

Anticipating the Trade-offs of Alternative Water Supplies

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Today's Outline

- Research Objective and Background
- Identifying trade-offs
- Trade-offs of Alternative Water Supply Strategies
- Key Takeaways



We forget that the water cycle and the life cycle are one.

– Jacques Cousteau

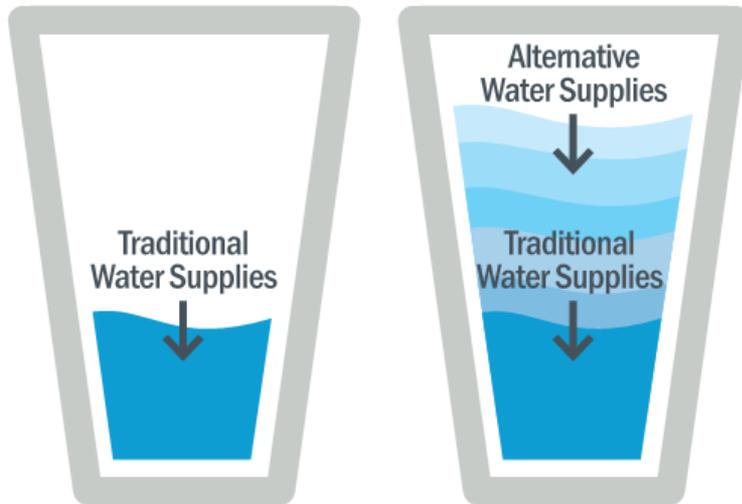




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Research Objective and Background

Diversifying water supply portfolios through alternative supplies



Utilities are expanding their options to round out their existing supply portfolios with alternative water supplies.

➤ WRF 4715 Objective

Provide guidance for utility supply planners to better identify and address the trade-offs of incorporating alternative water supplies into a diverse water supply portfolio for greater reliability

Leveraging industry knowledge to inform a guidance manual for other utilities



Taking a holistic perspective to improve long-term water supply reliability

ONE WATER

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

Traditional supplies

Sources historically used for water supply

Alternative supplies

Sources of water *not* from traditional sources

Para-supplies

Supply strategies that don't constitute as a physical supply

Taking a holistic perspective to improve long-term water supply reliability

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Traditional supplies

- Surface water
- Groundwater

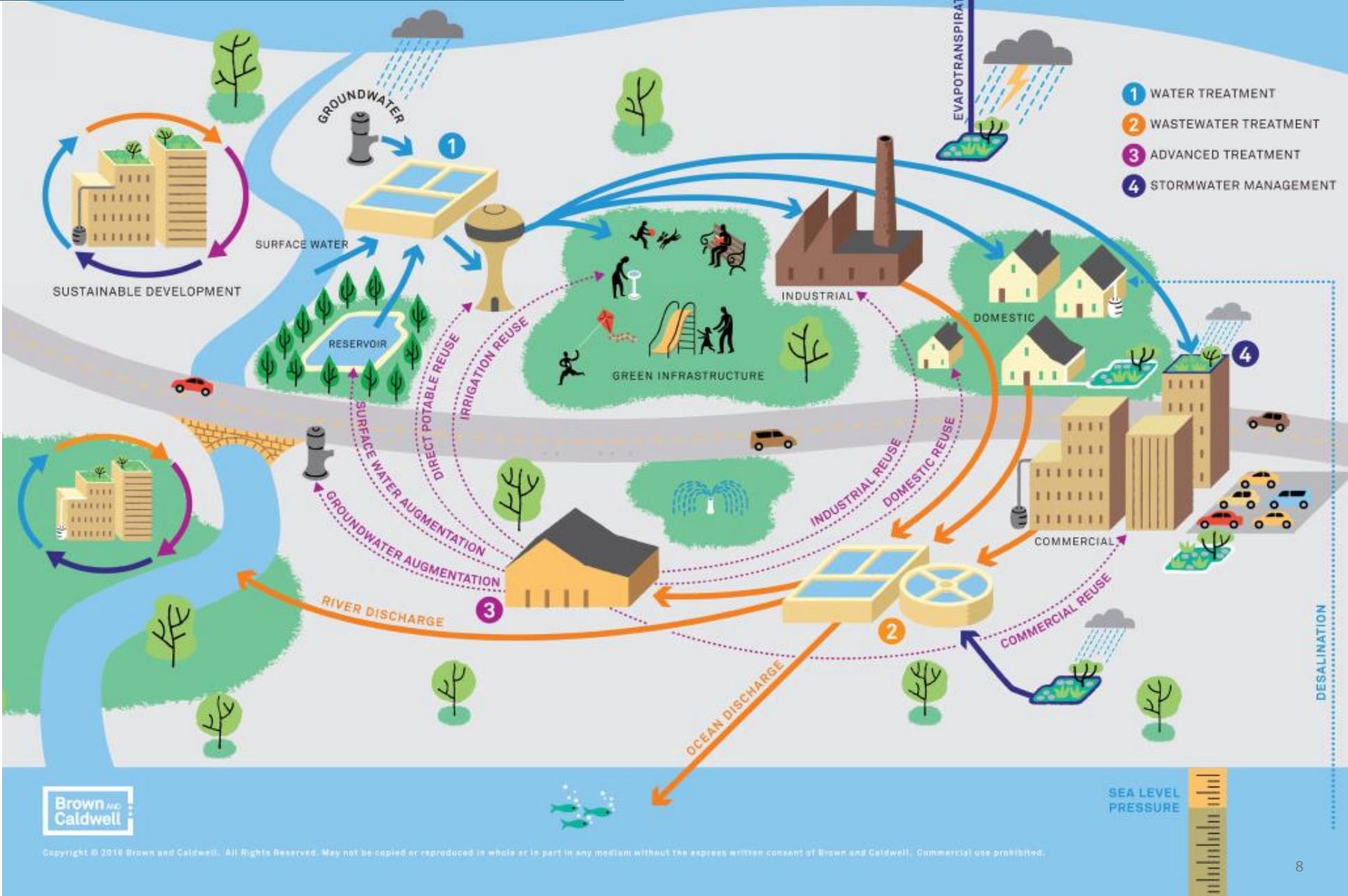
Alternative supplies

- Centralized non-potable reuse
- On-site reuse
- Desalination

Para-supplies

- Conservation
- Non-revenue water

Alternative supplies are an integral part of the One Water Cycle



Understanding the trade-offs for holistic decision making

Challenges and Risks

- Long-term O&M
- Changes in water quality
- Public health concerns
- Seasonal variation in supply
- Reduced revenue
- Underutilized assets

Benefits

- Water supply reliability
- Community benefits
- Resilience
- Environmental benefits
- Economic vitality
- Pollution control

Trade-offs are both supply- and utility-specific, so there is no one-size-fits-all solution.

Resilient and Sustainable Water Supplies

Expanding our reach to gain perspective through a national survey



Public water utilities composed the majority of survey respondents

Other respondents represented a variety of groups including business owners, attorneys, river authorities, special-purpose district representatives, and tribal government.

Alternative water supply and para-supply strategies investigated in this project include:

NON-POTABLE SUPPLIES



Stormwater



Non-potable reuse



Rainwater



Graywater



Blackwater

CENTRALIZED

DECENTRALIZED (*onsite reuse*)

POTABLE SUPPLIES



Seawater desalination



Brackish groundwater desalination



Potable reuse

PARA-SUPPLIES



Conservation



Reducing NRW

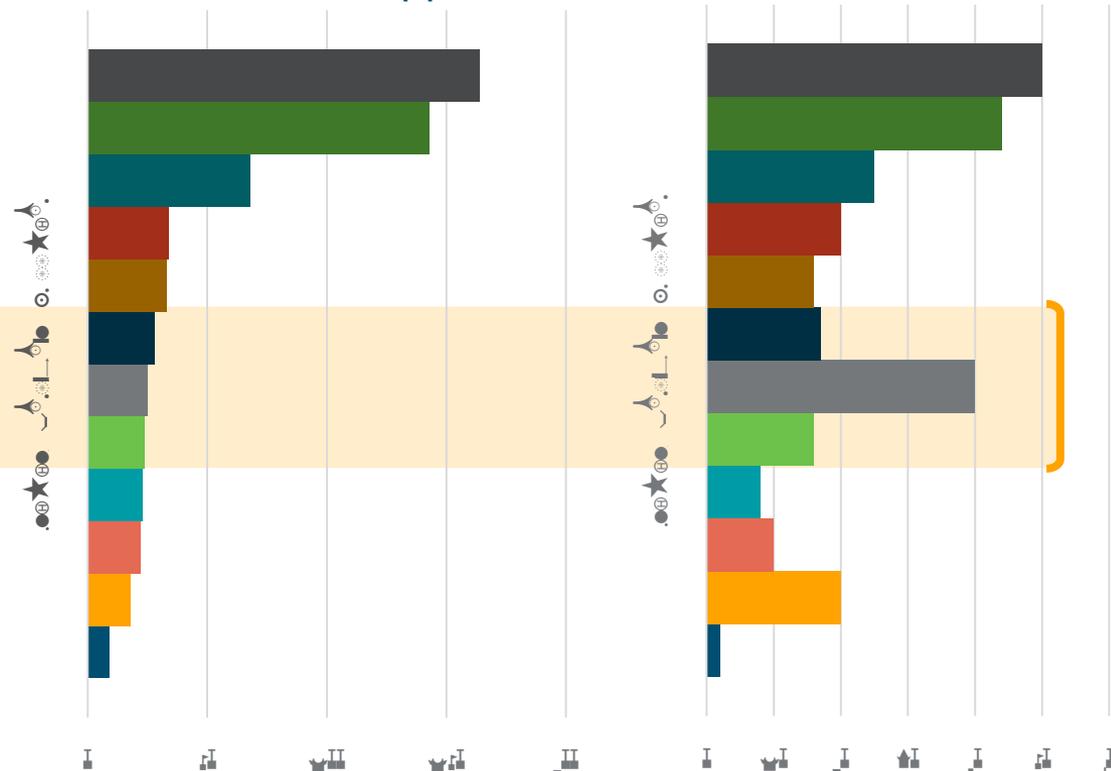
Future water portfolios will include more alternative potable supplies

64 % of the utilities surveyed rely on at least one alternative water supply

- Para-supply: Conservation
- Non-potable: Centralized Reclaimed water
- Para-supply: Reducing non-revenue water
- Non-potable: Decentralized Rainwater
- Other (please specify)
- Potable supply: Brackish groundwater
- Potable supply: Municipal wastewater effluent
- Potable supply: Seawater
- Non-potable: Decentralized Industrial water
- Non-potable: Decentralized Graywater
- Non-potable: Centralized Stormwater
- Non-potable: Decentralized Blackwater

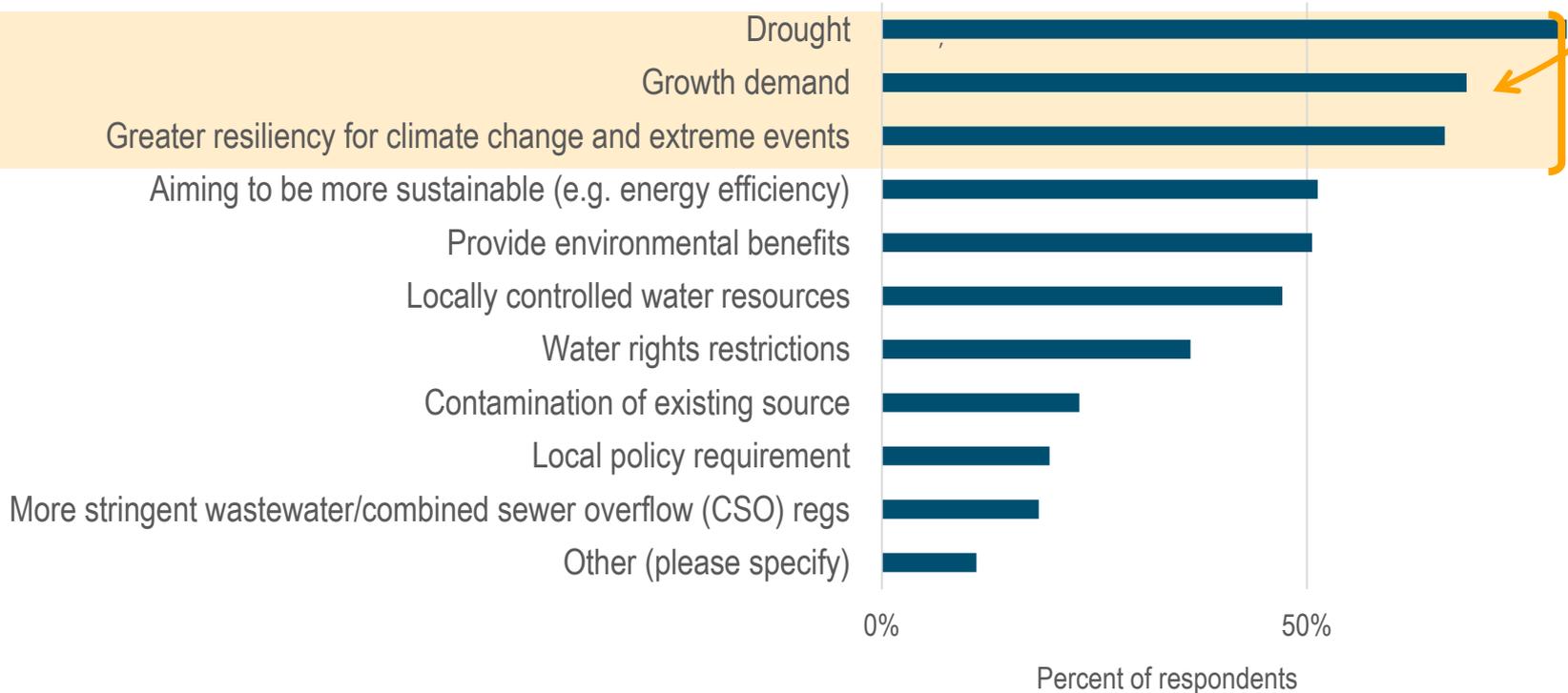
Current Alternative supplies

Future Alternative supplies



There are many drivers for considering alternative water supplies

The top drivers for utilities to seek alternative water supplies are **drought, growth demand, and desire for greater resilience** to climate change and extreme events.

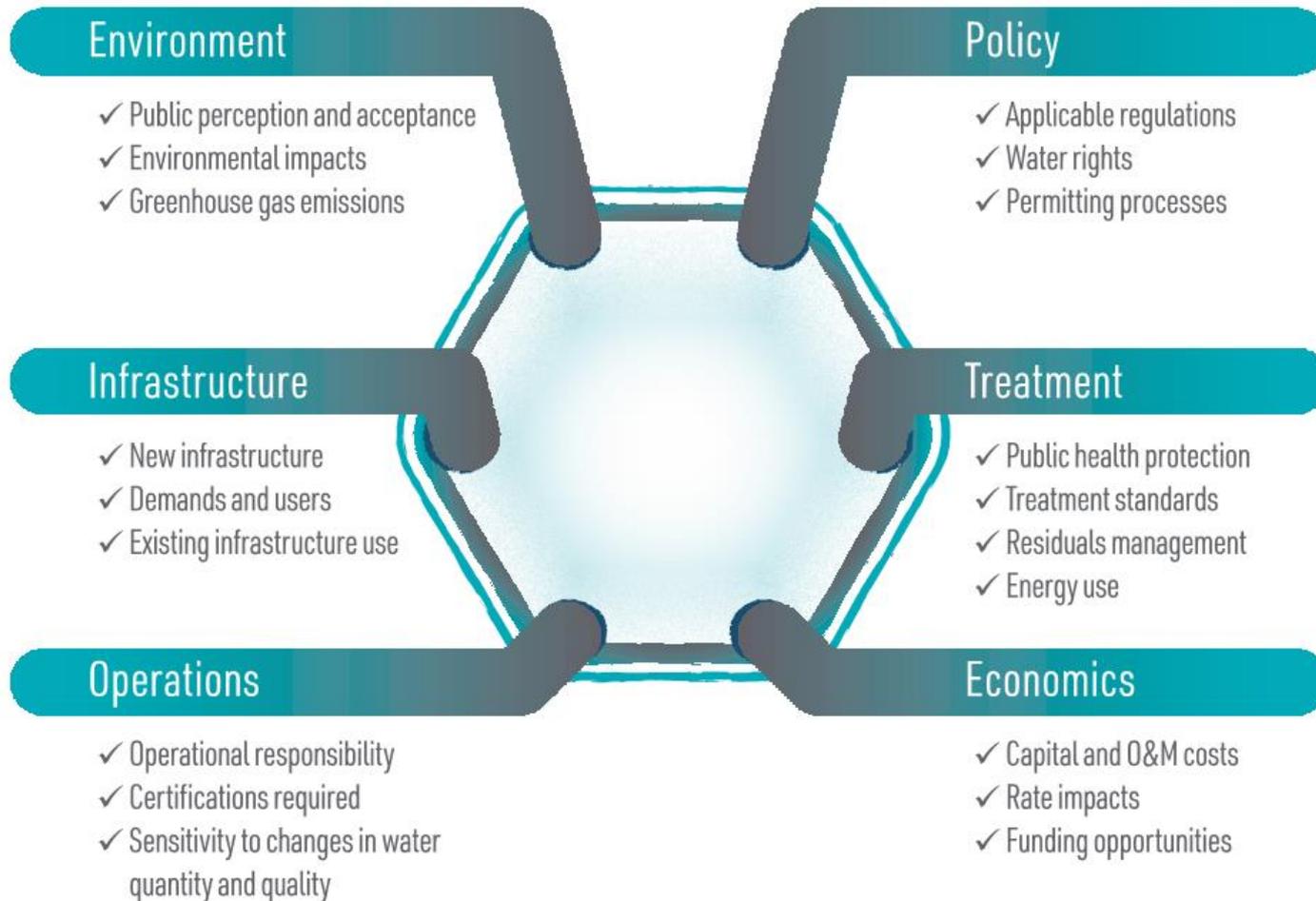




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Identifying Trade-offs

Trade-offs are identified within site-specific context



Successful planning for alternative supplies balances trade-offs

➤ Supply Diversification

Frame the process of supply selection as increased diversification of a water supply portfolio, as opposed to pitting options against each other through the **balance of trade-offs**

➤ Understand your stakeholders

Understanding which **risks (or challenges)** rank highest for a specific audience can help a utility better communicate the **benefit** of the selected alternative supply to different stakeholders.



Watershed-wide Planning Approach Helps Develop Region-specific Alternative Water Supply Plan

Utility: West Palm Beach Utilities Department (City of West Palm Beach, Florida)

- Evaluated trade-offs of a suite of water supply options over a 50-year planning horizon
- Shifted the City to a more integrated One Water System that augments surface water supply with alternative supplies (stormwater capture and harvesting, ASR, shallow groundwater wells, and reclaimed water)



Source: Algal blooms in Lake Okeechobee (USGS 2016)



It is important to look at quality and not just quantity.



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Alternative Water Supply Strategies

Common benefits and challenges for all alternative water supply strategies



BENEFITS

- Offset freshwater extraction/potable demand
- Supply resiliency during times of drought, flooding, or other catastrophic events.



RISKS & CHALLENGES

- Opposition from the public and NGOs can prolong the permitting process or shutdown a project
- Some of these alternative supplies are still new and regulations may not be in place; can be a risky investment

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Potable reuse

PARA-SUPPLIES



Conservation



Reducing NRW

Centralized non-potable reuse



Centralized non-potable reuse (NPR) is the large-scale collection, transport, and treatment of wastewater for NPR.

Key Benefits:

- Locally controlled, climate resilient water supply
- Divert wastewater effluent from discharge
- Supports large recycled water customers



Key Challenges:

- Seasonal variation in recycled water demand
- Requires separate distribution system
- Potential human health impact through accidental cross-connections



Source: Hurlburt Field 2013 (top),
US Army Corp of Engineers 2016 (bottom)

Centralized non-potable reuse

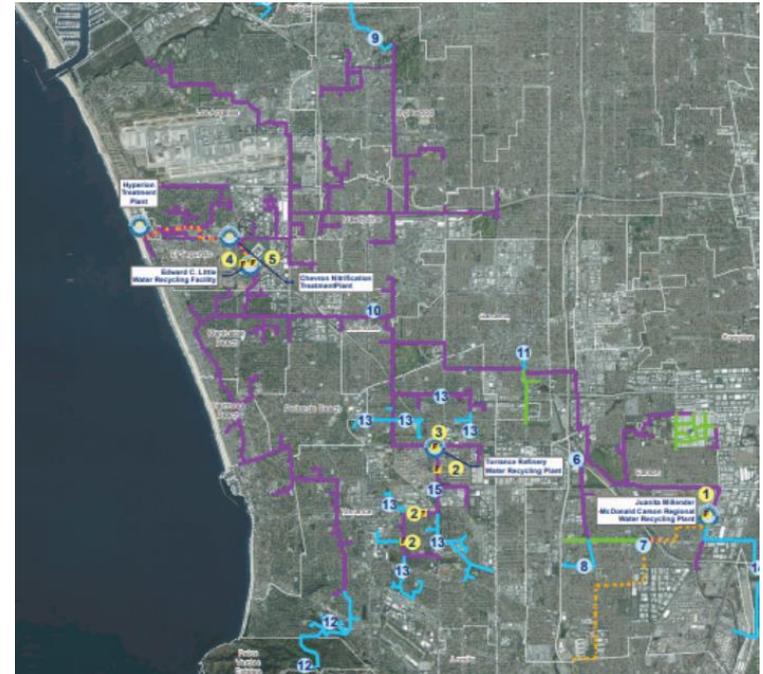


Centralized non-potable reuse (NPR) is the large-scale collection, transport, and treatment of wastewater for NPR.



Mitigation Strategies

- Find recycled water partners and map out future customers to inform where recycled water distribution should be
- Encourage new construction to build dual-plumbing



Source: West Basin 2018

Centralized non-potable reuse accommodating lower demands in an existing system



Source: View of outfall from a bike path (Metro District 2016)



Scenario planning process would have helped to consider “what ifs” to inform a more robust design at minimum flows.

Utility: Denver Water (Denver, Colorado)
30 MGD NPR system

Benefits:

- Reduced demand on potable supplies

Challenge & Mitigation Strategy:

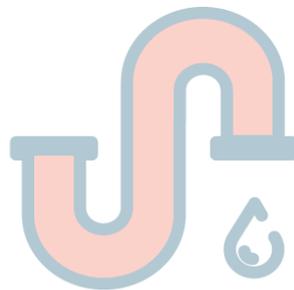
- Demand forecasting did not account for irrigation efficiencies and resulting reduced reclaimed water demand
- Adjusted recycling plant operations for minimum flows

On-site non-potable water reuse

On-site non-potable water systems (i.e. decentralized systems) is the on-site capture and treatment of alternative water sources (e.g. stormwater, graywater, blackwater) for non-potable applications.



Rainwater



Graywater



Blackwater

Rainwater harvesting



Rainwater harvesting is the collection of rainwater that falls upon a roof surface and is stored for later use.

Key Benefits:

- Provides water source for seismic resiliency planning
- Promotes environmental stewardship and enhances public awareness of water management

Key Challenges:

- Variable water quality and quantity
- Program dependent on customer participation
- Responsibility for O&M is with the system owner
- Depends on local regulations (water rights)



Source: CUWA 2016

Rainwater harvesting



Rainwater harvesting is the collection of rainwater that falls upon a roof surface and is stored for later use.



Mitigation Strategies

- Develop effective outreach program
- Establish clear guidelines for reuse



LESSONS LEARNED

Seattle Public Utilities

SPU's Rainwise program not only reduces urban runoff through rainwater harvesting – the program also provides the City with a supplemental emergency water supply for seismic resiliency.

Rainwater harvesting



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LESSONS LEARNED

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Conservation



Water conservation includes the policies, strategies, and activities that contribute to quantifiable and reliable water savings to meet current and future potable water demand.

+ Key Benefits:

- Extends existing potable water supplies
- Reduction in energy costs from reduced pumping

+ Key Challenges:

- Reductions in utility revenue
- Declining flows and related challenges (blockages, odor issues, accelerated corrosion rates)
- Water quality impacts to premise plumbing



LADWP "Save the Drop" campaign flyer used to promote conservation (LADWP 2017a)

Conservation



Water conservation includes the policies, strategies, and activities that contribute to quantifiable and reliable water savings to meet current and future potable water demand.



Mitigation Strategies

- Establish water rate structure with a base rate that covers cost of operations, paired with a tiered rate structure to discourage high water users
- Encourage participation through market-based rebates

Los Angeles Department of Water and Power



LADWP recovered loss in revenue by restructuring to a conservation-based tier structure that impacted inefficient high water users only. The program “supplies” over 24 percent of LADWP’s total average demand.



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Key Takeaways and Next Steps

Key takeaways from collective industry experience

Be engaged with multiple agencies

Proactively consider regulatory changes

Evaluate trade-offs holistically

- WRF 4615, WRF 4660

Learn how other agencies have tackled similar challenges to save time and money



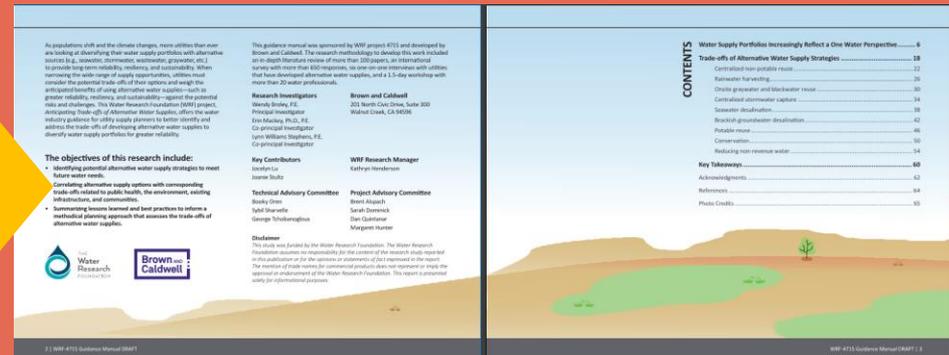
What to expect next for WRF 4715

● **Workshop**
August 2–3, 2018

● **DRAFT** Guidance
Manual to the Project
Advisory Committee
February 2019

● **FINAL** Guidance
Manual to the Project
Advisory Committee
July 2019

● **Publication date**
December 2019



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Thank you.

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Questions?