace make multiple MBR/loop systems an efficient design option. Construction of multiple plants in 2-3 stages would allow the system to achieve some economies of scale, while allowing for phased investment. The estimated capital cost of the system is $10 million, with an additional $3.5 million for installation of the reuse distribution system and building dual plumbing. It would have an estimated annual cost of $0.65 -

$0.75 million to operate and maintain. The annual benefit from reduced water and sewer use is estimated at $2.3 million.

Estimated economic performance of the water reuse system is based on an assumed DBO system service plan, under which the costs to the DBO firm would be converted into a contractual charge per gallon to the users of the system, including in this case SHA and potentially other private parcel developers. The cost estimates concluded that there would be a net savings over the business as usual (BAU) baseline for all participants (the DBO contractor, SHA, and the building owners). For a wide range of realistic potential scenarios, a water reuse system would either produce positive net financial benefits to the Yesler Terrace project, or result in net costs comparable to those for the BUA baseline.

A $19.73 million U.S. Department of Housing and Urban Development (HUD) grant was awarded to SHA for the Yesler Terrace redevelopment (federal funding).

Rate Structure for Water and Sewer Services from Public Utility:
For potable water, SPU charges a commodity charge (per 100 cubic feet (CCF)) as well as a base service fee. During off-peak times (September 16-March 15), the residential water rate in Seattle is $4.50/CCF. During peak times (May 16-September 15), the rate is $4.73/CCF for the first 5 CCF per month, and then increases to $5.72/CCF for the next 13 CCF per month, and then goes up to $11.80/CCF for any usage over 18 CCF per month. The base service charge is applied monthly and is based on the size of meter (e.g., for residential customers with a meter of ¾" or less, it is $13.50/month).

SPU sewer rates for 2013 are $11.65/CCF for both commercial and residential customers. There is also a 1 CCF minimum charge per premise per month.

For the assumed DBO management of the district integrated water reuse system, it is estimated that volumetric rates would be set at $0.014/gallon of system water use. This cost would be paid to the DBO by SHA or building owners.

Service Costs to Residents or Tenants:
Service costs are yet to be determined.

Incentives Provided to Promote District Utilities:
None.
Southwest Ecodistrict — Washington, DC

Project Description:
This 20 to 25-year plan for neighborhood revitalization would capture, clean, and hold all stormwater and graywater beneath 10th Street Southwest (SW) until it is needed for non-potable uses including irrigation, toilet flushing, and mechanical equipment. At a block scale, the plan recommends the capture and treatment of rainwater and stormwater across property lines using integrated green infrastructure elements in parks, plazas, building yards, and along streets such as rain gardens, cisterns, and grassed swales. The plan also calls for wastewater to be pumped to the treatment plant where byproducts from the treatment will be used to generate energy to run the plant.

Drivers for Incorporating District-Scale Utilities:
With the adoption of the DC Green Building Act and the updated District Elements of the Comprehensive Plan for the National Capital Region in 2006, the District of Columbia set a course to become a more sustainable and inclusive city. In May 2012, Mayor Vincent Gray released a Vision Plan to transform the District into the greenest, healthiest, and most livable city in the nation. In 2010, the National Capital Planning Commission (NCPC) joined federal and local partners to establish the SW Ecodistrict Initiative to transform the Southwest Rectangle into a sustainable and livable
neighborhood that uses federal land and natural resources efficiently and contributes to the economic vitality and environmental health of the city. In addition, new federal stormwater management requirements have been set which require that federal development projects manage a portion of their stormwater runoff onsite, or be subject to fees [Section 438 of the Energy Independence and Security Act].

Ownership Model:
The SW Ecodistrict consists of federal and privately owned buildings. Three governance initiatives are recommended at this time for the SW Ecodistrict: 1) partnership between the federal and District of Columbia governments, 2) creating a governance entity similar to a business improvement district that is managed by a board of public and private representatives, or 3) expanding the authorities of the existing Union Station Redevelopment Corporation.

Role of Public Utility in Project:
Approximately one-third of the city is in a combined sewer system and DC Water is interested in reducing combined sewer overflows. The SW Ecodistrict is not located within the combined sewer area and therefore, it has not received much attention or funding from DC Water at this time, primarily because the project would not help DC Water’s combined overflow burden. The SW Ecodistrict is in the early stages of planning, with only conceptual study completed to date. The role of the public utility, DC Water, in the project has yet to be determined.

Project Cost and Funding:
Project cost and funding is undetermined at this time; however, the draft The SW Ecodistrict Plan states that it could be done using a combination of low impact development (LID) property tax assessment fund/tax increment financing fund (TIF) or through the involvement of a private partner. The federal government has a variety of potential funding sources, including capital budgets, Congressional appropriations, land dispositions, federal grants, federal payment to business improvement districts, or federal bonds. The District of Columbia likewise has financing options through the capital budget, TIF funding, or payments in lieu of taxes (PILOT) funds.

Rate Structure for Water and Sewer Services from Public Utility:
Undetermined at this time.

Service Costs to Residents or Tenants:
Undetermined at this time.

Incentives Provided to Promote District Utilities:
The District Department of the Environment (DDOE) charges stormwater fees which are based on the average amount of impervious surface on a property. These fees are projected to grow significantly between 2012 and 2018 and are projected to be $576,000/year for federal and private development within the SW Ecodistrict by 2018. DDOE is developing a stormwater fee discount program that will provide the opportunity to receive up to a 55% discount off the stormwater fee to property owners who implement measures to manage or reuse stormwater runoff.
## Existing On-site Reuse Systems

<table>
<thead>
<tr>
<th>Green Building Reuse System</th>
<th>City</th>
<th>State/Country</th>
<th>Design Capacity (gpd)</th>
<th>Alternate Water Sources Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millennium Towers</td>
<td>New York</td>
<td>New York</td>
<td>25,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>The Solaire</td>
<td>New York</td>
<td>New York</td>
<td>25,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>The Helena</td>
<td>New York</td>
<td>New York</td>
<td>25,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>The Visionaire</td>
<td>New York</td>
<td>New York</td>
<td>25,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>Tribeca Green</td>
<td>New York</td>
<td>New York</td>
<td>25,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>Headquarters Park</td>
<td>Montgomery</td>
<td>New Jersey</td>
<td>6,000</td>
<td>Blackwater</td>
</tr>
<tr>
<td>Gillette Stadium</td>
<td>Foxborough</td>
<td>Massachusetts</td>
<td>250,000</td>
<td>Blackwater</td>
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<tr>
<td>Wrentham Outlet Mall</td>
<td>Wrentham</td>
<td>Massachusetts</td>
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<tr>
<td>Copper Hill School</td>
<td>Raritan Township</td>
<td>New Jersey</td>
<td>15,000</td>
<td>Blackwater</td>
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<tr>
<td>Carmel Valley Ranch Golf Course Community</td>
<td>Carmel</td>
<td>California</td>
<td>100,000</td>
<td>Blackwater</td>
</tr>
<tr>
<td>Pasadera Golf Course Community</td>
<td>Monterey</td>
<td>California</td>
<td>74,000</td>
<td>Blackwater</td>
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<tr>
<td>Las Palmas Community</td>
<td>Salinas</td>
<td>California</td>
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<td>Oak Hills Community</td>
<td>Salinas</td>
<td>California</td>
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<td>Indian Springs Community</td>
<td>Salinas</td>
<td>California</td>
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<td>Spreckels Community</td>
<td>Spreckels</td>
<td>California</td>
<td>180,000</td>
<td>Blackwater</td>
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<tr>
<td>Oregon Health &amp; Science University’s Center for Health &amp; Healing</td>
<td>Portland</td>
<td>Oregon</td>
<td>14,000</td>
<td>Blackwater</td>
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<tr>
<td>Philip Merrill Environmental Center Building, Chesapeake Bay Foundation</td>
<td>Annapolis</td>
<td>Maryland</td>
<td>100</td>
<td>Graywater (Composting Toilets too)</td>
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<tr>
<td>Rodale Institute Eco Center</td>
<td>Kutztown</td>
<td>Pennsylvania</td>
<td>300-500</td>
<td>Blackwater &amp; Rainwater</td>
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<tr>
<td>Northern Guilford Middle School</td>
<td>Greensboro</td>
<td>North Carolina</td>
<td>40,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>Plyler Hall at Furman University</td>
<td>Greenville</td>
<td>South Carolina</td>
<td>4,000</td>
<td>Blackwater</td>
</tr>
</tbody>
</table>
# Existing On-site Reuse Systems

<table>
<thead>
<tr>
<th>Green Building Reuse System</th>
<th>City or Location</th>
<th>State/Country</th>
<th>Design Capacity (gpd)</th>
<th>Alternate Water Sources Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esalen Institute</td>
<td>Big Sur</td>
<td>California</td>
<td>5,000</td>
<td>Blackwater</td>
</tr>
<tr>
<td>Durham County's 's Triangle WWTP administration building</td>
<td>Durham,</td>
<td>North Carolina</td>
<td>TBD</td>
<td>Blackwater</td>
</tr>
<tr>
<td>UK’s Millennium Dome</td>
<td>Greenwich</td>
<td>United Kingdom</td>
<td>185,500</td>
<td>Blackwater</td>
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<tr>
<td>German’s Berlin Kreuzberg, 70 people building</td>
<td>Berlin Kreuzberg</td>
<td>Germany</td>
<td>660</td>
<td>Graywater</td>
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<tr>
<td>BedZED</td>
<td>London</td>
<td>United Kingdom</td>
<td>15,850</td>
<td>Blackwater &amp; Rainwater</td>
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<tr>
<td>Vancouver Convention Center</td>
<td>Vancouver</td>
<td>British Columbia, Canada</td>
<td>20,000</td>
<td>Blackwater</td>
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<tr>
<td>Dockside Green Development</td>
<td>Victoria</td>
<td>British Columbia, Canada</td>
<td>37,100 (phase1), 100,000 (buildout)</td>
<td>Blackwater</td>
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<tr>
<td>Couran Cove Island Resort</td>
<td>South Stradbroke Island</td>
<td>Queensland, Australia</td>
<td>79,300</td>
<td>Blackwater</td>
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<td>Currumbin Ecovillage</td>
<td>Currumbin Ecovillage</td>
<td>Queensland, Australia</td>
<td>32,000</td>
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<tr>
<td>1 Bligh Street</td>
<td>Sydney</td>
<td>Australia</td>
<td>26,400</td>
<td>Blackwater (Sewer Mining)</td>
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<tr>
<td>Workplace6 Recycle Water Factory</td>
<td>Pyrmont, Sydney</td>
<td>Australia</td>
<td>10,600</td>
<td>Blackwater</td>
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<tr>
<td>Ballantrae Golf and Country Club</td>
<td>Ballantrae</td>
<td>Ontario, Canada</td>
<td>270,000</td>
<td>Blackwater</td>
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<tr>
<td>The Willow School</td>
<td>Gladstone</td>
<td>New Jersey</td>
<td>4,000</td>
<td>Blackwater &amp; Rainwater</td>
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<td>National Great Rivers</td>
<td>East Alton</td>
<td>Illinois</td>
<td>5,000</td>
<td>Blackwater &amp; Rainwater</td>
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<tr>
<td>Omega Center for Sustainable Living</td>
<td>Rhinebeck</td>
<td>New York</td>
<td>52,000</td>
<td>Blackwater</td>
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<tr>
<td>Discovery Point</td>
<td>Sydney</td>
<td>Australia</td>
<td>369,811</td>
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<tr>
<td>Oberlin College Environmental Studies Building</td>
<td>Oberlin</td>
<td>Ohio</td>
<td>2,000</td>
<td>Blackwater</td>
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<tbody>
<tr>
<td>Port of Portland</td>
<td>Portland</td>
<td>Oregon</td>
<td>5,000</td>
<td>Blackwater</td>
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<td>Springs Preserve</td>
<td>Las Vegas</td>
<td>Nevada</td>
<td>8,600</td>
<td>Blackwater</td>
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<td>Jordan Lake Business Park</td>
<td>Apex</td>
<td>North Carolina</td>
<td>1,200</td>
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<tr>
<td>Central Carolina Community College</td>
<td>Pittsboro</td>
<td>North Carolina</td>
<td>5,000</td>
<td>Blackwater</td>
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<td>Fay School</td>
<td>Southboro</td>
<td>Massachusetts</td>
<td>21,000</td>
<td>Blackwater</td>
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<tr>
<td>San Francisco Public Utilities Commission Headquarters</td>
<td>San Francisco</td>
<td>California</td>
<td>5,000</td>
<td>Blackwater &amp; Rainwater</td>
</tr>
<tr>
<td>Transbay Transit Center</td>
<td>San Francisco</td>
<td>California</td>
<td>9,700</td>
<td>Graywater &amp; Rainwater</td>
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<tr>
<td>San Francisco Public Safety Building</td>
<td>San Francisco</td>
<td>California</td>
<td>3,400</td>
<td>Graywater, Rainwater, &amp; Condensate Drainage</td>
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<tr>
<td>PG&amp;E Service Center</td>
<td>San Francisco</td>
<td>California</td>
<td>3,000</td>
<td>Foundation Drainage</td>
</tr>
<tr>
<td>San Francisco Museum of Modern Art (SFMOMA)</td>
<td>San Francisco</td>
<td>California</td>
<td>2,000</td>
<td>Rainwater &amp; Condensate Water</td>
</tr>
<tr>
<td>Moscone Convention Center</td>
<td>San Francisco</td>
<td>California</td>
<td>TBD</td>
<td>Foundation Drainage &amp; Rainwater</td>
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<tr>
<td>181 Fremont Street</td>
<td>San Francisco</td>
<td>California</td>
<td>TBD</td>
<td>Graywater</td>
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<tr>
<td>CHAZ Yorkville Condos</td>
<td>Toronto</td>
<td>Canada</td>
<td>TBD</td>
<td>Rainwater</td>
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<tr>
<td>The Radisson Hotel Park Inn</td>
<td>San Jose</td>
<td>Costa Rica</td>
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<tr>
<td>Salam Gardens Condominium</td>
<td>Muscat</td>
<td>Oman</td>
<td>1,600</td>
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<tr>
<td>Colorado Springs Fire Station 21</td>
<td>Colorado Springs</td>
<td>Colorado</td>
<td>TBD</td>
<td>Graywater</td>
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<tr>
<td>Sidewell Friends School</td>
<td>Washington</td>
<td>District of Columbia</td>
<td>3,000</td>
<td>Blackwater</td>
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<tr>
<td>Pennant Hills Golf Club</td>
<td>North Sydney</td>
<td>Australia</td>
<td>172,000</td>
<td>Blackwater (Sewer Mining)</td>
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</table>
## Existing On-site Reuse Systems

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Sydney Olympic Village</td>
<td>Sydney</td>
<td>Australia</td>
<td>1,800,000</td>
<td>Blackwater &amp; Stormwater</td>
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<tr>
<td>UConn Reclaimed Water Program</td>
<td>Storrs</td>
<td>Connecticut</td>
<td>1,000,000</td>
<td>Blackwater &amp; Rainwater</td>
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<td>London Olympic Village</td>
<td>London</td>
<td>United Kingdom</td>
<td>150,000</td>
<td>Blackwater &amp; Rainwater</td>
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<tr>
<td>Southeast False Creek</td>
<td>Vancouver</td>
<td>Canada</td>
<td>TBD</td>
<td>Rainwater</td>
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<tr>
<td>Yesler Terrace</td>
<td>Seattle</td>
<td>Washington</td>
<td>TBD</td>
<td>Blackwater &amp; Rainwater</td>
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<tr>
<td>Southwest Ecodistrict</td>
<td>Washington</td>
<td>District of Columbia</td>
<td>TBD</td>
<td>Graywater, Stormwater, &amp; Rainwater</td>
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<tr>
<td>Water Sustainability Campus</td>
<td>Anaheim</td>
<td>California</td>
<td>100,000</td>
<td>Blackwater</td>
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<tr>
<td>Marine Corps Recruit Depot</td>
<td>San Diego</td>
<td>California</td>
<td>10,000</td>
<td>Blackwater</td>
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</table>