



City of
**Santa
Monica**

DBIA Water/WW Webinar

2/16/2022

City of Santa Monica – Water Resources Division



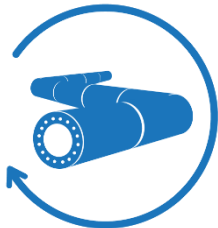
93,000+ residents
2,700+ commercial
customers



Drinking water and
fire protection



groundwater (local)
surface water (MWD)



Sewer collection and
recycled water

9 million gallons
of high-quality drinking
water daily

14 million gallons
of wastewater captured
and delivered for treatment
each day

77,000 gallons
per day of recycled
water

**4 water storage
reservoirs**
totaling 40 million gallons



Goals of the City's Sustainable Water Master Plan

- Long term cost benefits for rate payers
- Diverse, sustainable, & drought resilient water supply to support a sustainable community
- Reduction of energy footprint to support carbon reduction goals for the City



PLAN AT A GLANCE

The CAAP is a guiding document that provides overarching policy direction to achieve the interim goal of an 80% reduction in emissions by 2030 and to increase Santa Monica's resilience to climate change hazards and impacts. This plan supports and enhances many existing plans and initiatives within the City. The CAAP also suggests new plans and actions to supplement ongoing efforts and create new initiatives.

CLIMATE ACTION

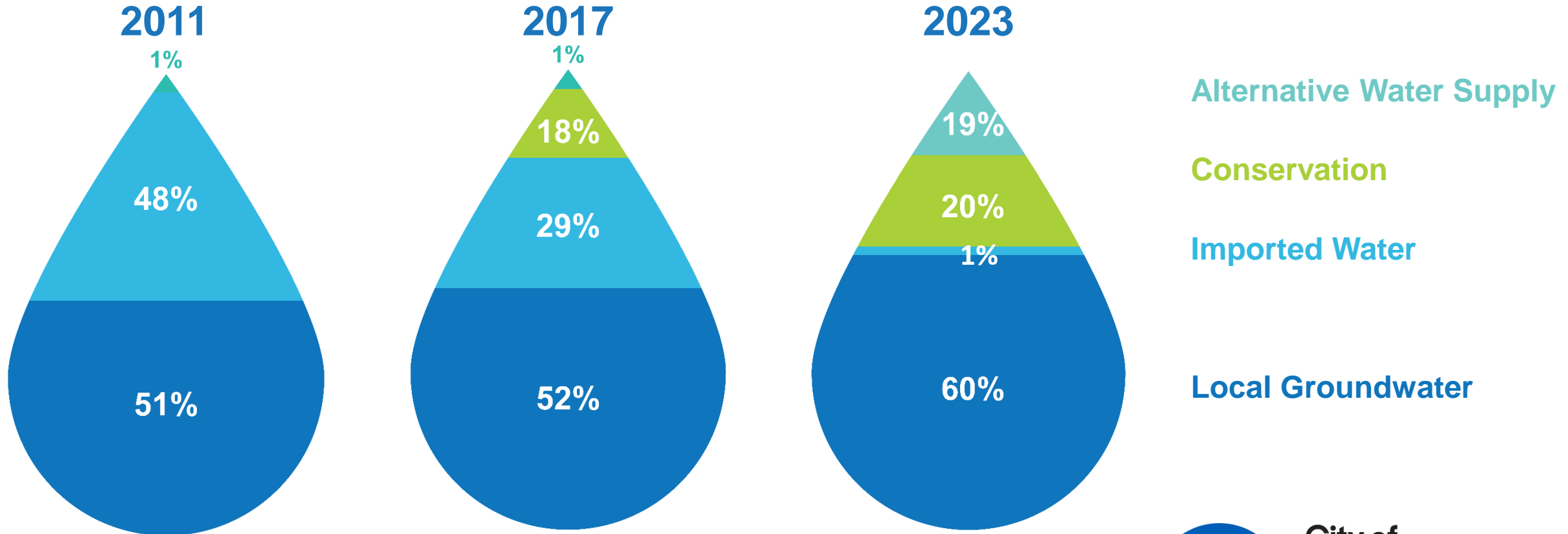
SECTOR	OBJECTIVES	SUPPORTING EFFORT
ZERO NET CARBON BUILDINGS	<ul style="list-style-type: none"> • Achieve 100% renewable grid electricity • Install 100 MW of local solar energy • Reduce fossil fuel use 20% in existing buildings • Discourage fossil fuels in new buildings 	<ul style="list-style-type: none"> • Zero net energy for new residential construction (2017) • Mandatory solar for new commercial construction (2017)
ZERO WASTE	<ul style="list-style-type: none"> • Divert 95% of materials from landfills 	<ul style="list-style-type: none"> • Plastic Bag Ban (2011) • Zero Waste Strategic Operations Plan (2014) • Disposable Food Serviceware Ordinance (2018)
SUSTAINABLE MOBILITY	<ul style="list-style-type: none"> • Convert 50% of local trips to foot, bike, scooter & skateboard • Convert 25% of commuter trips to transit • Convert 50% of vehicles to electric or zero emission 	<ul style="list-style-type: none"> • Land Use & Circulation Element (2010) • Bike Action Plan (2011) • Pedestrian Action Plan (2016) • Electric Vehicle Action Plan (2017)

CLIMATE ADAPTATION

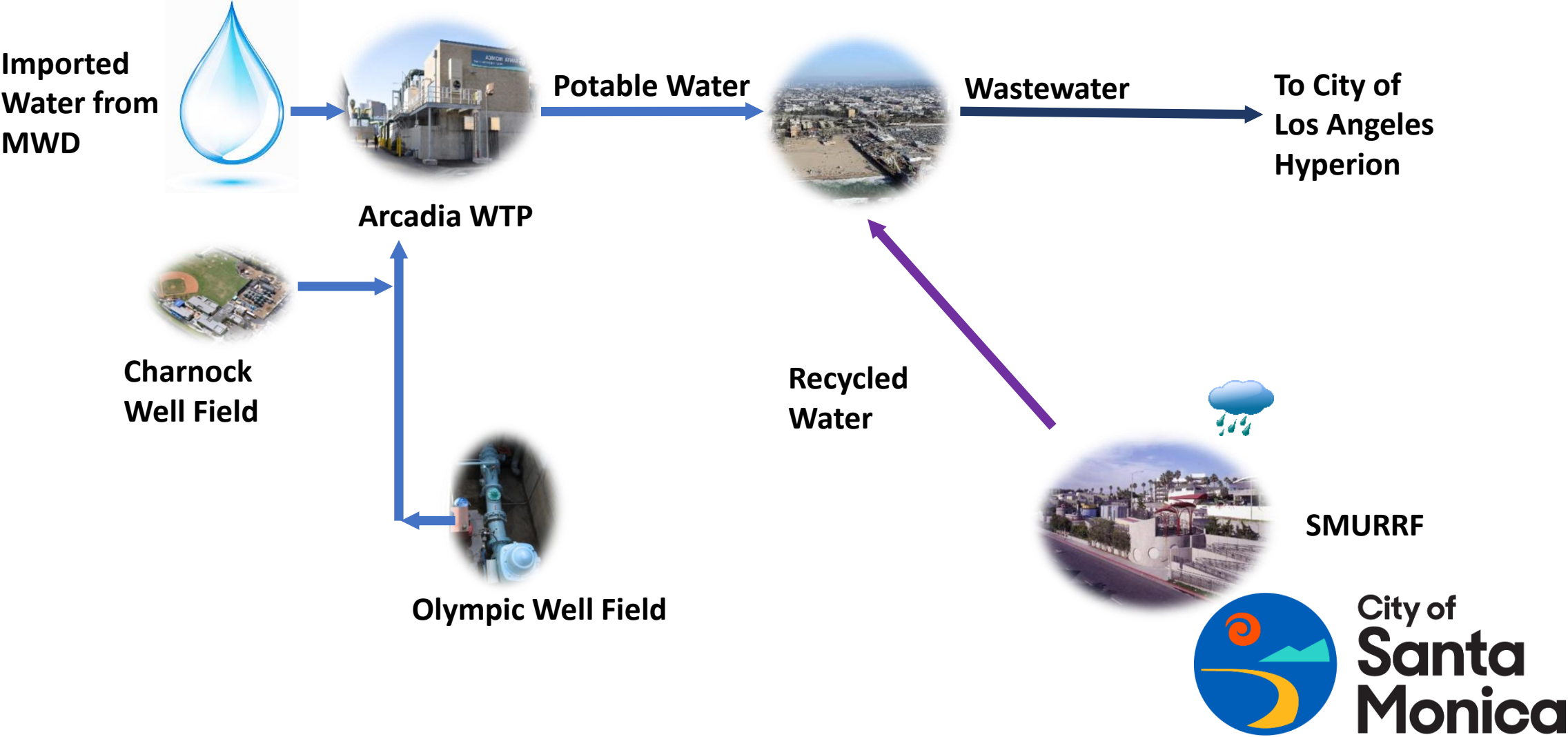
SECTOR	OBJECTIVES	SUPPORTING EFFORT
CLIMATE READY COMMUNITY	<ul style="list-style-type: none"> • Increase community resilience to climate change • Protect vulnerable groups from impacts • Integrate climate change impacts into City planning, operations & infrastructure projects 	<ul style="list-style-type: none"> • All Hazards Mitigation Plan (2015) • Santa Monica Organizations Active in Disaster (2018)
WATER SELF-SUFFICIENCY	<ul style="list-style-type: none"> • Achieve water self-sufficiency by 2023 	<ul style="list-style-type: none"> • Water Neutrality Ordinance (2017) • Sustainable Water Master Plan (2018)
COASTAL FLOODING PREPAREDNESS	<ul style="list-style-type: none"> • Enhance natural systems to prevent damage from coastal flooding • Increase resilience of public and private assets in the coastal flood zone 	<ul style="list-style-type: none"> • Local Coastal Program Land Use Plan (2018)
LOW CARBON FOOD & ECOSYSTEMS	<ul style="list-style-type: none"> • Increase self-reliance through local food production • Reduce or sequester carbon emissions from food production, consumption, waste and landscape management and natural processes 	<ul style="list-style-type: none"> • Urban Forest Master Plan (2015)

The CAAP is not an element of the City's General Plan or a regulatory document for the purposes of streamlining the California Environmental Quality Act (CEQA) process. Any policy or ordinance described in the CAAP must be developed and adopted through a public review process.

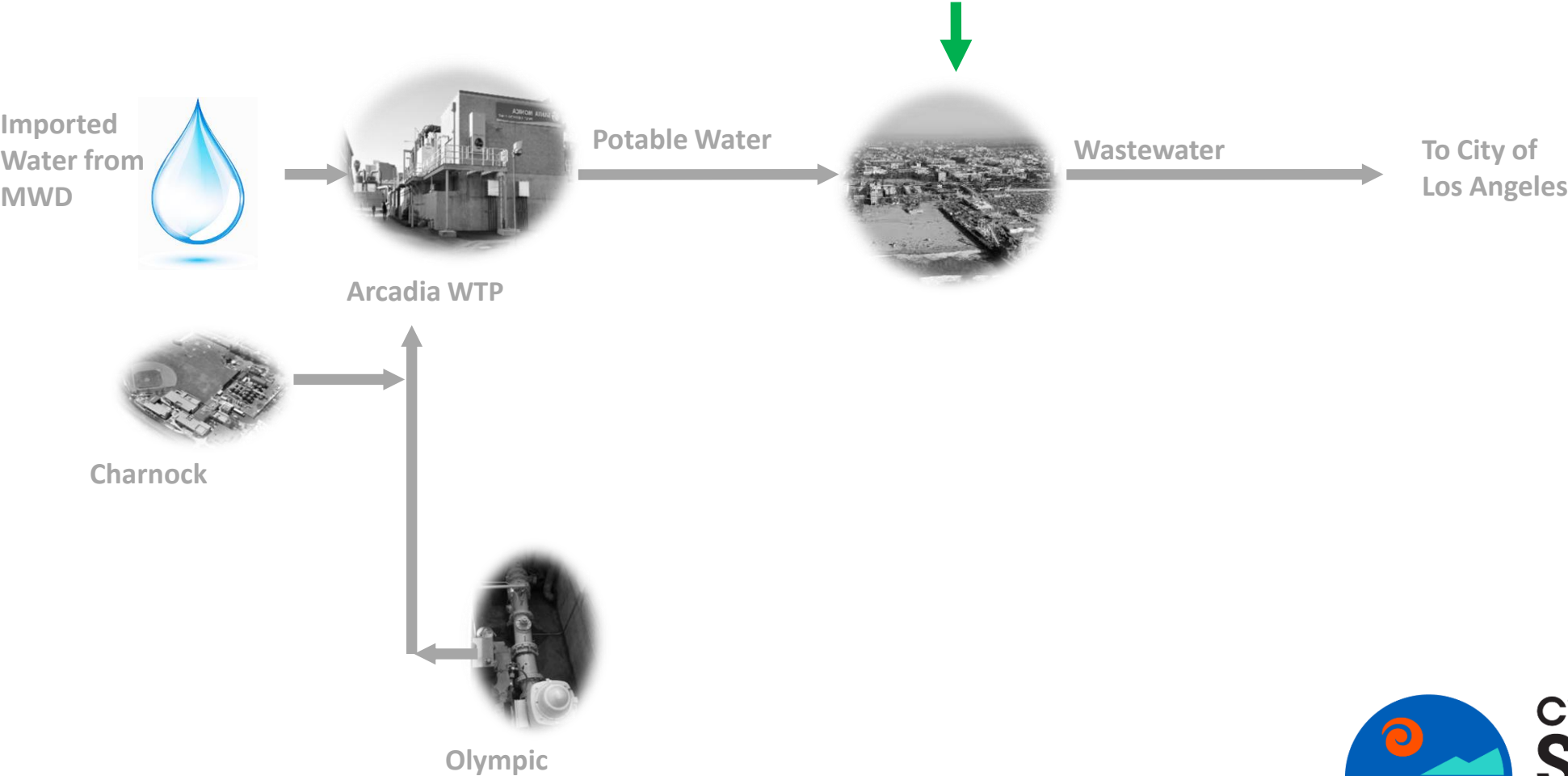
Leveraging Alternative Water Supplies for a Sustainable Future



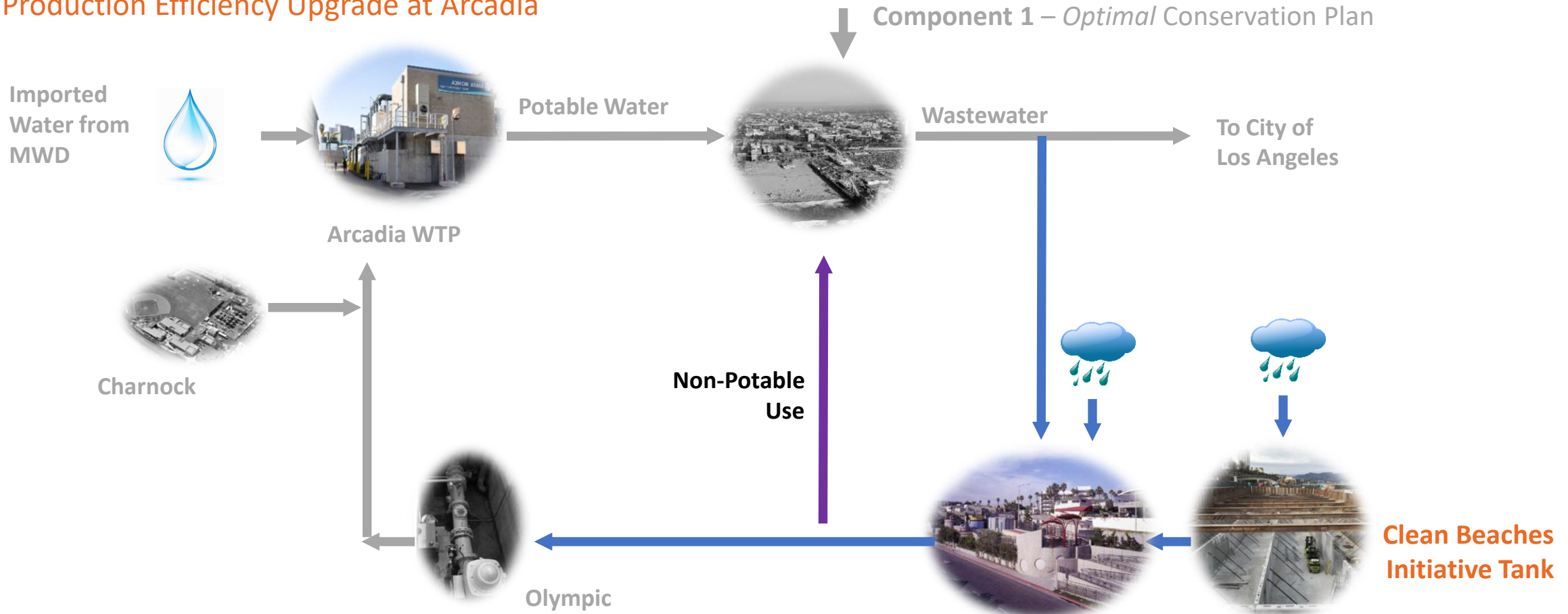
Integrated Approach to Maximize Local Water Resources



Component 1 – Optimal Conservation Plan



Component 2 – Alternative Water Supply Production Efficiency Upgrade at Arcadia



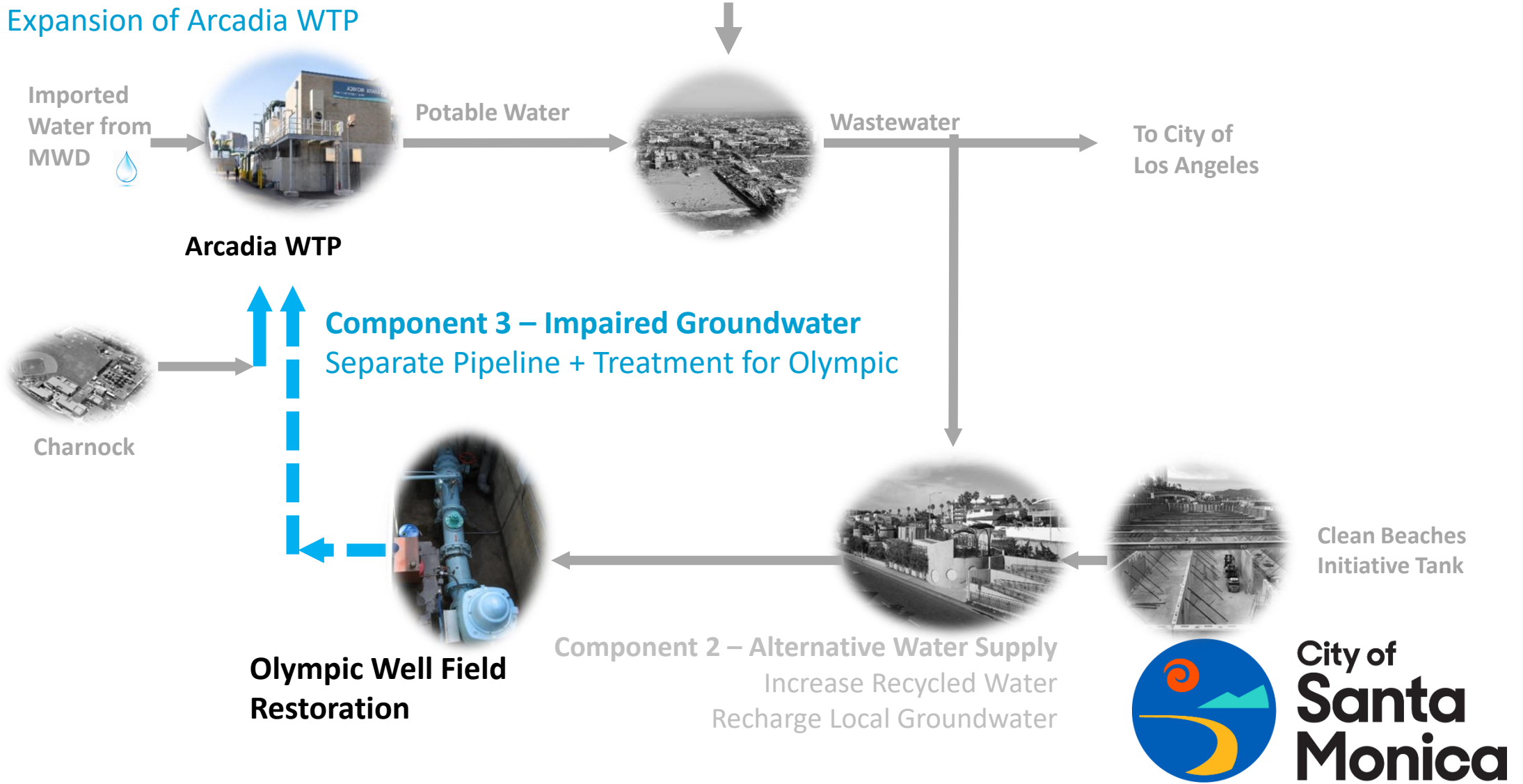
Component 2 – Alternative Water Supply

- Stormwater + Urban Runoff @ **SMURRF** for Non-Potable and Potable Reuse
- Stormwater Capture + Municipal WW @ **SWIP** for Potable Reuse

Component 2 – Alternative Water Supply
Production Efficiency Upgrade at Arcadia

Component 3 – New Local Groundwater
Expansion of Arcadia WTP

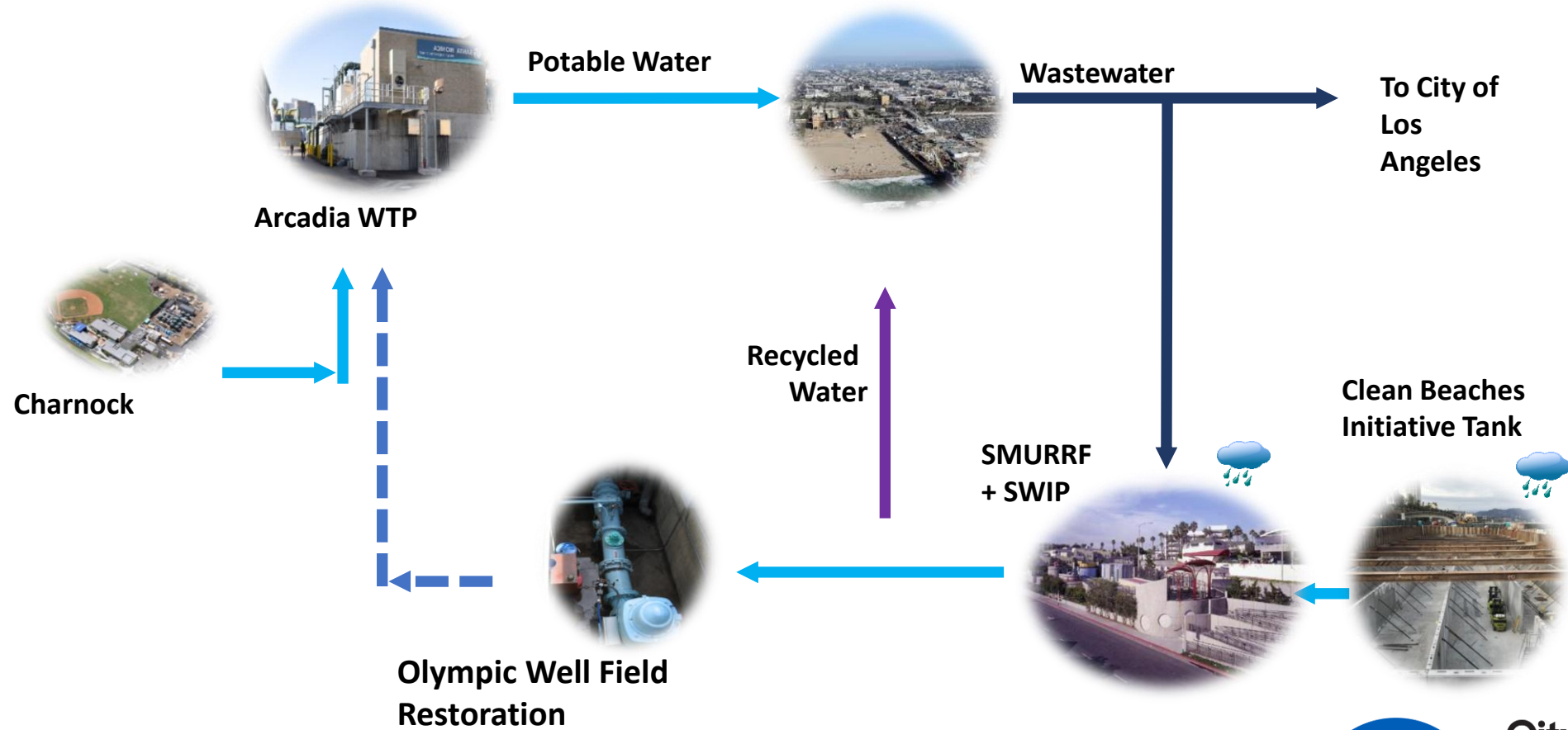
Component 1 – Optimal Conservation Plan



Component 1 – Conservation

Component 2 – Alternative Water Supply

Component 3 – New Local Groundwater





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Notable Projects

Sustainable Water Infrastructure Project (SWIP)

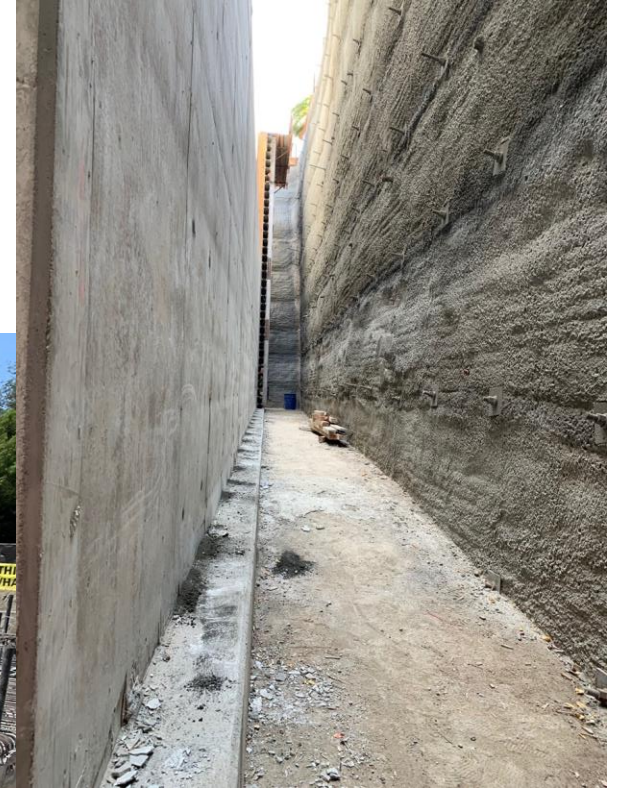


- Element 1
 - 1.5 MG Clean Beaches Tank
 - SMURRF Upgrades
- Element 2
 - New 1 MGD SWIP AWTF
 - 30/70 Blend of Stormwater and Wastewater
- Element 3
 - New 1.5 MG Stormwater capture tank

SWIP's Multiple Benefits

- Improves beach water quality
- Provides EWMP/MS4 compliance
- Drought resilient water supply
- Diversifies City's water supply portfolio
- Increases recycled water production
- Augments local groundwater supply
- Creates ~1,600 AFY of local water supply for the City

Stormwater Harvesting Tank

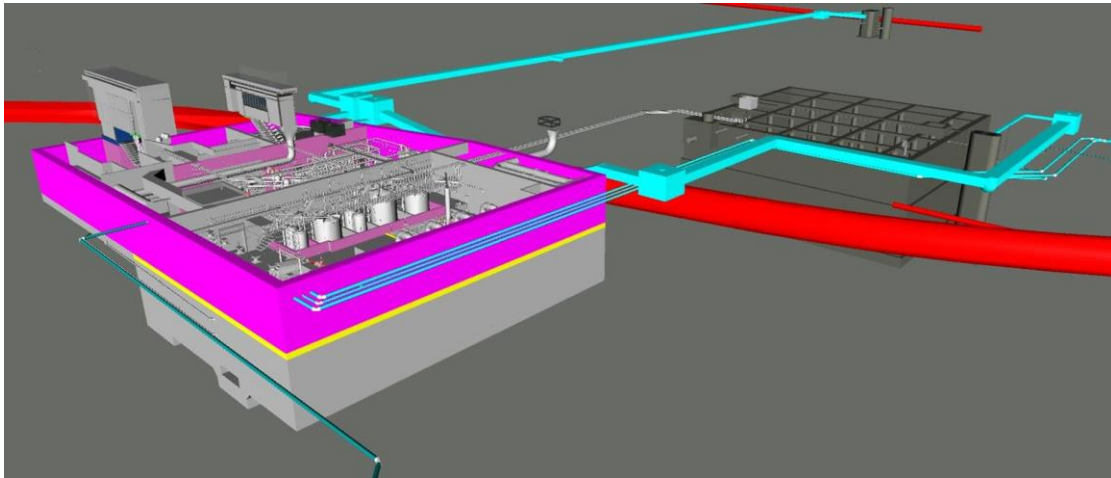
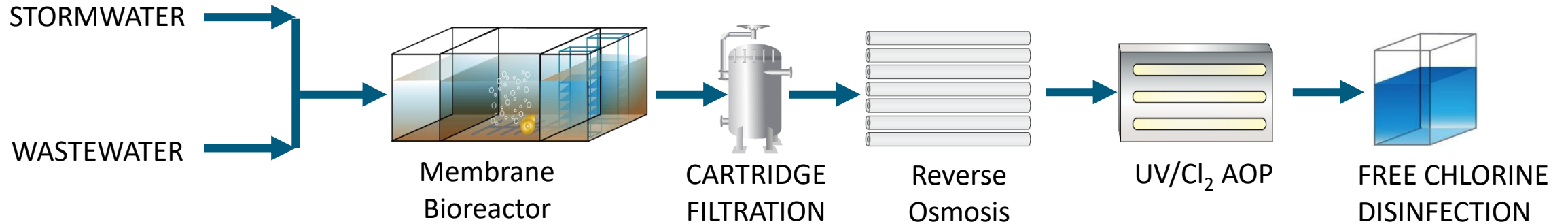


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SWIP Advanced Water Treatment Facility



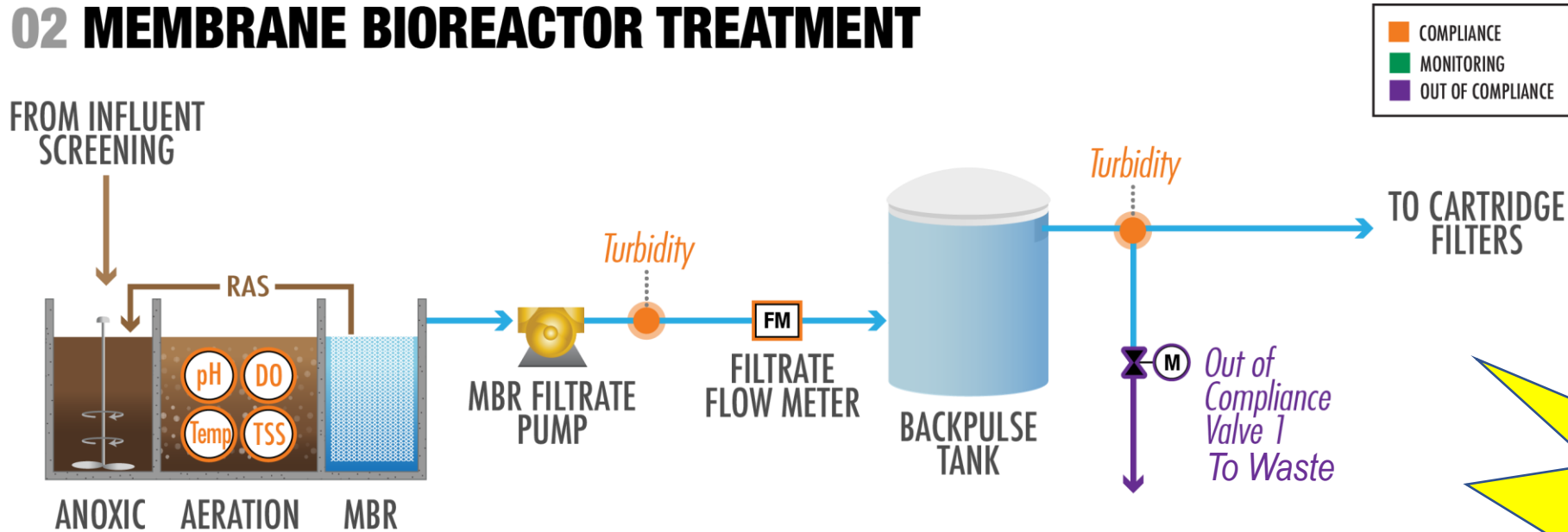
SWIP – Potable Reuse Treatment Train



- Source Water - Wastewater with up to 30% stormwater contribution when available
- AWTF completely underground
- Ability to meet 12-10-10 log removal for a GRRP within AWTF
- Produces 1,100 AFY of purified water for non-potable and potable reuse

SWIP – MBR

02 MEMBRANE BIOREACTOR TREATMENT



SRT > 11 days
TSS (used for SRT Calculation)

FLUX < 17 gfd

TURBIDITY ≤ 0.2 NTU

First MBR in CA to receive LRVs for Potable Reuse

MBR Log Reduction Values

Process	Virus	Cryptosporidium	Giardia
MBR	1.5	2.0	2.0
	1.0	2.5	2.5

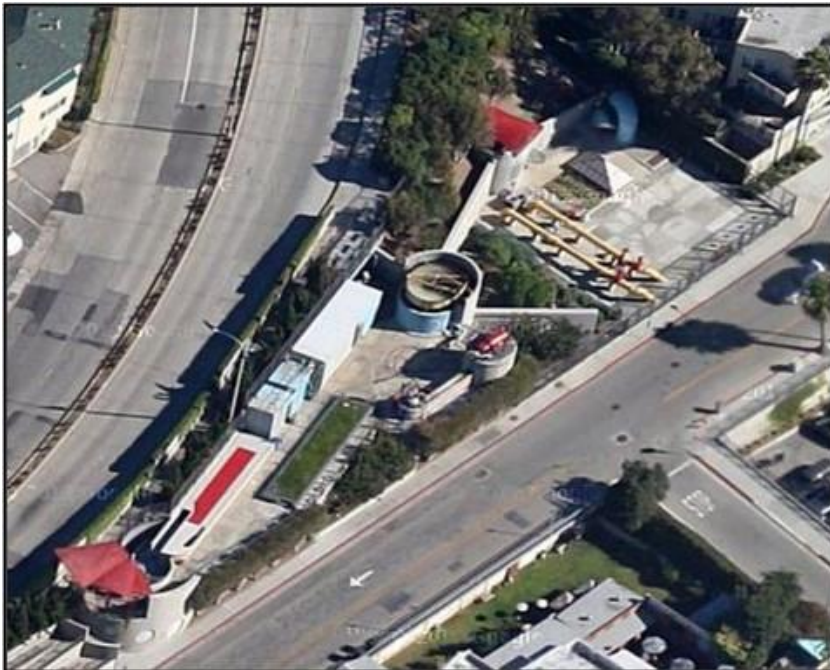
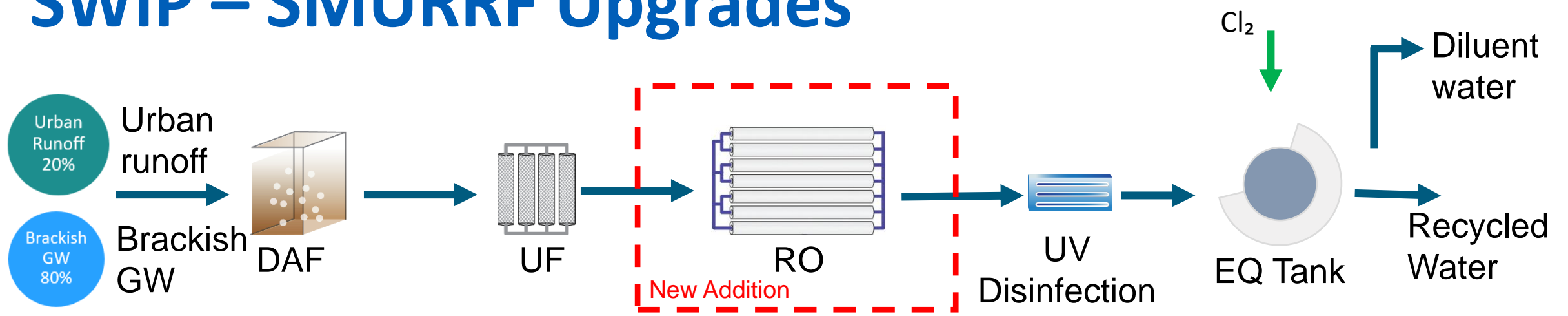
Australian Tier 1

WRF #4997



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SWIP – SMURRF Upgrades

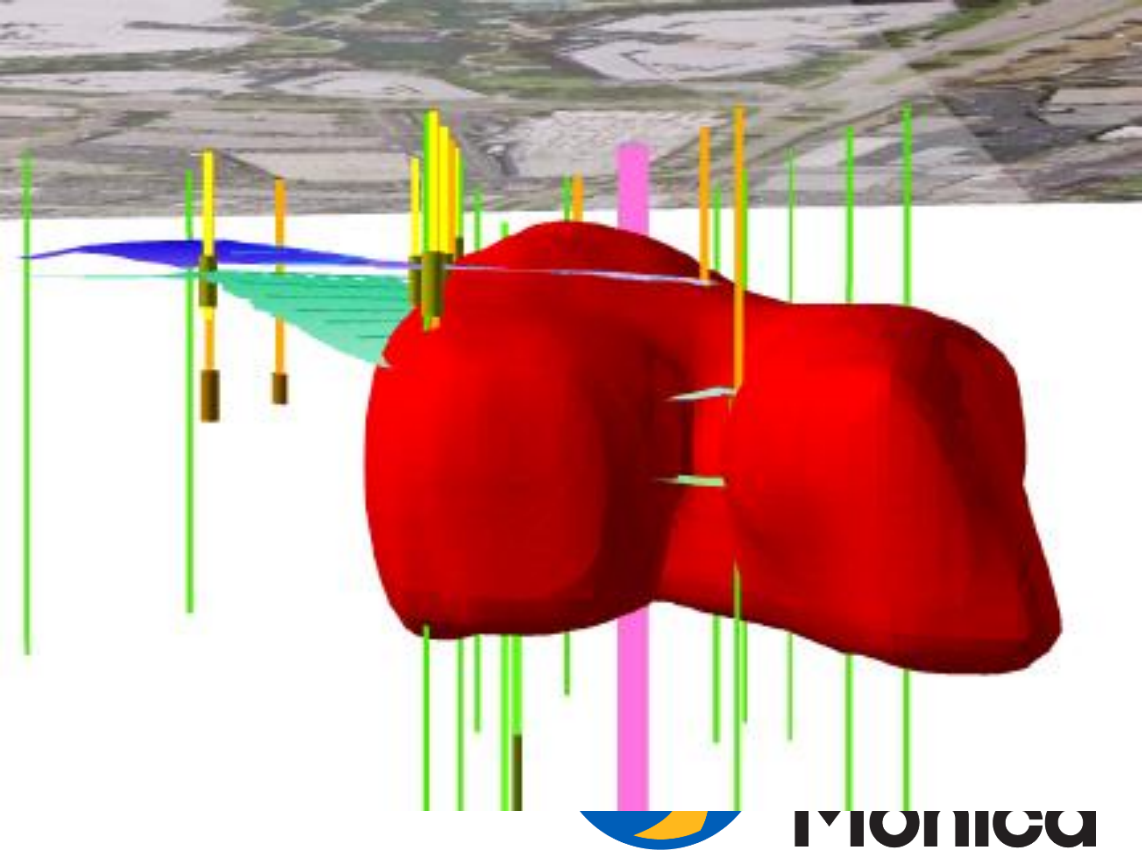
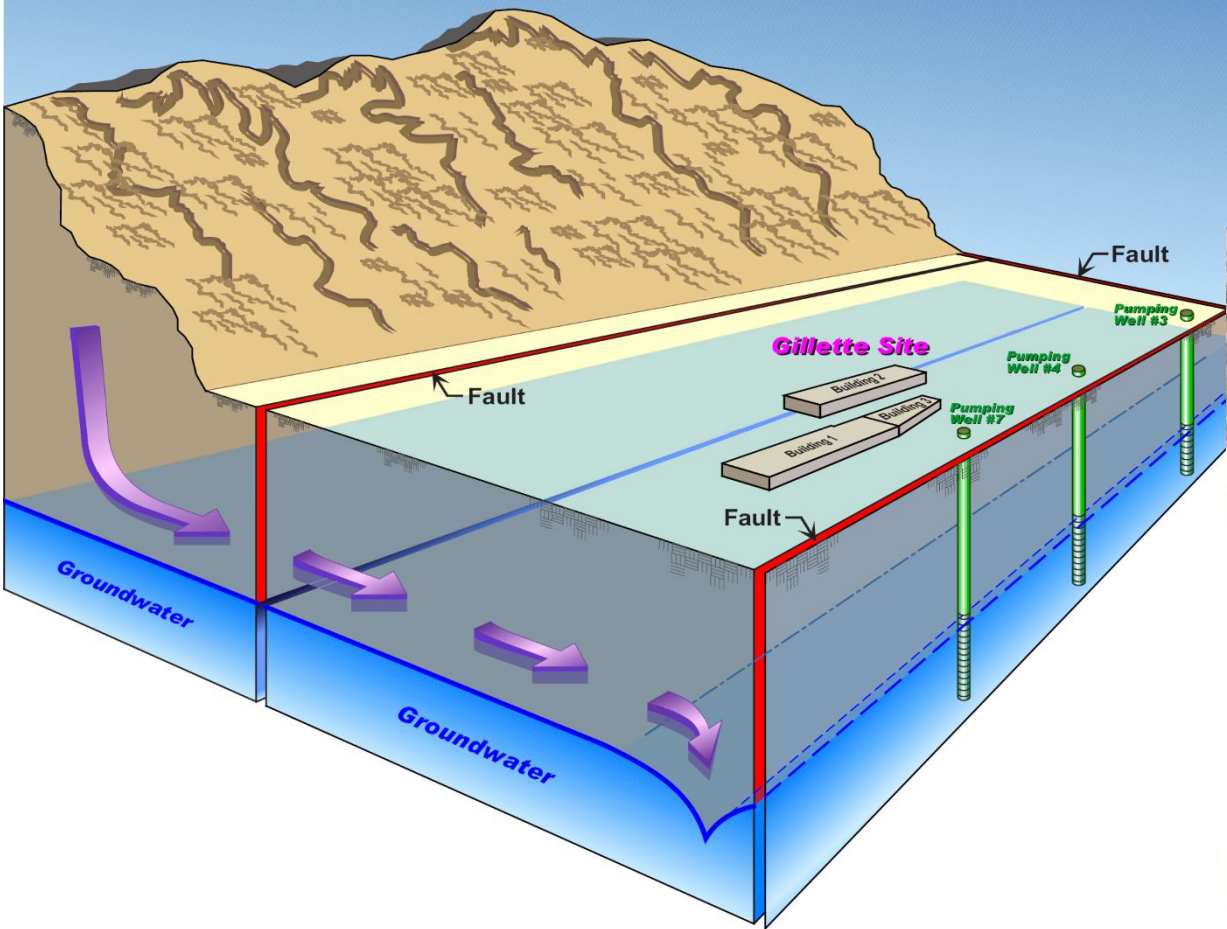


- Provides pollution control for Santa Monica Bay
- Source Water – Urban Runoff + Brackish GW
- Upgrade SMURRF to meet diluent water requirements for groundwater augmentation
- Produces up to 500 AFY of diluent water
- First stormwater direct injection project in CA

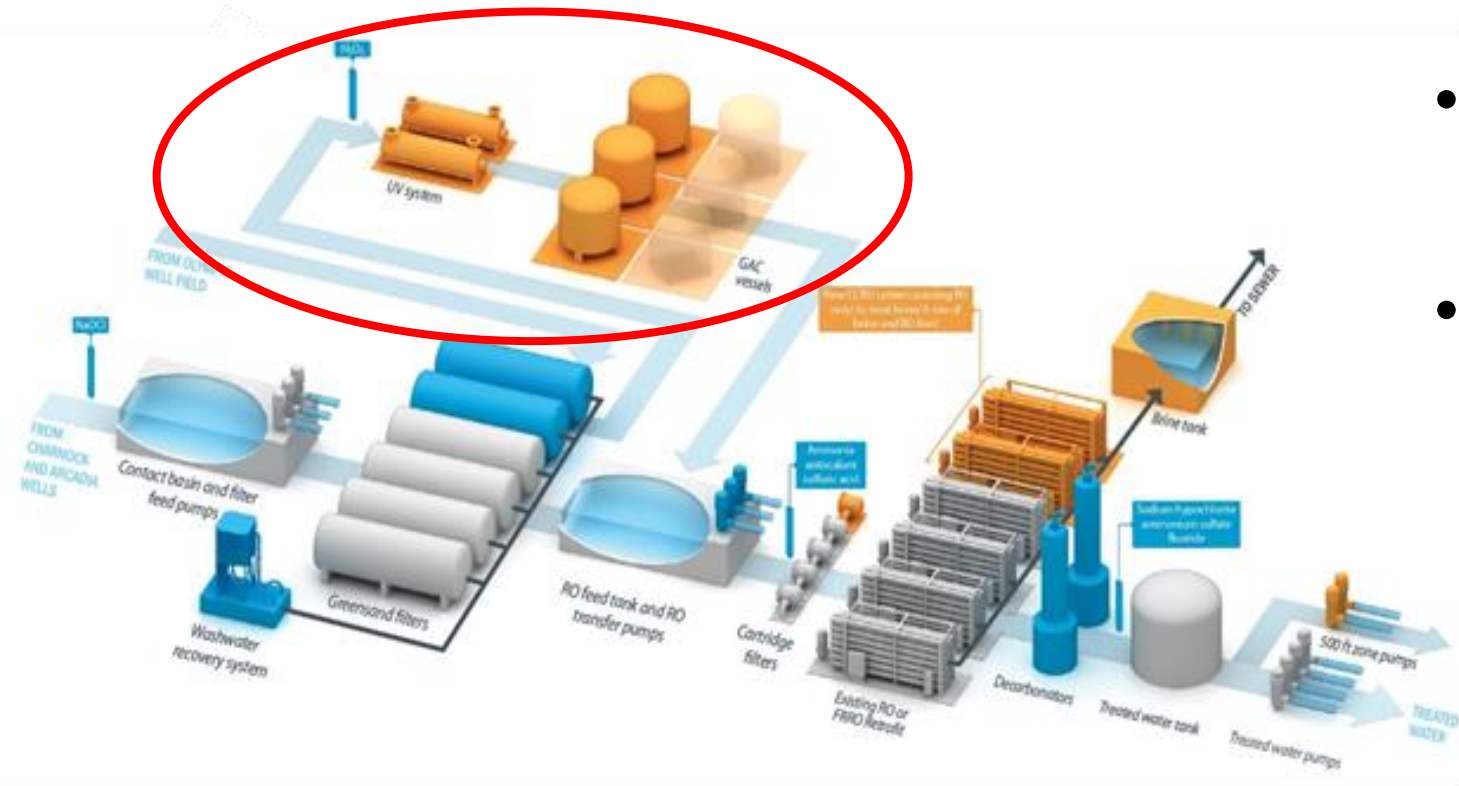


Olympic Well Field Restoration and Arcadia WTP Expansion

Olympic Well Field Restoration

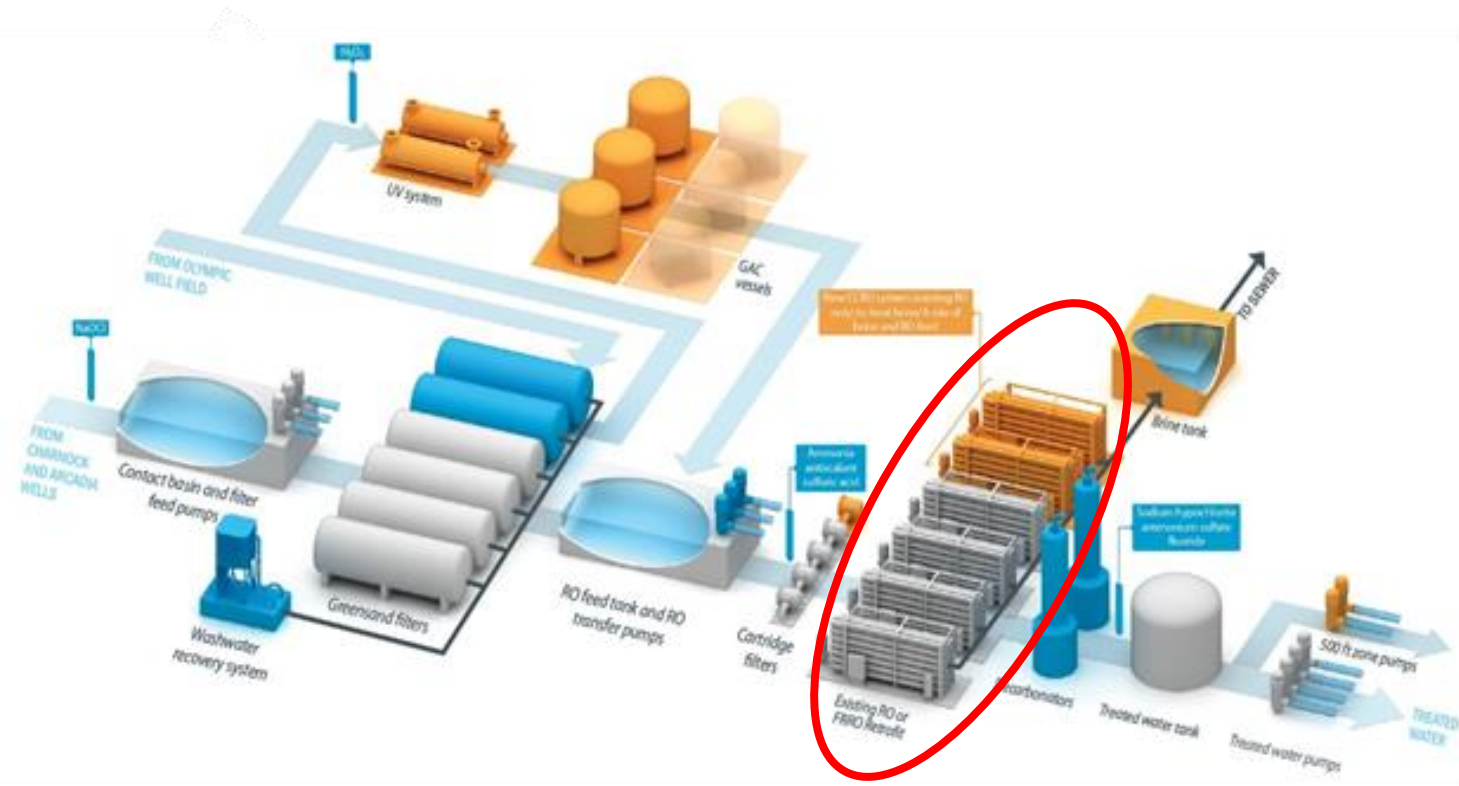


Olympic Well Field Restoration



- Key contaminants: TCE, PCE, 1,4-Dioxane, and 1,2,3-TCP
- Project Components
 - Two new groundwater wells
 - New Olympic Pipeline
 - New Olympic AWTF (UV AOP + GAC)

Arcadia WTP Production Efficiency Enhancement



- Upgraded in 2010 as part of the Charnock Well Field Restoration Project
- Provides multi-barrier treatment to comply with Division of Drinking Water 97-005 requirements
- Retrofit existing RO skids to achieve >90% recovery

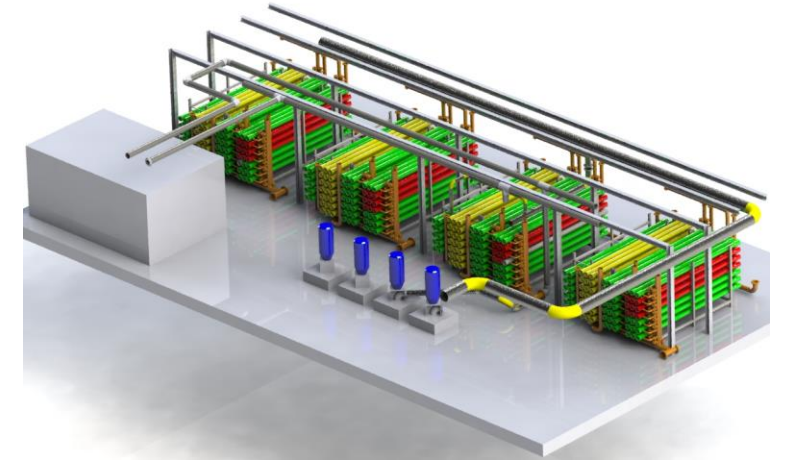
Is the RO Concentrate Worth the Squeeze?



Existing RO System



Closed Circuit RO (CCRO)



Flow Reversal RO (FRRO)

- Increase RO system recovery to $\geq 90\%$ to increase local water supply
- Side-by-side pilot testing of CCRO vs FRRO

Pilot “Tale of the Tape”

Pilot	FRRO	CCRO
Operations	Primary RO in High Recovery Mode	Concentrate minimization system = 62% greensand filtrate/38% RO concentrate
Online Time	<ul style="list-style-type: none"> • Total online time of 144 days • ~106 days at 89% or greater recovery • 15 consecutive days at 91% recovery 	<ul style="list-style-type: none"> • Total online time of 86 days • ~22 days at 89% or greater overall recovery • <5 non-consecutive days at 91% overall recovery
CIPs and Membrane Replacement	<ul style="list-style-type: none"> • Five CIPs • Membranes never replaced • Typical pilot operation between CIP events was over 30 days, longest operation was 42 days 	<ul style="list-style-type: none"> • Three CIPs • Membranes replaced five times • No typical pilot operation between CIP events or membrane replacements
Chemical Consumption	<ul style="list-style-type: none"> • pH of 6.3 (depressed from 7.5) • antiscalant dose of 1 ppm of AWC A-119 antiscalant or 2.5-3.0 ppm of Avista Vitec-4000 	<ul style="list-style-type: none"> • pH of 6.8 (depressed from 7.5) • antiscalant dose of 3 ppm of AWC A-119 antiscalant + antiscalant present in RO Concentrate



Benefits of FRRO For Santa Monica

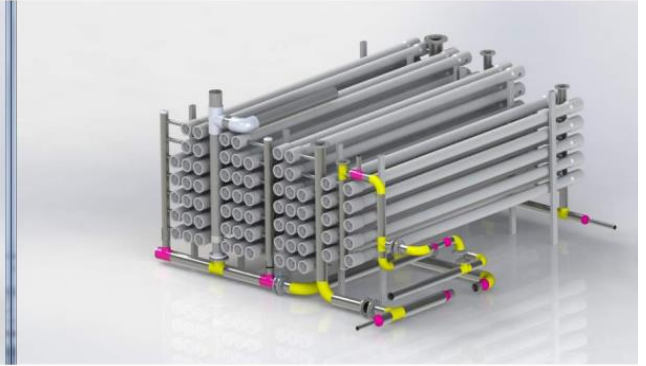
- Stable operations at high recovery $\geq 90\%$
- Ability to retrofit existing RO skids
- Lower operation and life-cycle cost
- Funding flexibility
- Operation flexibility
- Relatively lower risk profile

3D concept Design – Before (original design)

Front view



Back view

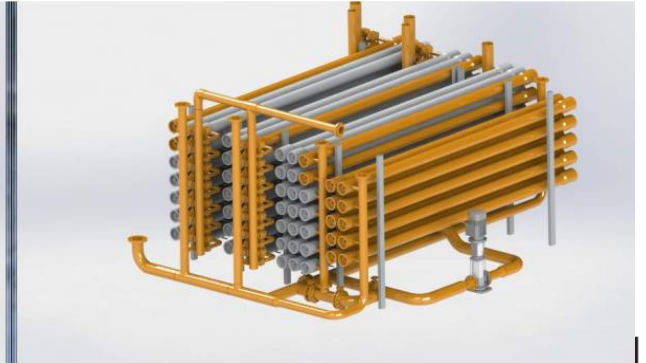


3D concept Design- After + additional parts

Front view



Back view



Funding Partners

- [State Water Resources Control Board: Clean Water SRF](#) - \$75 million loan for SWIP
- [Department of Water Resources: Water Desalination Grant Program](#) - \$10 million construction grant for the Production Efficiency Enhancement at Arcadia WTP
- [State Water Resources Control Board: Prop 1 Stormwater Grant](#) - \$8.77 million for SWIP stormwater tank
- [Los Angeles County Measure W Safe Clean Water Program](#) - \$7.5 million to support stormwater capture and treatment components of the SWIP.
- [Metropolitan Water District of Southern California: Local Resources Program](#) - \$19.6 million over 25 years for water produced by SWIP and the Production Efficiency Enhancement Project.
- [Water Revenue Bond](#) - \$78 million





City of
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**Progressive
Design-Build
Delivery**

Why Progressive Design-Build (PDB)?

- Over two decades of PDB experience with large/complex infrastructure projects
- Single point of contact
- Best qualified team
- Balance cost and risk
- Collaborative environment
- Performance Guarantee



PDB Delivery - Procurement

- Info Sessions
- Contractor vs Designer Led Team
- Innovation
- Confidential Meetings
- Indicative Cost Estimate

LESSONS LEARNED

- Define Deliverables
- Be Clear on Expectations
- Mark-Ups/Fee – What’s in it?
- “Real” Innovation – not just tech



City of
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PDB Delivery - Preconstruction

PROCUREMENT

- Info Sessions
- Contractor vs Designer Led Team
- Innovation
- Confidential Meetings
- Indicative Cost Estimate

PRECONSTRUCTION

- Collaborative Delivery
- Equipment Procurement
- Permitting
- GMP = Cost vs Risk
- Performance Guarantee

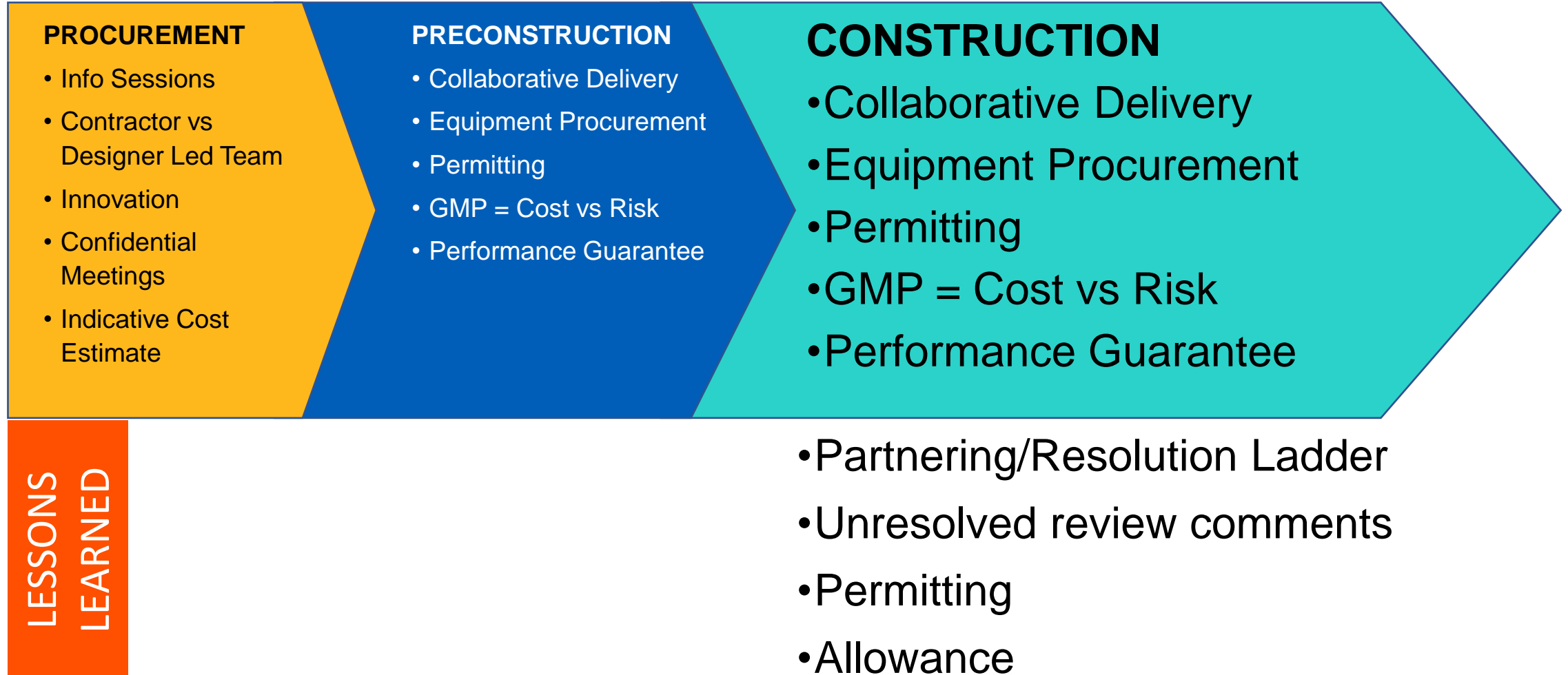
LESSONS LEARNED

- Partnering
- Funding Uncertainty
- QA/QC vs Schedule
- Operator Input



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PDB Delivery - Construction

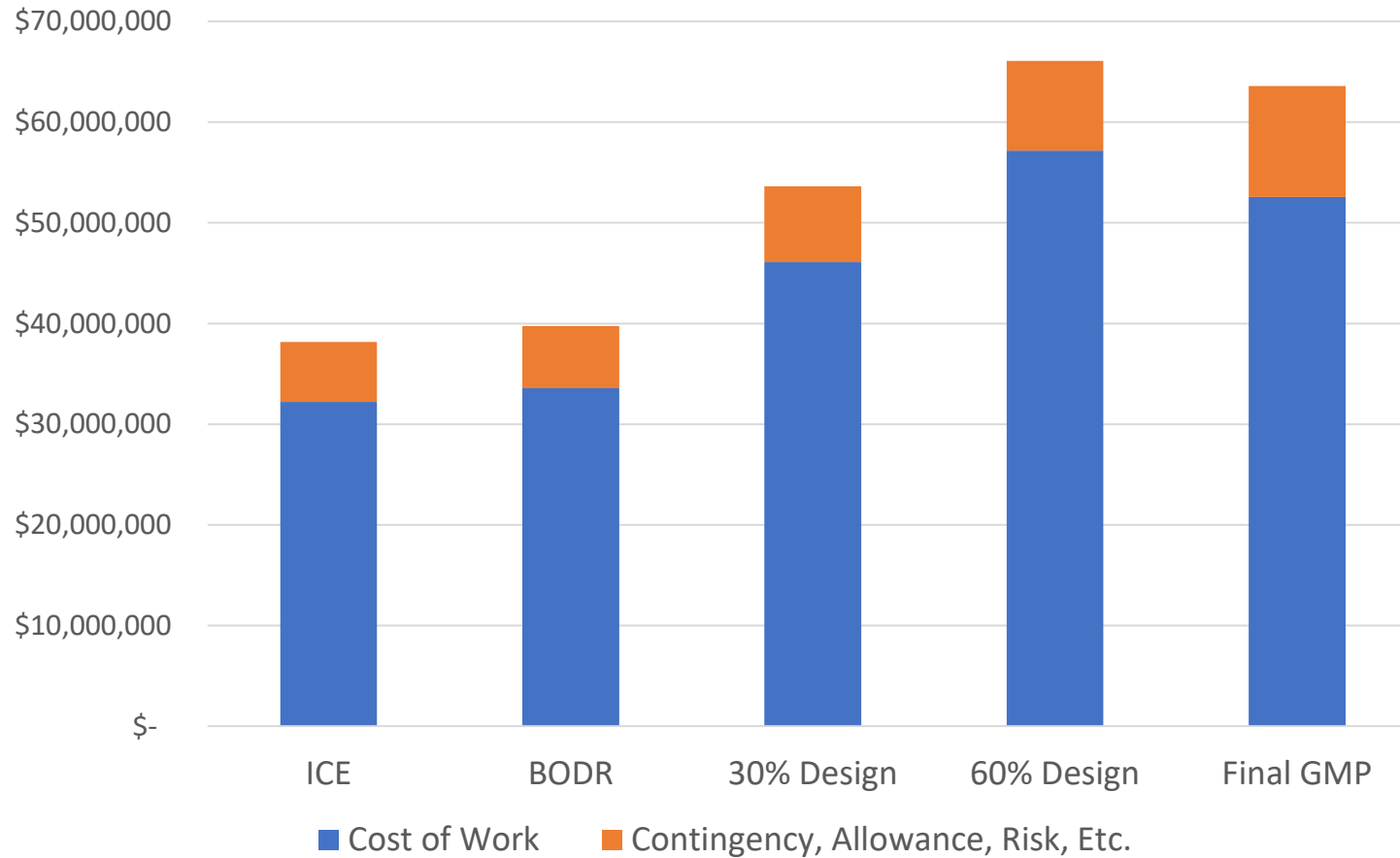




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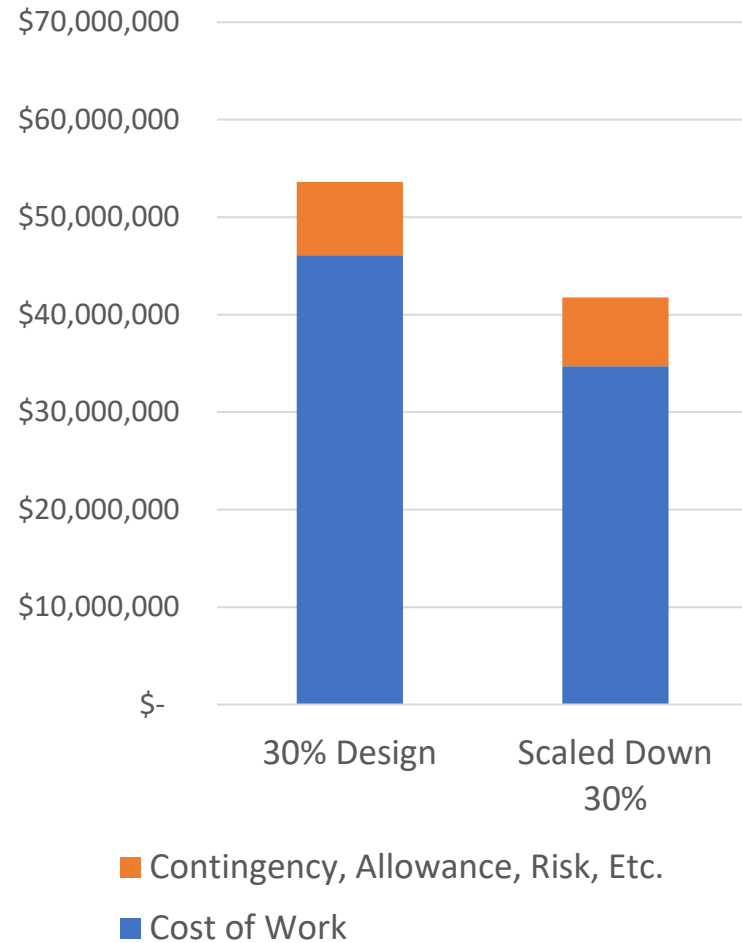
Key PDB Features

“Real Time” Pricing Flexibility and GMP



- Price as you go
- Cost control
- Adjust to market conditions
- Cost vs Critical Path
- Allowances

“Real Time” Pricing Flexibility and GMP



- Funding Uncertainty due to Covid-19
- Tracked Two GMPs
 - Available Settlement Funds
 - \$10M Prop 1 Desal Grant
- No impact on design package and schedule
- Restored full scope when additional funding was secured

Equipment Selection

DUPONT



KOCH
SEPARATION SOLUTIONS



 **suez**



Selection Considerations

- Experience
- Water Quality
- MBR Normal Daily Flux
- **Filter Area**
- Equipment Cost
- **Warranty**
- Service Support
- **MBR Net Daily Production and Total Plant Output (RO @ 75-85%)**



City of
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Understanding Risk with New Technology

High Recovery RO Risk	Study	Pilot	DB/Tech Provider	Owner
Feasible Recovery	✓			
Sustainable Recovery		✓		
Performance Guarantee		✓	✓	
Performance – Treated Water Quality	✓	✓	✓	
Performance – CIP Frequency		✓		✓
Performance – Membrane Life				✓
Performance – Raw Water Quality		✓	✓	✓
System Warranty			✓	
Membrane Warranty				✓

Performance Guarantee

- Performance parameters
 - Water quality
 - Production
 - Chemical/energy consumption
- Treatment Performance
 - Individual process
 - Overall treatment train
- Permitting
- Performance Test Duration and Results
- Pass/Fail Resolution

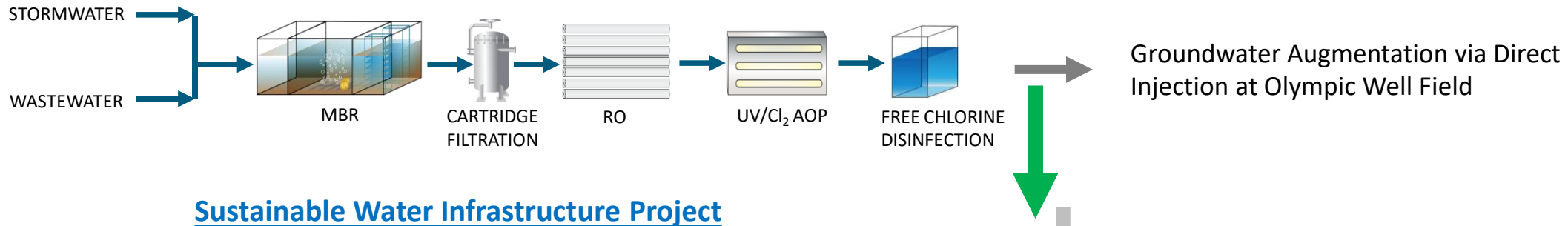


Non-Potable Reuse
Potable Reuse



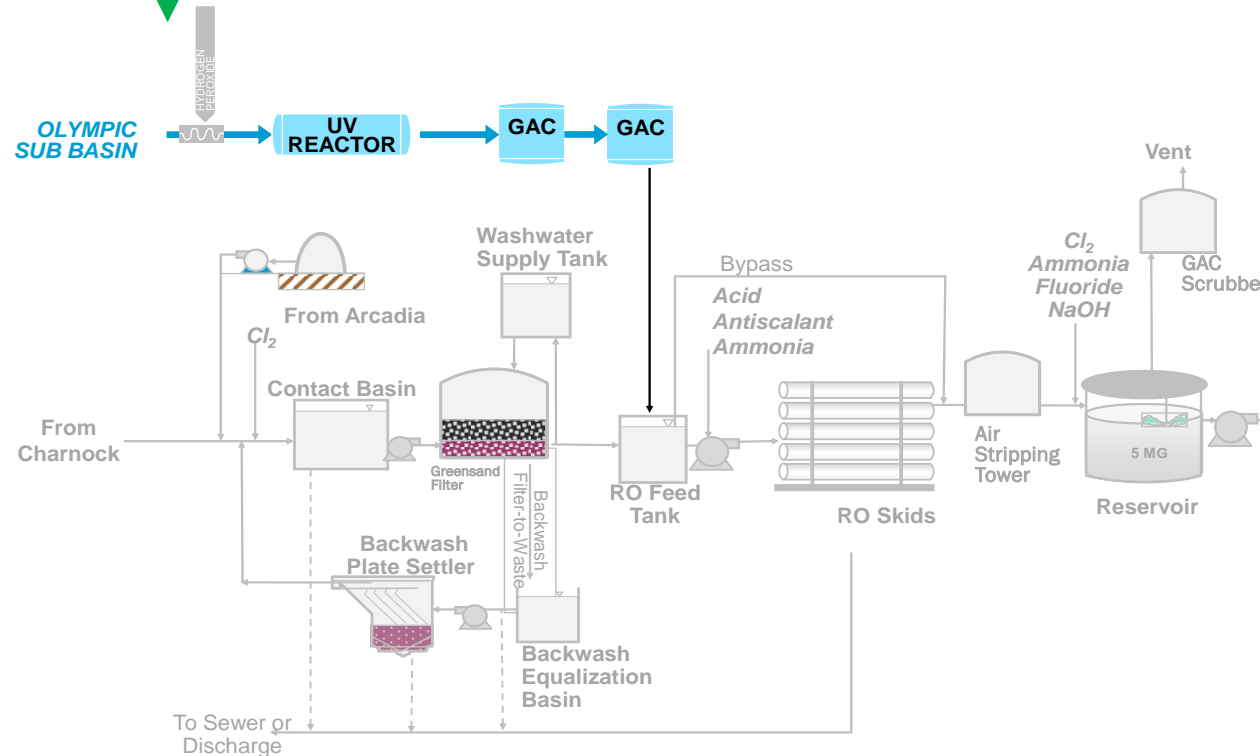
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What is in Our PDB Future? DPR?



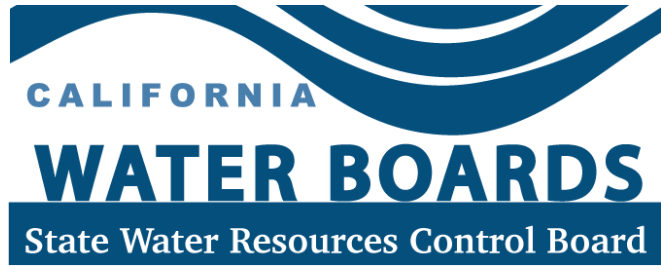
Future Potable Reuse – Raw Water Augmentation?

- Pending DDW guidelines in 2023
- <10% Contribution in Raw Water to Arcadia WTP
- Additional treatment through UV/H₂O₂ AOP, GAC, and RO at Arcadia WTP
- Existing Arcadia WTP is a permitted 97-005 facility



Arcadia Water Treatment Plant

Project Partners



CALIFORNIA DEPARTMENT OF
WATER RESOURCES



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An aerial photograph of Santa Monica, California, during sunset. The image shows the coastline with waves breaking on the beach. In the foreground, the Santa Monica Pier is visible, featuring a colorful roller coaster and other amusement rides. The city of Santa Monica is densely packed with buildings, including several high-rise apartment complexes. The sky is a mix of orange, pink, and purple, indicating the time is either dawn or dusk. The overall scene is a vibrant and scenic view of a coastal city.

Contact Info:
sunny.wang@santamonica.gov

THANK YOU...