The One Water Approach to Urban Water Management

Rosey Jencks, Vice President

One Water NorCal

Brown AND Caldwell

Water Research Foundation®

National Experience

Resilient water solutions is top of mind for our clients across the U.S.
This illustration provides just a sample of our water solutions, including the latest innovations in brackish water treatment in Scottsdale, AZ to the closed loop **1Water** solutions in Quincy, WA to green infrastructure solutions spanning the nation from the Pacific Northwest to the Eastern U.S. BC is leading the way in sustainable water integration for our clients in Hawaii and the mainland.

LEGEND: Planning, Conservation, Stormwater, Seawater/Brackish, Reuse, Groundwater, Surface Water

Water Resource Optimization // QUINCY, WA

BC has worked on innovative water resource optimization in order to meet the demands of this thriving agricultural processing and cloud computing hub. Landlocked and limited in supply and discharge capacity, early project efforts included the hydrogeologic characterization of both the unconsolidated deposits and fractured basalt system within the Quincy Basin and the evaluation of new surface water discharge locations, groundwater recharge through surface percolation, discharge to drywells, and beneficial reuse. We also recently completed the design of a 1 mgd groundwater recharge facility.

Integrated Water Plan // SEATTLE PUBLIC UTILITIES

BC led efforts to model, assess, and provide cost/benefit analysis on various integrated gray, green, and programmatic stormwater projects to address overflows and meet consent decree requirements. The solutions will allow the City to defer overflow control capital expenditures and instead implement stormwater measures with greater water quality benefits.

Low-Impact Development Basin Relief // PORTLAND, OR

BC has designed numerous low-impact development vegetated stormwater facilities that collect, filter, infiltrate, and convey stormwater runoff from existing streets to support water quality and quantity goals.

Integrated Water Resources Plan // PLACER COUNTY WATER AGENCY (CA)

BC led assessment of integrated water solutions to meet one of the fastest-growing California areas. Efforts included segregating buildout demands into uses able to be supplied by recycled water and local groundwater. GIS was used to project development. BC led integration of past plans and developed future water supply strategies.

Advanced Water Treatment Facilities // U.S. MARINE CORPS, CAMP PENDLETON (CA)

Owner's agent for the $90M design-build of a water treatment plant designed to reduce total dissolved solids and total organic carbon from brackish well water supply. Project includes the modeling of reverse osmosis reject/brine ocean disposal, development of draft engineer's report, construction cost estimates, and design-build procurement.

Water Reuse Master Plan // SAN DIEGO, CA

BC led a citywide recycled water study to identify and evaluate alternatives for potable and non-potable reuse through 2035. Critical elements of the study included future expansion considerations and future siting of reuse facilities to serve industrial and potable reuse demands. BC also studied new technologies and conveyance to serve industrial and commercial customers, as well as meet groundwater demands.

Brine Removal Study // SCOTTSDALE, AZ

BC is leading a pilot study to test a two-pass membrane system flow scheme that removes the elevated sodium chloride content in reclaimed water, but retains potentially beneficial ions such as calcium, magnesium, and sulfate. If successful, this process offers many benefits including lowering the cost of concentrate management and disposal, removing predominantly only what is necessary—sodium chloride, limiting chemical usage, lowering operating costs compared to reverse osmosis with blend, and higher water recovery. On satisfactory results of the pilot study, the next phase would be a demonstration-scale facility study.

Big Creek Lake Watershed Management Plan // MOBILE, AL

BC developed an actionable watershed management plan for Big Creek Lake, a 3,800-acre potable water reservoir, and the 103-mile watershed area. The efforts included monitoring tributaries to determine flows. Existing- and future-conditions hydrologic, nutrient, and carbon budgets were developed for the lake. A lake nutrient assimilation model was used to determine future lake nutrient enrichment.

Climate Change Impact Study // SOUTHEAST WISCONSIN REGIONAL PLANNING COMMISSION (SEWRPC), WI

BC assessed climate change scenario impacts on Milwaukee-area treatment facility performance.

Climate Change Adaptive Management Planning // MID-OHIO REGIONAL PLANNING COMMISSION (OH)

BC is the engineer for a climate change adaptation project with the Mid-Ohio Regional Planning Commission, U.S. Geological Survey, City of Columbus, Del-Co Water Company, Inc., and Ohio Water Development Authority. This proactive, science-based study is designed to ensure that central Ohio has clean and secure water resources for current residents and businesses, and to sustain needs from future growth through 2099.

Green Infrastructure BMPs // COLUMBUS, OH

BC is a partner in the identification of green infrastructure solutions that would reduce volume and overflows. Solutions such as green roofs, parking lot rain gardens, and street rain gardens are being modeled in select areas to assess impacts and potential results if scaled up in other areas of the city. The work has identified best practices and alternative ways to meeting stormwater control needs.

Watershed Management Plan // ATLANTA, GA

BC prepared a 50-year Comprehensive Watershed Management Plan that addressed the City's overall water management. The efforts assessed the stormwater system, stream water quality, and strategies for integrated management in close collaboration with City water and wastewater staff.

"Integrated Water Management: Planning for Future Water Supplies" WATER RESEARCH FOUNDATION

BC is leading an effort with the Water Research Foundation (WRF) to bring diverse stakeholders across the nation together to discuss integrated water management barriers. More than 30 utilities, regulators, research organizations, and academia are coming together under BC and WRF's leadership to help define research objectives and prioritize further research needed to support integrated water management best practices across the nation.

California Urban Water Agencies

BC is at the forefront of the toughest issues facing water planners today, especially through the efforts of Cindy Paulson, who has served as executive director of the California Urban Water Agencies since 2011. Through this, Cindy supported CUWA's first Climate Change Policy Principles and Water Reuse Policy Principles. Topics have covered the full spectrum of 1Water, from reuse and conservation to desal and financial sustainability to meet the states future water needs effectively.

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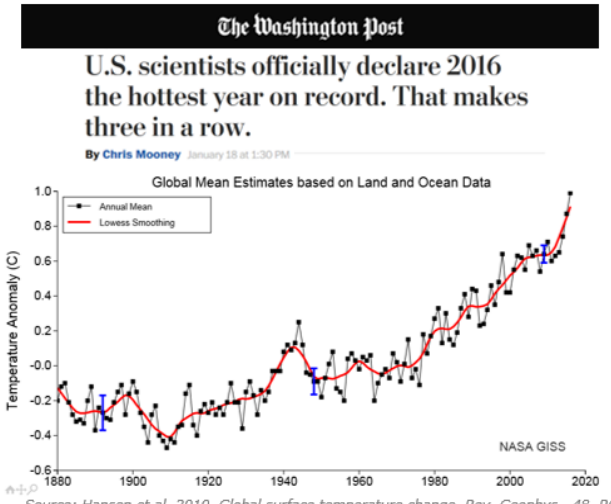
Today's Outline

- What we mean by One Water?
- Driving forces for reliability/resiliency
- One Water Blueprint
- One Water Project examples
- Discussion

One Water defined

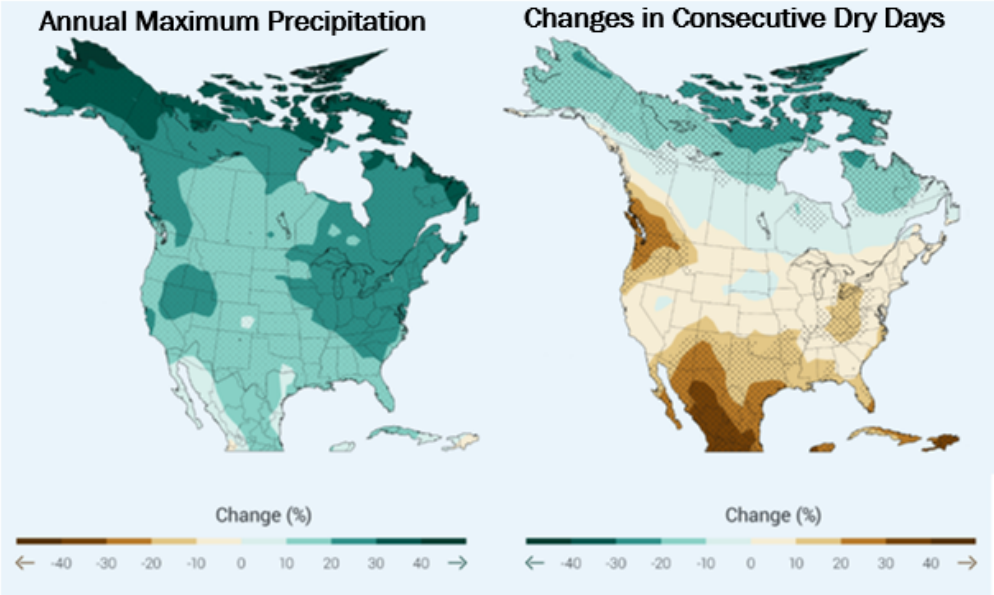
One Water is an integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs.

Why do we need a One Water Approach?



Source: Hansen et al. 2010. Global surface temperature change. Rev. Geophys., 48. RG4004, doi:10.1029/2010RG0

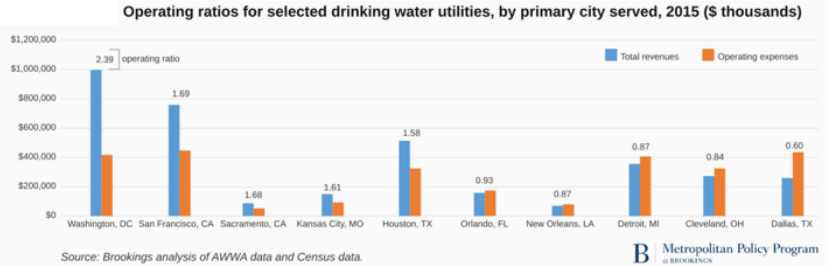
Extreme Precipitation Events and Longer Droughts Expected



2070-2099 predictions

Source: NOAA NCDC/CICS-NC, 2014 National Climate Assessmer

Challenges to Financial Sustainability



Source: Brooking's Institute, Dec. 2016

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Water Research Foundation

To Meet Current Challenges - One Water Shifts How We Manage Our Water Resources

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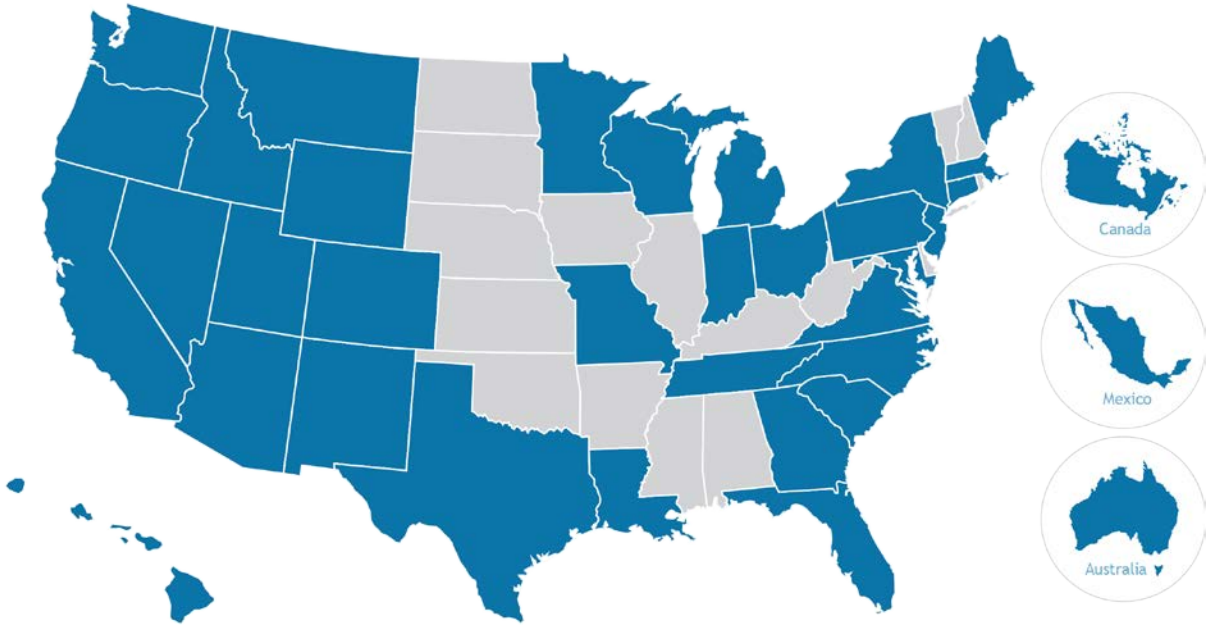
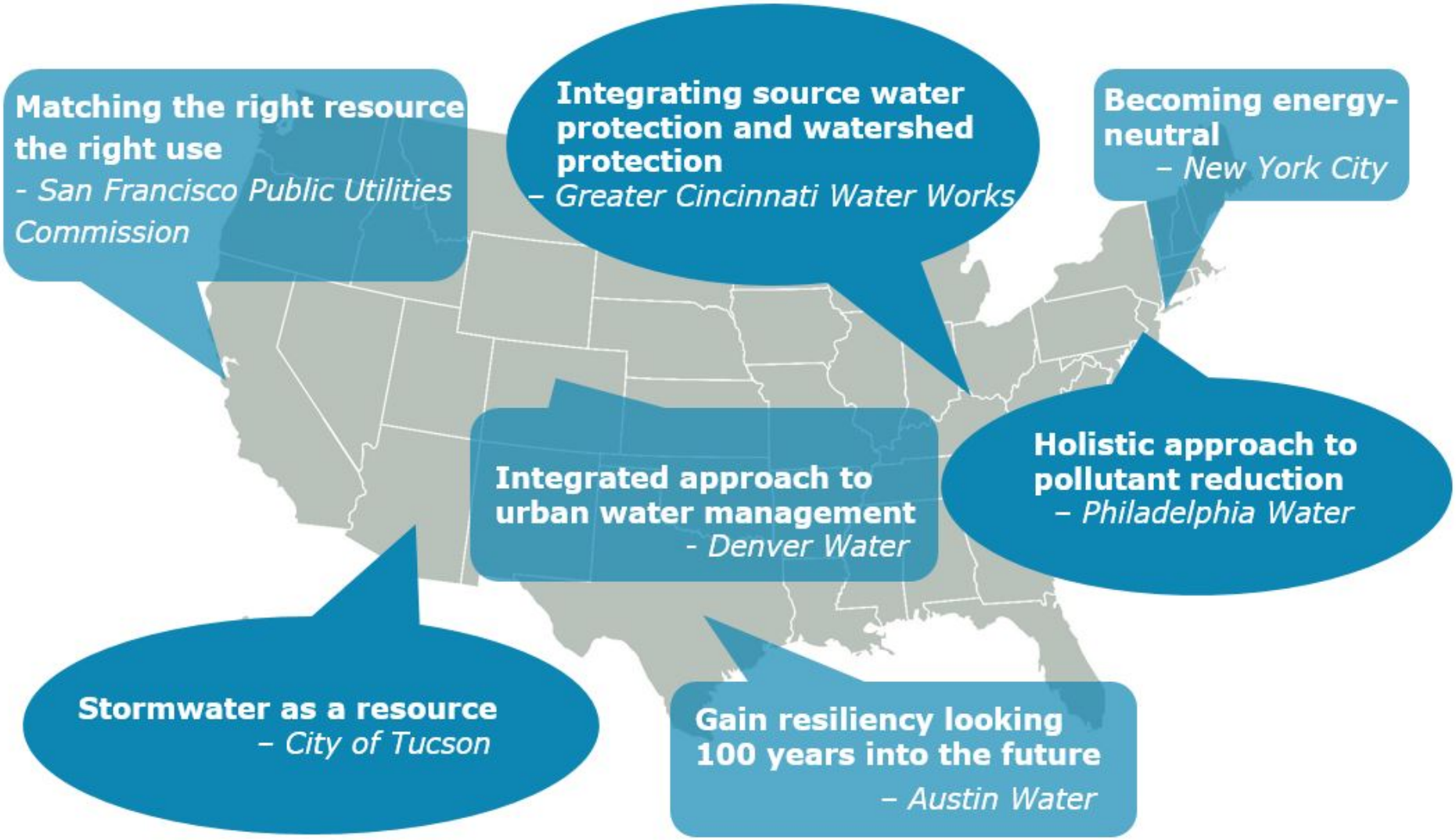
Blueprint reflects input from Utilities and Water Professionals Worldwide

- International survey completed by more than 800 water professionals
- More than 10 one-on-one interviews
- 2-day workshop with more than 35 water professionals

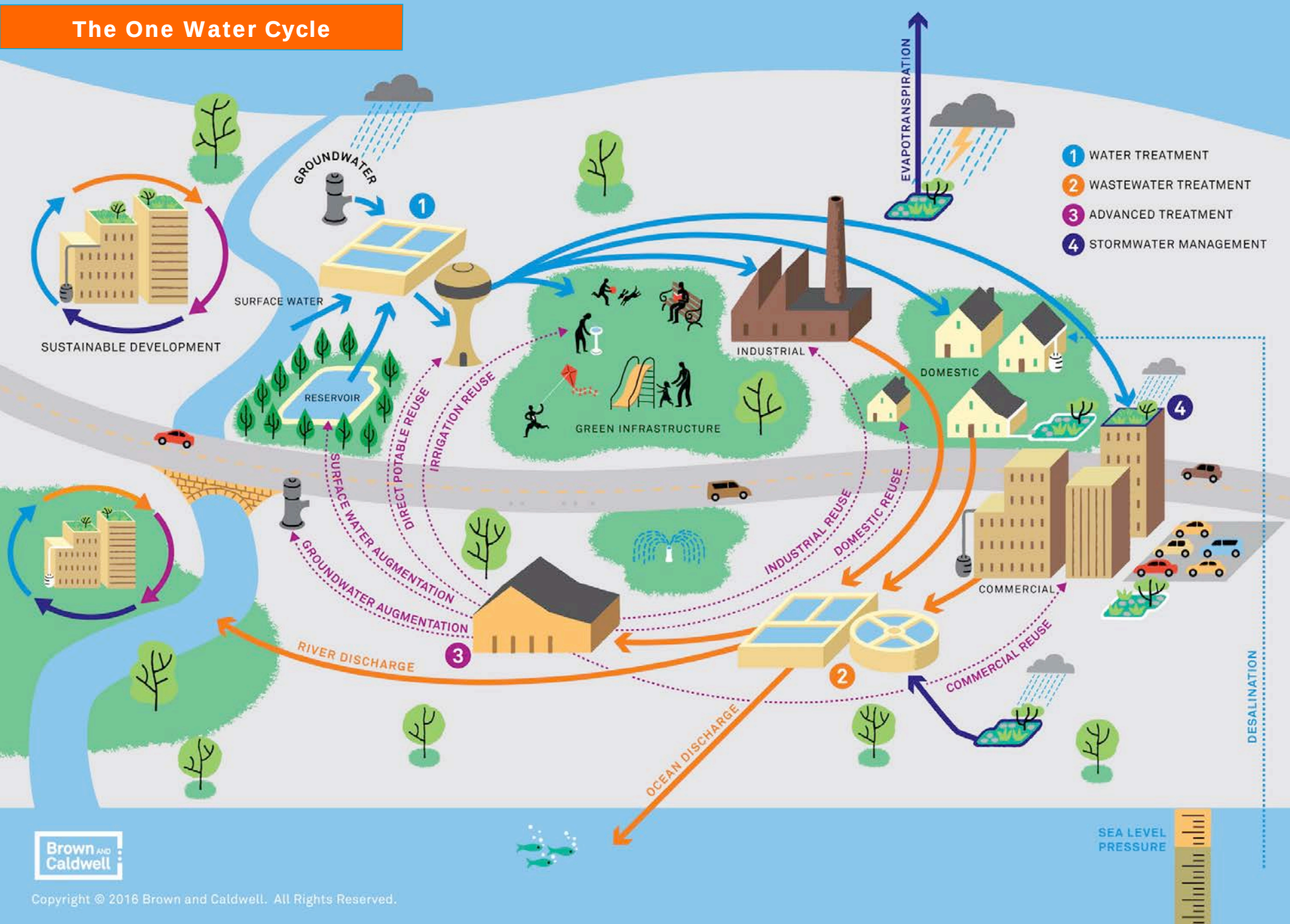


Definition of One Water is Site-specific



Key Elements of a One Water Approach

The One Water Cycle



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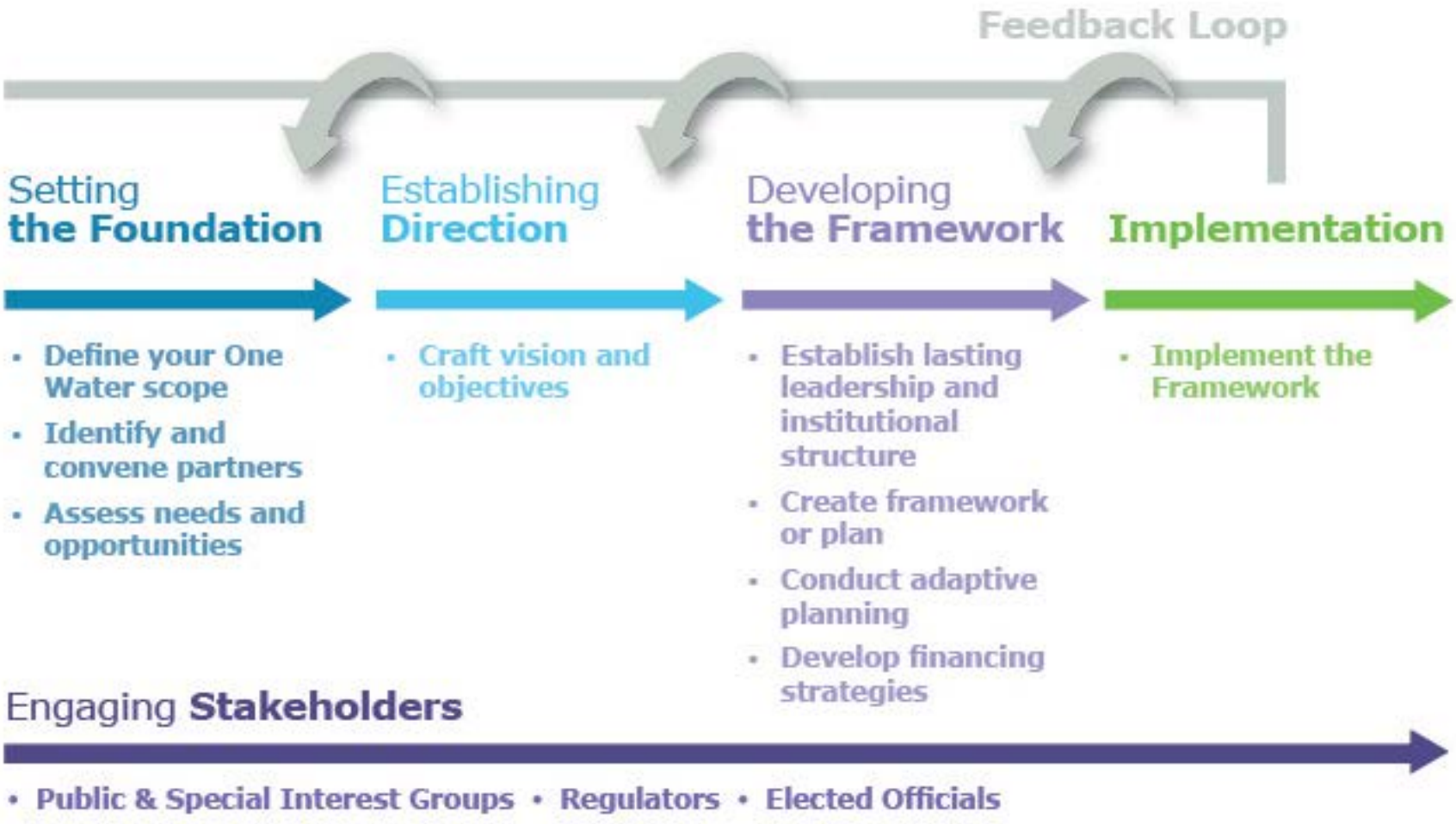
The Blueprint Provides Step-by-step Guidance



Each Blueprint Step Highlights Tangible Actions, Outcomes, Challenges

Define Your One Water Scope

One Water can look very different from one place to the next depending on your climate and geography, water resources, and environmental stressors. Developing a One Water framework begins with defining what One Water is or could be for your entity.

IMPORTANT ACTIONS

- ✓ Determine the challenges that your entity, community, and region are facing that may impact long-term water supply reliability, water resource resilience, or water quality needs.
- ✓ Reach out to other cities and utilities of similar size and with similar attributes that have implemented a One Water approach for insights to seed internal dialogue.
- ✓ Consider using a "re-imagining" exercise to explore how you might do things differently if you were creating your system from scratch.
- ✓ Consider what your organization is already doing or planning for to enhance sustainability and determine how best to leverage these existing activities.
- ✓ Decide what issues you want to address with an integrated One Water approach and what form it will take. Will this be a simple framework or a comprehensive plan?
- ✓ Begin to identify internal and external partners to include in the development of your One Water approach.

KEY OUTCOMES

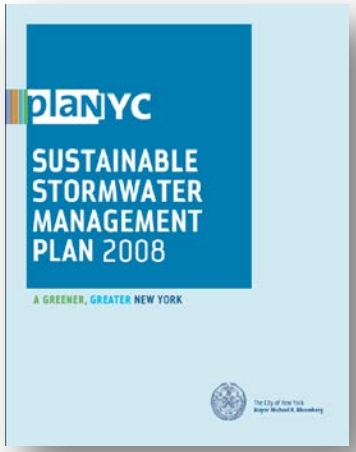
- A rough definition of One Water for your entity including what will and won't be included

POTENTIAL CHALLENGES

- Identifying innovative approaches to water management
- Thinking big
- Defining a workable scale and scope

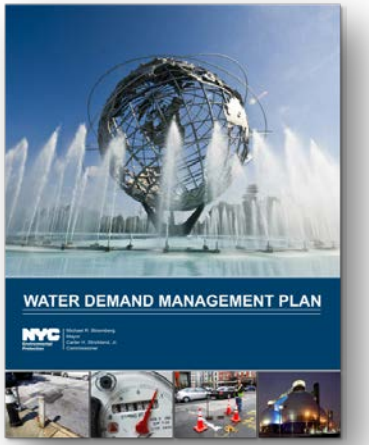
NYC DEP - One Water As a Unifying Framework for Multi-faceted Initiatives

2007

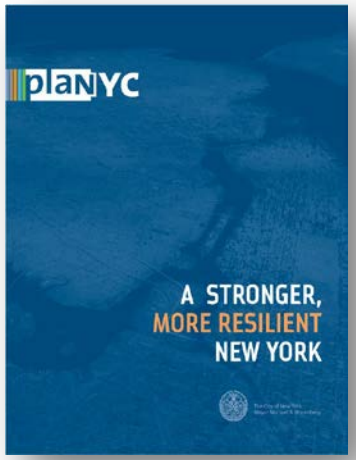


2008

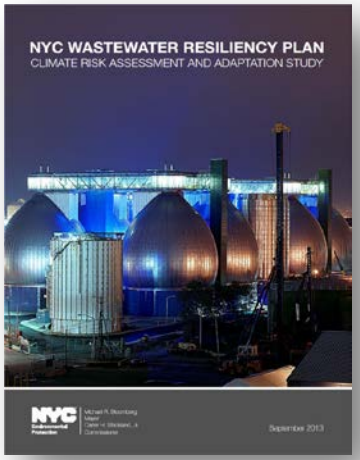
2010



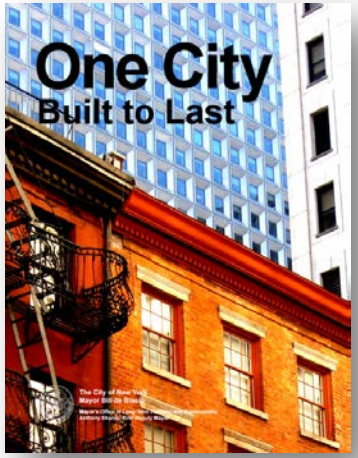
2013



2013



2013



2014

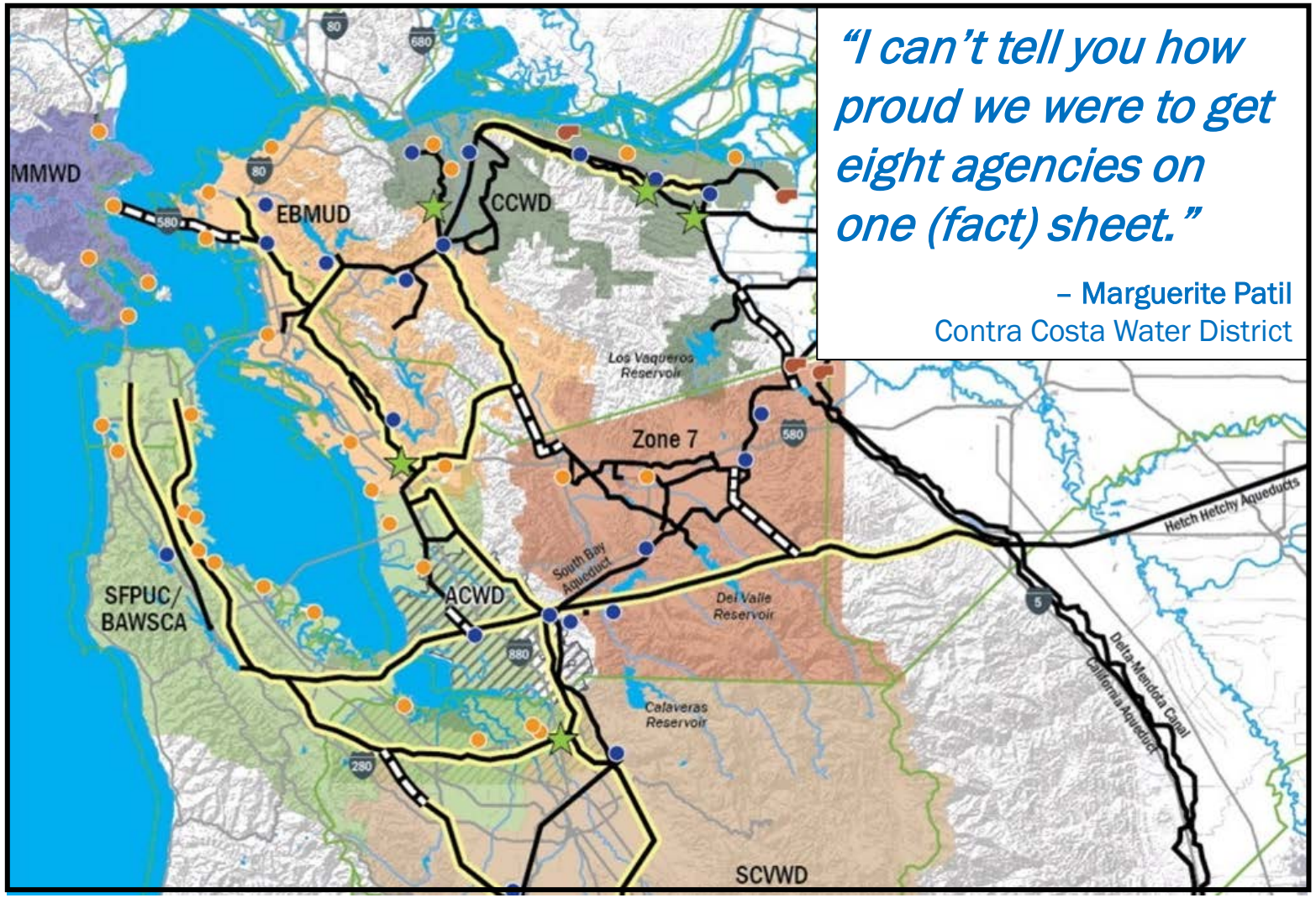
2015

New NYC Citywide Vision and Guiding Principles Sets Direction for Integrated Water Management

Guiding Principles:

- Integrate management of water resources and policies
- Cultivate climate resilience
- Contribute to a livable city
- Improve the health of local watersheds
- Provide flood protection
- Provide reliable, secure, and clean water supply
- Implement, monitor, and maintain a reliable and resilient wastewater system

Bay Area Regional Reliability Partnership Established Early Foundation for Success



"I can't tell you how proud we were to get eight agencies on one (fact) sheet."

– Marguerite Patil
Contra Costa Water District

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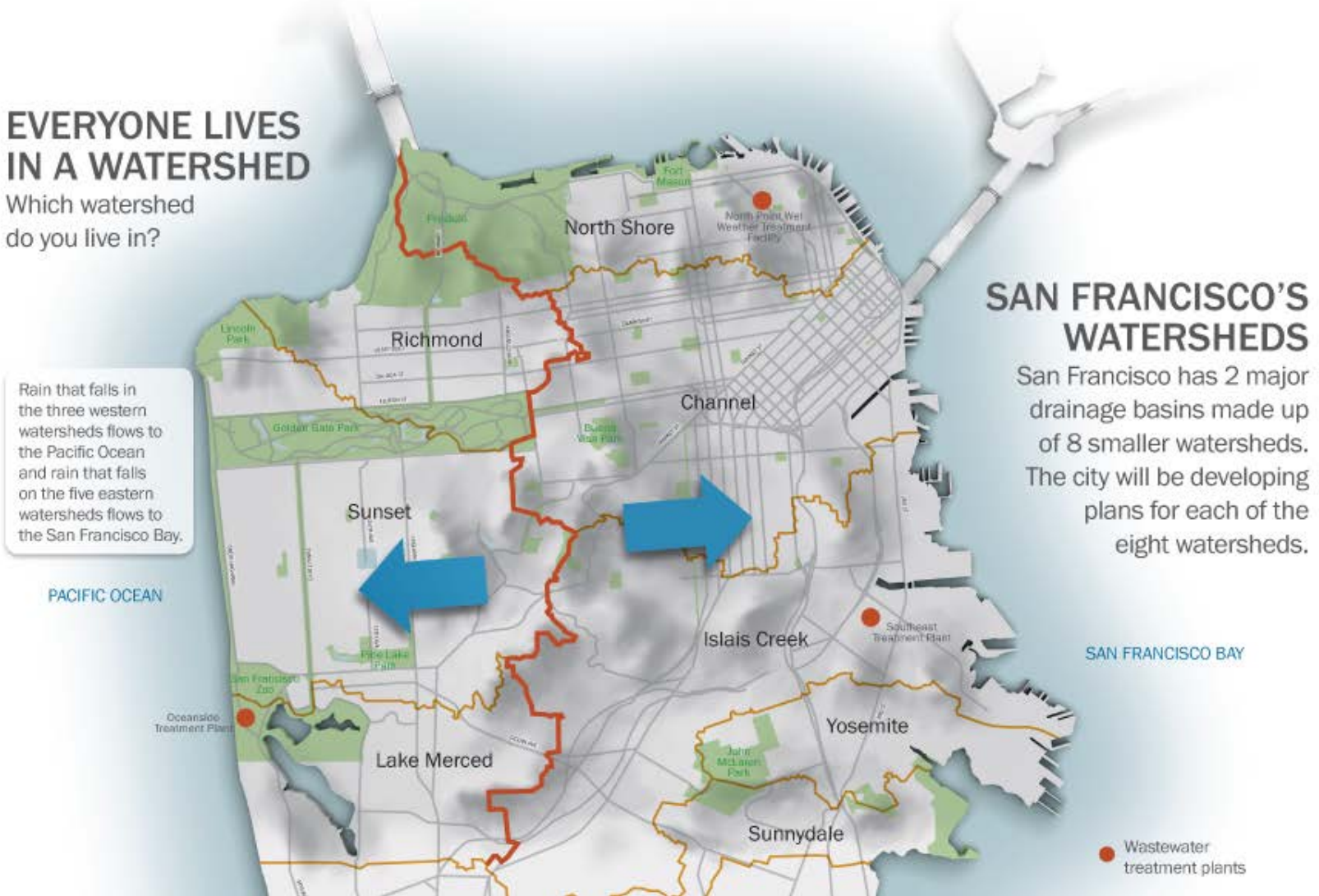
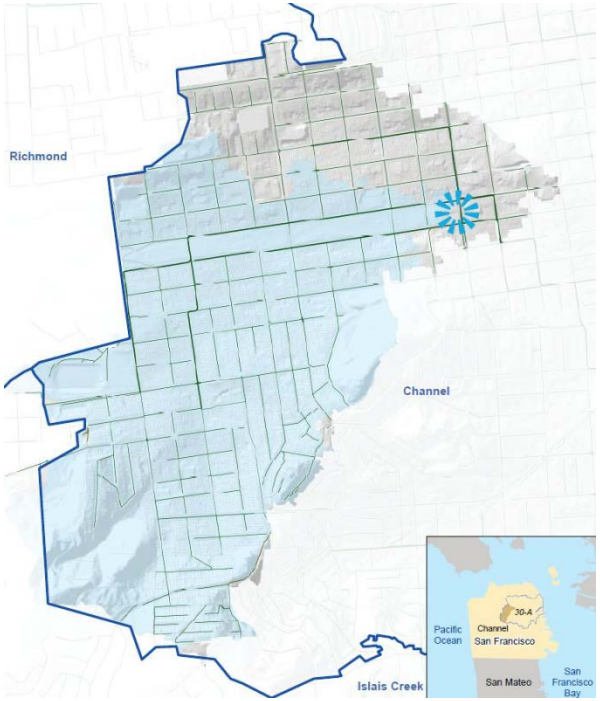
SAN FRANCISCO'S EIGHT WATERSHEDS

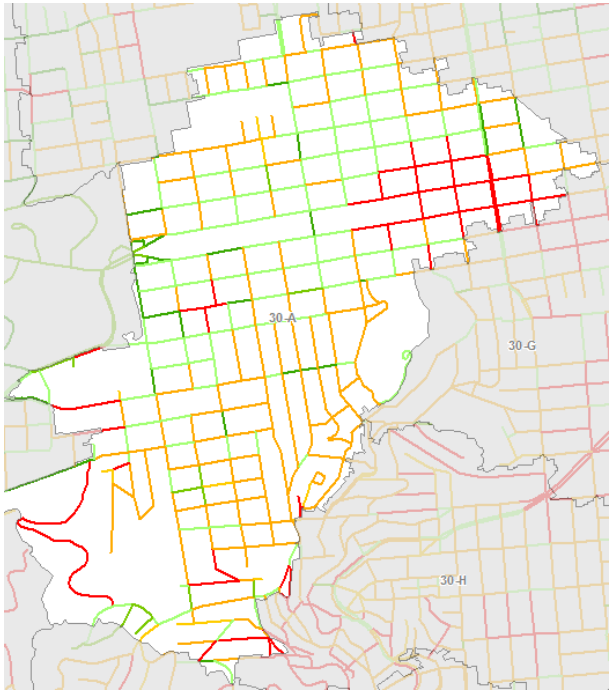


UWA OPPORTUNITIES PROCESS

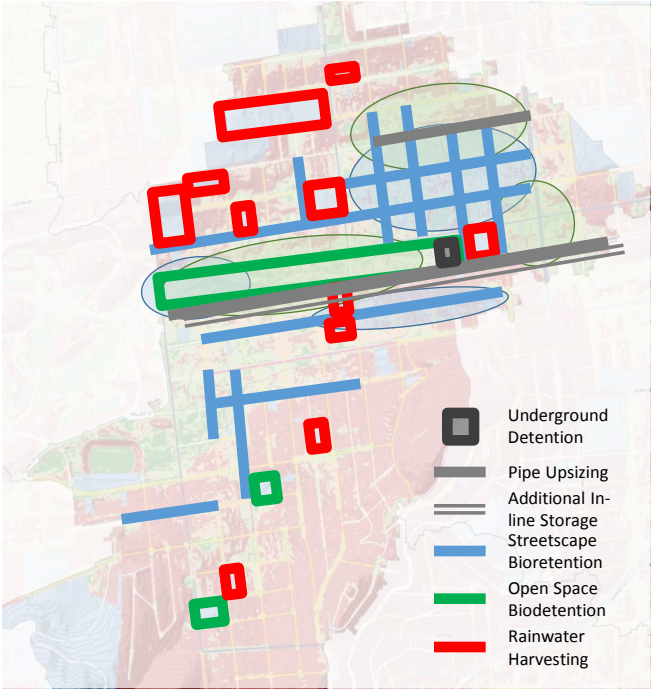
NEEDS



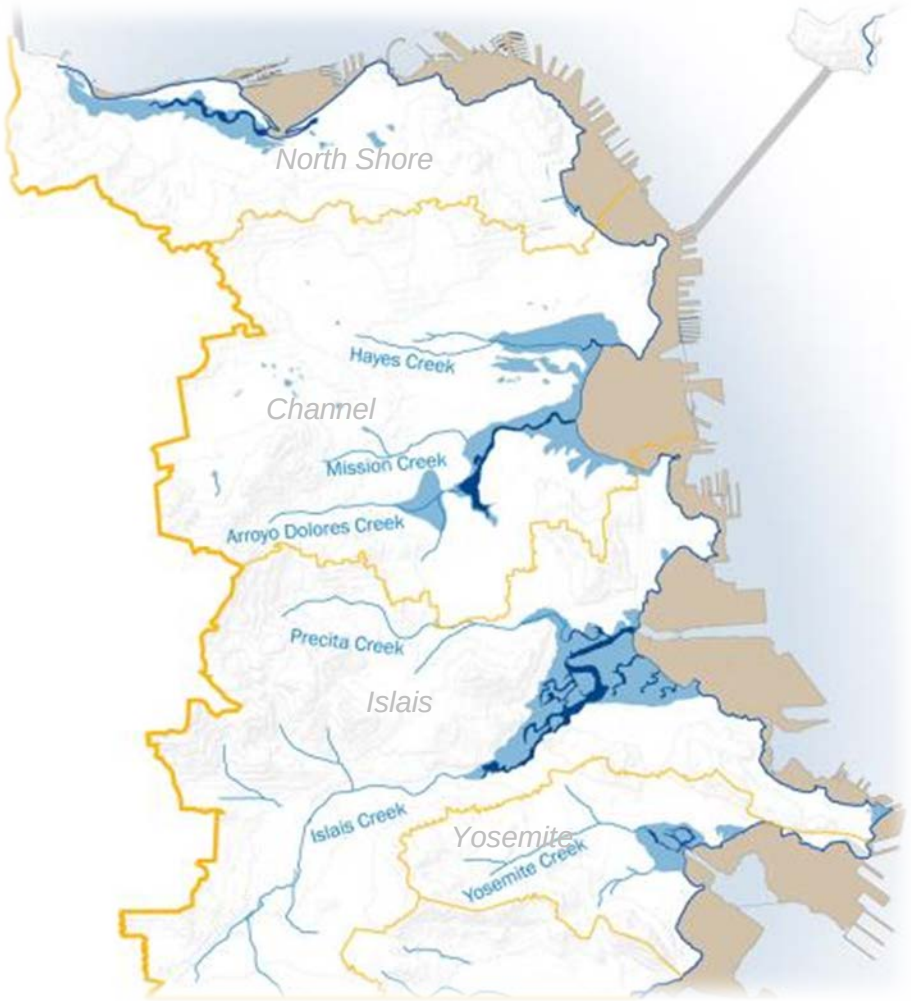
SUITABILITY



CONCEPTS



Historic Hydrology



Collection System

Creek Daylighting

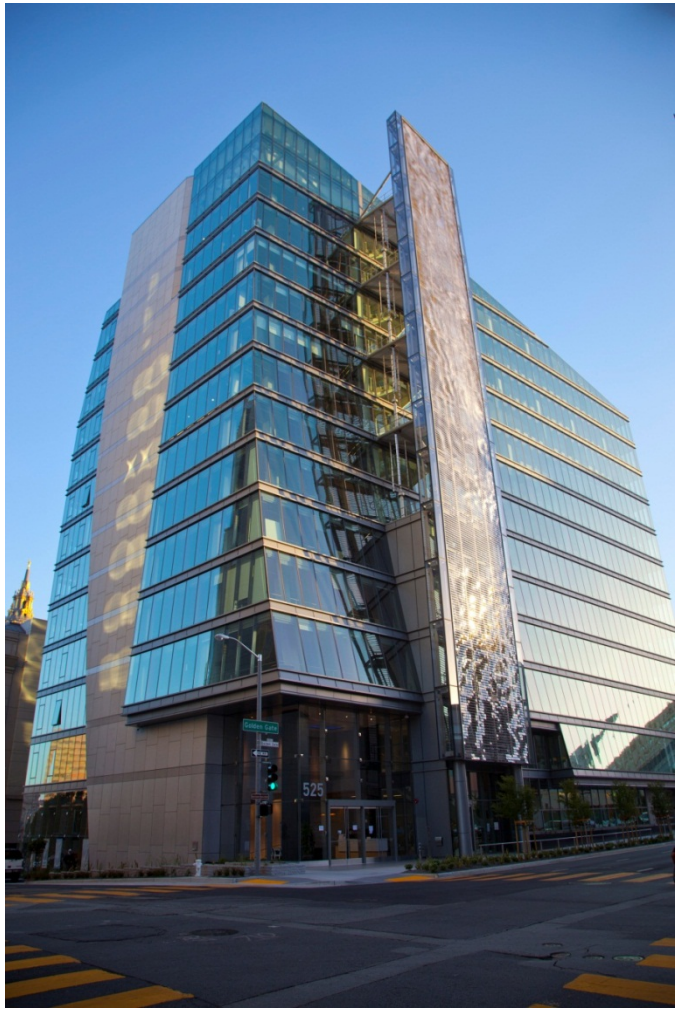
Islais Creek, 1920's San Francisco
Image: Greg Gar Collection

Alemany Blvd/I-280, San Francisco
Image: Greg Gar Collection

Cheong Gye Cheon, Seoul, SK – Before and After
http://lacreekfreak.wordpress.com/

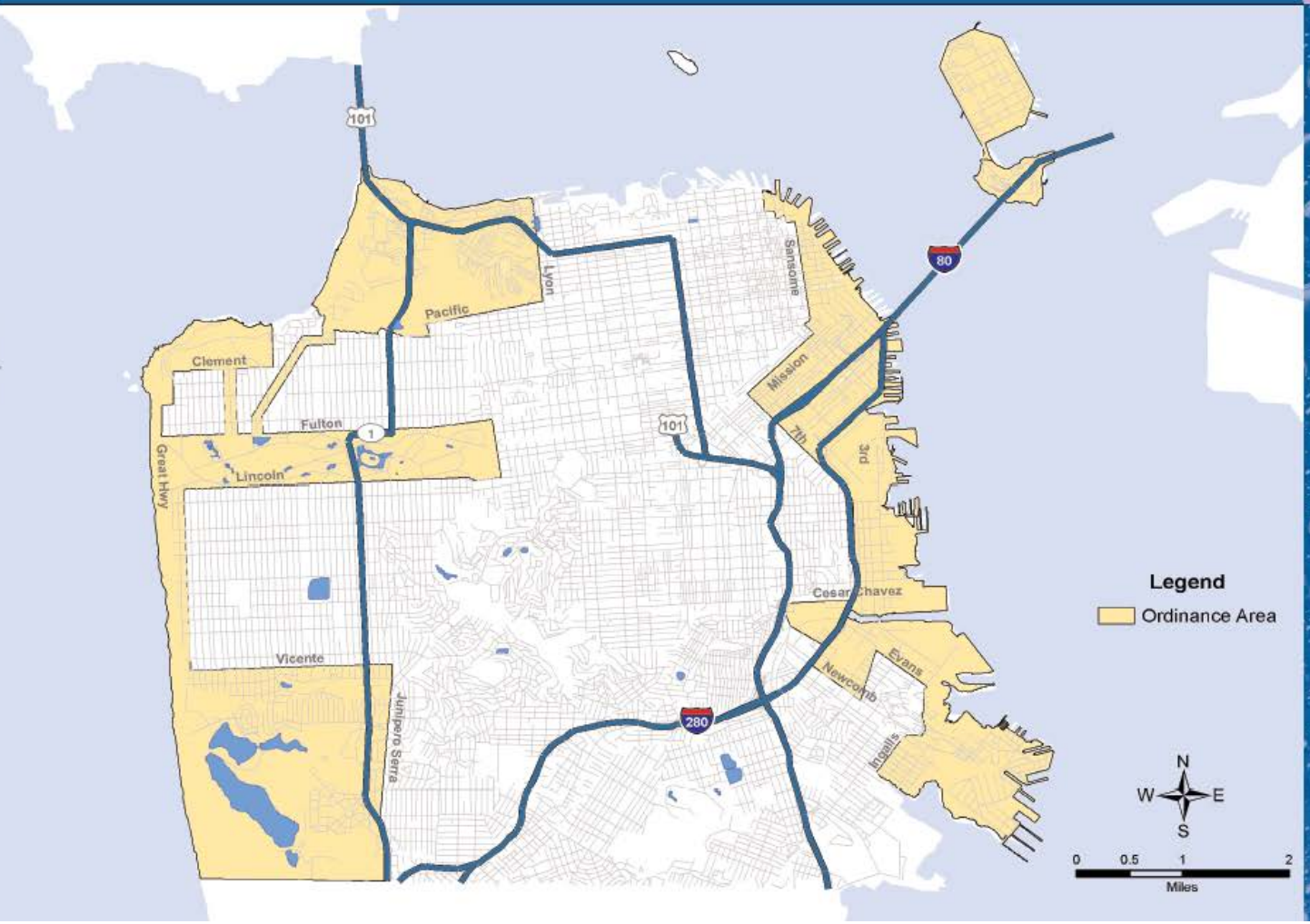
Floodable Spaces

SFPUC Headquarters



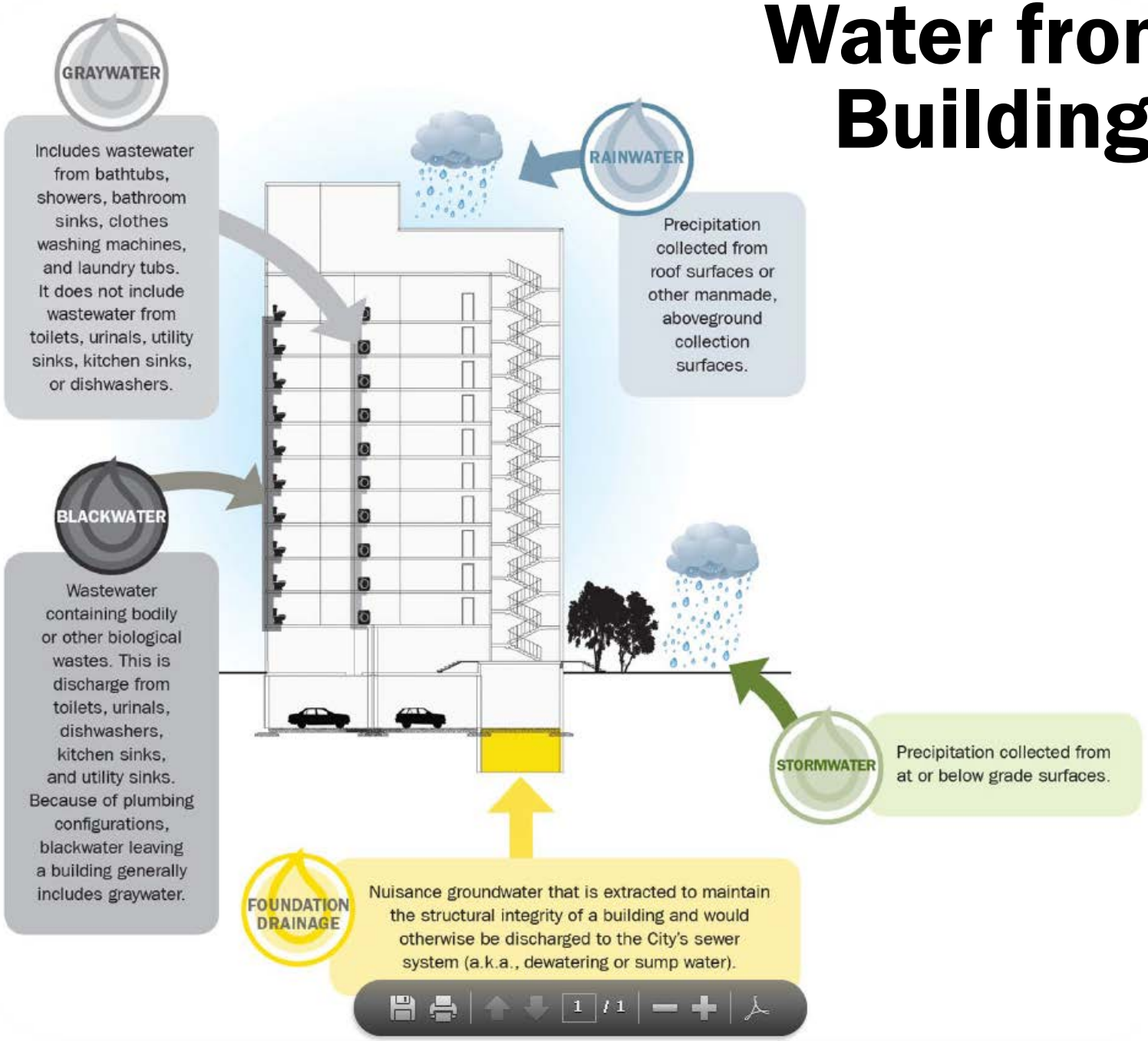
City and County of San Francisco

Designated Recylced Water Use Areas



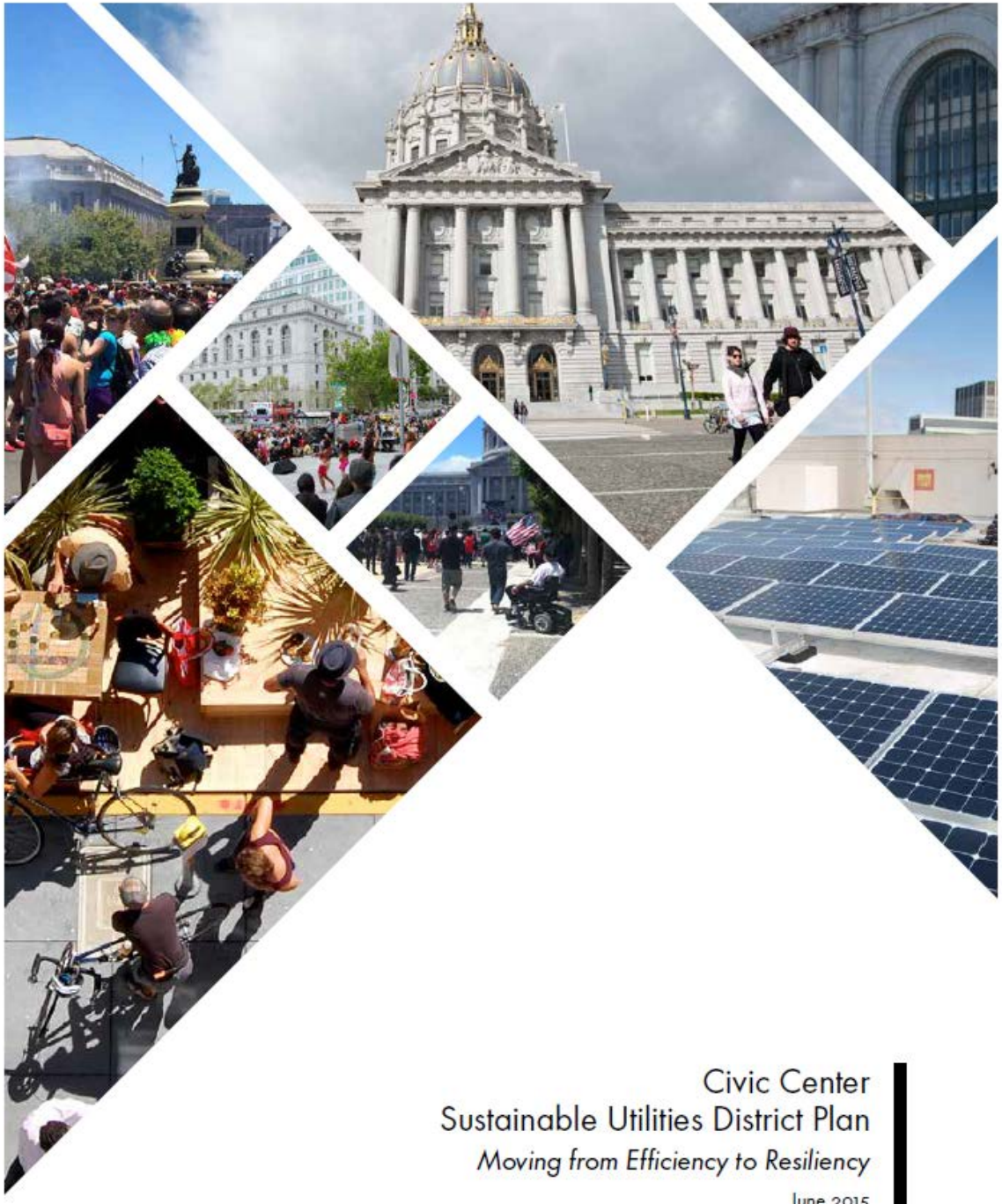
What You Should Know About San Francisco's Recycled Water Ordinances

Water from Buildings



Non-potable Water Program Guidebook

A Guide for Implementing Onsite Non-potable Water Systems in San Francisco



Civic Center Sustainable Utilities District

Zero imported water, zero wastewater, and zero net energy

- Reduction of potable water demand
- On-site wastewater treatment and reuse
- Green infrastructure for stormwater management
- Sustainable energy production

Seismic and climate resiliency

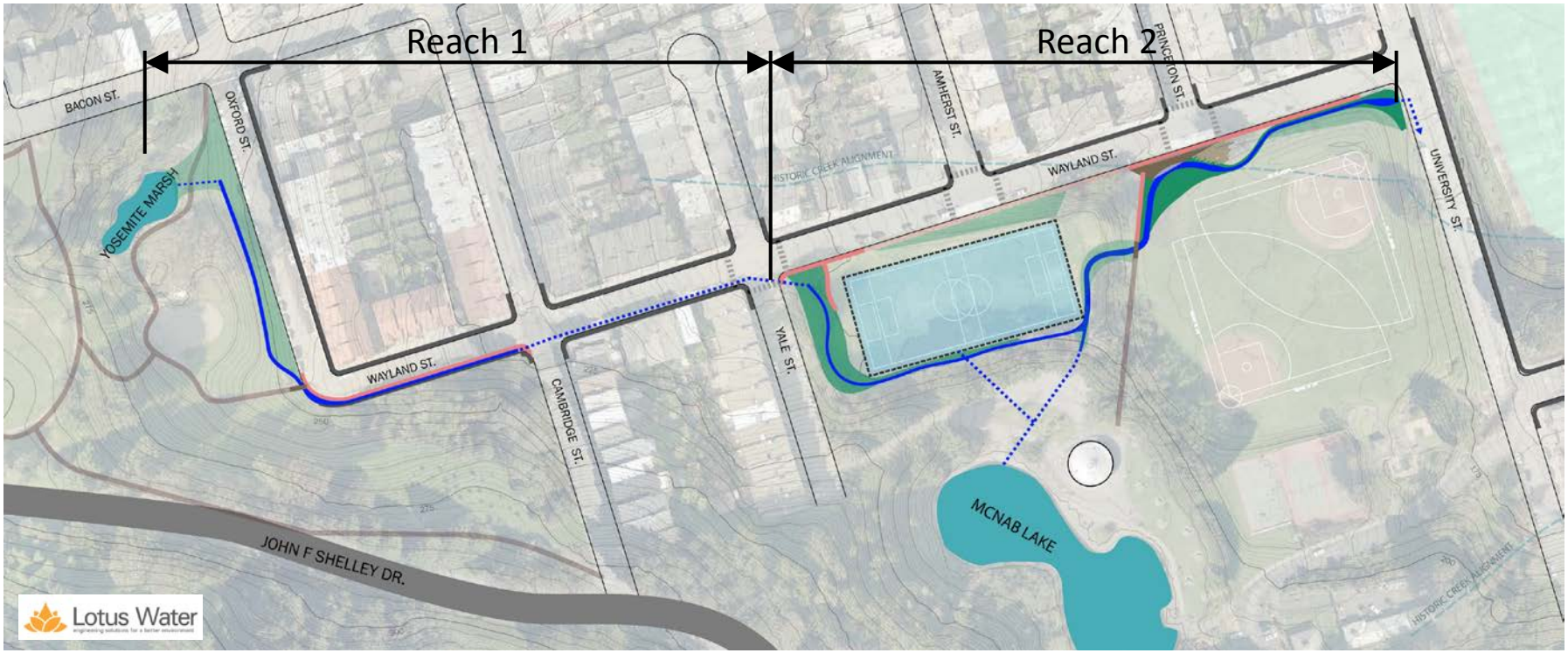
- A District treatment and reuse system powered by local energy could allow Civic Center to function during extreme events.
- Incorporate emergency readiness into site planning activities

Enhanced public realm

- Open space and pedestrian safety

Civic Center Sustainable Utility District

Yosemite Creek Daylighting Overview



Summary

- 2,100 linear feet of creek daylighting
- 3,600 square feet of bioretention areas / rain-gardens
- 700,000 gallon underground storage cistern below soccer field
- integrated ultra-high efficiency irrigation system (EPIC)

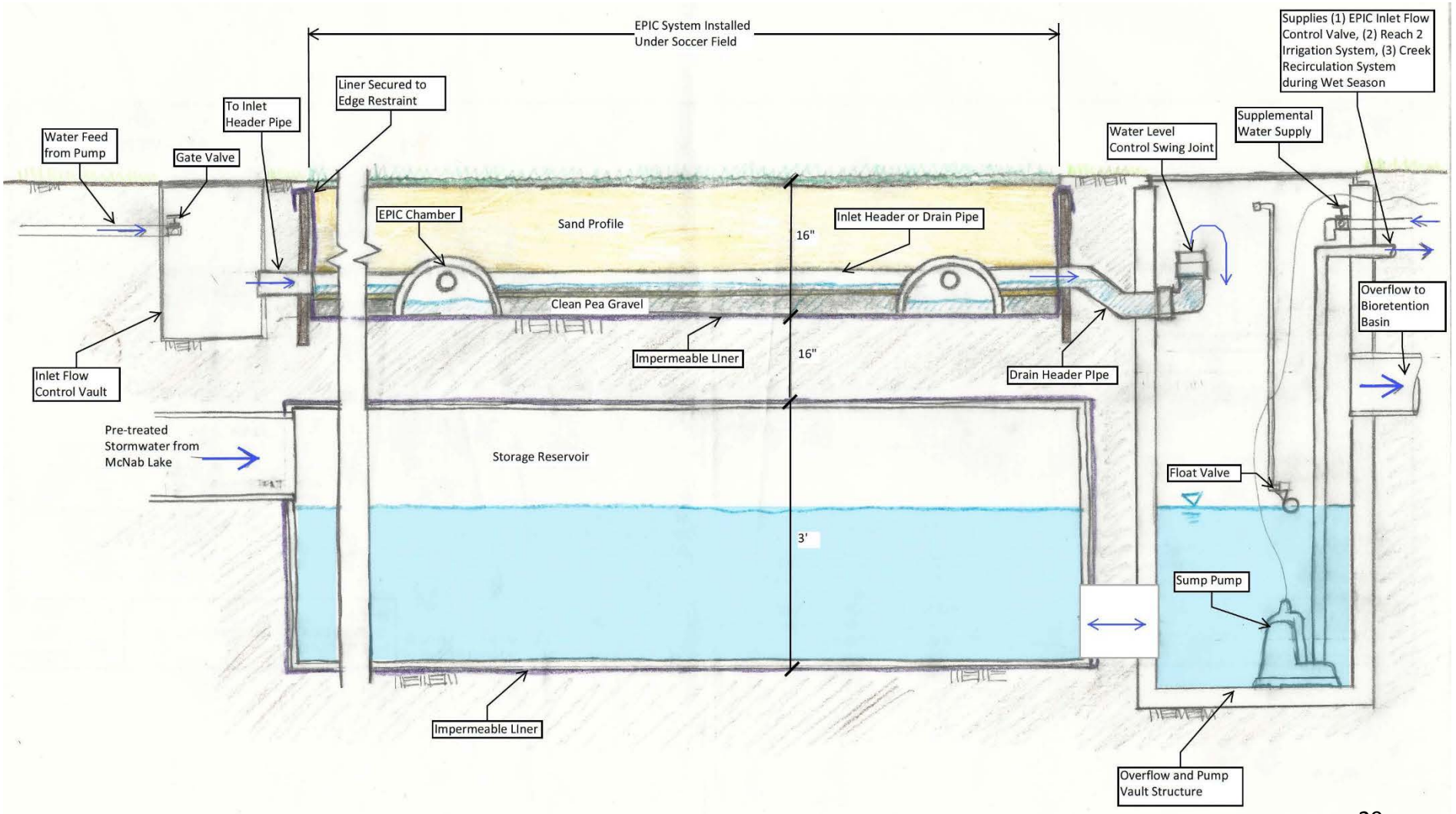
Key numbers

- Total volume managed 9.3 MG/yr
- Volume Retained: 3.3 MG/yr
- Project Cost: $14 M
- Annualized cost: 0.09$/gal managed

Yosemite Creek Daylighting Overview

Lotus Water

Irrigation and Reservoir System



Lotus Water

Download a copy of the Blueprint for One Water:

http://www.waterrf.org/Pages/Projects.aspx?PID=4660

Thank you!

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it's about connecting

Brown AND Caldwell essential ingredients®