DECEMBER 2024 • **FINAL REPORT**

Pure Water Los Angeles Master Plan

LOS ANGELES DEPARTMENT OF WATER & POWER

Jacobs ARCADIS PURE WATER LOS ANGELES

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Acronyms and Abbreviations

ADWF	average dry weather flow
AF	acre-foot (feet)
AFY	acre-foot (feet) per year
AWPF	Advanced Water Purification Facility
BAC	biological activated carbon
Board	Board of Commissioners
CB	Central Basin
CEQA	California Environmental Quality Act
cfs	cubic foot (feet) per second
City	City of Los Angeles
County Public Works	Los Angeles County Public Works
DCTWRP	Donald C. Tillman Water Reclamation Plant
DDW	Division of Drinking Water
demo	demonstration facility
DiPRRA	Direct Potable Reuse Responsible Agency
DPR	direct potable reuse
ECLWRF	Edward C. Little Water Recycling Facility
GAC	granular activated carbon
GRRP	Groundwater Replenishment Reuse Project
GWR	groundwater replenishment
HPOAS	high-purity oxygen activated sludge
HWRP	Hyperion Water Reclamation Plant
IAP	Independent Advisory Panel
IPR	indirect potable reuse
LAA	Los Angeles Aqueduct
LAAFP	Los Angeles Aqueduct Filtration Plant
LADWP	Los Angeles Department of Water and Power
LAGWRP	Los Angeles-Glendale Water Reclamation Plant
LAR	Los Angeles Reservoir
LASAN	Los Angeles Sanitation & Environment
Los Angeles RWQCB	Los Angeles Regional Water Quality Control Board
LRV	log reduction value
MBR	membrane bioreactor

MCDA	multi-criteria decision analysis
Metropolitan	Metropolitan Water District of Southern California
MF	membrane filtration
MGD	million gallon(s) per day
Mid	middle demand
MP	Master Plan
NDMA	N-nitrosodimethylamine
NdN	nitrification and denitrification
O&M	operations and maintenance
ONAT	Operation NEXT assessment tool
ozone-BAC	ozone and biological activated carbon
PCB	polychlorinated biphenyls
peroxone	ozone-peroxide advanced oxidation
PFAS	per- and polyfluoroalkyl substances
Program	Pure Water Los Angeles Program
Pure Water Los Angeles	Pure Water Los Angeles Program
PWSC	Pure Water Southern California
RIMS II	Regional Input-Output Modeling System II
RO	reverse osmosis
ROC	reverse osmosis concentrate
RWA	raw water augmentation
RWQCB	Regional Water Quality Control Board
SFB	San Fernando Basin
SWA	surface water augmentation
T-certification	drinking water treatment operator certification
TIWRP	Terminal Island Water Reclamation Plant
TM	technical memorandum
TWA	treated water augmentation
UWMP	Urban Water Management Plan
UV	ultraviolet
UVAOP	ultraviolet advanced oxidation process
VNC	Van Norman Complex
VNPS #2	Van Norman Pump Station #2
WCB	West Coast Basin
WCBBP	West Coast Basin Barrier Project
West Basin	West Basin Municipal Water District
WRD	Water Replenishment District of Southern California
WRP	water reclamation plant
WTP	water treatment plant

EXECUTIVE SUMMARY

PURE WATER LOS ANGELES

ES-1. Introduction

The Los Angeles Department of Water and Power (LADWP) plans to implement the Pure Water Los Angeles Program (Pure Water Los Angeles or Program), an innovative water supply initiative in partnership with Los Angeles Sanitation & Environment (LASAN). The vision for Pure Water Los Angeles is to:

> *"…increase and optimize the City's local supplies and support the transition to seventy percent local water by maximizing the production of purified recycled water as part of a diversified water portfolio in an affordable manner to mitigate risks from climate change and ensure an equitable and resilient future for the region." (LADWP 2024a)*

LADWP's water system relies on multiple water supplies, each of which come with unique challenges. These challenges are exacerbated by climate change, with more extreme dry and wet periods that strain existing supplies and infrastructure. Beneficial water reuse from Pure Water Los Angeles will continue to advance LADWP's goal of diversifying its water supply portfolio **(Figure ES-1)** while enhancing resiliency for the City of Los Angeles (City) to mitigate these future risks and challenges due to climate change.

This report summarizes the work that has been completed as part of the development of the Pure Water Los Angeles Master Plan (MP).

Figure ES-1. LADWP's Local Water Supply Initiatives

Figure ES-2. Pure Water Los Angeles Program Elements

ES-1.1 BACKGROUND

The LADWP Board of Commissioners (Board) tasked Water System staff to develop this MP to validate and advance the strategy of Pure Water Los Angeles (then known as Operation NEXT) in November 2021. The Program will provide the structured framework to diversify the City's water supply portfolio by maximizing beneficial reuse from the Hyperion Water Reclamation Plant (HWRP) (LADWP 2024a). This report identifies the reuse approaches that were developed and the related alternatives that were screened. Two reuse approaches and six alternatives were selected for consideration moving forward as part of the identified next steps in Program implementation.

The MP brings together many technical components, including the source water (HWRP membrane bioreactor [MBR] filtrate), the Advanced Water Purification Facility (AWPF) that provides the water supply, as well as conveyance, storage, demands, and potential post-treatment for raw water augmentation as shown on **Figure ES-2**. The intent is that this MP will represent a foundational building block for the Program strategy from which to move forward in subsequent Program phases to implement Pure Water Los Angeles. Through the MP, LADWP:

- Identified potential scenarios and implementation strategies
- Developed the range of estimated costs
- Identified potential funding opportunities
- Assessed potential partnerships
- Identified major milestones to facilitate phasing

ES-1.2 VISION, MISSION, AND GOALS

LADWP developed the vision, mission, and goals for the Program, shown on **Figure ES-3** (LADWP 2024a).

Figure ES-3. Pure Water Los Angeles Vision, Mission, and Goals

Pure Water Los Angeles Vision: Increase and optimize the City's local supplies and support the transition to seventy percent local water by maximizing the production of purified recycled water as part of a diversified water portfolio in an affordable manner to mitigate risks from climate change and ensure an equitable and resilient future for the region.

Pure Water Los Angeles Mission: Partner across the region to build and operate a world-class advanced recycled water system, to replenish local groundwater basins and support future direct potable reuse applications.

Pure Water Los Angeles Goals:

- **GOAL 1** — Maximize Reuse of Wastewater Effluent from Hyperion Water Reclamation Plant to Create a New and Sustainable Local Water Supply
- **GOAL 2** — Construct New and Upgrade Existing City's Infrastructure in a Cost-Effective and Responsible Manner
- **GOAL 3** — Urgently Implement Water Strategies to Diversify Los Angeles' Water Supply Portfolio
- **GOAL 4** — Increase the Resiliency, Reliability, and Sustainability of the City's Wastewater and Water Supply Systems
- **GOAL 5** — Protect Santa Monica Bay and Enhance Ecosystem Health across the LA Basin
- **GOAL 6** — Provide Community & Equity Benefits

ES-1.3 VALIDATION OF STRATEGY

The *Validation of Strategy Technical Memorandum* (Jacobs and Arcadis 2024a) described the critical step of validating the Program strategy developed in the *Concept Study* (LADWP 2021a). The *Concept Study* presented the initial concepts for reusing purified recycled HWRP MBR filtrate, and this work served as a foundational document for this MP.

The validation effort meets the direction of the LADWP Board. Per the November 2021 Board Meeting, the Program was directed to seek subject matter expert support to validate the Pure Water Los Angeles strategy.

The MP included steps to validate the *Concept Study* through enhancement of the original integration components. The validation effort assessed the readiness of the *Concept Study* strategy, and identified gaps for which additional analyses were completed. The original *Concept Report* strategy was validated as feasible, and with enhancements it was carried forward as one of the Program alternatives. The validation effort also identified other Program alternatives for assessment that have the potential for enhancing the original concept by addressing the need for more storage and demand opportunities and partnerships for early phases. Thus, the validation effort served as the basis for developing Program alternatives for this MP.

Validation

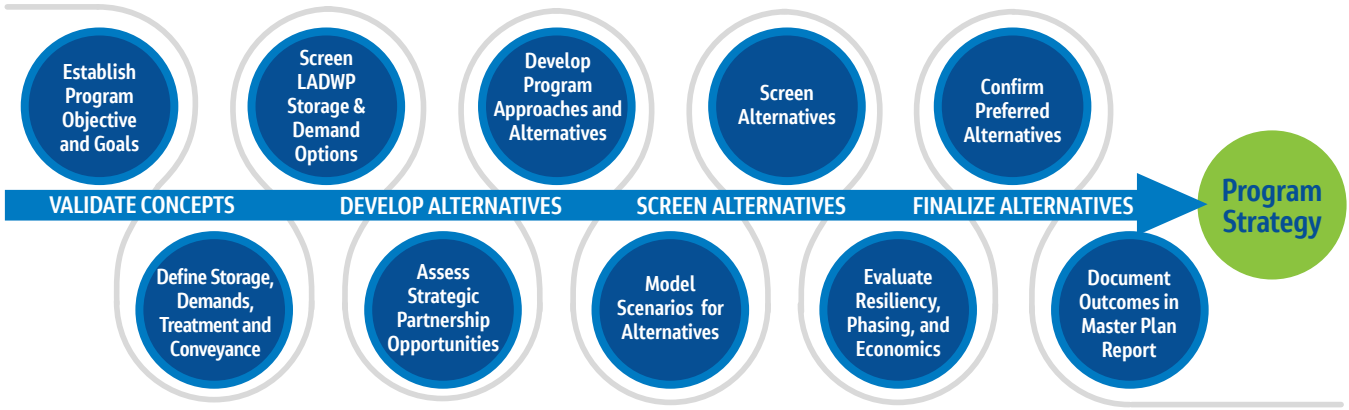
- Identified water quality requirements
- Assessed and refined component flow demands
- Developed additional treatment approaches
- Identified partnership opportunities
- Refined conveyance alignments and assessed critical conditions
- Developed independent cost estimates
- Developed an independent schedule

The validation effort also included an independent review of cost, schedule, and phasing. The independent review validated that the estimated cost in current dollars and schedule were reasonable, with the considerations noted in Section 1.

ES-1.4 MASTER PLAN PROJECT APPROACH

The MP project approach consisted of work tasks to identify and develop alternatives that could be compared for their ability to meet the Program goals. **Figure ES-4** provides a "roadmap" for the MP showing the important elements of Program alternative identification, development, and assessment.

Figure ES-4. Master Plan Roadmap to Set Program Strategy



The MP consisted of the development of Program approaches and alternatives. Subsequent work tasks then screened the alternatives to a shortlist. The screened alternatives were analyzed in more detail and assessed based on resiliency benefits, water supply modeling, cost estimates, phasing, and additional technical details. The MP culminated with the confirmation of the preferred alternatives as the basis for a Program strategy including estimated costs, schedule, a preliminary phasing plan, and a Program Implementation Roadmap identifying next steps. These preferred alternatives will then be

further developed and evaluated in the subsequent public outreach, conveyance alignment study, and environmental planning phase in accordance with applicable environmental review requirements.

ES-1.4.1 *HYPERION WATER RECLAMATION PLANT*

LASAN is planning on converting HWRP to MBR secondary treatment. MBR will provide high-quality pre-treatment for advanced water treatment, providing the water source for the Program and environmental benefits to the Santa Monica Bay. HWRP planned improvements will replace the high-purity, oxygen activated sludge process with an MBR treatment process that would "require less space and produce a higher quality water" (LASAN 2022). HWRP MBR filtrate will serve as feed to the AWPF for Pure Water Los Angeles. It is anticipated that 272 million gallons per day (MGD) of HWRP flow would supply the AWPF, resulting in up to 230 MGD of product water for either indirect potable reuse (IPR) or direct potable reuse (DPR) scenarios, based on a reverse osmosis recovery of 85% (LASAN 2023). LADWP selected 230 MGD as the available supply capacity for the comparison of Program alternatives in the MP (Hazen 2024).

The HWRP conversion to MBR is currently planned to occur in three phases (LASAN 2023), with battery conversions in the initial two phases providing 60 MGD of MBR filtrate per phase. Planned Program phasing is shown in **Table ES-1** and will provide source water to the AWPF; assumptions on MBR conversion are subject to change based on final analysis on phasing, packaging, and scheduling, as well as timing with Pure Water Los Angeles storage and demand deliveries. The schedule was based on alignment of the treatment, conveyance, and storage and demand component delivery durations.

Although MBR and AWPF water deliveries do not necessarily need to be aligned, aligning these water deliveries with the other Program components is important so that supply and demand infrastructure is available concurrently to minimize stranded assets. As such, the phasing may be further refined through active collaboration with LASAN.

The MBR completion dates in **Table ES-1** reflect the latest possible completion dates to accommodate AWPF operation and delivery to identified storage and demand locations. Thus, MBR phasing may be completed before these dates for other reasons, such as considerations for operations or constructability.

Table ES-1. Anticipated Phasing for HWRP Conversion and AWPF

Phase	MBR Completion Year	Added MBR Flow (MGD)	AWPF Completion Year	Added AWPF Flow (MGD)	Total AWPF Capacity (MGD)
1	2039	60	2040	50	50
2	2045	60	2046	50	100
3	2055	152	2056	130	230

ES-1.4.2 *PROGRAM ALTERNATIVES SCREENING CRITERIA*

LADWP developed screening criteria for comparing Program alternatives to develop a shortlist of screened alternatives that move forward to the more detailed evaluation (LADWP 2024b).

In defining these criteria, LADWP noted that critical components such as "Resiliency, Reliability, & Sustainability" and "Community Benefit & Equity" are foundationally significant in guiding the Program and, thus, will be considered as goals rather than specific criteria for use in comparing Program alternatives. Additionally, further public engagement with Pure Water Los Angeles will be sought to provide guidance to LADWP throughout the Programmatic Environmental Impact Report, planning, and implementation process (LADWP 2024b).

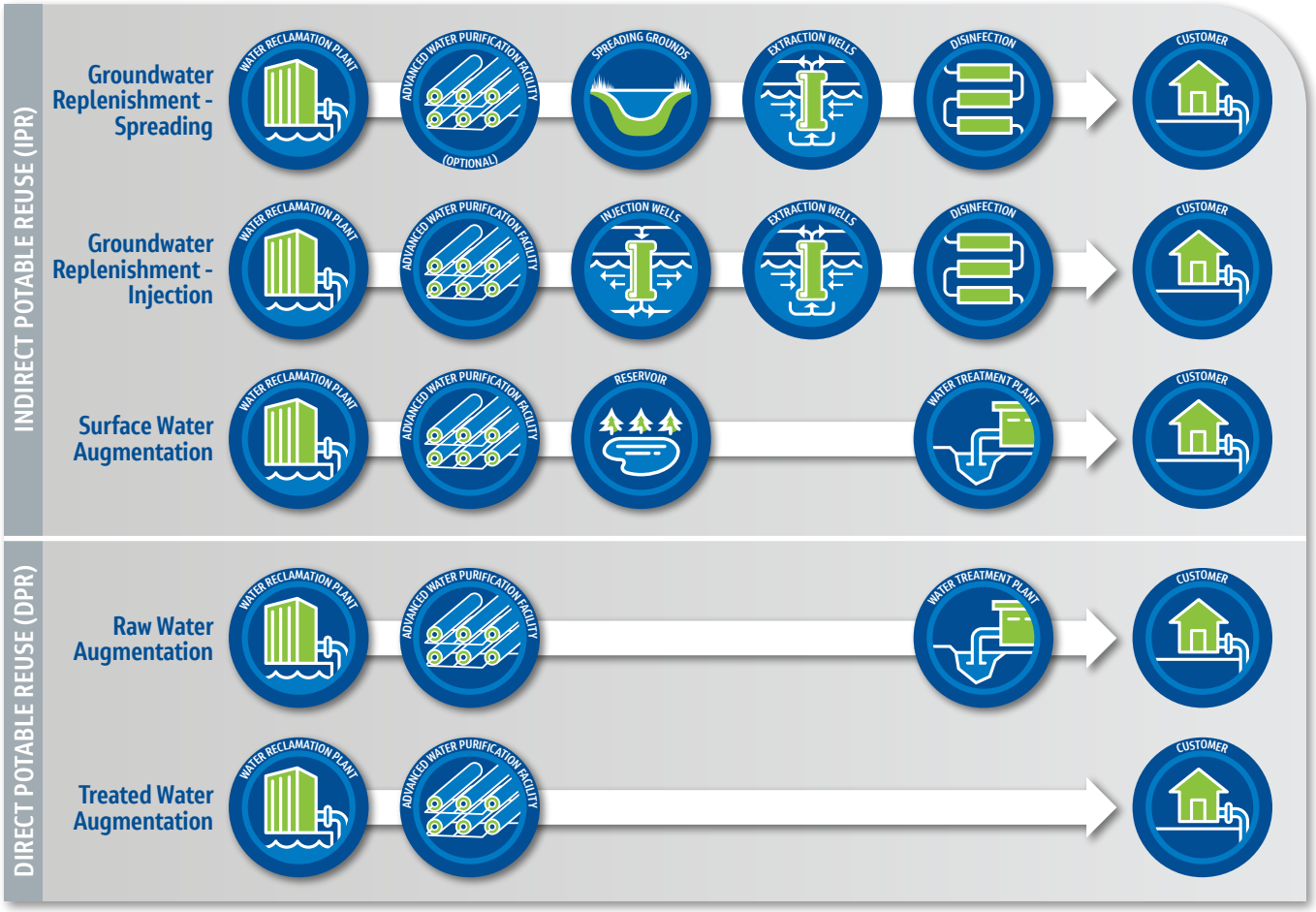
Screening Criteria

1. Minimize Operational Complexity and Maintain Water Quality in the Distribution System
2. Environmental Stewardship
3. Regulatory Acceptance
4. Cost-Effective Water Supply
5. Regional Partnerships
6. Phasing & Early Deliveries
7. Adaptability to Future Supply & Demand Changes

ES-1.5 IDENTIFICATION OF WATER INTEGRATION COMPONENTS

California's regulations allow for five potable reuse approaches for IPR and DPR (**Figure ES-5**). For a DPR project, a Direct Potable Reuse Responsible Agency (DiPRRA) is responsible for compliance with the DPR regulations. The DiPRRA must be a public water system that provides water for human consumption. The DiPRRA is responsible for all aspects of a DPR project, from wastewater source to integration with the drinking water supply. As a public water system in California, holding drinking water supply permits for the components identified for the alternatives, LADWP is eligible to serve as the DiPRRA.

Figure ES-5. Potable Reuse Approaches



In the context of this MP, Program components can be classified based on their ability to either source, supply, store, or directly distribute water. LASAN will provide MBR filtrate from HWRP as part of the Program. The AWPF, which is to be served by and located either at or in the vicinity of HWRP, will supply purified recycled water for the Program. The location of the AWPF is currently being evaluated by LADWP and LASAN.

Various components were evaluated and screened as storage and demand locations, as shown in **Table ES-2**. The MP does not include surface water augmentation as a Program storage location because of neighborhood considerations, conveyance costs, space limitations for additional treatment, and low storage potential. Treated water augmentation is also not included in the MP as a Program demand option, given that LADWP will be exploring this approach further after the MP, with input from community stakeholders.

Table ES-2. Potential Storage and Demand Locations

LADWP SYSTEM	REGIONAL PARTNER OPPORTUNITIES	LOCAL PARTNER OPPORTUNITIES
Groundwater Replenishment (GWR) » Central Basin (CB) » San Fernando Basin (SFB) **Surface Water Augmentation (SWA)** » Non-Potable Reservoirs **Raw Water Augmentation (RWA)** » Van Norman Complex (VNC) » Raw Water Source	» Los Angeles County Public Works » Metropolitan Water District of Southern California » Water Replenishment District of Southern California » West Basin Municipal Water District	» City of Beverly Hills » City of Burbank » City of Glendale » City of San Fernando » City of Santa Monica

ES-1.6 PROGRAM ALTERNATIVES DEVELOPMENT

The source, supply, storage, and demand components were used to develop multiple Program alternatives. The Program alternatives were developed based on the MP's foundational assumptions and incorporate LADWP system components, potential partnerships, and conveyance alignments into potable reuse approaches. Each Program alternative is intended to create a robust strategy for a diversified water portfolio, meeting the Program goals.

In the context of California IPR and DPR regulations, four potable reuse approaches were developed to categorize the Program alternatives based on the level and location of treatment **(Table ES-3)**. Two water qualities, IPR and DPR, were considered for two different treatment locations. The formulation of a potable reuse framework for the Program relies on different strategic approaches. The Program evaluated three distinct approaches for overall supply management: IPR at the AWPF, IPR with Post-AWPF DPR treatment, and DPR at the AWPF. Each approach encompasses alignment, and storage and demand options, offering multiple alternatives within each approach.

Table ES-3. Potable Reuse Approaches

Potable Reuse		Treatment Location		Alternative	Rationale
Approach	Treatment	AWPF	VNC		
I	IPR	IPR	—	1, 2, 3	Fastest to implement and permit
II	IPR, DPR	IPR	DPR	4, 5, 6	Fit for purpose treatment
III	DPR	DPR	—	7, 8, 9	Flexibility to integrate potable water anywhere in the LADWP distribution system
IV	IPR, DPR	IPR, DPR	—	10	Fit for purpose treatment with dual pipeline alignments

Approach IV considered IPR and DPR treatment trains at the AWPF, with separate alignments to San Fernando Basin (SFB) and Van Norman Complex (VNC) to provide the appropriate water quality for the delivery locations. This approach was considered to be cost-prohibitive; therefore, it was eliminated.

Table ES-4 summarizes the storage and demand locations comprising the nine alternatives. Each alternative has other potential partnerships along the alignment that could be pursued.

Table ES-4. Program Alternative Components

Potable Reuse Approach	Program Alternatives	West Basin Connection	Central Basin GWR	Metropolitan PWSC Connection	San Fernando Basin GWR	Van Norman Complex RWA	Metropolitan Jensen WTP Connection
I	1, 2	♦	♦	♦	♦		
I	3	♦	♦	♦			
II	4, 5, 6	♦	♦	♦	♦	♦	♦
III	7, 8, 9	♦	♦	♦	♦	♦	♦

ES-1.7 MASTER PLAN TREATMENT BASIS

For the purposes of this MP, requirements for size, space, and cost were developed using the treatment train basis for each of the potable reuse approaches, as summarized in **Table ES-5**.

Table ES-5. Basis for Space and Cost Development for the Master Plan

Potable Reuse Approach	AWPF Treatment	VNC or DPR Location Treatment
I	MBR + RO + UVAOP	Not applicable
II	MBR + RO + UVAOP	UVAOP + GAC
III	MBR + Ozone-BAC + MF + RO + UVAOP	Chemical feed for pH, chlorine residual control

GAC = granular activated carbon
MF = membrane filtration
Ozone-BAC = ozone-biological activated carbon
RO = reverse osmosis
UVAOP = ultraviolet advanced oxidation process
Includes post-treatment stabilization and chloramination

Of the potable reuse approaches developed, Approach I incorporates the prescribed treatment train for IPR, and Approach III applies the prescribed treatment train for DPR, from the Title 22 *California Code of Regulations*. Approach II incorporates the prescribed IPR train at the AWPF and assumes additional DPR treatment downstream at VNC. Demonstration and validation testing for chemical control, and likely for pathogen control, is required for both the prescribed and alternative treatment trains for DPR.

The assumed treatment requirements for the AWPF will be informed by ongoing LADWP studies. For Approach II, an ultraviolet advanced oxidation process and granular activated carbon were used as the basis for DPR treatment at VNC. This provides a conservative estimate for space and capital and operating costs. While VNC is being used as the location basis in this report due to existing land availability, treatment may be sited elsewhere north of SFB.

For Approach II, the additional DPR treatment processes at VNC will also require demonstration to seek approval of alternative chemical control and alternative pathogen control treatment processes within the alternatives clauses in the DPR regulations. Thus, Division of Drinking Water (DDW) engagement and coordination will be required to refine and select a final treatment train.

ES-1.8 PROGRAM ALTERNATIVES SCREENING

Comparing alternatives was an important phase of MP development. Using a multi-criteria decision analysis approach, the nine identified Program alternatives were assessed and screened. The alternatives screening was based on the seven criteria described in Section ES-1.4.2.

On March 26, 2024, LADWP held a workshop to review the Program alternative scoring and develop a shortlist of screened alternatives (LADWP 2024c). This workshop was an important milestone for the Program, with the main objective of identifying the screened Program alternatives to evaluate in more

detail. **Figure ES-6** shows the results of the screening evaluation, with Approaches II and III having the highest scores. These scores are the culmination of LADWP's internal effort involving the Water System Division Directors and collaboration with LASAN. Based on the workshop, the screened Program alternatives were identified by LADWP as:

» Approach II – IPR with Post-AWPF DPR

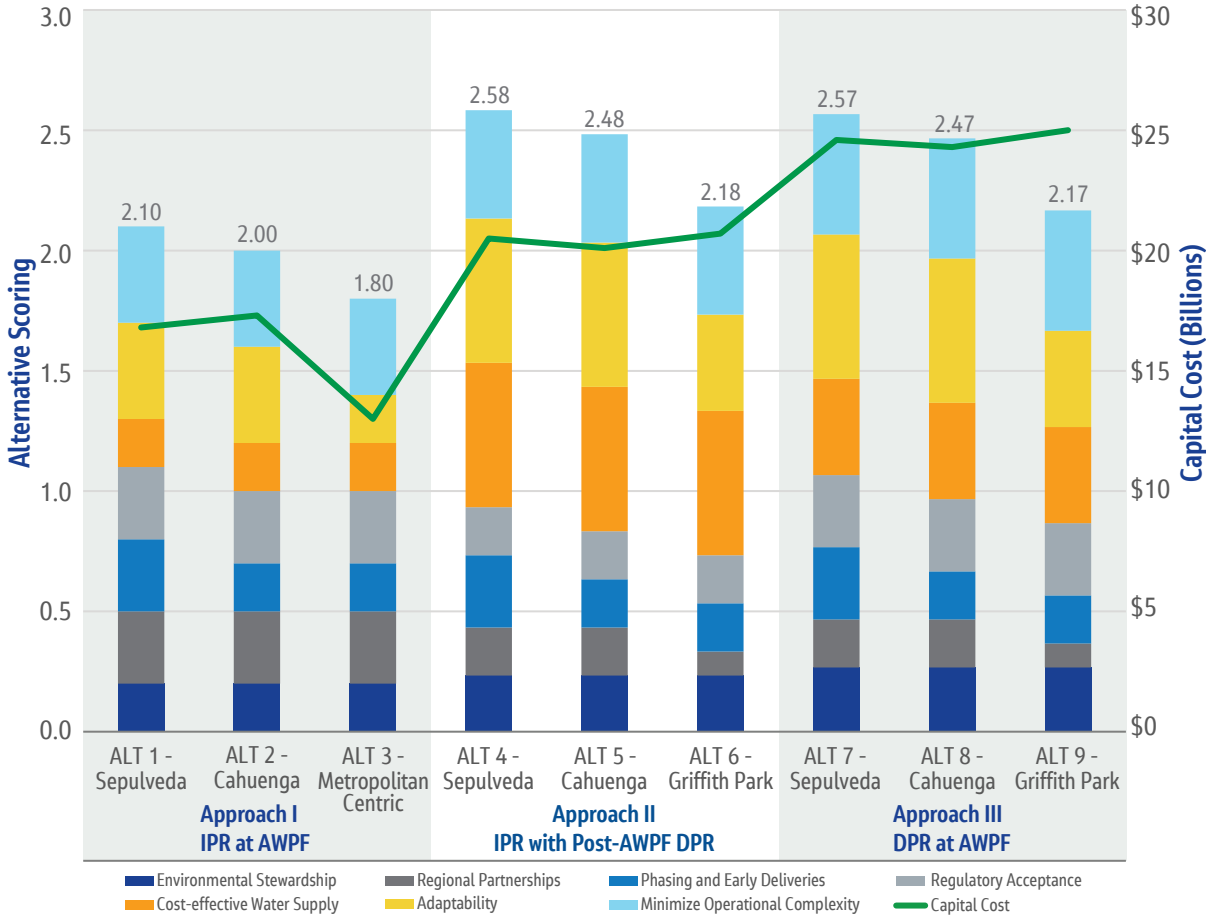
» Approach III – DPR at AWPF

Both of these approaches incorporate DPR to VNC. The primary difference between Approaches II and III is the location of the DPR treatment, either at the AWPF or VNC. Approach II could be adapted to Approach III if post-AWPF treatment is not selected by LADWP.

This DPR connection will occur at a location that will feed a majority of LADWP's system to support equitable distribution to customers. The screened alternatives allow all three south to north alignments to advance to public outreach and the environmental planning phase.

The screened approaches provide operational flexibility and adaptability to account for future water supply and regulatory changes, while being more cost-effective based on LADWP's evaluation criteria.

Figure ES-6. Program Alternative Scoring Summary



ES-1.9 PROGRAM ALTERNATIVES EVALUATION

Additional evaluations were completed on the screened Program alternatives to inform the future Program requirements and impacts. Additional water supply modeling was conducted for six scenarios to evaluate a range of hydrological and demand conditions. Further analyses were completed for resiliency, vulnerability, economic benefits, cost, and schedule. The additional evaluations included:

- Using the water supply model (Operation NEXT assessment tool, or ONAT) to identify differences among the alternatives for purified recycled water usage and potential limitations for storage and demand locations
- Evaluating resiliency and vulnerability of the main infrastructure components
- Estimating cost
- Evaluating the economic benefits and impacts, focused on estimating job creation
- Developing the Program schedule and phasing

The results of the additional evaluations include:

- **All six alternatives** would result in **similar production from the AWPF**, with production and utilization driven by LADWP prioritization and Los Angeles Aqueduct (LAA) flow conditions rather than Program alternatives.
- Pure Water Los Angeles supply can potentially provide additional supplies (Goal 3 on Figure ES-3) to **offset purchased imported water sources**.
- **Balancing Program production** with other LADWP sources, such as groundwater rights, **will be an important step** during implementation to avoid competition between sources.
- All six alternatives will **provide additional resiliency to LADWP's water supplies** by adding a new source of supply, and in reducing drought-related shortages and lessening the potential impact of earthquake-related outages on water supplies.
- **Potable reuse is a vital strategy for building seismic resilience** (Goal 4 on Figure ES-3) by reducing reliance on more vulnerable, imported water sources. Pure Water Los Angeles will provide a reliable alternative water supply to mitigate the risk of water shortages and support critical infrastructure and public health and safety, even potentially in the face of catastrophic seismic events.
- **Maximum utilization for purified recycled water is expected for seismic or emergency scenarios**, and while infrequent, a significant seismic event could disrupt traditional water supply sources, highlighting the critical importance of the Program. By investing in this Program that maximizes water reuse (Goal 1 on Figure ES-3), LADWP can not only mitigate some of the risks associated with natural disasters but also contribute to improving long-term water security and environmental sustainability. The Program's projected potential cost savings during emergency scenarios, estimated at $1.0 to 2.3 billion for the scenarios examined, underscore its potential to safeguard community well-being, even in the face of adversity.
- Infrastructure for each alternative was evaluated **based on vulnerability**, and some **differences were identified** among the six alternatives. For example, all of the south to north alignments have climate and seismic vulnerabilities, however, the Sepulveda alignment is less vulnerable than the Cahuenga and Griffith Park alignments. The Sepulveda alignment has fewer fault crossings (half as many) and lower flood vulnerability as compared to the other south to north alignments. Recommendations were developed to address these identified areas of vulnerability to improve resiliency.
- As a further consideration regarding vulnerability, while designing infrastructure to address frequent scenarios offers efficiency, the threat of "black swan" events, defined as rare, high-impact occurrences with the potential to severely impact or limit entire systems, could also be considered. For critical infrastructure, such as water systems, **addressing vulnerability and building resilience** through approaches such as scenario planning or considering black swan events could add significant value, despite the additional cost.

- The **Program will result in significant economic benefits in terms of job creation**, an opportunity for workforce development, and economic growth with multiple benefits throughout the Los Angeles County and Southern California region.
- Before the public outreach effort and detailed conveyance alignment study, **estimated Program costs are a primary differentiator between the approaches**. Approach II – IPR with Post-AWPF DPR is estimated to have a capital cost that is approximately $4 billion less than Approach III – DPR at AWPF. However, Approach II requires additional, more extensive validation testing and DDW approval before implementation.

Cost estimates were updated since the screening assessment, including incorporating finalized construction and non-construction markups. **Table ES-6** shows the estimated capital and operations and maintenance costs for the preferred Program alternatives, in 2024 dollars. These Class 5 level cost estimates have an expected accuracy range from -50% to + 100% for concept screening, with a project definition level up to 2% (AACE 2020). The accuracy tightens as the project definition evolves.

Table ES-6. Estimated Costs for Preferred Program Alternatives

Approach	Alternative	Alignment	Total Capital Cost, $ billions	Annual O&M Cost, $ millions
Approach II – IPR + Post-DPR	4	Sepulveda	21.3	411
	5	Cahuenga	20.9	405
	6	Griffith Park	21.6	409
Approach III – DPR at AWPF	7	Sepulveda	25.4	462
	8	Cahuenga	25.1	452
	9	Griffith Park	25.8	460

ES-1.10 PROGRAM IMPLEMENTATION AND NEXT STEPS

The MP is a critical step in developing the Pure Water Los Angeles Program. Following this MP, additional evaluations are necessary to further refine the preferred Program alternatives and develop the final Program that will be implemented.

Implementing Pure Water Los Angeles is a joint effort by LADWP and LASAN. To support the Program advancing, LADWP and LASAN should establish agreements, Program governance, and roles and responsibilities. This should be memorialized in an overall joint plan that addresses the following topics:

- Shared vision and goals
- Communications approaches
- Other partners
- Program timeline
- Financial considerations
- Other topics identified by LADWP and LASAN

The Statement of Intent for the Water Reuse Collaborative (Water Reuse Collaborative 2023) describes a commitment among Southern California water agencies to collaborate on large-scale water reuse projects, including Pure Water Los Angeles and Metropolitan Water District's Pure Water Southern California (PWSC). These initiatives aim to enhance regional water resilience, operational efficiency, environmental quality, and equitable access to resources, while maintaining affordability and pursuing funding opportunities. The Pure Water Los Angeles Program aligns with the collaborative goals by:

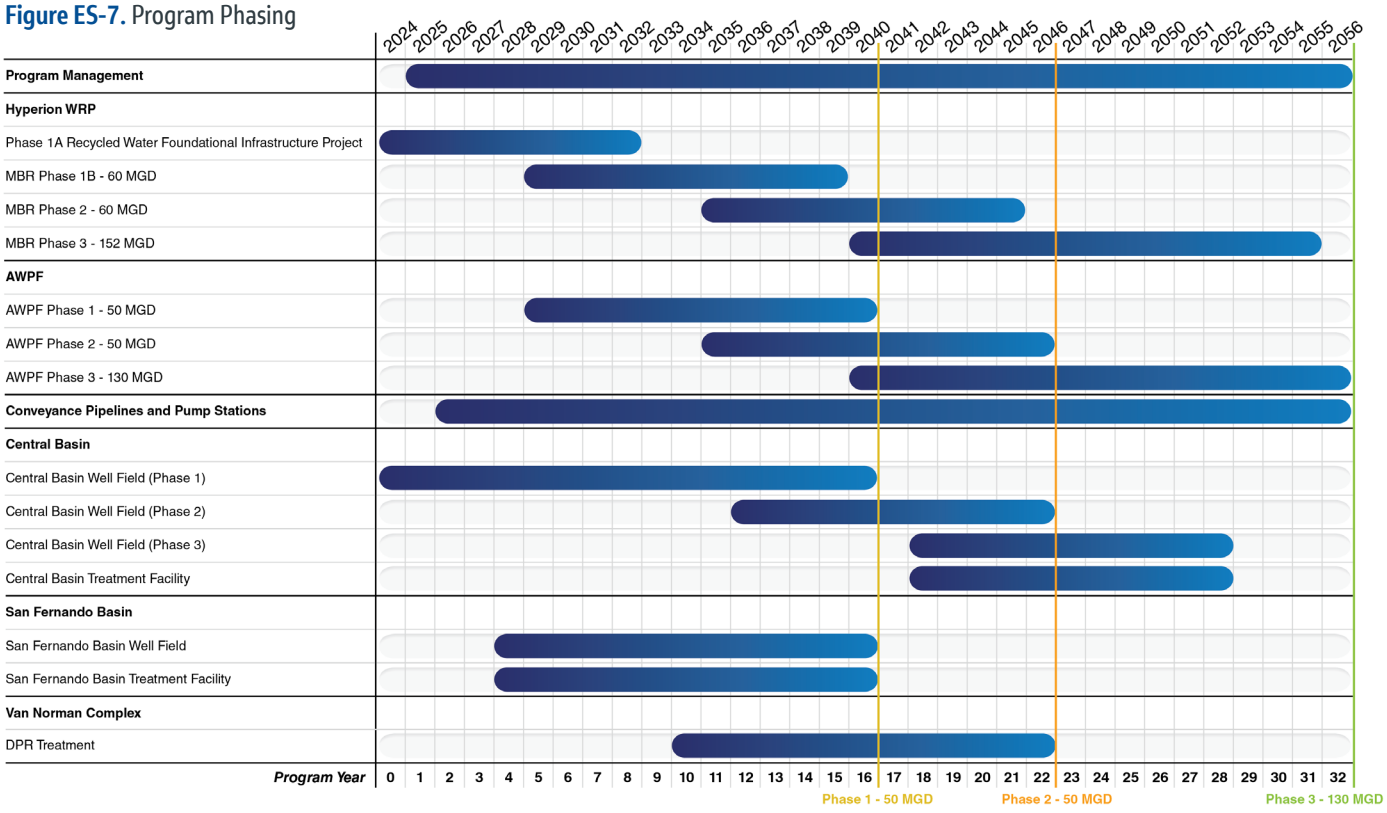
- Contributing to the region's water supply resilience
- Integrating infrastructure to improve operational flexibility
- Supporting affordability through cost efficiencies
- Advancing environmental benefits and equitable access to resources for underserved communities

Thus, the Water Reuse Collaborative provides a foundation for future partnerships as part of the Program.

Section 7 of this MP report brings together the governing considerations, decisions, and next steps to advance the Program following MP completion. The MP report culminates with the Program Implementation Roadmap, which was developed to identify decisions, recommended next steps, and evaluations that will be required to define the Program for implementation.

As defined in this MP report, the Program may be implemented in three proposed phases that can serve Los Angeles **(Figure ES-7).** The first phase could serve purified recycled water to Central Basin (CB) and SFB in 2040, followed by a second phase that may serve additional purified recycled water flow to SFB and CB as well as DPR to VNC by 2046. The third phase could expand deliveries to SFB, CB, and VNC by 2056, with a potential connection to the PWSC program. The latest schedule deadline for a decision on the location of DPR treatment is estimated to be 2033 to meet Program phasing.

Figure ES-7. Program Phasing



CB and SFB would require IPR-quality water from the AWPF, which allows time for demonstration and approval of Approach II post-AWPF DPR options and additional construction of the conveyance pipeline to the north. Given the construction duration for the pipeline to the north, partnerships could be pursued to use the purified recycled water that will be available for Phases 1 and 2.

To meet the established phasing plan, LADWP in partnership with LASAN will need to take the steps necessary to complete the identified evaluations and to manage, finance, administer, permit, and implement the Program and its individual projects. The Program Implementation Roadmap was developed by component to help identify the next steps for the City to implement the Program and make decisions to meet the Program schedule. With the completion of the MP, the most immediate steps include:

- Establishing LADWP and LASAN agreements, as well as Program governance, and roles and responsibilities, and memorializing these decisions in an overall joint plan
- Continuing collaboration with LASAN and the Mayor's Office Climate Cabinet Water Resilience Working Group on decisions, such as water quality and treatment location

- Conducting community and stakeholder outreach to obtain Program input
- Completing the programmatic environmental planning phase
- Establishing an overall Program management approach
- Conducting the conveyance alignment study
- Continuing discussions with potential partners
- Establishing Program flow capacity and capability
- Defining the individual projects that constitute the Program
- Conducting hydraulic analyses
- Conducting siting and treatment evaluations, including for the AWPF and DPR treatment locations
- Demonstrating and validating treatment performance for the prescribed and alternative DPR treatment approaches under consideration
- Developing a Real Estate Procurement Plan

As these steps advance, LADWP should refine the Program phasing, size, cost, and schedule for implementation.

1. Introduction

The Los Angeles Department of Water and Power (LADWP) plans to implement the Pure Water Los Angeles Program (Pure Water Los Angeles or Program), an innovative water supply initiative in partnership with Los Angeles Sanitation & Environment (LASAN). The vision for Pure Water Los Angeles is to:

> *"…increase and optimize the City's local supplies and support the transition to seventy percent local water by maximizing the production of purified recycled water as part of a diversified water portfolio in an affordable manner to mitigate risks from climate change and ensure an equitable and resilient future for the region." (LADWP 2024a)*

Water reuse as part of Pure Water Los Angeles aligns with LADWP's local water supply initiatives that include conservation, water recycling, capture of stormwater, and recharge and recovery of groundwater to provide increased water storage and supply diversity **(Figure 1-1)**. Pure Water Los Angeles will result in beneficial potable reuse of purified recycled water to provide a valuable local water resource that will "increase the resiliency, reliability, and sustainability of the City of Los Angeles' (City's) wastewater and water supply systems" (LADWP n.d.). This report summarizes the work that has been completed for the Pure Water Los Angeles Master Plan (MP).

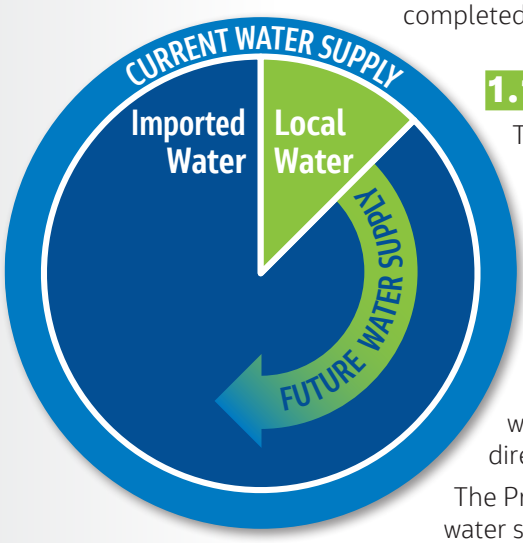


Figure 1-1 LADWP Provides Increased Water Supply Diversity through Pure Water Los Angeles and Other Initiatives

1.1 BACKGROUND

The LADWP Board of Commissioners (Board) tasked Water System staff to develop a Master Plan to advance the Operation NEXT Program in November 2021. The Program was renamed Pure Water Los Angeles in July 2024. The development of the MP aligns with, and is guided by, LADWP and LASAN's goal to "maximize reuse of wastewater effluent from Hyperion Water Reclamation Plant (HWRP) to create a new and sustainable local water supply" (LADWP 2024a). LADWP and LASAN jointly identified the mission of Pure Water Los Angeles as to "partner across the region to build and operate a world-class advanced recycled water system to replenish local groundwater basins and support future direct potable reuse applications" (LADWP 2024a).

The Program will provide the structured framework to further diversify the City's water supply portfolio (LADWP 2024a). This report identifies the alternatives under consideration for the structured Program framework. Through the MP, LADWP identified a range of scenarios and implementation strategies, developed the range of costs and funding opportunities, assessed potential partnerships, and identified major milestones to facilitate phasing.

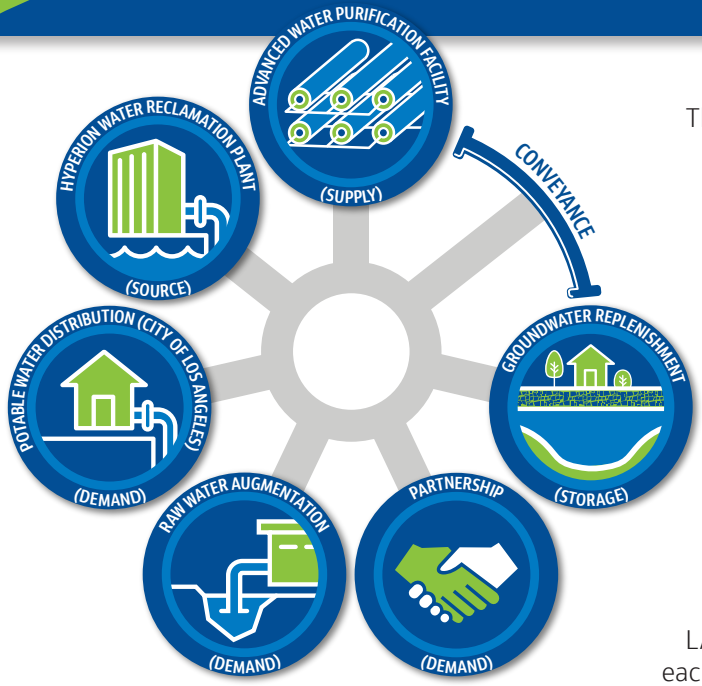


Figure 1-2. Pure Water Los Angeles Program Elements

The MP brings together many technical components, including the source water (HWRP membrane bioreactor [MBR] filtrate), the Advanced Water Purification Facility (AWPF) that provides the water supply, as well as conveyance, storage, demands, and potential post-treatment for raw water augmentation as shown on **Figure 1-2**. The MP report defines the elements (source, supply, storage, and demand) of the Program, including the combination of these elements into screened alternatives suitable for comparative assessments, including estimated costs and an indicative phasing plan. The intent is that this MP will represent a foundational building block for the Program strategy from which to move forward in subsequent Program phases to implement Pure Water Los Angeles.

LADWP's water system relies on multiple water supplies, each of which come with unique challenges. These challenges are exacerbated by climate change, with more extreme dry and wet periods that challenge existing supplies and infrastructure. For example, Los Angeles Aqueduct (LAA) flow is variable from year to year due to a variety of conditions, and decreases in flow from LAA currently result in more use of purchased imported water. The calendar year flow available from the LAA to LADWP is shown from 2000 to 2023 on **Figure 1-3**. The variability in the available flow indicates the hydrologic extremes associated with climate change that present challenges to LADWP. Beneficial water reuse from Pure Water Los Angeles will continue to advance LADWP's goal of diversifying its water supply portfolio for the City to mitigate these future risks and challenges from LAA and other supplies.

Figure 1-3. LADWP's Available Flow from the Los Angeles Aqueduct

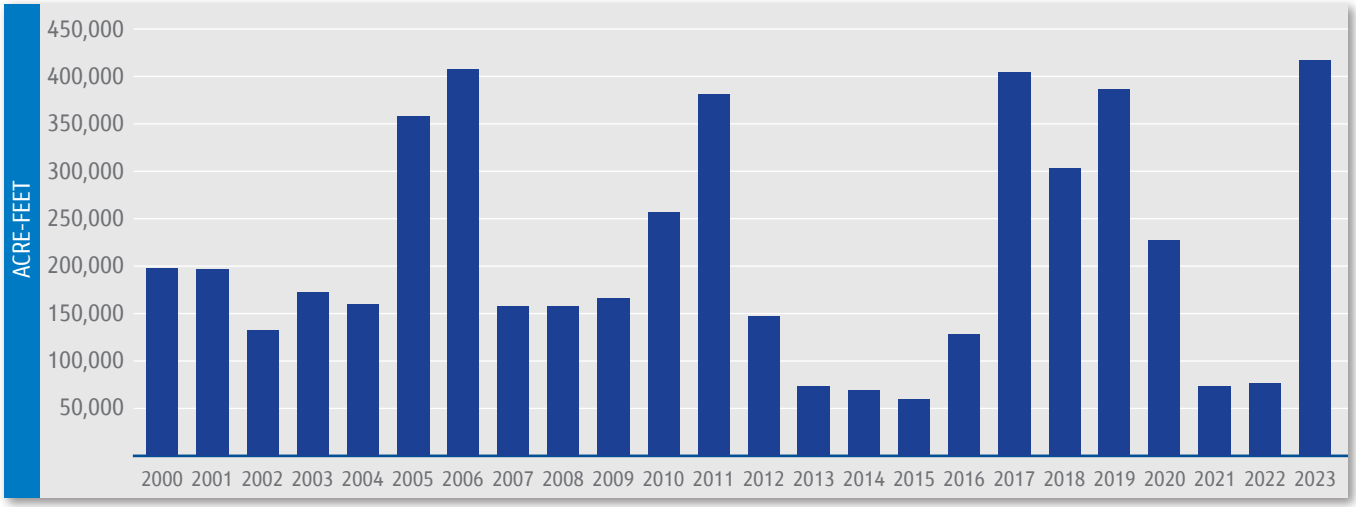
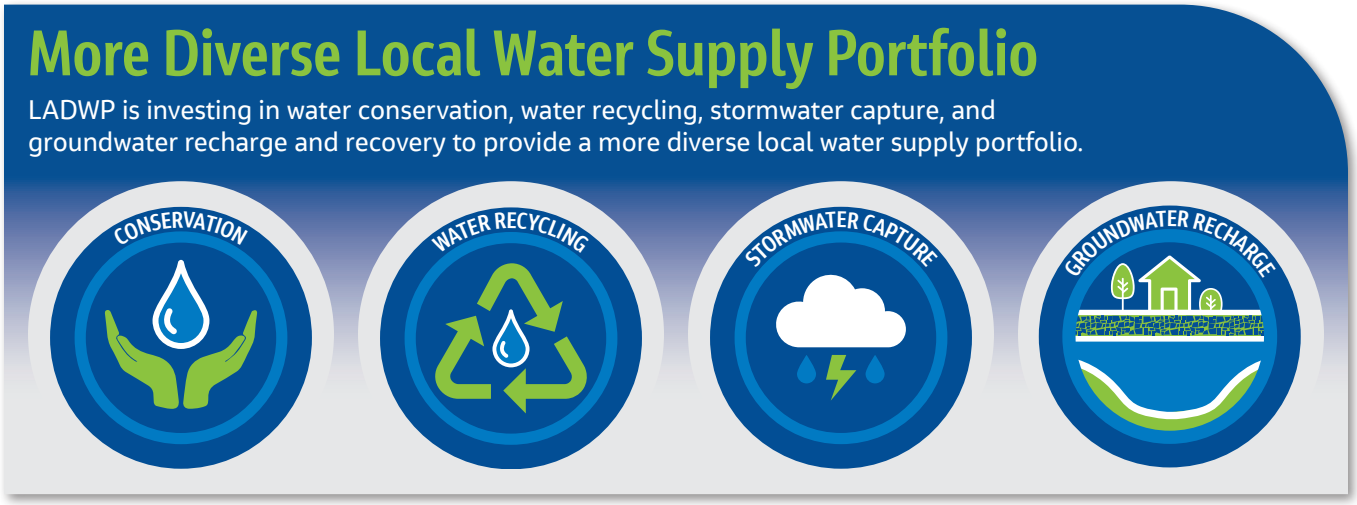


Figure 1-4. LADWP's Local Water Supply Initiatives

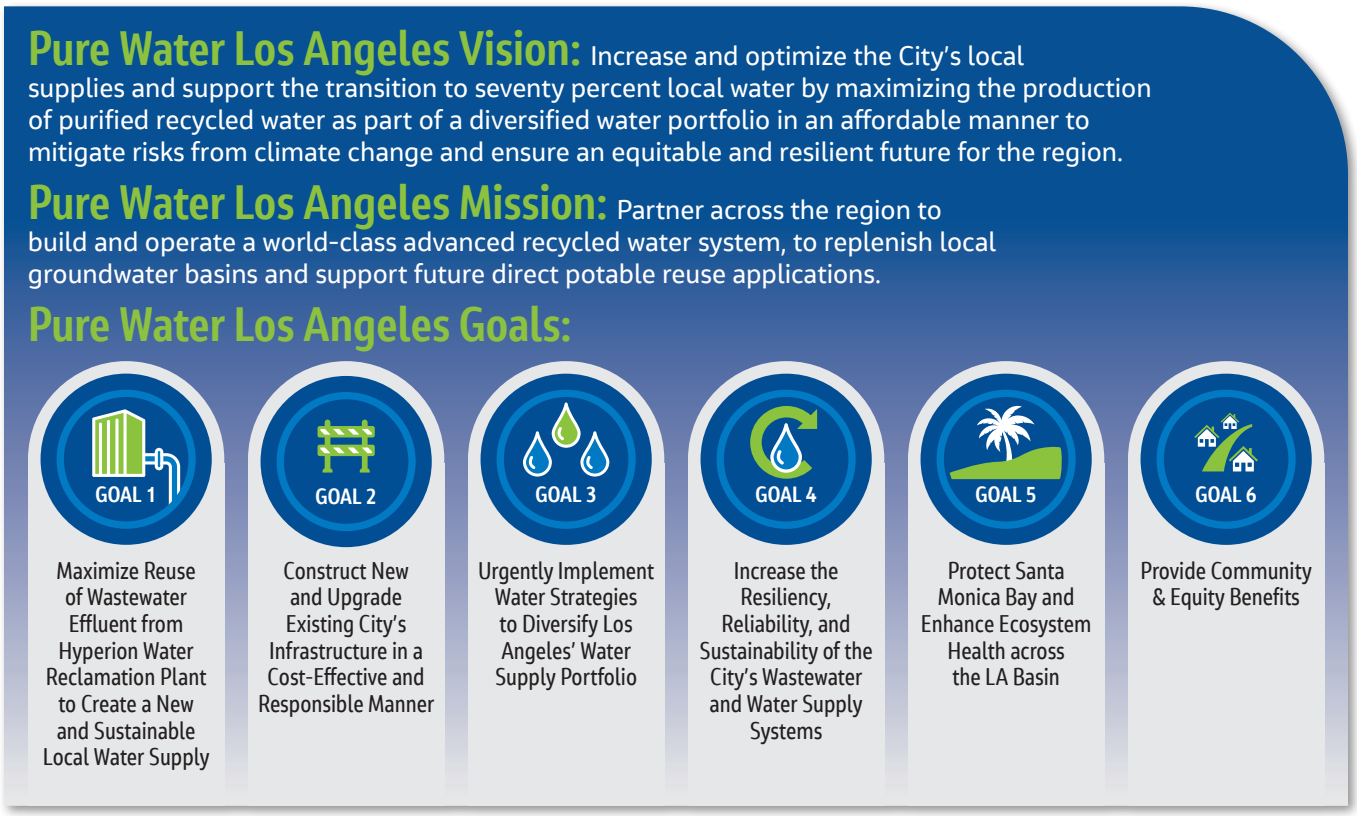


Preceding Pure Water Los Angeles, LADWP evaluated how to further diversify its water supply portfolio (LADWP 2017) and decided to pursue investments in the local supply initiatives shown on **Figure 1-4**, conservation, water recycling, capture of stormwater, and recharge and recovery of groundwater. Pure Water Los Angeles incorporates reuse and groundwater recharge and recovery from these previously-identified approaches, and the Program will supplement and enhance LADWP's overall efforts.

1.2 VISION, MISSION, AND GOALS

LADWP developed the Vision, Mission, and Goals for the Program, as shown on **Figure 1-5**.

Figure 1-5. Pure Water Los Angeles Vision, Mission, and Goals



LADWP also defined resiliency, reliability and sustainability as follows (LADWP 2024a):

» **Resiliency** is the ability to withstand unforeseen events such as earthquakes and recover or restore service timely after a major outage.

» **Reliability** is the ability to deliver water and wastewater services to users on a continuous basis, and to resolve minor interruptions, due to system upsets, in a timely manner.

» **Sustainability** is the ability to meet present water needs by using renewable sources or practices, without compromising the ability of future generations to meet their needs.

1.3 VALIDATION OF STRATEGY

The *Validation of Strategy Technical Memorandum* (TM) (Jacobs and Arcadis 2024a) described the critical step of validating the Program strategy developed in the *Concept Study* (LADWP 2021a). The *Concept Study* presented the initial concepts for reusing purified HWRP wastewater effluent and served as a foundational document for the MP.

The validation effort meets the direction of the Board, and per the November 2021 Board Meeting, Operation NEXT (now Pure Water Los Angeles) was directed to seek subject matter expert support to validate the Program strategy. The MP reflects the steps taken to validate the *Concept Study* through enhancement of the original integration components by:

» **Identifying water quality** requirements

» **Assessing** and refining component **flow demands**

» **Developing** additional **treatment approaches**

» **Identifying partnership** opportunities

» **Refining conveyance alignments** and assessing **critical conditions**

» **Developing** independent **cost estimates**

» **Developing** an independent **schedule**

The validation effort assessed the readiness of the *Concept Study* strategy, and identified gaps for which additional analyses were completed. The validation effort also included an independent review of cost, schedule, and phasing. **The independent review validated that the estimated cost in current dollars and schedule were reasonable, with a recommendation to include escalation and Program risk contingency.**

The validation effort described in the *Validation of Strategy* TM considered opportunities, risk, and constraints including regulations, cost-sharing, emerging technologies, and partnership opportunities. The validation step considered the source water, water supply, and integration components consisting of the potential storage and demand associated with the Central Basin (CB), West Coast Basin (WCB), San Fernando Basin (SFB), and Van Norman Complex (VNC), among others; and potential regional partnerships, including with the Metropolitan Water District of Southern California (Metropolitan).

The original Concept Report strategy was validated as feasible, and with enhancements has been carried forward as one of the Program alternatives. The validation effort also identified other Program alternatives for assessment by addressing the need for more storage and demand opportunities and partnerships for early phases. Thus, the validation effort provided recommendations to improve the plan for LADWP to manage the new source of supply and served as the basis for developing Program alternatives for this MP.

The MP validation findings supported the development of the Operation NEXT Assessment Tool (ONAT). ONAT is a system model that allows for assessment and optimization of potential Pure Water Los Angeles infrastructure and sizing. The model was used to evaluate different scenarios and is based on a range of projected hydrological and demand conditions, allocations of Pure Water Los Angeles supply, regional partnerships, and water supply and risk conditions. Specifically, ONAT was developed to support evaluating the infrastructure needs of Pure Water Los Angeles, comparison of alternatives, and the water

ONAT Model Evaluated Six Scenarios to Understand the Future Use of Pure Water Los Angeles Water

ALTERNATIVES SCREENING

1. **Current Trends Scenario:** Adjusted historical water supply conditions to reflect current policy, infrastructure, and projected demands
2. **Extreme Drought Scenarios:** Most extreme droughts from historical record
3. **Pluvial Scenario:** Most extreme pluvial (wet period) from historical record

ALTERNATIVES ANALYSES

4. **Future Climate Change Scenarios:** Future climate projections
5. **Emergency/Seismic Scenario:** Loss of supply from either LAA or Metropolitan due to a major seismic event
6. **Demand Uncertainty Scenario:** Explore future alternative water demand projections

supply resiliency and economic benefits of the Program alternatives. ONAT was developed in GoldSim, a modeling platform with Monte Carlo probabilistic capabilities used for visualizing and dynamically simulating complex systems in engineering, science, and business. Results from ONAT modeling are included in Section 6 of this MP report.

1.4 PURE WATER LOS ANGELES MASTER PLAN BASIS

There are many assumptions that serve as the basis for the MP, including the following:

- Critical components of the Program, specifically "Resiliency, Reliability, & Sustainability" and "Community Benefit & Equity," are **foundationally significant** in guiding the Program.
- **Public acceptance** of Pure Water Los Angeles will be sought to provide guidance to LADWP throughout the planning and implementation process (LADWP 2024b).
- For the MP, preliminary **Program alternative sizing and costing** were **based on conservative assumptions** (higher flowrate; maximum pipeline pressure and velocity), with potential revision in the future based on results from ONAT modeling, partnership agreements, environmental analysis per the *California Environmental Quality Act* (CEQA), and subsequent analyses.
- LASAN is planning on converting HWRP to MBR to support the shift to water recycling. The existing secondary system was constructed in the 1990s and would be expected to require significant improvements during the implementation phases of the Program. MBR will provide high-quality pretreatment to advanced water treatment, providing the **water source for Pure Water Los Angeles**. LASAN's improvements will be beneficial to the environment and to the Program.
- Pure Water Los Angeles will take the water source and provide advanced water purification with the purified water serving as the **water supply** for the alternatives considered in this MP.
- All alternatives and flows assume the supply meets at least **indirect potable reuse** (IPR) water quality and regulatory requirements leaving the AWPF.
- The MP focuses on the **Program downstream of the AWPF**, and the location of the AWPF will be determined outside of this MP. There may also be revisions to the available flowrate from the HWRP, the capacity of direct potable reuse (DPR) treatment that can be accommodated if the HWRP is selected as the site for the AWPF, and other assumptions.
- For Program alternatives assuming treatment of all Pure Water Los Angeles flow for DPR, the AWPF will include DPR treatment (that is, ozone and biological activated carbon [BAC] filtration before reverse osmosis [RO]) that meets the **prescribed approach** defined by California's regulatory requirements for DPR, which took effect on October 1, 2024.
- For Program alternatives assuming treatment of some Pure Water Los Angeles flow at the VNC for DPR, IPR level treatment will be provided at the AWPF. All **additional treatment required for DPR** at or before VNC will be provided before introducing flow to the Los Angeles Aqueduct Filtration Plant (LAAFP) or Los Angeles Reservoir (LAR). While VNC is being used as the location basis in this report due to existing land availability, treatment may be sited elsewhere north of SFB.
- **DPR treatment** will be provided **for raw water augmentation (RWA)**.

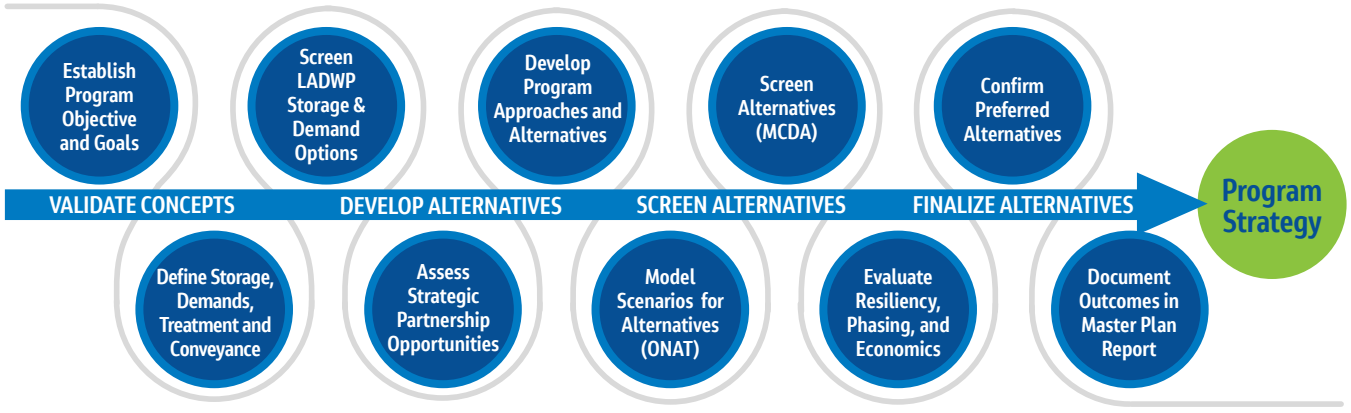
- **Treated Water Augmentation (TWA) may be considered at some time in the future if approved by LADWP**.
- Each Program alternative includes the ability to send flow to Metropolitan as part of a **potential regional partnership** with the Pure Water Southern California (PWSC) program.
- **Continued supply to West Basin** will be provided as secondary effluent or MBR filtrate at a minimum.
- Additional assumptions have been developed based on LADWP input through the MP development. These additional assumptions, which represent greater levels of detail for specific alternatives and their components, are described in the remaining sections of this report and the associated TMs.

1.5 MASTER PLAN TASKS

The MP project approach consists of work tasks developed to identify a set of alternatives that could be compared for their ability to meet the Program goals. **Figure 1-6** provides a roadmap showing the important elements of Program alternative identification, development, comparison, and selection.

The MP report focused significantly on the identification, comparison, and development of Program approaches and alternatives. **Figure 1-6** shows the main Program elements. The work tasks included screening the alternatives to a shortlist using a multi-criteria decision analysis (MCDA) approach. The screened alternatives were then analyzed in more detail and assessed based on resiliency, water supply modeling, cost estimates, phasing and additional technical details. These efforts include work described in the 11 TMs that were developed to support the MP. Through the MP, LADWP confirmed the preferred alternatives as the basis for a Program strategy. Following the MP, the Program strategy will be further developed and evaluated, along with a conveyance alignment study and continued outreach, including in the subsequent environmental planning phase in accordance with applicable environmental review requirements.

Figure 1-6. Master Plan Roadmap to Set Program Strategy



1.5.1 *INITIAL TASKS*

The work commenced with the *Validation of Strategy TM* (Jacobs and Arcadis 2024a), which, as described previously, identified additional storage and demand components for use in the development of Program alternatives.

The initial work tasks included the work described in the additional TMs that are submitted with this report, as follows:

- *Potable Reuse Regulations Summary TM* (Jacobs and Arcadis 2024b): This TM documents the regulatory requirements for potable reuse. These regulations define the requirements for the level of treatment required for Program alternatives.

- *Interconnectable Partnership Opportunities TM* (Jacobs 2024a): This TM identifies partnerships and potential collaboration opportunities that could be further considered by LADWP to include in Program alternatives.
- *Identification of Storage and Demands TM* (Jacobs and Arcadis 2024c): This TM provides a summary of the potable reuse source, supply, storage, and demand options that were selected for incorporation into Program alternatives development.
- *Operation NEXT Assessment Tool Summary Description TM* (Jacobs 2024b): This TM documents the approach and assumptions that were used to assess the storage and demand flowrates over a range of anticipated conditions. The results from ONAT modeling support the comparison of the Program alternatives and overall sizing of the Program.

These initial tasks established the foundation for the Program alternatives that were evaluated, compared, and screened, as described in Sections 2, 3, and 4.

1.5.2 *PROGRAM ALTERNATIVES SCREENING*

LADWP developed screening criteria for comparing potable reuse approaches and corresponding Program alternatives to narrow the preferred alternatives that move forward to the environmental planning phase. LADWP defined the following Program alternatives screening criteria (LADWP 2024b):

1. Minimize Operational Complexity and Maintain Water Quality in the Distribution System
2. Environmental Stewardship
3. Regulatory Acceptance
4. Cost-Effective Water Supply
5. Regional Partnerships
6. Phasing & Early Deliveries
7. Adaptability to Future Supply & Demand Changes

In defining these criteria, LADWP noted that critical components identified as foundationally significant (that is, "Resiliency, Reliability, & Sustainability" and "Community Benefit & Equity") would be considered as goals rather than specific criteria for use in comparing Program alternatives. Additionally, as noted previously, public acceptance of Pure Water Los Angeles would be sought to provide guidance to LADWP throughout the planning and implementation process (LADWP 2024b).

These screening criteria, their definitions for the MP, their associated metrics, and the weighting of each criterion, are described in detail in Section 5 of this report and in the following TM:

- *Program Alternatives Screening TM* (Arcadis and Jacobs 2024): This TM describes the assessment and screening to a shortlist of Program alternatives, for additional detailed evaluation. The alternatives screening is described in Section 5 of this report.

1.5.3 *SUBSEQUENT EVALUATIONS*

With the Program alternatives screened, subsequent evaluations consisted of the following:

- *Operation NEXT Assessment Tool Results TM* (Jacobs 2024c): This TM focuses on the modeling results, including the main findings for purified recycled water production from a future AWPF, as a new water supply to the City, and for system storage.
- *Resiliency Analysis TM* (Jacobs 2024d): This TM explores the future uncertainties related to climate, seismic, and demand risks through the development of resilience scenarios. The resilience benefits of the Program are evaluated by comparing the changes in water supply reliability and other factors from conditions without the Program.
- *Economic Benefits TM* (Jacobs 2024e): This TM estimates potential jobs to be created or supported by the Program alternatives.

» *Costs, Schedule, and Phasing TM* (Jacobs and Arcadis 2024d): This TM documents the estimated costs, schedule for Program implementation, and the phasing plan developed for the Program components.

» *Funding TM* (Jacobs 2024f): This TM summarizes the initial evaluation of potential Program funding opportunities, with the objective of providing information for use in developing the necessary long-term funding strategy.

Additional analyses completed for the preferred Program alternatives are summarized in Sections 6 and 7 of this report.

1.6 ORGANIZATION OF REPORT

The Pure Water Los Angeles MP report submittal consists of the following sections:

» **Section 1** – Introduction, which introduces the Program and this MP report

» **Section 2** – Recycled Water Sources summarizes existing recycled water sources and projections for future use

» **Section 3** – Potable Reuse Integration Components identifies locations for integrating potable reuse within the LADWP water system and through potential external partnerships

» **Section 4** – Program Alternatives Development compiles the source, supply, storage, and demand components into multiple Program alternatives

» **Section 5** – Program Alternatives Screening describes the assessment and screening of Program alternatives

» **Section 6** – Program Alternatives Evaluation summarizes the additional evaluations completed on the screened Program alternatives to inform the future Program requirements and impacts

» **Section 7** – Program Implementation describes the main next steps that will be required to implement a successful Program

» **Appendix A** – Includes component by component details from Section 7's Program Implementation Roadmap

» **Appendix B** – Comprises the individual TMs that provide detailed information for the analyses conducted for the MP

2. Recycled Water Sources

This section summarizes existing recycled water sources and projections for future use in the LADWP service area. LASAN, one of the five bureaus under the Department of Public Works, owns, operates, and maintains four water reclamation plants (WRPs) that serve over 4 million people within two service areas covering 600 square miles (LASAN n.d.). These WRPs treat recycled water in four main LADWP service areas, as shown on Figure 2-1. Although HWRP is the primary future source of supply for Pure Water Los Angeles, flow projections at the other facilities may impact the Program as well; therefore, this section discusses existing and future WRP treatment approaches.

Figure 2-1. LADWP Recycled Water Service Areas

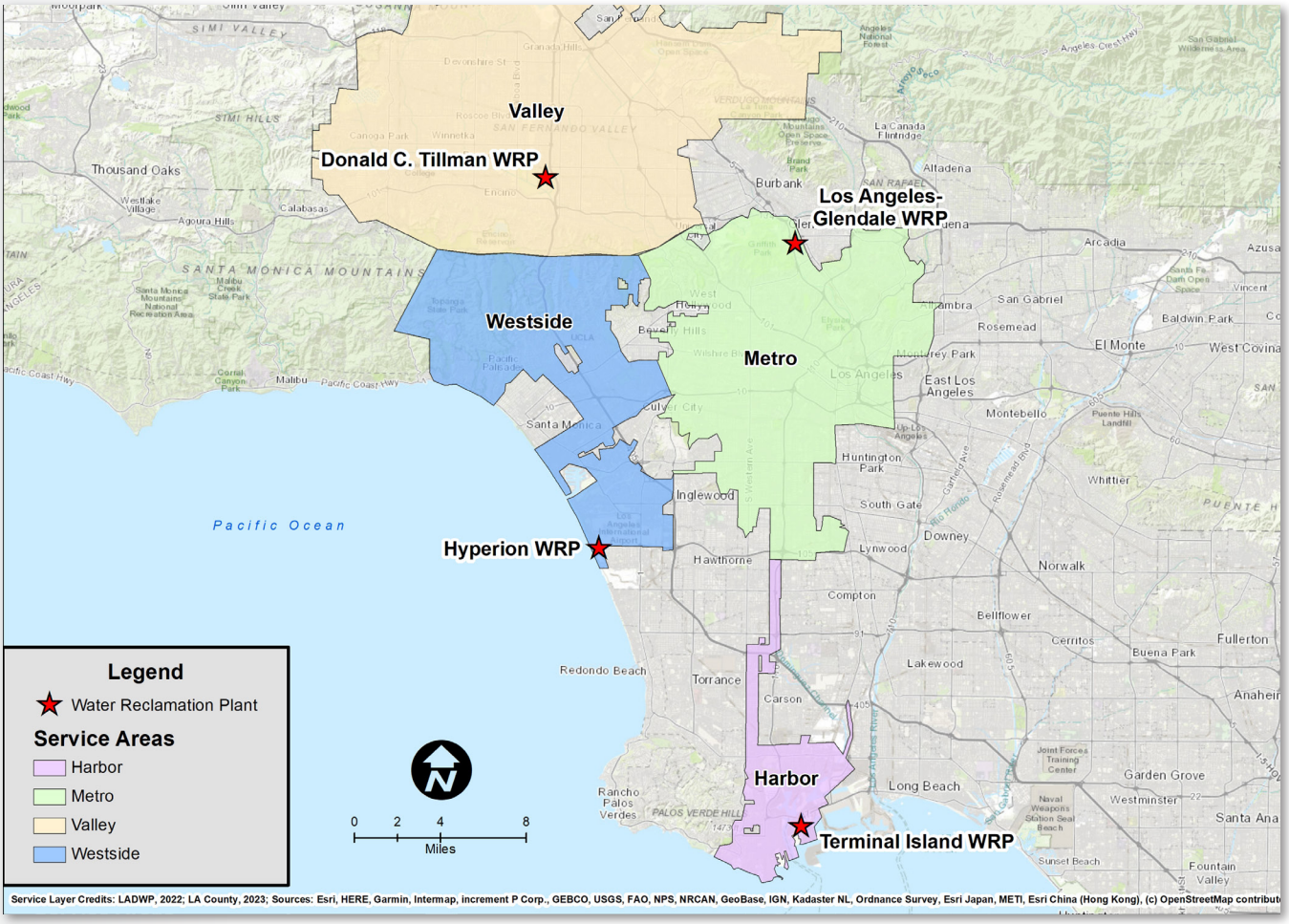


Figure 2-2. Hyperion Water Reclamation Plant

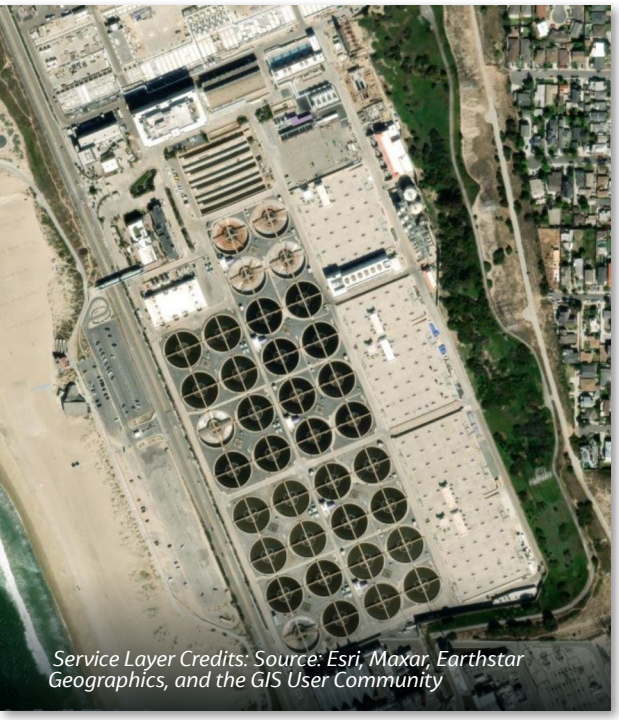


Table 2-1. Future Flow Scenarios to HWRP

Scenario	Total Flow (MGD)
Low Flow	244
Medium Flow	277
High Flow	302

2.1 HYPERION WATER RECLAMATION PLANT

The HWRP **(Figure 2-2)** is the oldest and largest of the City's WRPs, collecting and treating flow mainly from Los Angeles and 24 contracting agencies. HWRP provides secondary treatment with a permitted average treatment capacity of 450 million gallons per day (MGD) and a current peak day wet weather flow capacity of 850 MGD. In 2025, the peak day wet weather flow capacity will be reduced to 740 MGD (Los Angeles RWQCB 2023). Since 2020, the current average dry weather flow (ADWF) has been 250 MGD (Los Angeles RWQCB 2023). HWRP consists of preliminary treatment, primary treatment, and secondary biological treatment, using a high-purity oxygen activated sludge (HPOAS) process. The current treatment process does not provide nutrient removal (Los Angeles RWQCB 2023).

Most treated effluent is discharged into the Pacific Ocean through a 5-mile outfall, and approximately 35 MGD are conveyed to West Basin Municipal Water District's (West Basin's) recycled water facilities for additional treatment for beneficial reuse (LASAN 2022; Los Angeles RWQCB 2023).

LADWP and LASAN are partnering in two important projects that will provide recycled water for beneficial uses and inform future improvements at HWRP. Construction of the first project, the Hyperion AWPF, is complete and will treat up to 1.5 MGD of advanced treated recycled water for non-potable uses at the Los Angeles International Airport and for HWRP in-plant uses. The Hyperion AWPF consists of an MBR, RO, and ultraviolet advanced oxidation process (UVAOP) treatment (Los Angeles RWQCB 2023). The Hyperion AWPF is scheduled to conduct commissioning and startup from October 2024 to March 2025, culminating in the production of recycled water.

The second project, the Hyperion MBR Pilot Facility, is a collaboration between LASAN and LADWP. The primary goal of the Hyperion MBR Pilot Facility Project is to obtain the necessary scientific, technical, design, and operational data for the future transformation of HWRP to a full-scale MBR facility (LASAN 2021). The Hyperion MBR Pilot Facility has a treatment capacity of approximately 1 MGD and has the ability to test three MBR systems and two RO systems. The Hyperion AWPF and the Hyperion MBR Pilot Facility will not only serve as a proof of concept from a technical perspective, but will also inform regulatory, financial, and institutional considerations.

LASAN is expected to modernize the HWRP and provide MBR secondary treatment that will serve as the water source for Pure Water Los Angeles. HWRP planned improvements will replace the HPOAS process with MBR that would "require less space and produce a higher quality water" (LASAN 2022). HWRP MBR filtrate would serve as feed to the AWPF for Pure Water Los Angeles. Recent work by LASAN describes three scenarios for future flows to HWRP - low, medium, and high flow **(Table 2-1)**. The scenarios vary based on estimates for population growth, indoor water use, bypasses from upstream WRPs, and low flow diversion sites, among other considerations.

It is anticipated that 272 MGD would provide the source water to the AWPF, resulting in up to 230 MGD of purified water for either IPR or DPR scenarios, based on an RO recovery of 85% (Hazen 2024). LADWP selected 230 MGD as the available supply capacity for the MP's comparison of Program alternatives.

Figure 2-3. Donald C. Tillman Water Reclamation Plant

Figure 2-4. Los Angeles-Glendale Water Reclamation Plant

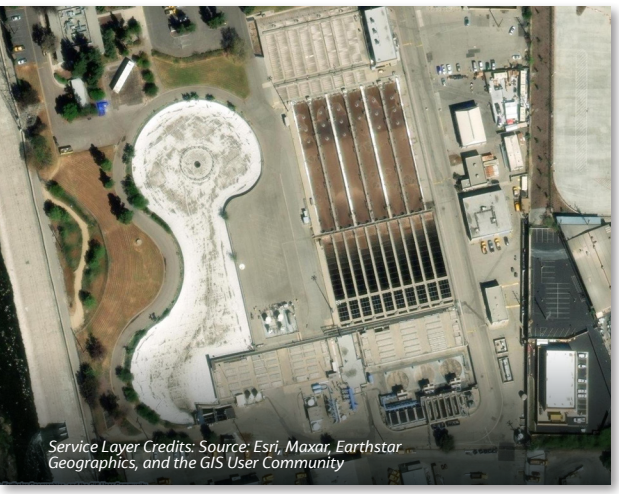
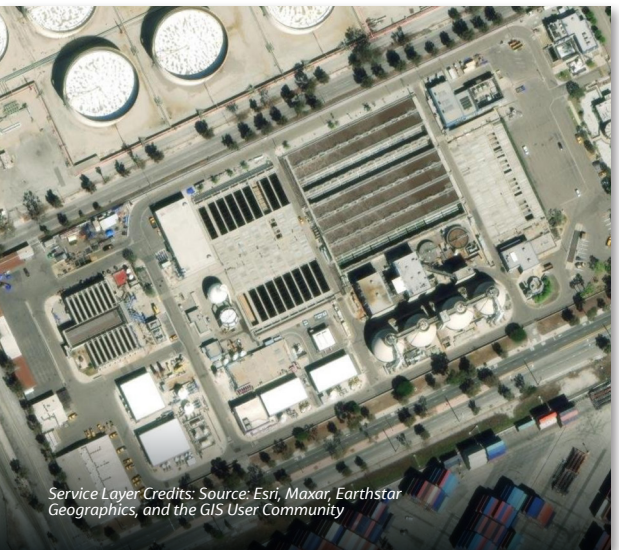


Figure 2-5. Terminal Island Water Reclamation Plant



2.2 DONALD C. TILLMAN WATER RECLAMATION PLANT

The Donald C. Tillman Water Reclamation Plant (DCTWRP) **(Figure 2-3)**, one of the two plants located upstream of HWRP, has an ADWF capacity of 80 MGD with nitrification and denitrification (NdN) and currently treats approximately 45 MGD of wastewater, providing 32 MGD of recycled water meeting Title 22 requirements. Recycled water from DCTWRP is used for irrigation, industrial, in-plant, and environmental beneficial uses. All recycled water from DCTWRP is used within the LADWP service area (LADWP 2021b).

LADWP and LASAN are implementing the Los Angeles Groundwater Replenishment (GWR) Project to replenish up to 22,000 acre-feet (AF) (20 MGD) of recycled water from DCTWRP to the Hansen Spreading Grounds for recharge into SFB (LADWP 2024d). In fall 2024, the Board of Commissioners for LADWP and the Board of Public Works approved the first phase of the AWPF at DCTWRP, with a capacity of 25 MGD for both non-potable reuse and IPR end uses. Construction began in December 2024 and is anticipated to be complete in 2027.

The Los Angeles GWR Project may impact flows to HWRP. Currently, some flow bypasses DCTWRP and is sent to HWRP. Increased recycled water treatment at DCTWRP could decrease flows to HWRP, potentially impacting flows available for Pure Water Los Angeles (LASAN 2023), however these impacts are accounted for in the ONAT model.

2.3 LOS ANGELES-GLENDALE WATER RECLAMATION PLANT

The Los Angeles-Glendale Water Reclamation Plant (LAGWRP) **(Figure 2-4)**, the other plant located upstream of the HWRP, is a joint project of the City and the City of Glendale. The LAGWRP has an ADWF treatment capacity of 20 MGD with NdN and currently treats approximately 17 MGD, providing 14 MGD of recycled water that meets Title 22 requirements. The Cities of Los Angeles and Glendale are each entitled to 50% of the LAGWRP capacity. Recycled water for non-potable uses from LAGWRP is served to both cities and to multiple areas, such as Griffith Park and the Los Angeles Greenbelt Project (LADWP 2021b).

Future plans for additional reuse at LAGWRP may impact flows to HWRP. Currently, residuals from LAGWRP are sent to HWRP, and flows can also bypass LAGWRP and be sent to HWRP. Increased recycled water treatment at LAGWRP could decrease flows to HWRP, potentially impacting flows available for Pure Water Los Angeles (LASAN 2023), however these impacts are accounted for in the ONAT model.

2.4 TERMINAL ISLAND WATER RECLAMATION PLANT

The Terminal Island Water Reclamation Plant (TIWRP) **(Figure 2-5)**, captures and treats flows in the Harbor area outside of HWRP's sewershed, has an ADWF capacity of 30 MGD, and typically treats between 12 and 16 MGD. The facility consists of primary, secondary, and tertiary treatment without NdN (Los Angeles RWQCB 2021). The AWPF at TIWRP includes membrane filtration (MF), RO, UVAOP, and stabilization to provide up to 12 MGD of recycled water that serves the Dominguez Gap Seawater Intrusion Barrier and landscape irrigation. Remaining effluent is discharged to the Los Angeles Harbor (LADWP 2021b).

The City is planning on expanding recycled water from TIWRP to reduce discharge to the Los Angeles Harbor as directed by the Los Angeles Water Board Order No. 85-77 and Resolution No. 94-009. Increased recycled water use includes industrial users, as well as increasing the flow to the Dominguez Gap Seawater Intrusion Barrier from 6.0 to 9.5 MGD. Improvements to increase flow to the Dominguez Gap were expected to be completed in 2024 (Los Angeles RWQCB 2021).

Increased recycled water use at TIWRP does not impact potential flows to Pure Water Los Angeles because its sewershed is separate from the HWRP sewershed.

2.5 RECYCLED WATER FLOWS

Table 2-2 summarizes recycled water flows from all WRPs.

Table 2-2. Summary of Recycled Water Sources

Recycled Water Source	Permitted ADWF Treatment Capacity (MGD)	Current ADWF Flows (MGD)	Existing Recycled Water Flow (MGD)	Projected Future Recycled Water Flow Production (MGD)
HWRP	450 (MMF)	250[a]	1.5 (non-potable)[b] 35 (to West Basin)[b,c]	To be defined as the Program develops
DCTWRP	80[d]	45[d]	32 (non-potable)[d]	32 (non-potable)[d] 25 (potable)[f]
LAGWRP	20[d]	17[d]	14 (non-potable)[d]	See Note g
TIWRP	30[e]	12 to 16[e]	12 (non-potable)[d]	12 to 16 (non-potable and potable)[d,e]

[a] Source: LASAN 2023. [b] Source: NPDES 2023. [c] Source: LASAN 2022. [d] Source: LADWP 2021b. [e] Source: NPDES 2021. [f] LADWP 2024d.
[g] Potential increased recycled water production at LAGWRP is identified in Hyperion Flow Projections Update TM (LASAN 2023), although no capacity or specific planning efforts are noted.
MMF: maximum monthly flow

2.6 HYPERION WATER RECLAMATION PLANT CONVERSION PHASING

The HWRP conversion to MBR is planned to occur in three phases (LASAN 2023). Planned Pure Water Los Angeles Program phasing was updated during MP development as shown in **Table 2-3** and will provide source water to the AWPF. Assumptions on MBR conversion are subject to change based on final analysis of phasing, packaging, and scheduling, as well as timing with Pure Water Los Angeles storage and demand deliveries. Although MBR and AWPF water deliveries do not necessarily need to be aligned, aligning these water deliveries with the other Program components is important so that supply and demand infrastructure is available concurrently to minimize stranded assets. As such, the phasing may be further refined through active collaboration between LADWP and LASAN. The MBR completion dates in **Table 2-3** reflect the latest possible completion dates to accommodate AWPF operation and delivery to identified storage and demand locations; thus, MBR phasing may be completed before the dates listed for other reasons, such as considerations for operations or constructability.

Table 2-3. Anticipated Phasing for HWRP Conversion and AWPF

Phase	MBR Completion Year	Added MBR Flow (MGD)	AWPF Completion Year	Added AWPF Flow (MGD)	Total AWPF Capacity (MGD)
1	2039	60	2040	50	50
2	2045	60	2046	50	100
3	2055	152	2056	130	230

3. Potable Reuse Integration Components

Locations for integrating potable reuse were identified within the LADWP water system and through external partnerships. Each integration location has unique considerations based on the capacities, infrastructure, and applicable regulations. The integration components serve as building blocks for development of the Program alternatives.

3.1 POTABLE REUSE APPROACHES AND REGULATIONS

The two most important regulatory agencies and stakeholders for Pure Water Los Angeles permitting are the California State Water Resources Control Board Division of Drinking Water (DDW) and the Los Angeles Regional Water Quality Control Board (Los Angeles RWQCB). DDW regulates public water systems and oversees the implementation of water recycling projects such as Pure Water Los Angeles. The *California Water Code*, Section 13561, defines two types of potable recycled water use: IPR and DPR. Within each category, requirements vary based on the specific application of reuse.

DDW
Protection of Public Health
Enforcement of water quality objectives by end use.

DDW is responsible for the protection of public health, regulation of drinking water, and water recycling criteria. The Los Angeles RWQCB is responsible for permitting and enforcement of water quality objectives for the beneficial uses of the state's waters within the areas considered for Pure Water Los Angeles (Los Angeles RWQCB 2014).

California's regulations allow for five potable reuse approaches. The treatment, monitoring, and permitting requirements for each are driven by the environmental buffer between the treatment process and consumer. This buffer provides time to respond to and address system or water quality issues before water reaches customers. The primary difference between IPR and DPR is the presence and size of the environmental buffer. **Figure 3-1** shows the different approaches to IPR and DPR, with an increasing level of treatment required as the buffer is reduced or eliminated.

Los Angeles
RWQCB
Protection of Environment
Enforcement of water quality requirements for discharges to surface water and groundwater basins.

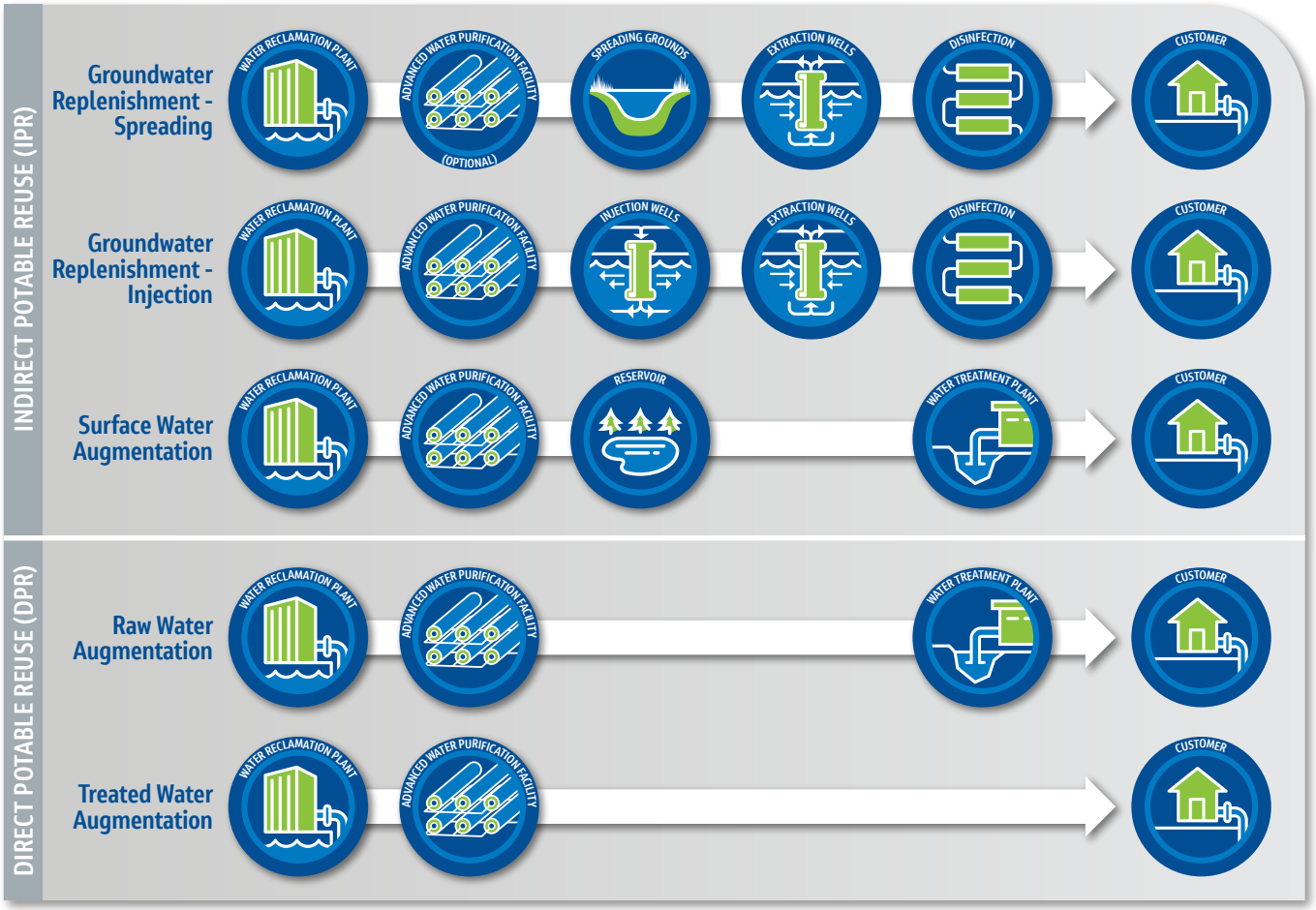
Water reuse regulations address GWR for IPR, surface water augmentation (SWA) for IPR, and RWA for DPR, in which the purified recycled water is released into receiving waters; and TWA for DPR. As a result, the quality standards established for the receiving waters are applied to the treated water, following the guidelines described in the *Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Los Angeles RWQCB 2014) and the *Water Quality Control Plan: Santa Ana River Basin Plan* (Santa Ana RWQCB 2019) for water delivered to PWSC.

For a DPR project, a Direct Potable Reuse Responsible Agency (DiPRRA) is responsible for compliance with DPR regulations. The DiPRRA must be a public water system (SWRCB 2024) that provides water for human consumption with a minimum number of service connections, as defined in Section 116275 of the *California Safe Drinking Water Act* (116275 of the *California Safe Drinking Water Act*, contained in Part 12, Chapter 4 of the *California Health and Safety Code*.). The DiPRRA is responsible for all aspects of

a DPR project, from wastewater source to integration with the drinking water supply. As a public water system in California, holding multiple drinking water supply permits related to the storage and demand locations, LADWP is eligible to serve as the DiPRRA.

The Potable Reuse Regulations Summary TM (Jacobs and Arcadis 2024b) details the potable reuse regulatory requirements for the level of treatment required for Program alternatives.

Figure 3-1. Potable Reuse Approaches



3.2 IDENTIFICATION OF WATER INTEGRATION COMPONENTS

Program components can be classified based on their ability to either source, supply, store, or directly distribute water. LASAN will provide MBR filtrate to the Program from HWRP. The AWPF, which is to be served by and located at or in the vicinity of HWRP, will supply water for the Program. LADWP and LASAN are working collaboratively to evaluate the location of the AWPF site.

PROGRAM COMPONENTS

- **Source water partner:** A wastewater agency, in this case, LASAN, that can provide treated wastewater effluent to the Program for further treatment and reuse
- **Supply:** Treated wastewater effluent that has undergone advanced water treatment for potable reuse
- **Storage:** Component that places and holds purified recycled water supply for a specified time before being used for demand
- **Demand:** Component that takes purified recycled water supply for consumptive end uses or distribution to regional or local partners

» **Major conveyance:** Large-diameter pipelines that convey purified recycled water from the AWPF to the integration components

» **Regional partner:** Covers a large geographic region, encompassing cities and areas of special designation, with the ability to process or use large volumes of water supply from the Program

» **Local partner:** A single city, an area of special designation, or an existing customer of LADWP located within proximity to a potential Pure Water Los Angeles conveyance alignment

Various components were evaluated and screened as storage and demand locations **(Table 3-1)**.

Table 3-1. Potential Storage and Demand Locations

LADWP SYSTEM	REGIONAL PARTNER OPPORTUNITIES	LOCAL PARTNER OPPORTUNITIES
GWR » Central Basin » San Fernando Basin **SWA** » Non-Potable Reservoirs **RWA** » Van Norman Complex » Raw Water Source	» Los Angeles County Public Works » Metropolitan Water District of Southern California » Water Replenishment District of Southern California » West Basin Municipal Water District	» City of Beverly Hills » City of Burbank » City of Glendale » City of San Fernando » City of Santa Monica

The *Identification of Storage and Demands* (Jacobs and Arcadis 2024c) provides a summary of the potable reuse source, supply, storage, and demand options that were selected for incorporation into Program alternatives development. The *Interconnectable Partnership Opportunities* (Jacobs 2024a) identifies partnerships and potential collaboration opportunities that could be further considered by LADWP to include in Program alternatives.

3.2.1 *LOS ANGELES DEPARTMENT OF WATER AND POWER WATER DISTRIBUTION SYSTEM*

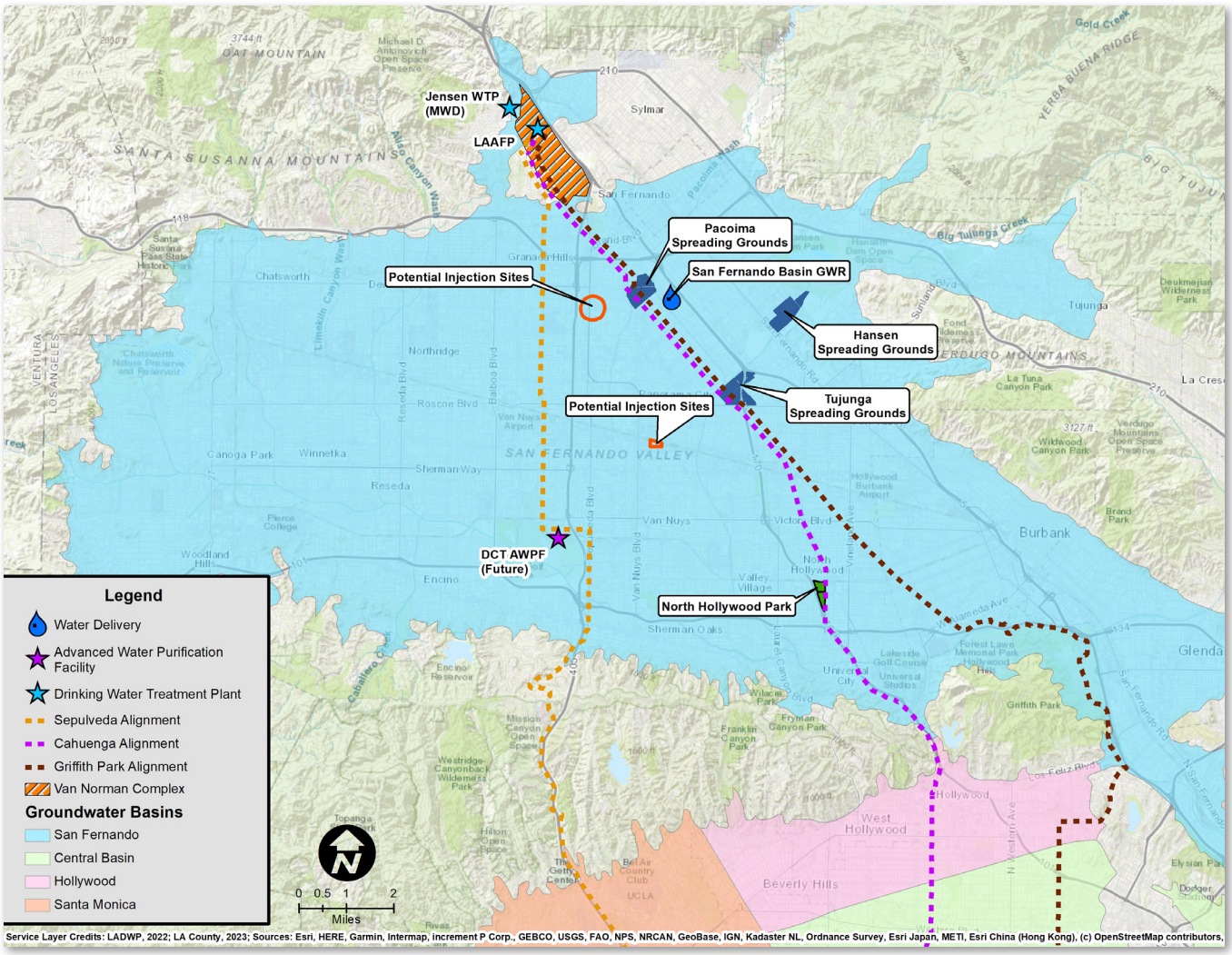
The following components within the LADWP water distribution system were evaluated.

STORAGE

» **Central Basin:** Based on proposed LADWP system improvements (LADWP 2024e), between 10 cubic feet per second (cfs) (6.5 MGD) and 59 cfs (38 MGD) of demand will exist in CB. LADWP currently has a water entitlement of 17,236 acre-feet per year (AFY) and storage volume of 34,472 AF in CB. LADWP also has a water entitlement of 1,503 AFY in WCB that can be transferred and used in CB. This results in a potential total water entitlement of 18,739 AFY in CB. CB has 330,000 AF of dewatered space. Under the CB Judgment 2013 amendment (WRD 2013), the purified recycled water from Pure Water Los Angeles may be applied to replenish CB as either a replenishment project up to 31 cfs (20 MGD), which would support the extraction by the parties under existing water rights (also discussed under 3.2.2 Partnerships), or as an augmentation project that exceeds LADWP's existing rights up to an additional 28 cfs (18 MGD) (Jacobs and Arcadis 2024a). Water provided in an augmentation project could be extracted up to the volume provided for augmentation (LADWP 2024f).

» **San Fernando Basin (Figure 3-2):** LADWP currently holds approximately 87,000 AFY of water rights in the SFB. SFB has 550,000 AF of dewatered space. The opportunities to deliver purified recycled water from Pure Water Los Angeles include spreading grounds (130 cfs [84 MGD]), injection wells (77 cfs [50 MGD]), and stormwater capture parks (23 cfs [15 MGD]). LADWP is constructing SFB remediation projects consistent with the *Comprehensive Environmental Response, Compensation, and Liability Act* and National Contingency Plan to extract and treat groundwater. These projects were implemented to reduce and contain contamination, while providing LADWP with treated drinking water. The new projects are estimated to bring the total production capacity in the SFB to

Figure 3-2. San Fernando Basin



approximately 300 cfs (194 MGD) (LADWP 2021b). For planning purposes, a maximum extraction capacity of 220 cfs (142 MGD) is being used for conservatism, as this is estimated to be the maximum demand that can be currently met from water extracted in SFB.

» **Reservoirs:** The MP validation identified 10 LADWP-owned reservoirs within the City's boundaries as potential locations for integrating Pure Water Los Angeles water. Six potable reservoirs were categorized as DPR under TWA, and four non-potable reservoirs were categorized as IPR under SWA because of the downstream treatment required. At the direction of LADWP, the non-potable reservoirs for SWA were eliminated from further consideration because of neighborhood considerations, regulatory considerations, conveyance costs, space limitations for additional treatment, and low storage potential. The potable reservoirs will not be included in the current Program alternatives, but are available for future TWA adaptability if allowed by LADWP (Jacobs and Arcadis 2024a). The potable reservoirs have storage capacities that range from 32 to 137 MG.

DEMANDS

» **Van Norman Complex (Figure 3-3):** Pure Water Los Angeles water may be used to supplement the source water to LAAFP or LAR as RWA. An integration point upstream of LAAFP is currently viewed as operationally beneficial, due to the ability to serve relatively isolated areas of LADWP's system, including Van Norman Pump Station #2 (VNPS#2) and Rinaldi Trunkline. VNC could accept Pure

Water Los Angeles flows that could partially offset purchased imported water. Additional treatment may be needed at or near VNC before flowing to LAAFP and LAR, depending on the upstream AWPF treatment approach. The applicability of the *California Toxics Rule* water quality limits (such as N-nitrosodimethylamine [NDMA]) must also be confirmed before finalizing upstream treatment. LAAFP or LAR could receive up to 252 cfs (163 MGD) of Pure Water Los Angeles water for the AWPF IPR approach based on land availability for DPR treatment at or near VNC and demand that exceeds LAA supply in dry years, and up to 356 cfs (230 MGD) of Pure Water Los Angeles water for the AWPF DPR approach (LADWP 2024g).

Figure 3-3. Van Norman Complex

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

MAJOR CONVEYANCE

Large-sized pipelines are required to convey purified recycled water from the AWPF to the integration locations. Three west to east alignments (Slauson, Florence, and Manchester) and three south to north alignments (Sepulveda, Cahuenga, and Griffith Park) have been established for consideration.

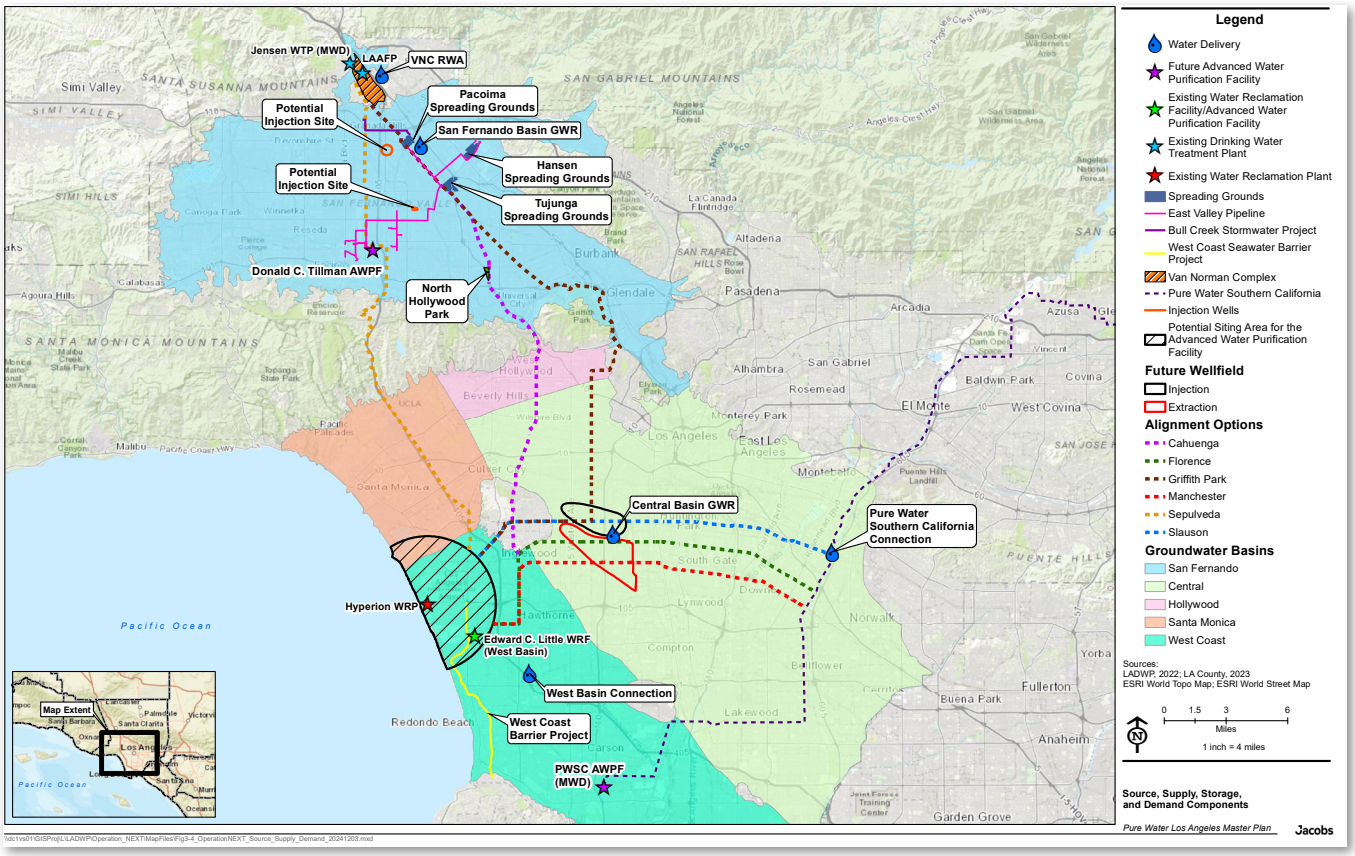
» **West to East Alignment:** The Joint Water Replenishment District (WRD) and LADWP MP (Jacobs 2022) established the routing of the three main west to east alignment options to convey purified recycled water from the HWRP or AWPF to the east integration components, terminating at a connection to the backbone pipeline for PWSC: Slauson (23.3 miles), Florence (23.7 miles), and Manchester (22.8 miles).

» **South to North Alignment:** The *Concept Study* (LADWP 2021a) established three south to north alignment options to convey purified recycled water from the respective junctions along the west to east alignment to the integration components, terminating at VNC: Sepulveda (29.0 miles), Cahuenga (27.3 miles), and Griffith Park (29.5 miles). Based on the validation effort, alternative segment alignments were proposed to avoid conflicts such as residential, commercial, and industrial structures.

A preliminary review focused on quantifying the pipeline sections requiring tunneling or trenching, as well as identifying impactful ground conditions. Following the MP, a conveyance alignment study will need to be conducted to support a preferred alignment selection (Jacobs and Arcadis 2024a).

Figure 3-4 shows the source, supply, storage, and demand components, as well as the major conveyance alignments, identified as the basis for the Program alternatives. Subsequent sections of this MP show a single west to east alignment for simplicity.

Figure 3-4. Source, Supply, Storage and Demand Components



3.2.2 *PARTNERSHIPS*

As the source water partner, LASAN will provide MBR filtrate to the Program from HWRP. LADWP has been actively engaging with other external agencies throughout the MP development to explore opportunities for partnerships that would benefit the City in the development of Pure Water Los Angeles (Water Reuse Collaborative 2023). The objectives of partnerships to benefit the Program are as follows:

» **Maximize recycled water use to:**
  - Supplement existing water supplies with a diverse portfolio of sources.
  - Increase drought and climate resiliency.
  - Improve system flexibility.

» **Maximize use of existing and planned infrastructure.**

» **Maximize opportunities for cost-sharing to lower the cost burden on rate payers.**

» **Increase access to funding through** coordinated pursuits.

» **Enhance technical collaboration through sharing of research and demonstration findings.**

Agency	Meeting Engagement
LA County Public Works	Jan 5, 2023
Metropolitan	Oct 20, 2022 (with LACSD) Mar 16 and Apr 2023 Apr 17, Jul 17, and Aug 8, 2024 Sep 18, Nov 5, and Dec 4, 2024
West Basin	Sep 21, 2022 Oct 11 and Nov 5, 2024
WRD	Oct 31, 2022 Nov 5, 2024

Continued engagement with these partners to gauge interest and gain insight on their potential water demands under varying climate conditions will be critical for proper Program sizing.

REGIONAL PARTNERSHIPS

Four regional partnership opportunities were identified and evaluated as summarized in the *Interconnectable Partnership Opportunities TM* (Jacobs 2024a):

1. **Los Angeles County Public Works:** County Public Works is responsible for managing stormwater, providing potable water, and ensuring healthy watersheds for the safety and benefit of Los Angeles County communities. County Public Works plans, operates, and maintains infrastructure within the Los Angeles County Flood Control and Waterworks Districts through implementation of integrated water resource strategies. (County Public Works n.d.). Replenishment to CB, SFB, and the West Coast Basin Barrier Project (WCBBP) have been identified to be beneficial to Pure Water Los Angeles when recycled water can be prioritized. Additional evaluation to identify ways to optimize County Public Works' infrastructure operations would help maximize the use of such infrastructure by Pure Water Los Angeles (Jacobs 2024a).
2. **Metropolitan Water District of Southern California:** Metropolitan is a public water wholesaler in Southern California that imports water through the Colorado River Aqueduct and State Water Project (Metropolitan n.d.). The potential interconnections between Pure Water Los Angeles and Jensen Water Treatment Plant (WTP) and PWSC were identified to support a regional partnership. At the time the TM was developed, the estimated planning values were up to 48 cfs (31 MGD) to Jensen WTP and 42 to 232 cfs (27 to 150 MGD) to PWSC (Metropolitan 2023; Jacobs 2024a).
3. **Water Replenishment District of Southern California:** WRD is the Basin Manager and Watermaster for CB and WCB. WRD has expressed interest in obtaining water from Pure Water Los Angeles to support the brackish plume remediation in the WCB up to 18 cfs (12 MGD) and regular replenishment to sustain a safe yield for existing customers within CB up to 15 cfs (10 MGD) to replace Metropolitan water (WRD 2022; Jacobs 2024a). WRD also expressed interest in 31 cfs (20 MGD) from Pure Water Los Angeles for GWR toward LADWP's existing rights as part of WRD's management of the basin (Jacobs 2024a).
4. **West Basin Municipal Water District:** West Basin, a member agency of Metropolitan, is a potable water wholesaler and provider of recycled water. The existing connectivity between HWRP and West Basin's system offers potential to use existing infrastructure, including conveyance and the Edward C. Little Water Recycling Facility (ECLWRF). The main advantage of this partnership is that

it could potentially decouple the construction schedule for new pipelines and the AWPF in early phases. The estimated planning values are 27 cfs (17.5 MGD) to WCB and 35 cfs (22.5 MGD) to West Basin customers, for a total up to 62 cfs (40 MGD) with seasonal variations (West Basin 2022; Jacobs 2024a).

LOCAL PARTNERSHIPS

Existing LADWP customers could also serve as potential local partners under Pure Water Los Angeles, especially those that are located in proximity to the alternative alignments with a potential for using recycled water. LADWP could engage these customers, as well as other customers located near the selected Program alternative alignment, to identify demands and evaluate the cost-effectiveness of these connections as the Program progresses.

Local partnership opportunities were identified for IPR and DPR:

- City of Beverly Hills
- City of Burbank
- City of Glendale
- City of San Fernando
- City of Santa Monica

3.3 SELECTION OF INTEGRATION COMPONENTS

Each integration location has unique considerations based on the end-use requirements, applicable regulations, capacities, and infrastructure that were evaluated and screened to select the preferred components as the basis for the development of Program alternatives. All alternatives and flows assume the supply meets at least IPR water quality and regulations leaving the AWPF.

The MP validation findings initiated the development of ONAT to estimate the available volume of water for Pure Water Los Angeles components, based on wastewater projections, hydrological conditions, and water demands. ONAT incorporated the anticipated flows for the components controlled by LADWP and the purified recycled water volume that would be available for potential partnerships.

Table 3-2 provides a summary of the storage and demands within the LADWP system confirmed for incorporation in the Program alternatives.

Table 3-2. Storage and Demands within LADWP System

Component Description	Potable Reuse	Potential Pure Water Los Angeles Supply	
		cfs	MGD
Central Basin (Storage) *GWR and extraction in the Los Angeles Forebay through phased upgrades to distribution and the existing Manhattan and 99th Street wellfields, as well as new injection and extraction wellfields. Requires water quality analysis, groundwater modeling, and extraction treatment.*	GWR	up to 28	up to 18
San Fernando Basin (Storage)			
Spreading Grounds *GWR at Tujunga, Pacoima, and Hansen Spreading Grounds and extraction with existing production wells. Requires plume management and extraction treatment.*	GWR	up to 130	up to 84
Injection Wells *GWR through new injection wells and extraction with existing production wells. Requires plume management and extraction treatment.*	GWR	up to 77	up to 50
Stormwater Capture Parks *Recharge in planned infiltration galleries during dry conditions.*	GWR	up to 23	up to 15

Component Description	Potable Reuse	Potential Pure Water Los Angeles Supply	
		cfs	MGD
Van Norman Complex (Demand)	RWA		
Integration of DPR treated water into the raw water supply upstream of LAAFP or into LAR (uncovered finished water reservoir).	Approach II Approach III	up to 252 up to 356	up to 163 up to 230

Table 3-3 provides a summary of the partnership opportunities identified for potential incorporation in the Program alternatives.

Table 3-3. Partnership Opportunities

Component	Potable Reuse Approach	Potential Pure Water Los Angeles Supply	
		cfs	MGD
Demands for Potential Regional Partnerships			
West Basin Municipal Water District *Delivery of water to ECLWRF for meeting West Basin Demands.*[a]	GWR	31 to 62	20 to 40
Water Replenishment District of Southern California *Support the brackish plume remediation in the WCB.* *Groundwater replenishment toward LADWP existing rights in CB.*[b]	 GWR GWR	 up to 18 up to 31	 up to 12 up to 20
Metropolitan Water District of Southern California			
PWSC[c] *Connection to PWSC Backbone to convey recycled water from the Warren Facility AWPF to recharge WCB, CB, and Main San Gabriel Basin and to Weymouth WTP for RWA.*	GWR or RWA	73 to 232	47 to 150
Jensen WTP *Interconnect with Jensen WTP.*	RWA	up to 48	up to 31
Demands for Potential Local Partnerships			
Santa Monica	IPR or DPR	up to 8	up to 5
Others in proximity to the alignment: *City of Beverly Hills* *City of Burbank* *City of Glendale* *City of San Fernando*	IPR or DPR	TBD	TBD

Source: (Jacobs 2024a, Jacobs and Arcadis 2024c)

[a] *Including existing 35 cfs (22.5 MGD) for irrigation and industrial demands, as well as existing 19 cfs (12.5 MGD) flow to WCBBP and 8 cfs (5 MGD) of potential flow to WCBBP.*

[b] *Values represent a 10-month operating period.*

[c] *The lower end of the range to PWSC [73 cfs (47 MGD)] was identified during discussions after completion of the Interconnectable Partnership Opportunities TM (Jacobs 2024a).*

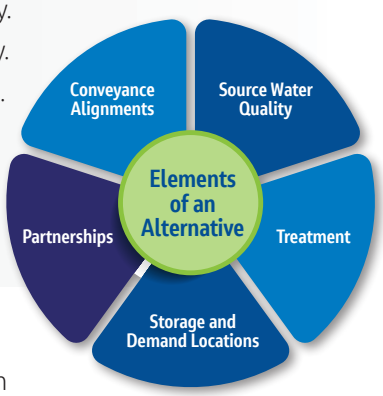
4. Program Alternatives Development

The source, supply, storage, and demand components were used to develop multiple Program alternatives. The Program alternatives were developed based on the MP's foundational assumptions and incorporate LADWP system components, potential partnerships, and conveyance alignments into potable reuse approaches. Each Program alternative is intended to create a robust strategy for a diversified water portfolio, meeting the Program objective and goals.

4.1 FOUNDATIONAL ASSUMPTIONS

Foundational assumptions, developed collaboratively throughout the MP development, are as follows:

1. Maximize use of recycled water from HWRP, to the benefit of the City.
2. Optimize Program sizing based on flow needs, not source availability.
3. Treat to a minimum water quality for IPR, with consideration for DPR.
4. Continue delivery to West Basin.
5. Leverage existing infrastructure.
6. Consider partnerships with external agencies.
7. Optimize project phasing.



4.2 POTABLE REUSE APPROACHES

Four potable reuse approaches were developed to categorize the Program alternatives based on the level and location of treatment **(Table 4-1)**. Two water qualities, IPR and DPR, were considered for two different treatment locations.

Table 4-1. Potable Reuse Approaches

Potable Reuse		Treatment Location		Alternative	Rationale
Approach	Treatment	AWPF	VNC		
I	IPR	IPR	—	1, 2, 3	Fastest to implement and permit
II	IPR, DPR	IPR	DPR	4, 5, 6	Fit for purpose treatment
III	DPR	DPR	—	7, 8, 9	Flexibility to integrate potable water anywhere in the LADWP distribution system
IV	IPR, DPR	IPR, DPR	—	10	Fit for purpose treatment with dual pipeline alignments

4.3 PROGRAM ALTERNATIVES

Ten alternatives were created within the four potable reuse approaches. The different alternatives represent combinations of source water quality (based on the level of treatment), combined with storage and demand locations, different pipeline alignments, and treatment approaches. Approach IV considered IPR and DPR treatment trains at the AWPF, with separate alignments to SFB and VNC to provide the appropriate water quality for the delivery locations. LADWP considered this approach to be cost-prohibitive due to the dual pipeline alignments and eliminated it from further consideration.

The remaining alternatives were assessed and shortlisted to the screened Program alternatives using an MCDA approach. **Table 4-2** summarizes the storage and demand locations comprising the nine alternatives. Each alternative has other potential partnerships along the alignment that could be pursued. The flow to West Basin could be provided as either secondary effluent, MBR filtrate, or purified recycled water.

Table 4-2. Program Alternative Components

Potable Reuse Approach	Program Alternatives	West Basin Connection	Central Basin GWR	Metropolitan PWSC Connection	San Fernando Basin GWR	Van Norman Complex RWA	Metropolitan Jensen WTP Connection
I	1, 2	♦	♦	♦	♦		
I	3	♦	♦	♦			
II	4, 5, 6	♦	♦	♦	♦	♦	♦
III	7, 8, 9	♦	♦	♦	♦	♦	♦

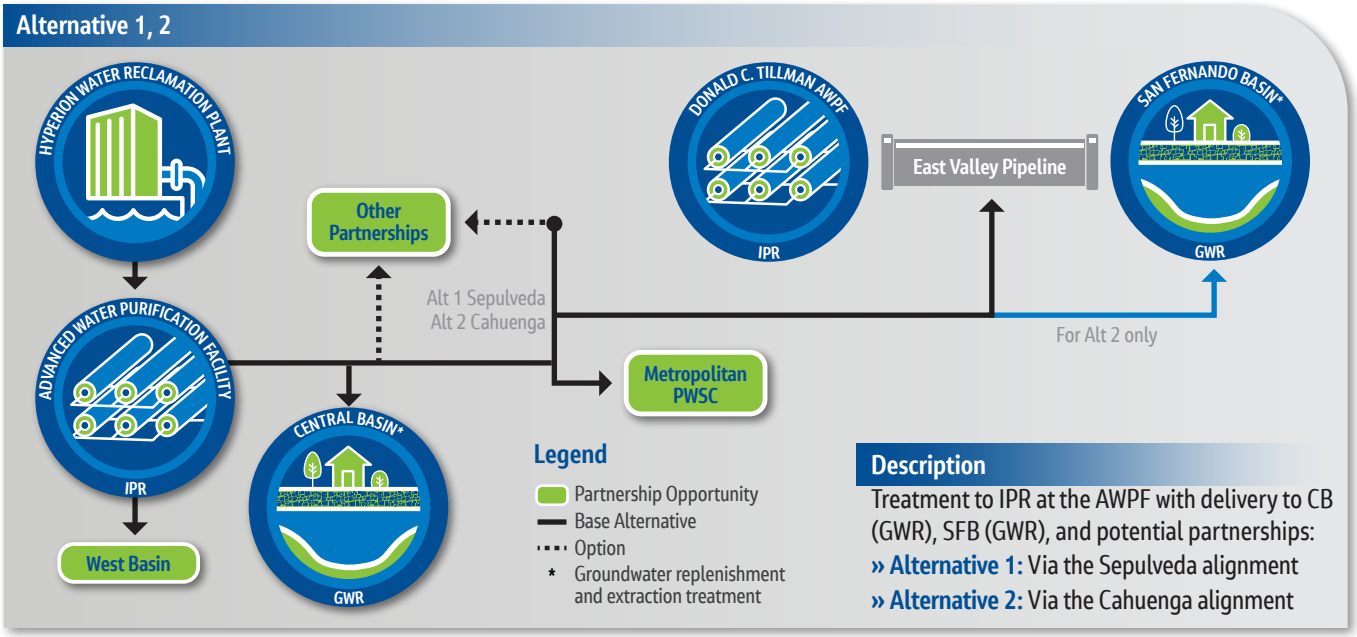
4.3.1 *POTABLE REUSE APPROACH I*

Under Potable Reuse Approach I, Alternatives 1, 2, and 3 focus on delivery of IPR-quality water from the AWPF:

» **Within the LADWP System:** GWR at CB and SFB

» **For Partnership Opportunities:** West Basin, Metropolitan PWSC, and potentially others along the alignment

Potable Reuse Approach I – IPR



The planned HWRP treatment provides MBR filtrate as the source water to the AWPF. The planned AWPF treatment train consists of RO, UVAOP, and post-treatment stabilization. The components at the HWRP and the AWPF comprise the overall IPR treatment process (Hazen 2024).

The following considerations are common to Alternatives 1 and 2:

» Well-established approach (IPR for GWR) and easiest to permit

» No delivery to VNC

» Fit for purpose treatment to match location requirements

» GWR requires extraction treatment

» Coordination with potential partners for design, flow, and water quality demands

The following are unique to Alternative 1:

» Shortest south to north alignment

» Use of existing infrastructure, 54-inch diameter East Valley pipeline at Tillman AWPF for delivery to SFB

The following is unique to Alternative 2:

» Increased capacity access to SFB

Figure 4-1 presents Program Alternatives 1 and 2.

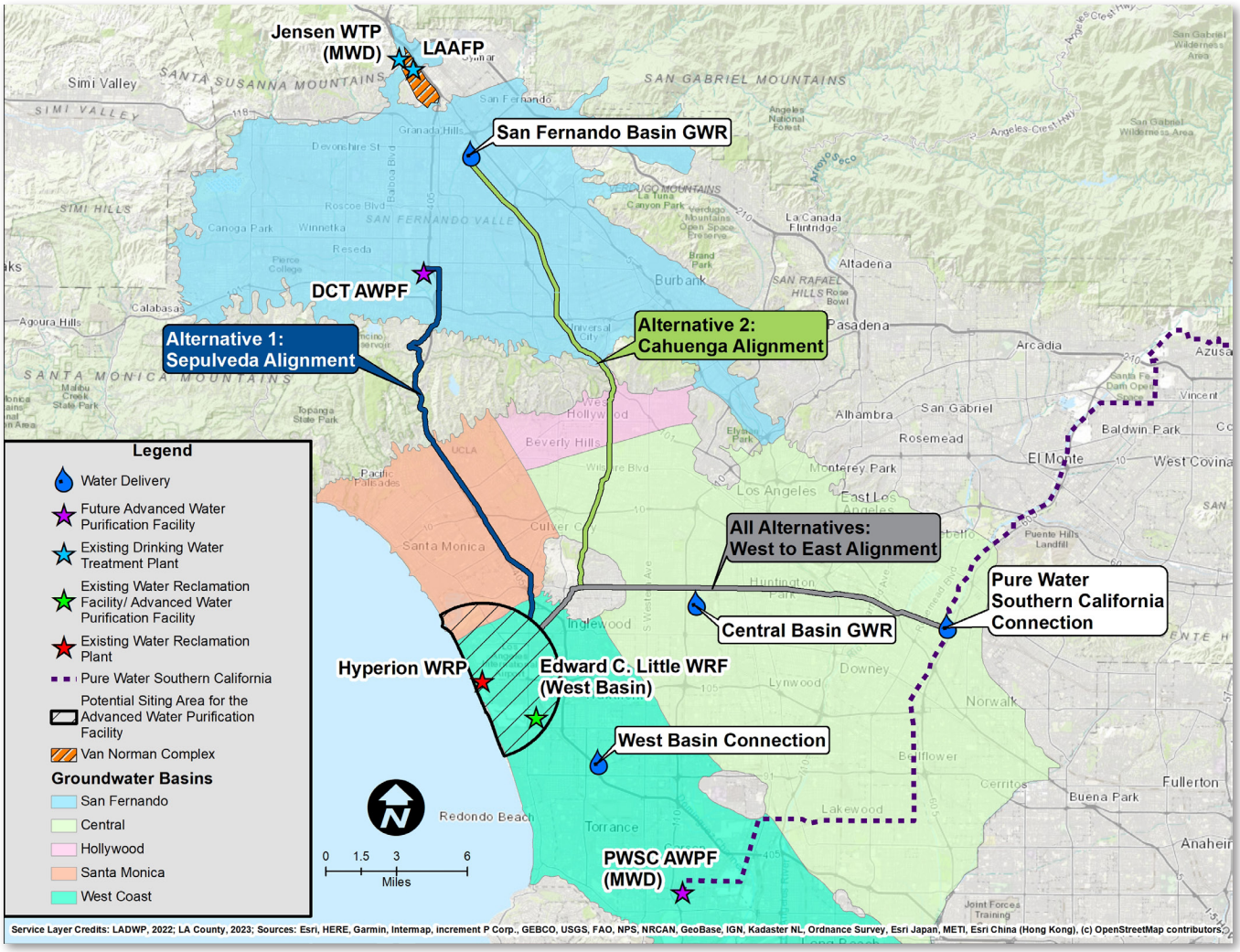
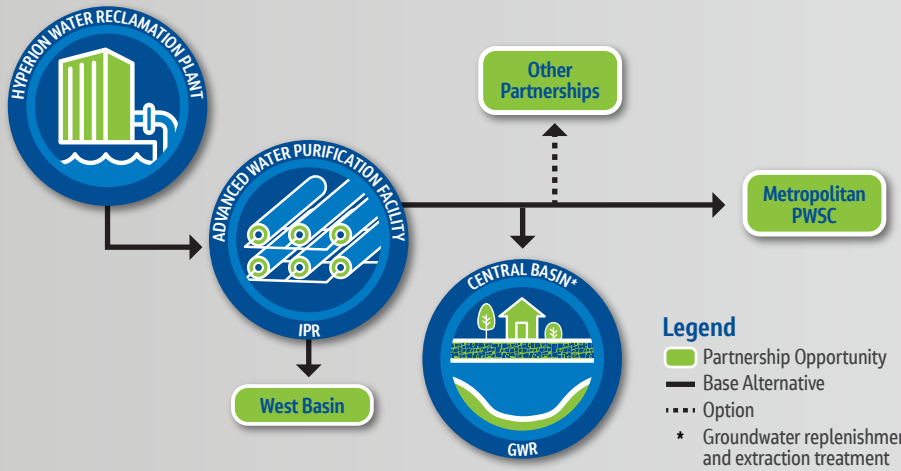


Figure 4-1. Program Alternatives 1 and 2

Potable Reuse Approach I – IPR

Alternative 3



The following considerations are pertinent to Alternative 3:

- Well-established approach (IPR for GWR) and easiest to permit
- No south to north alignment for delivery to SFB and VNC
- Although it is the shortest conveyance length, the cost does not account for Metropolitan's PWSC conveyance or any additional treatment requirements
- Lowest delivery of Pure Water Los Angeles water to LADWP system
- Fit for purpose treatment to match location requirements
- GWR requires extraction treatment
- Coordination with potential partners for design, flow, and water quality demands

Figure 4-2 presents Program Alternative 3.

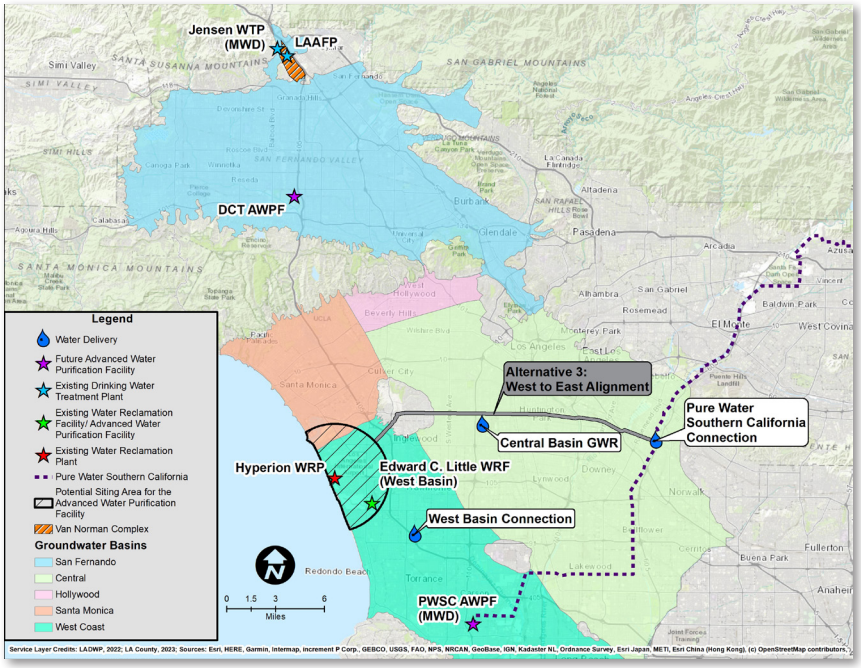


Figure 4-2. Program Alternative 3

4.3.2 *POTABLE REUSE APPROACH II*

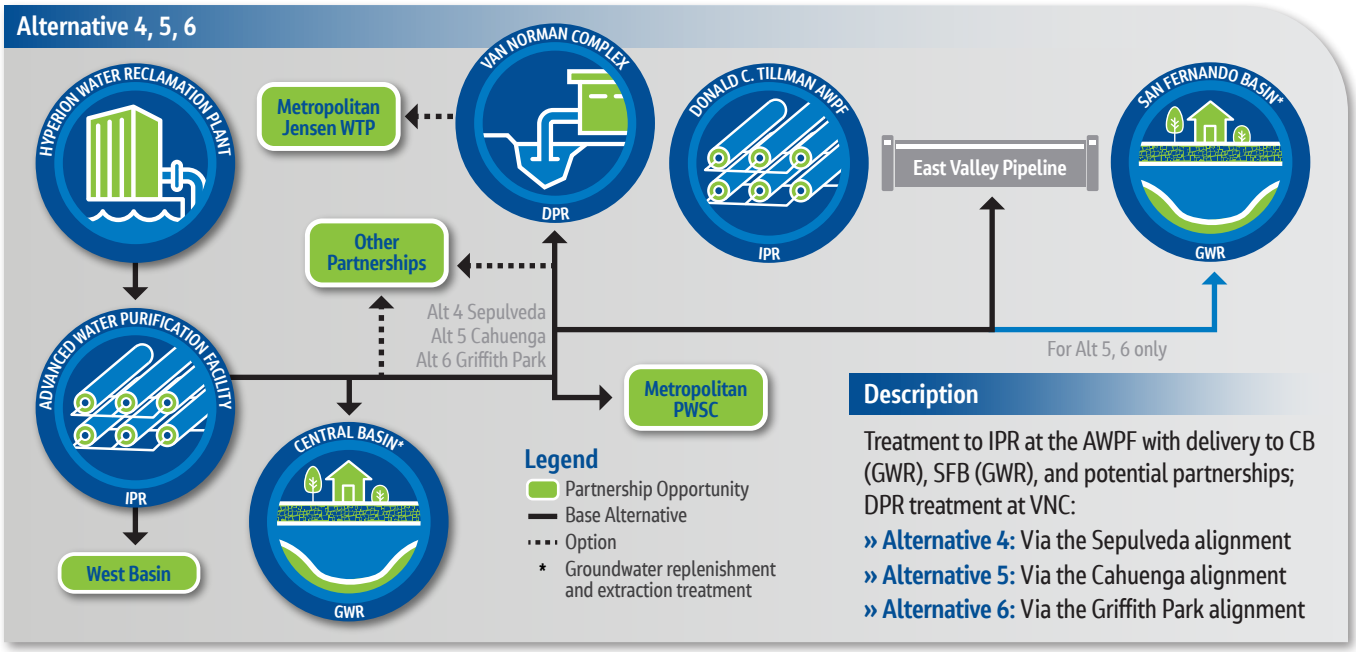
Under Potable Reuse Approach II, Alternatives 4, 5, and 6 focus on delivery of IPR-quality water from the AWPF, with additional treatment for DPR-quality water at or near VNC:

» **Within the LADWP System:** GWR at CB and SFB and RWA at VNC

» **For Partnership Opportunities:** West Basin, Metropolitan, and potentially others along the alignment

The planned HWRP treatment train provides MBR filtrate as the source water to the AWPF. The planned AWPF treatment train consists of RO, UVAOP, and post-treatment stabilization. The components at the HWRP and the AWPF comprise the overall IPR treatment process (Hazen 2024). UVAOP and granular activated carbon (GAC) adsorption at VNC provide additional treatment for DPR application. This treatment train is the basis for sizing and cost estimating in the MP only. Its viability remains subject to future validation testing, with review and approval by DDW. For Approach II, DPR treatment is referred to at VNC, but DPR treatment could be at an alternative location between SFB and VNC.

Potable Reuse Approach II – IPR and DPR



The following are common to Alternatives 4, 5, and 6:

» Flexibility for storage and demand locations along alignment

» Fit for purpose treatment to match location requirements

» Well-established approach (IPR for GWR) and easiest to permit

» Alternative treatment to DPR at VNC, requiring demonstration and regulatory approval

» Assumed treatment train for DPR at VNC is appropriately conservative for the MP; additional study by LADWP is recommended to evaluate alternative approaches that may have benefits moving forward

» GWR requires extraction treatment

» Coordination with potential partners for design, flow, and water quality demands

The following is unique to Alternative 4:

» Use of existing infrastructure, 54-inch diameter East Valley pipeline at Tillman AWPF for delivery to SFB

The following is unique to Alternatives 5 and 6:

» Increased delivery capacity to SFB

4.3.3 *POTABLE REUSE APPROACH III*

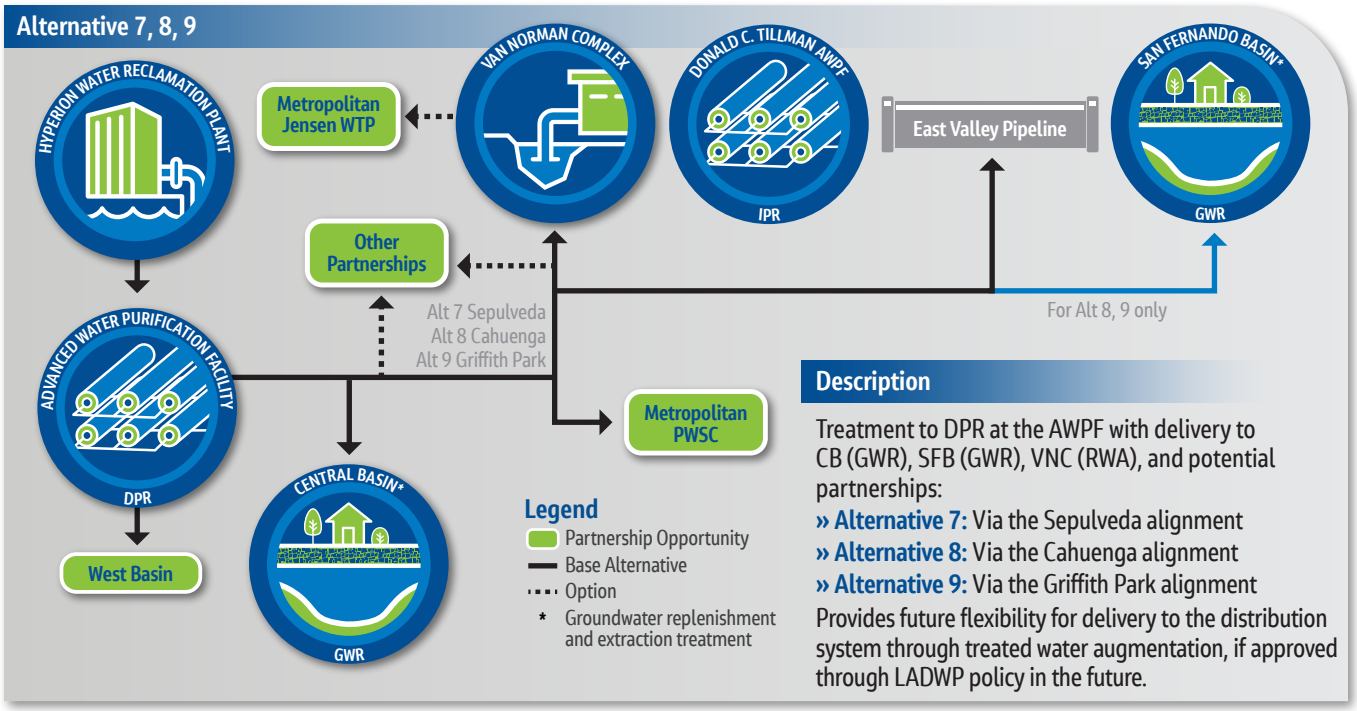
Under Potable Reuse Approach III, Alternatives 7, 8, and 9 focus on delivery of DPR-quality water from the AWPF:

» **Within the LADWP System:** GWR at CB and SFB, RWA at VNC, and the potential for future TWA at LADWP distribution system connections (subject to approval by LADWP policy)

» **For Partnership Opportunities:** West Basin, Metropolitan, and others along the alignment

The planned HWRP treatment train consists of MBR as the source water to the AWPF. The planned AWPF treatment train consists of ozone-biological activated carbon filtration (ozone-BAC), MF, RO, UVAOP, chlorine disinfection, post-treatment stabilization, and chloramines for residual disinfection. The components at the HWRP and AWPF comprise the overall DPR treatment process (Hazen 2024).

Potable Reuse Approach III – DPR



The following considerations are common to Alternatives 7, 8, and 9:

» Flexibility for storage and demand locations along alignment

» Prescribed treatment to DPR water quality per regulatory requirements

» No additional potable reuse treatment at storage and demand locations

» Higher cost for DPR treatment for IPR applications

» Provides an upper limit for treatment costs

» GWR requires extraction treatment

» Coordination with potential partners for design, flow, and water quality demands

The following is unique to Alternative 7:

» Use of existing infrastructure, 54-inch diameter East Valley pipeline at Tillman AWPF for delivery to SFB

The following is unique to Alternatives 8 and 9:

» Increased delivery capacity to SFB

Figure 4-3 presents Program Alternatives 4, 5, and 6 as well as Alternatives 7, 8, and 9. The component integration locations and conveyance alignments are the same for these groups of alternatives, with the main difference being the location and level of potable reuse treatment. Alternatives 4, 5, and 6 represent IPR treatment at the AWPF with DPR treatment at VNC, while Alternatives 7, 8 and 9 provide DPR treatment at the AWPF.

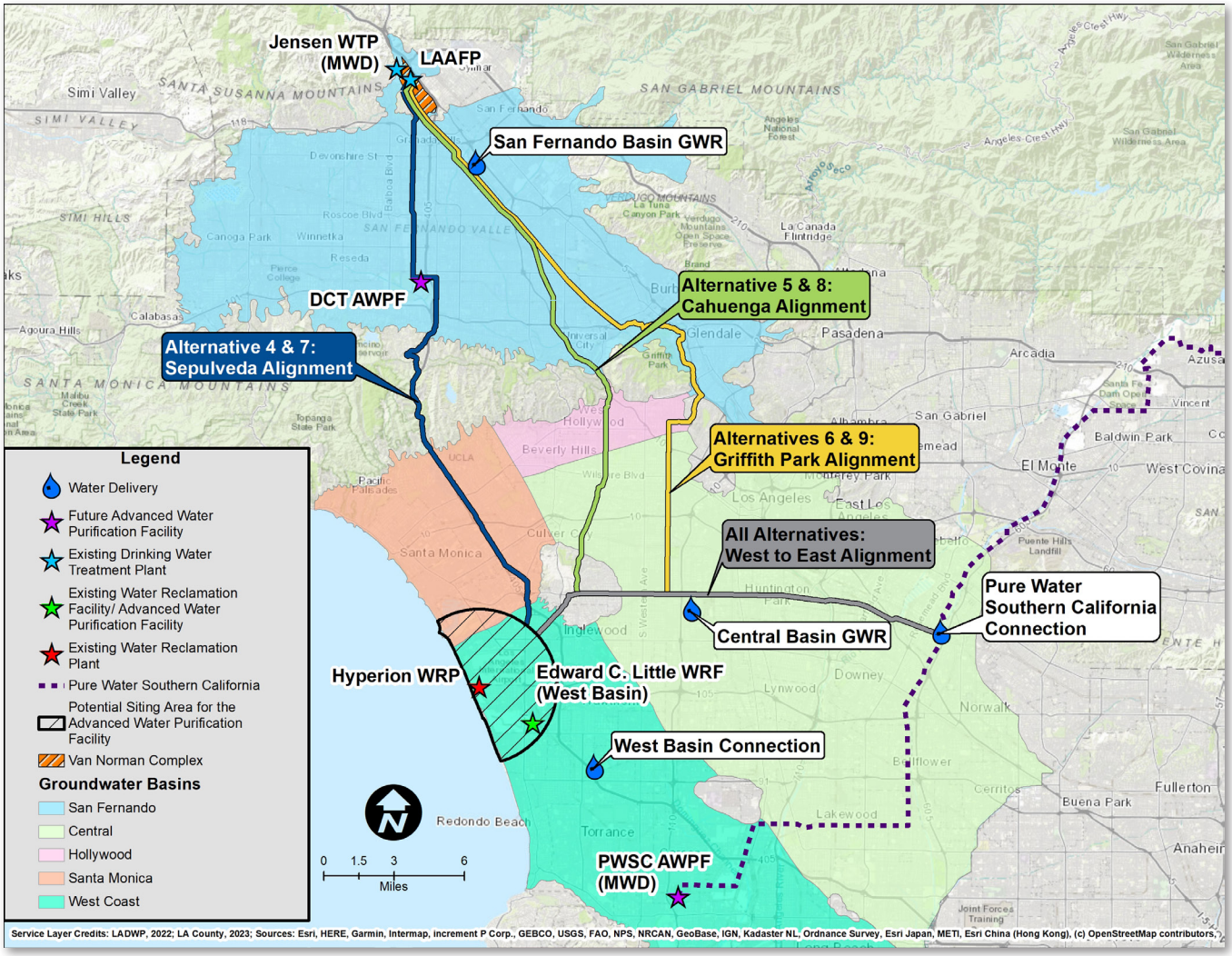


Figure 4-3. Program Alternatives 4, 5, and 6 or 7, 8, and 9

4.4 TREATMENT BASIS FOR MASTER PLAN

For the purposes of this MP, requirements for size, space, and cost were developed using the treatment train basis for each of the potable reuse approaches, as summarized in **Table 4-3**. All alternatives are intended to meet the minimum required log reduction values (LRVs) for IPR through GWR of 12/10/10 for enteric virus, *Giardia* cyst, and *Cryptosporidium* oocyst, respectively, and for DPR of 20/14/15 for the same pathogens.

Table 4-3. Basis for Footprint and Cost Development for the Master Plan

Potable Reuse Approach	AWPF Treatment	VNC or DPR Location Treatment
I	MBR + RO + UVAOP	Not applicable
II	MBR + RO + UVAOP	UVAOP + GAC
III	MBR + Ozone-BAC + MF + RO + UVAOP	Chemical feed for pH, chlorine residual control

MF = membrane filtration
Ozone-BAC = ozone-biologial activated carbon
RO = reverse osmosis
Includes post-treatment stabilization and chloramination

In the future, the assumed treatment requirements for the AWPF will be informed by an ongoing LADWP study. For Potable Reuse Approach II, UVAOP and GAC will be used as the basis for DPR treatment north of SFB or at VNC. For simplicity, the location of this treatment in Approach II is noted as VNC within the MP. This provides a reasonably conservative estimate for footprint and capital and operating costs.

Of the potable reuse approaches developed, Approach I incorporates the prescribed treatment train for IPR, and Approach III applies the prescribed treatment train for DPR, from the Title 22 California Code of Regulations. Approach II incorporates the standard IPR train at the AWPF and assumes additional DPR treatment at VNC. For Approach II, the additional DPR treatment processes at VNC require demonstration and utilizing the alternative clause in the DPR regulations for chemical control, as well as an alternative for pathogen control.

Additionally, LADWP expressed interest in evaluating the viability of an alternative IPR treatment train in Approach II consisting of MBR, RO, ozone-peroxide advanced oxidation (peroxone), and high-dose ultraviolet (UV) disinfection (and photolysis) at the IPR AWPF. The DPR element would include chlorination followed by UV disinfection only at DPR locations for TWA. Because peroxone has not yet been implemented or permitted in California, it is expected that demonstration of a treatment train with peroxone would be required for chemical control and pathogen control, both IPR and DPR, to obtain potential DDW approval.

Based on review of the regulations, it is anticipated that demonstration testing of the default DPR train in Approach III would be required. Any demonstration testing of alternatives (such as in Approach II) would also require testing of the default DPR train in parallel. It may be possible to leverage the Hyperion MBR Pilot or other ongoing or planned test facilities to conduct this testing. It is recommended that LADWP begin to develop a research and demonstration plan for the default DPR treatment train, as well as the alternative IPR treatment train with peroxone and alternative DPR treatment trains at VNC. The research and demonstration plan should consider pathogen reduction LRVs and chemical control to meet requirements for IPR and DPR.

Table 4-4 summarizes the initial concepts for consideration for the research and demonstration plan. Other potential alternative treatment trains are being explored by LADWP and will be evaluated as the Program evolves.

Table 4-4. Research and Demonstration Concepts for Potable Reuse Approach II

Location and Application	Treatment Train or Processes for Demonstration	Included in MP Basis
DPR at VNC	UV disinfection only	No
DPR at VNC	UV disinfection + GAC	No
DPR at VNC	UVAOP + GAC	Yes
IPR at AWPF	RO + peroxone + UV disinfection	No
IPR at AWPF	RO + peroxone + UV disinfection at IPR AWPF UV disinfection at DPR locations	No

Note: Other treatment processes downstream of RO may be considered for the DPR process at VNC, such as ozonation, air stripping, or other.

The Program alternatives described in this section were evaluated and screened to a shortlist of Program alternatives using an MCDA approach, as described in Section 5.

5. Program Alternatives Screening

Comparing alternatives was an important phase of MP development. Using an MCDA approach, alternatives were assessed and shortlisted. The screened alternatives were further evaluated to determine those to advance as the basis for a Program strategy and the CEQA review process.

5.1 ALTERNATIVES SCREENING PROCESS

The MCDA process **(Figure 5-1)** is a decision science evaluation method frequently used to aid the decision-making process during the planning stages of a complex program. MCDA considers both monetary and non-monetary criteria. The non-monetary criteria are defined to establish a common understanding of how they would apply to the Program alternatives, and measurement scales are assigned to score the performance of each Program alternative relative to each criterion. The relative importance of each criterion is established using weighting factors. The final Program alternative score is the sum of each criterion's score, which is weighted. For this analysis, a higher score indicated a more favorable alternative.

Figure 5-1. Multi-Criteria Decision Analysis Process

5.2 SCREENING CRITERIA

LADWP developed seven screening criteria and associated weightings for evaluating the Program alternatives (LADWP 2024b, LADWP 2024h). **Table 5-1** summarizes the selected screening criteria and weightings.

Table 5-1. LADWP Program Alternative Screening Criteria and Weightings

Number	Screening Criteria	Evaluation Criteria (%)	Weight (%)
1	Minimize Operational Complexity and Maintain Water Quality in Distribution System	Distribution system flexibility (5)	20
		Pure Water Los Angeles backbone complexity (5)	
		Pure Water Los Angeles treatment complexity (5)	
		Prevents water quality impacts (5)	
2	Adaptability to Future Supply and Demand Changes	Ability to use or provide reasonable access to a range of potable reuse strategies, including (20): GWR, SWA, RWA and TWA	20
3	Cost-effective Water Supply	Program cost compared to flow used by the City (20)	20
4	Regulatory Acceptance	Level of regulatory uncertainty for treatment selection and Program approval (10)	10
5	Phasing and Early Deliveries	Provides supply in an earlier time frame (10)	10
6	Regional Partnerships	Ability to manage water in wet years through partnerships (10)	10
7	Environmental Stewardship	Recycled water used in a dry year in comparison to the total water demand (3)	10
		Provides brine discharge improvements (4)	
		Provides treatment consistent with water use (3)	

Source: (LADWP 2024a, 2024b)

5.3 ONAT RESULTS

As described in Section 1, ONAT is a system model that produced initial results to aid the Program alternatives screening process. The assumptions used for ONAT modeling during screening, along with the associated results, are included in the *Program Alternatives Screening* TM (Arcadis and Jacobs 2024).

The February 2024 ONAT model version generated results that supported the initial screening of alternatives **(Figures 5-2 through 5-4)**. It should be noted that the ONAT results were later advanced based on finalizing assumptions and prioritization, so final results vary from the values summarized in the figures. The main metrics used for this initial screening were:

- **Criteria 3:** Cost-effective Water Supply, percentage of average purified recycled water production that stays within the City **(Figure 5-2)**. Approaches II and III had higher capital costs but resulted in more of the Program water being used by the City. This increased usage resulted in a more cost-effective water supply based on the defined criteria.
- **Criteria 6:** Regional Partnerships, percentage of total purified recycled water production managed by LADWP's partners in wet years **(Figure 5-3)**. Approach I allowed for a higher percentage of Program flows to be used by regional partners during wet years when usage by the City would be more limited.
- **Criteria 7:** Environmental Stewardship, percentage of total City demands met by purified recycled water deliveries during dry years **(Figure 5-4)**. Approaches II and III were able to meet a higher percentage of the City's demands during dry years when other water supplies may be limited. This can provide environmental benefits by reducing the reliance on imported water supplies.

Figure 5-2. Pure Water Los Angeles In-City and Partner Usage

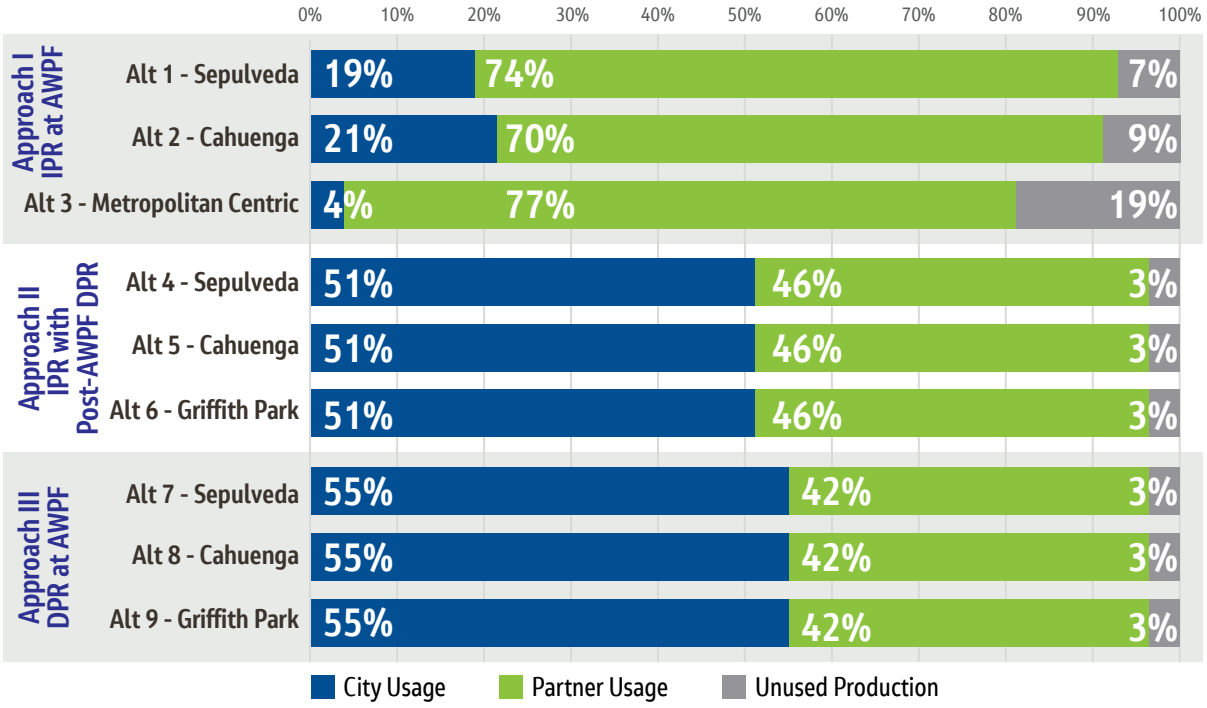


Figure 5-3. Percentage of Total Purified Recycled Water Production Managed by LADWP's Partners in Wet Years

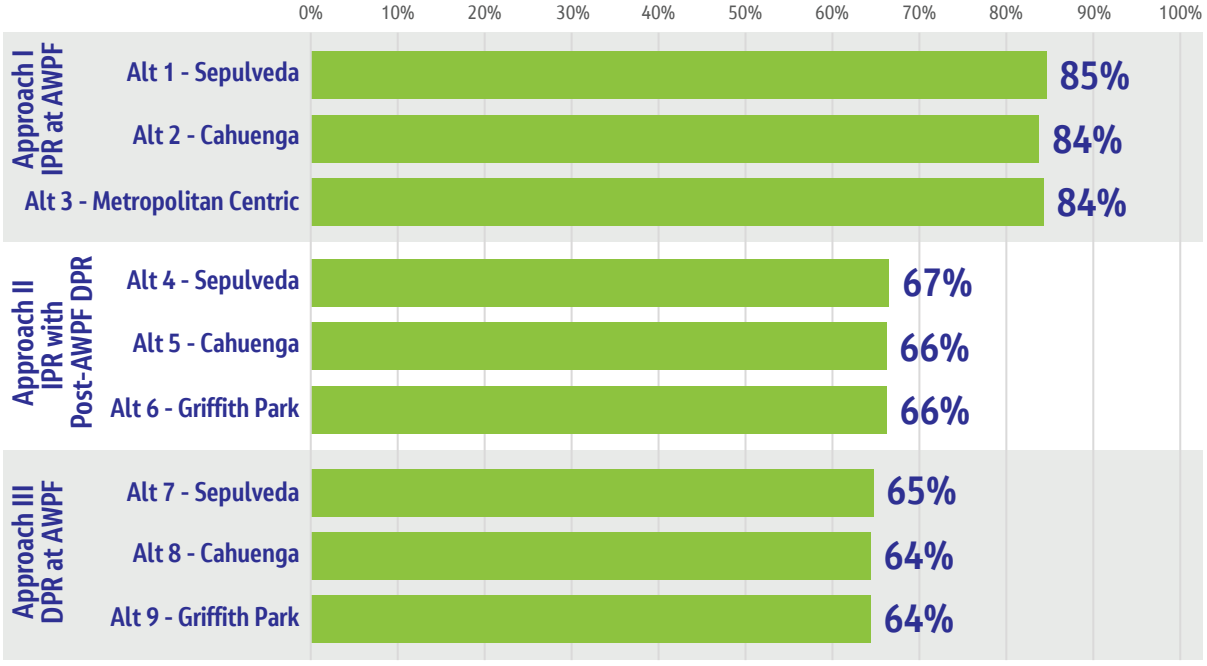
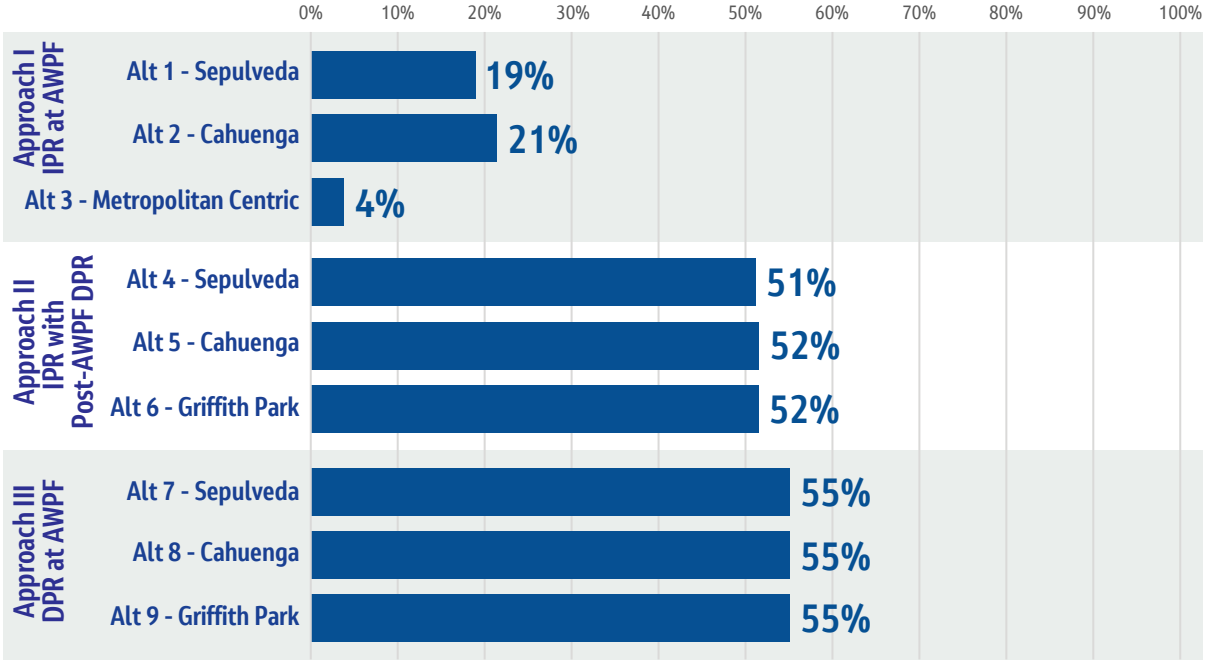


Figure 5-4. Percentage of Total City Demands Met by Purified Recycled Water in Dry Years



Due to the current Program definition, defined MP scope, and pending partnership discussions, it is assumed that water that is delivered to PWSC is not returned to the City at this time. This assumption may change pending additional negotiations between the City and Metropolitan.

The ONAT model results are intended solely for illustrative purposes. These results have been generated based on assumptions available at the time of development. Projections in this document do not reflect any commitment by LADWP to a future supply portfolio, supply proportions, operations, or strategy. Nothing in this document should be construed as an intent or agreement to future purchases or limits. Results are hypothetical only and subject to change by LADWP. Following the MP, it is expected that further modeling will be conducted on the screened alternatives to aid in their comparison, and potentially, as an input to determining the potential Program size.

5.4 SCREENING ANALYSIS SUMMARY

On March 26, 2024, LADWP held a workshop to review the Program alternative scoring and develop a shortlist of alternatives (LADWP 2024c). This workshop was an important milestone for the Program, with the main objective of identifying the shortlisted Program alternatives to evaluate in more detail. **Figure 5-5** shows the results of the screening evaluation completed for the workshop. These scores are the culmination of LADWP's internal effort involving the Water System Division Directors.

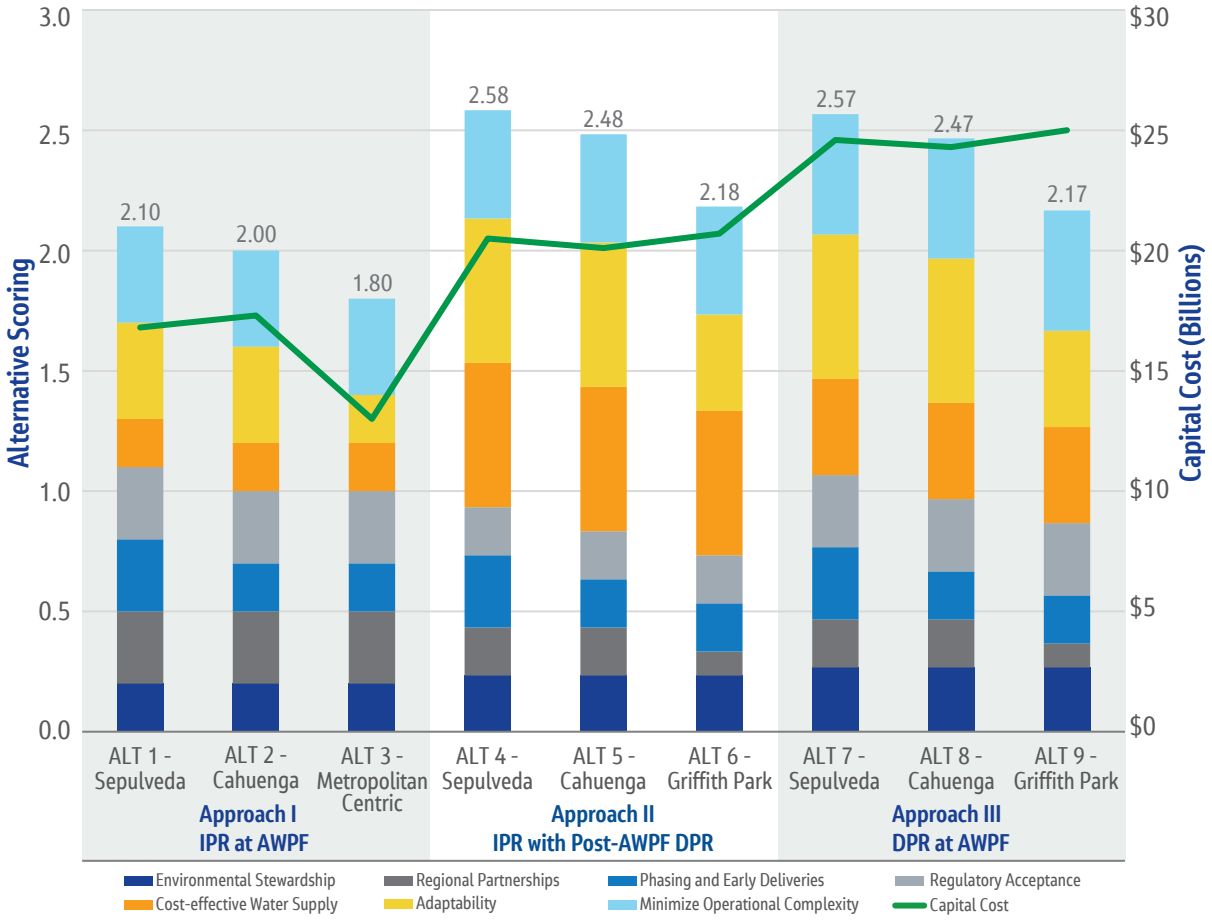
A more detailed description of the scoring can be found in the *Program Alternatives Screening* TM (Arcadis and Jacobs 2024). Based on the scoring completed, Approaches II and III had the highest scores, ranging from 2.17 to 2.58, based on the following:

- Approaches II and III scored higher due to adaptability to future supply and demand changes based on the ability to send water north to SFB and VNC, which gives access to SWA, GWR, and DPR (RWA) storage and demand locations.
- Approaches II and III scored higher based on cost-effectiveness with respect to the selected criteria, which had a high value on the use of the Pure Water Los Angeles flow to meet LADWP demands. These two approaches convey Pure Water Los Angeles flows to VNC for DPR.
- The Program alternative scores for Approaches II and III were similar when assuming the same alignment (that is, Sepulveda, Cahuenga, or Griffith Park).

» Within Approaches II and III, preliminarily, the Sepulveda alignment (Alternatives 4 and 7) scored the highest due to early phasing benefits of being able to leverage existing infrastructure (such as the East Valley Pipeline) and easier access to potential Partners.

» The lowest score from Approaches II and III exceeded the highest score for Approach I.

Figure 5-5. Program Alternative Scoring Summary



5.5 SCREENED PROGRAM ALTERNATIVES

Based on the workshop, the screened Program alternatives were identified by LADWP as:

» Approach II – IPR with Post-AWPF DPR

» Approach III – DPR at AWPF

> *Thus, LADWP's identification of screened alternatives means that the Pure Water Los Angeles Program will include DPR to VNC. Approach I, which was eliminated from further consideration, did not include DPR and did not connect to VNC. This DPR connection will occur at a location that will feed a majority of LADWP's system, meaning that DPR flow will support equitable distribution to customers.*

Approaches II and III were both moved forward for additional analysis and potentially for inclusion in the CEQA review. The differences in the alternatives within an approach are based on conveyance alignments, and a conveyance alignment study by LADWP will further refine the conveyance alignment

selection. Approach I can be considered an early phase of Approaches II and III because the Program would begin as IPR until conveyance is completed to VNC for DPR uses. Thus, it is not critical to examine Approach I further on its own.

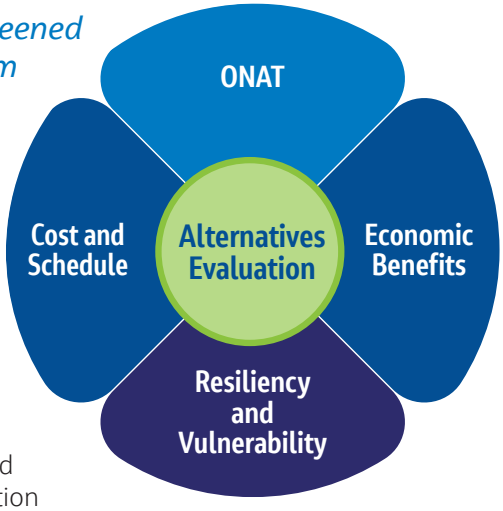
Additionally, the screened alternatives allow all three south to north alignments to advance to the detailed analysis stage, as well as the public outreach and subsequent environmental permitting phase.

The selected approaches provide operational flexibility and adaptability to account for future water supply and regulatory changes, while being more cost-effective based on LADWP's evaluation criteria. The primary difference between Approach II and Approach III is the location of the DPR treatment, either at the AWPF or VNC. Approach II has a lower estimated capital cost and would also provide treatment that is more consistent with the end use. However, post-AWPF DPR treatment requires additional demonstration testing and approval by DDW under the alternatives clause of the DPR regulations.

Based on the schedule to design and construct conveyance to VNC, Approach II could be adapted to Approach III if post-AWPF treatment is not preferred by LADWP. The screened Program alternatives were further evaluated in more detail as described in Section 6.

6. Program Alternatives Evaluation

Additional evaluations were completed on the screened Program alternatives to inform the future Program requirements and impacts. Additional ONAT modeling was conducted for six scenarios to evaluate a range of hydrological and demand conditions. Further analyses were completed for resiliency, vulnerability, economic benefits, cost, and schedule.



6.1 BASIS FOR EVALUATION

Based on the alternative screening process in Section 5, six alternatives within Approach II – IPR with Post-AWPF DPR and Approach III – DPR at AWPF were selected for further evaluation to understand Program water storage and demands, identify benefits, develop phasing, and estimate costs. The evaluations were completed, not to further screen the alternatives; rather, to identify future assessments to progress the Program, such as a conveyance alignment study, hydraulic analysis of each Program component, public outreach, and validation testing of DPR treatment technologies. All six alternatives will be carried forward into the environmental planning process for CEQA.

The additional evaluations included:

- Using the ONAT model to identify differences among the alternatives for purified recycled water usage and potential limitations for storage and demand locations
- Evaluating resiliency and vulnerability of the main infrastructure components
- Estimating cost
- Evaluating the economic benefits and impacts, focused on estimating job creation
- Developing the Program schedule and phasing

6.2 EVALUATION OF ALTERNATIVES

This section includes the results of the modeling and analysis completed on the screened Program alternatives, as summarized in the following documents:

- *Operation NEXT Assessment Tool Results TM* (Jacobs 2024c)
- *Resiliency Analysis TM* (Jacobs 2024d)
- *Cost, Scheduling, and Phasing TM* (Jacobs and Arcadis 2024d)
- *Economic Benefits TM* (Jacobs 2024e)
- *Funding TM* (Jacobs 2024f)

6.2.1 *OPERATION NEXT ASSESSMENT TOOL MODELING*

After the workshop on March 26, 2024, additional ONAT modeling was completed for the screened alternatives, as summarized in **Table 6-1**.

Table 6-1. Modeled Flows for Screened Approaches and Alternatives

Approach	Alternative	Alignment	Flows (MGD)[1]					
			CB	SFB	VNC	West Basin	Metropolitan	WRD
II: IPR with Post-AWPF DPR	4	Sepulveda	Up to 18[2]	Up to 55[3]	Up to 163[4]	20 to 40	Up to 47[5]	Up to 20[6]
	5	Cahuenga	Up to 18[2]	Up to 177[7]	Up to 163[4]	20 to 40	Up to 47[5]	Up to 20[6]
	6	Griffith Park	Up to 18[2]	Up to 177[7]	Up to 163[4]	20 to 40	Up to 47[5]	Up to 20[6]
III: DPR at AWPF	4	Sepulveda	Up to 18[2]	Up to 55[3]	Up to 230	20 to 40	Up to 47[5]	Up to 20[6]
	5	Cahuenga	Up to 18[2]	Up to 177[7]	Up to 230	20 to 40	Up to 47[5]	Up to 20[6]
	6	Griffith Park	Up to 18[2]	Up to 177[7]	Up to 230	20 to 40	Up to 47[5]	Up to 20[6]

[1] Total flows for individual storage and demand locations are greater than the maximum AWPF capacity of 230 MGD. Operational decisions would be made to send purified recycled water to specific storage and demand locations based on LADWP prioritization. Unless otherwise noted, flows in this table assume a 12-month operating period.

[2] Flow to CB is based on the augmentation exceeding existing groundwater rights, which would be available for extraction by LADWP on a 1:1 volume basis. The 18 MGD value is based on a 10-month operating period.

[3] Flow to SFB would be through the existing East Valley Pipeline for the Sepulveda alignment, which has a capacity of 80 MGD. Of this, approximately 22,000 AF is reserved for the Los Angeles Groundwater Replenishment Project from the future Donald C. Tillman Advanced Water Purification Facility. Operating basis for various spreading grounds and injection wells vary (Jacobs and Arcadis 2024c).

[4] Based on land availability at VNC for Post-AWPF DPR treatment, assuming UVAOP and GAC.

[5] Flow to PWSC (LADWP 2024i). While Jensen is a component of the ONAT model, this was node was not turned on for the model runs pending ongoing discussions between LADWP and Metropolitan.

[6] Flow to WRD represents a potential partnership between LADWP and WRD. Flows are based on the replenishment of LADWP existing groundwater rights. The 20 MGD value is based on a 10-month operating period.

[7] Assumes a new pipeline to SFB that can be sized to accommodate greater flow than the East Valley Pipeline.

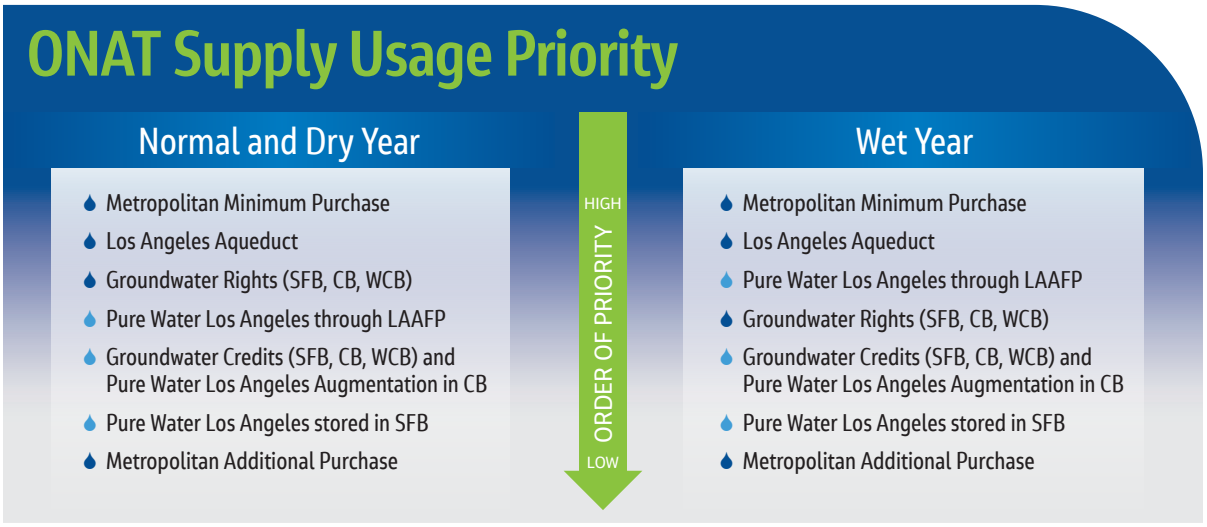
Model Inputs and Planning Scenarios

The model inputs were based on the best estimates of future LAA flows from historical data, various combinations of City system demand projections, and different Program alternative options. Future LAA flows, as provided by LADWP, are estimates derived from historical data from April 1922 to March 2024. The LAA flow estimates were adjusted by LADWP to reflect current flow restrictions, which have changed over time since 1922; the resulting values are referred to as LAA-adjusted historical flow estimates.

The model incorporates LADWP priorities for the destination of Program purified recycled water (storage and demand locations) that govern where and how much Program water is delivered from the AWPF in dry, normal, and wet years. The model also incorporates LADWP priorities for LADWP water supplies that govern what water supplies will be used to meet LADWP system demands in dry, normal, and wet years **(Figure 6-1)**. The provided future LAA flows and City demand estimates are the primary model drivers and sources of variability in model results.

ONAT modeling focused on flows to CB, SFB, LAAFP, WRD, and PWSC and included existing flow to West Basin. Refer to Section 3 for details about flow rates for these potential storage and demand locations. Flows to other partnerships were not modeled to help understand potential available flows and inform those ongoing discussions.

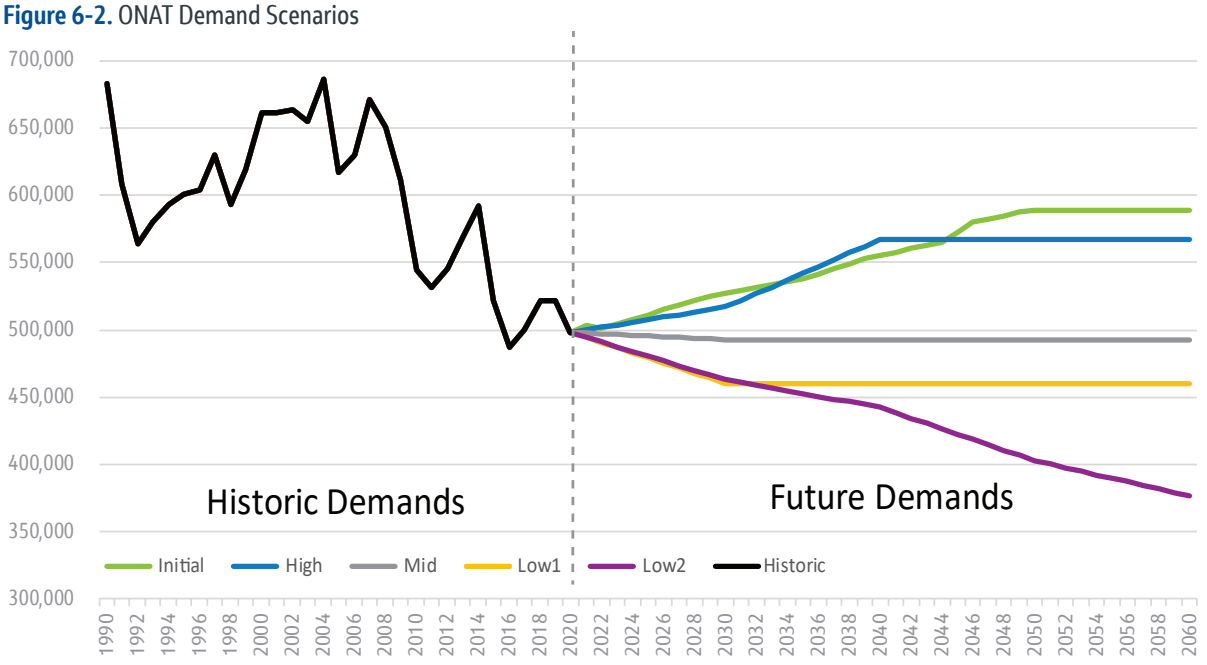
Figure 6-1. LADWP Supply Priority to Meet City Demands



Five demand scenarios were modeled to evaluate a range of possible future demands (Figure 6-2):

1. **Initial –** Based on LADWP's 2020 Urban Water Management Plan (UWMP 2020) estimates (LADWP 2021b)
2. **High –** Based on UWMP 2020 flow projections and Southern California Association of Governments 2016 population forecasts and static water use efficiency estimates
3. **Middle (Mid) –** Assumed no growth from the City's 2020 population and no change in per capita water usage
4. **Low1 –** Used small decreases in the City's population and the achievement of legislative residential indoor water use efficiency targets
5. **Low2 –** Used larger decreases in population (consistent with Department of Finance 2023 projections) and more efficient water use assumptions beyond current residential indoor use targets

Figure 6-2. ONAT Demand Scenarios



Model Results

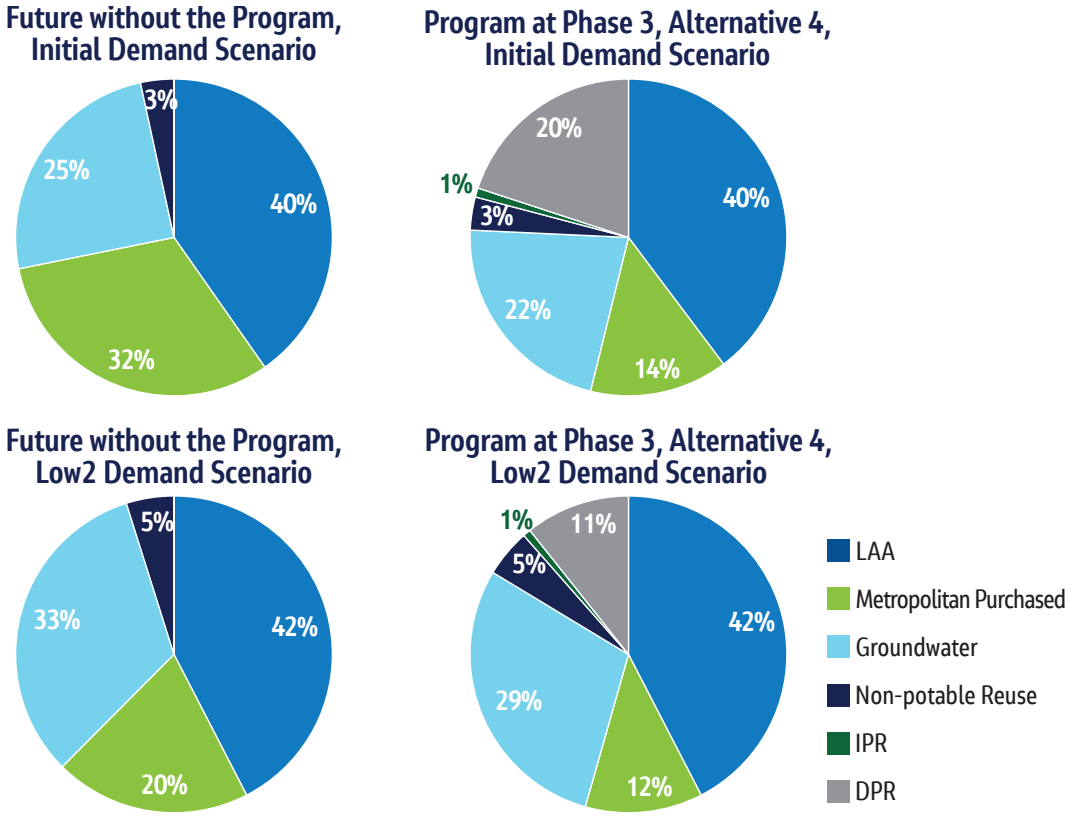
As a new water supply source for the City's water supply portfolio, the Program could make the City's water supplies more resilient. The model results are estimates based on the latest assumptions and are subject to change in the future. Potential changes in water supply portfolio were estimated from a future system without Pure Water Los Angeles as compared to a future system with Pure Water Los Angeles. For this example, Alternative 4 was modeled at both the Initial demand scenario and the Low2 demand scenario in the system with Pure Water Los Angeles, as summarized on **Figure 6-3**, resulting in the following observations from the modeling:

- LAA supply could stay in the same range, from 40 to 42% of the City demands with or without the Program, depending on the demand scenario.
- Metropolitan-imported water could be reduced from 20 to 32% without the Program to between 12 and 14% of the City demands with the Program.
- Groundwater supply utilization could stay approximately the same, from 25 to 33% of the water supply portfolio without the Program to between 22 and 29% of the City demands with the Program.
- Non-potable recycled water use could stay approximately the same with or without the Program, at approximately 3 to 5% of the City demands, based on updated non-potable demand projections.
- The Program, which will incorporate IPR and DPR, could supply between 12 and 21% of the City demands, depending on the demand scenario.

These potential water supply portfolio changes are based on model runs using Alternative 4 with Initial and Low2 demand scenarios; thus, findings may vary when using other alternatives and demand scenarios.

There are two sets of plots included on **Figure 6-3**. The upper pie charts are based on the Initial demand scenario and the lower pie charts are based on the Low2 demand scenario. The charts on the left

Figure 6-3. Modeled Future LADWP Water Supply Portfolio with and without Pure Water Los Angeles, Phase 3

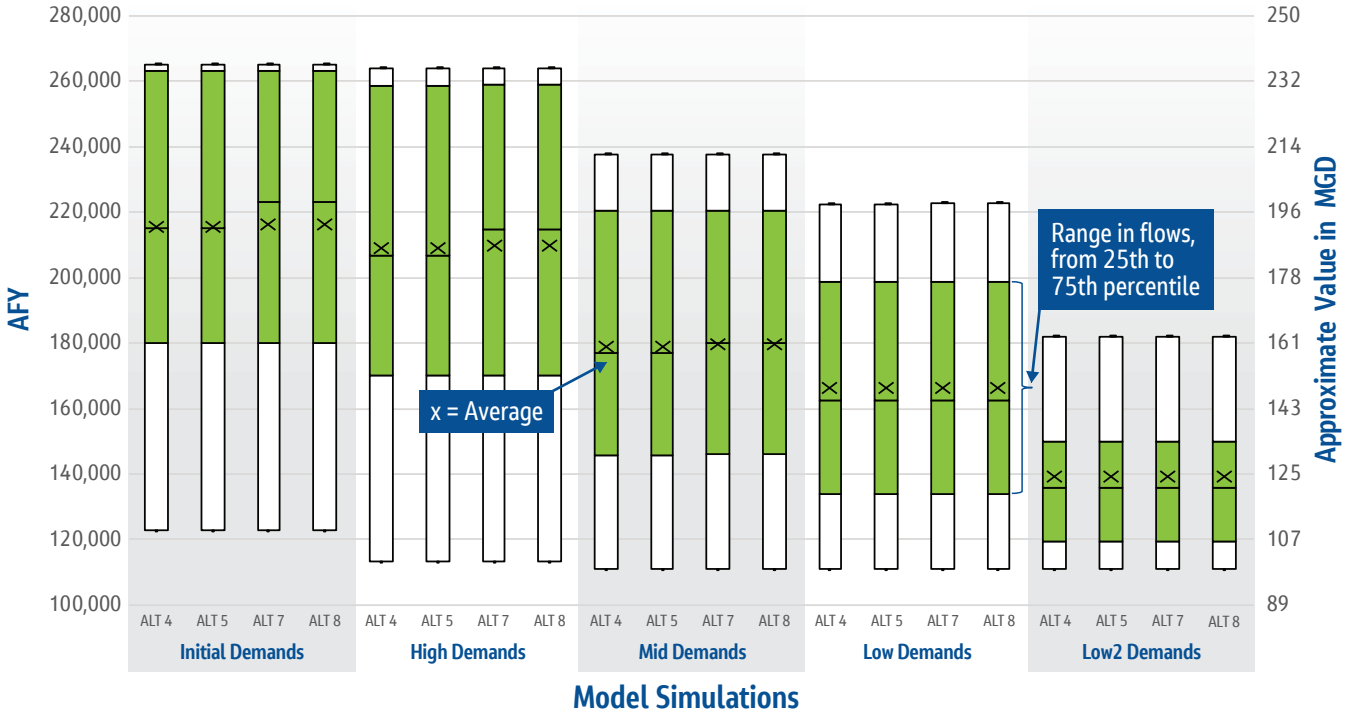


represent a future system without Pure Water Los Angeles, while the charts on the right represent a future system with Pure Water Los Angeles. These two sets of plots, one at an Initial demand scenario and the other at the lowest demand scenario, show the range of modeled supply portfolio differences in a future system with and without Pure Water Los Angeles.

While current groundwater supply utilization represents approximately 10% of LADWP's supply portfolio, in the future, groundwater utilization is expected to increase based on projected increased remediation pumping in SFB and system improvements in the Harbor area.

Figure 6-4 summarizes Program production for all model simulations that use LAA-adjusted historical flows. The charts show that variations in purified recycled water production could be expected based on the current variability of LAA flows, system demands, and preference for current water supply priorities to meet system demands. The figure shows a minimum demand of approximately 112,000 AFY (155 cfs [100 MGD]). This is based on variations in seasonal demands assumed for West Basin (31 cfs to 62 cfs [20 to 40 MGD]), WRD (26 cfs [17 MGD]), and Metropolitan's PWSC (73 cfs [47 MGD]).

Figure 6-4. Program Production under Various Model Scenarios



Note: Some simulations exceed 260,051 AFY (232 MGD) due to MBR demands that are not subjected to AWPF treatment.

On average, demands for CB and SFB would be approximately 13 cfs (8.4 MGD). Average production could vary from 139,000 AFY (192 cfs [124 MGD]) to 216,000 AFY (299 cfs [193 MGD]), depending on future City demand projections.

The flow to PWSC was updated to reflect discussions between LADWP and Metropolitan, with a fixed base flow of 73 cfs (47 MGD) assumed to PWSC (LADWP 2024i). Flow to PWSC could potentially be higher, pending future needs of and coordination with Metropolitan. Jensen WTP is a component of the ONAT model, but this node was active for the model runs pending ongoing discussions between LADWP and Metropolitan.

Program production could vary significantly based on annual LAA runoff conditions and seasonal variability. The variation could be nearly 112,100 AFY (155 cfs [100 MGD]). Seasonal variations in

production are also notable; on average, the difference between the highest and lowest production seasons would be approximately 56 cfs (36 MGD). Peak summer demands do not necessarily align with peak Program production because there may be high LAA flows during the summer months, creating a seasonal offset where the highest production occurs in spring and lowest production in fall.

Important findings related to purified recycled water production from the AWPF include:

- Each approach and alternative produce similar results for AWPF production under the same system demand conditions.
- Initially, a significant volume of purified recycled water is used to recharge SFB and at LAAFP, with LAAFP use continuing through the modeling time series considered.
- The variability of wet, normal, and dry LAA flow conditions, paired with demand uncertainties, is a major driver for variations in AWPF production rates.
- The system uses the Metropolitan PWSC connection less frequently during dry periods and high demand conditions, but could use its entire 73 cfs (47 MGD) potential capacity during wet periods and low demand conditions, assuming Metropolitan also has the capacity for the water.

Important findings related to the Program as a new water supply to the City include:

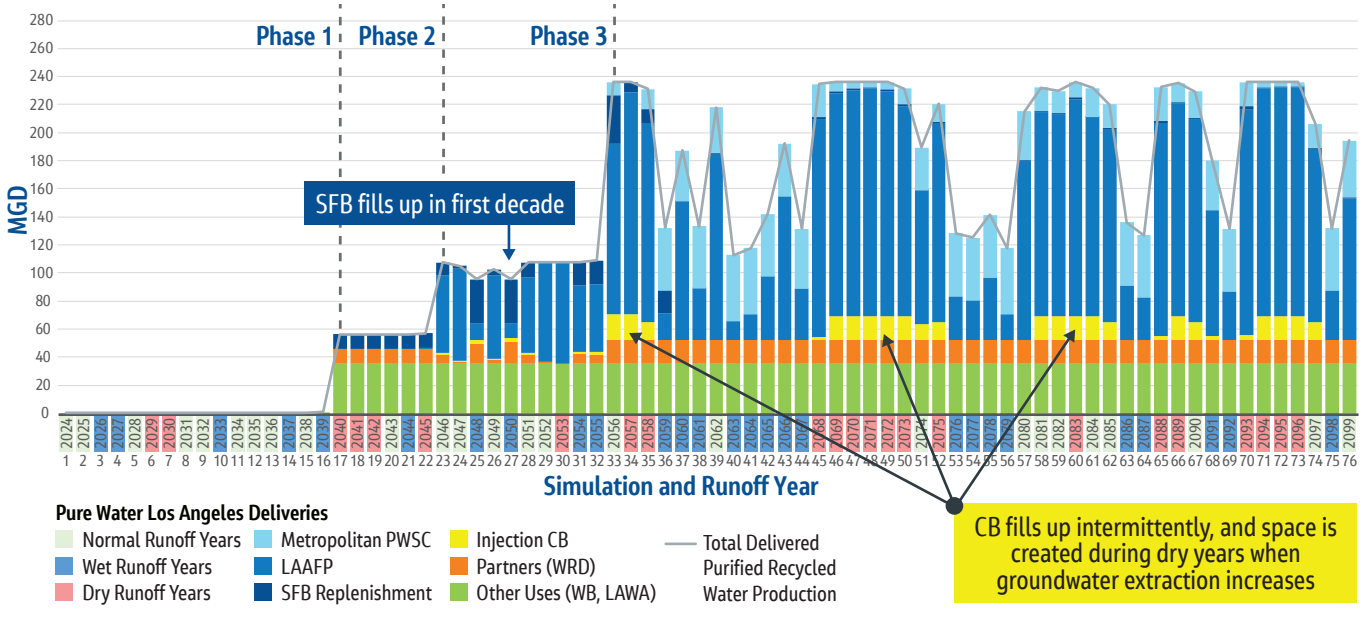
- There is initial demand for Program purified recycled water delivery for IPR in SFB and CB, then to LAAFP for DPR.
- The long-term use of Metropolitan-purchased imported water reduces once Pure Water Los Angeles comes online.
- It is important to balance Program purified recycled water usage with use of existing groundwater rights.

Important findings related to system storage include:

- Under the current set of assumptions, CB and SFB could fill up based on water supply prioritization, as well as increases in recharge with the Program and current stormwater improvement projects.
- Water storage opportunities within the region could be valuable to optimize the Program's purified recycled water supply and should be considered.

Figure 6-5 shows a time series of the average annual Program production and estimated demands for the produced flows. It shows the LAA runoff year type (wet, normal, or dry) for the Alternative 4 Mid scenario of 500,000 AFY demand. ONAT modeling was completed during the preliminary phasing

Figure 6-5. Average Annual Pure Water Los Angeles Production – Alternative 4 Middle Demand Scenario



plan for the Program, which was established before the final phasing plan for the Program described in Section 6.2.5. However, for this MP report, **Figure 6-5** was developed from one ONAT model run to reflect the final phasing plan, unlike other model results presented in the *ONAT Results TM* (Jacobs 2024c), which are based on the preliminary phasing plan.

The following traits are common across each model run:

- A minimum production around 132 cfs (85 MGD) after Phase 2 is in place, and production ranging from 155 cfs (100 MGD) to 325 cfs (210 MGD) after Phase 3, depending on water year type and potential demands from partners, such as WB, WRD, and Metropolitan, with high reliance on Metropolitan PWSC or future storage during wet years
- A high correlation between potential idle production flows and wet LAA years
- High LAAFP demands for Program production during dry years
- High use of SFB replenishment during the initial project phases until the groundwater basin reaches full capacity

The ONAT model shows that the Program could significantly reduce wastewater discharges to the ocean and enhance system reliability, while providing a new water supply for LADWP. Based on the model results, the Program could be refined related to the volumes and priorities of the existing water supply portfolio. The ONAT results can be used to support this discussion and offer insights into various Program strategies that can be tested to help the entire system balance reliability, the use of current supplies, and sizing of the overall Program.

As potential next steps, future ONAT modeling to further develop the Program could include:

- Testing strategies that characterize uncertainties beyond LAA flows; the main uncertainties include SFB recharge projections, SFB stormwater capture, demand projections, and the phasing and size of the Program
- Adding model rules so Program production could be turned on and off based on LAA forecasts, estimating when the AWPF would be operational, and testing the benefits of a forecasted approach; it is also important to determine the size of demand and storage needed to accommodate seasonal variability of LAA flows, emphasizing the importance of finding a steady demand for Program flows
- Running model simulations with baseline Program flows as a higher priority, and conducting more robust stochastic model analyses

6.2.2 *RESILIENCY BENEFITS AND VULNERABILITY ANALYSIS*

The *Resiliency Analysis TM* (Jacobs 2024d) explored future uncertainties related to climate, seismic, and demand risks through the development of resilience scenarios. The resilience benefits of the Program were evaluated by comparing the changes in water supply reliability, water cost, and other factors from conditions without the Program. The TM described the assumptions, methods, and results of the resilience analysis for the Program, which focused on two main aspects of resilience: resilience benefits of Pure Water Los Angeles and the vulnerability of Pure Water Los Angeles infrastructure.

The Program was found to offer considerable resilience benefits in general, and more pronounced benefits under extreme drought and earthquake scenarios. Maximum utilization for purified recycled water is expected for seismic or other emergency scenarios, and though infrequent, a significant seismic event could disrupt traditional water supply sources, highlighting the critical importance of the Program.

Some areas within LADWP's northern service area are served exclusively by LAAFP, meaning that a disruption to current water supply sources poses risks to those areas in particular. Potable reuse is a vital strategy for building seismic resilience by reducing reliance on more vulnerable, imported water sources. Pure Water Los Angeles will provide a reliable alternative water supply to VNC and the vicinity of the LAAFP to mitigate the risk of water shortages and to support critical infrastructure and public health and safety, even potentially in the face of catastrophic seismic events. By investing in this Program that maximizes water reuse, LADWP can not only mitigate some of the risks associated with natural disasters but also contribute to improving long-term water security and environmental sustainability.

The Program is expected to generate water cost savings over alternative supply options during critical supply shortages. The Program's projected potential cost savings during emergency scenarios, estimated at $1.0 to 2.3 billion for the scenarios examined, underscore its potential to safeguard community well-being, even in the face of adversity. **Table 6-2** summarizes the resilience benefits of Pure Water Los Angeles.

Table 6-2. Resilience Benefits Results for Various Climate Scenarios With and Without the Program

Program Benefits and Impacts	Metric	Reference (no Program)	Historical Hydrology (Scenario 1)	Climate Change Scenario (Scenario 4)	Seismic Scenario (Scenario 5)
Maximize reuse of locally generated wastewater	Total percent of LASAN wastewater used (%), following Phase 3 implementation	10%	46%	49%	46%
Resiliency of water supply during critical scenarios	Reduction in potential water shortages during critical resilience scenarios (AF)	N/A	330,000 AF (over 2 years)	200,000 AF (over 5 years)	225,000 AF (over 2 years)
Economic benefits of water cost savings during critical scenarios	Cost savings during critical resilience scenarios ($B)	N/A	$1.6-$2.3B	$1.0-$1.3B	$1.1-$1.6B

AF = acre-foot (feet) B = billion(s) N/A = not applicable $ = 2024 U.S. dollars

The vulnerability assessment identified where proposed Program facilities would be vulnerable to climate and seismic changes. Many of the facilities are vulnerable to flooding and wildfire risks, while virtually all future facilities will be challenged with extreme heat conditions. Sea level rise does not appear to cause vulnerability at HWRP, but an integrated coastal hazard assessment is recommended to better understand the implications of seismic events with increased sea levels on the coastal road.

Table 6-3 summarizes the vulnerability ratings for each climate and seismic risk hazard by Program facility. Refer to the *Resiliency Analysis TM* (Jacobs 2024d) for details about the criteria used to develop the vulnerability ratings. The Sepulveda alignment has fewer fault crossings and lower flood vulnerability than the other south to north alignments.

Table 6-3. Summary of Vulnerability Rating for Each Climate and Seismic Risk Hazard by Facility

Pure Water Los Angeles	Extreme heat[a]	Wildfire	Extreme precipitation	Pluvial and floodplain	Flooding, coastal; cliff retreat	Earthquake, seismic
Proposed AWPF (HWRP)	L	--	L	L	L[b]	L/M
Sepulveda Alignment	M/H	M	L/M	L/M	--	M
Cahuenga Alignment	H	L/M	M	M	--	M/H
Griffith Park Alignment	H	L/M	L/M	M	--	M/H
Slauson Alignment	L/M	L/M	M	M	--	M/H
Florence Alignment	M/H	L/M	M	L/M	--	L/M
Manchester Alignment	M/H	L/M	M	M	--	L
VNC	H	M	L	L	--	M/H
Stormwater Parks	M/H	L	L	L	--	M
Future Wellfields	L	L	M/H	M/H	--	L/M
Spreading Grounds	M/H	M/H	L/M	M	--	L/M
Secondary Potential Injection Location	M/H	L	L	L	--	L

[a] *Days exceeding 95 degrees Fahrenheit*
[b] *Integrated coastal hazard-seismic assessment not conducted, but recommended to verify rating*
L = low risk L/M = low-medium risk M = medium risk M/H = medium high risk H = high risk

Based on the findings of this assessment, several recommendations for next steps have been developed. These recommendations reflect the understanding that it is important to communicate, socialize, and review these findings with both Program Management and Operations staff to facilitate a supported set of adaptation strategies. The recommendations include:

- **Integrate Multiple Climate Vulnerabilities:** Integrate specific climate vulnerabilities into a compounded and weighted score developed by LADWP to support prioritization and facilitate multihazard resilience actions.
- **Develop Facility-specific Actions (pluvial flooding, wildfire, and extreme heat vulnerabilities):** Using the results from this assessment, identify the most vulnerable facilities across these three categories, and build facility-specific adaptation strategies. Actions for these hazards will likely be best addressed at the facility level.
- **Develop Regional Strategies:** This assessment has identified some regions where multiple climate hazards are concentrated. These include the coastal zone at HWRP, flooding at the CB area and future recharge wells, and wildfire in the foothills. LADWP and LASAN should consider whether regional strategies such as a regional coastal protection plan or wildfire resilience actions are more effective than facility-specific actions in these regions.
- **Update and Integrate LADWP and LASAN Design Standards:** One of the primary engineering drivers for facilities design and operations is standards. LADWP and LASAN should consider revisiting, reviewing, and updating design standards and policies as appropriate to account for highly likely changes in the climate that current and future facilities will operate within, such as more extreme precipitation, increase in extreme heat days, and higher sea levels.

» **Coordinate with Other City and Regional Climate Adaptation Strategies:** Align Program efforts with those of the City, as well as regional efforts, such as PWSC, so that Program actions are consistent and integrated across all elements of the Program.

» **Protect City Occupational Health:** Develop updated policies and protocols to provide greater protection of worker health during extreme climate events, such as extreme heat and flooding.

Adoption of these recommendations would address potential vulnerabilities and enhance Program resilience.

Seismic vulnerability could be reduced through integration of design features that will help minimize damage and avoid catastrophic failure during a seismic event, with detailed recommendations provided in the *Resiliency Analysis TM* (Jacobs 2024d). A risk-based investment could be adopted when designing and sizing pipelines to withstand potential earthquake damage.

As a further consideration regarding vulnerability, while designing infrastructure to address frequent scenarios offers efficiency, the threat of "black swan" events, defined as rare, high-impact occurrences with the potential to severely impact or limit entire systems, could also be considered. For critical infrastructure, such as water systems, addressing vulnerability and building resilience through approaches such as scenario planning or considering black swan events could add significant value, despite the additional cost.

6.2.3 *COST ESTIMATES*

Cost estimates were updated since the screening assessment by incorporating finalized construction and non-construction markups. **Table 6-4** provides the total capital and operations and maintenance (O&M) cost estimates for the screened Program alternatives in Year 2024 dollars. For this Class 5 level estimate, the expected accuracy range is -50% to + 100% for concept screening based on gross unit costs and parametric modeling techniques, for a project definition level up to 2% (AACE 2020). The accuracy tightens as the project definition evolves. The *Cost, Schedule, and Phasing TM* (Jacobs and Arcadis 2024d) provides additional detail.

Table 6-4. Total Capital and O&M Cost Estimates for Screened Program Alternatives

Approach	Alternative	Alignment	Total Capital Cost, $ billions	Annual O&M Cost, $ millions
Approach II – IPR + Post-DPR	4	Sepulveda	21.3	411
	5	Cahuenga	20.9	405
	6	Griffith Park	21.6	409
Approach III – DPR at AWPF	7	Sepulveda	25.4	462
	8	Cahuenga	25.1	452
	9	Griffith Park	25.8	460

6.2.4 *ECONOMIC BENEFITS AND IMPACTS*

Each screened Program alternative offers many direct and indirect benefits. Among these benefits, the Program will support local and regional economies by generating jobs, supporting businesses and the environment, and contributing to the well-being of Los Angeles and Southern Californian residents. Investment in construction of the Program will create or sustain thousands of jobs across a variety of industries, including:

» Professional
» Technical services
» Transportation
» Real estate
» Leasing

An economic analysis was conducted to estimate potential jobs to be created or supported by the Program for the five-county region comprising the following counties:

- Los Angeles
- Orange
- Riverside
- San Bernardino
- Ventura

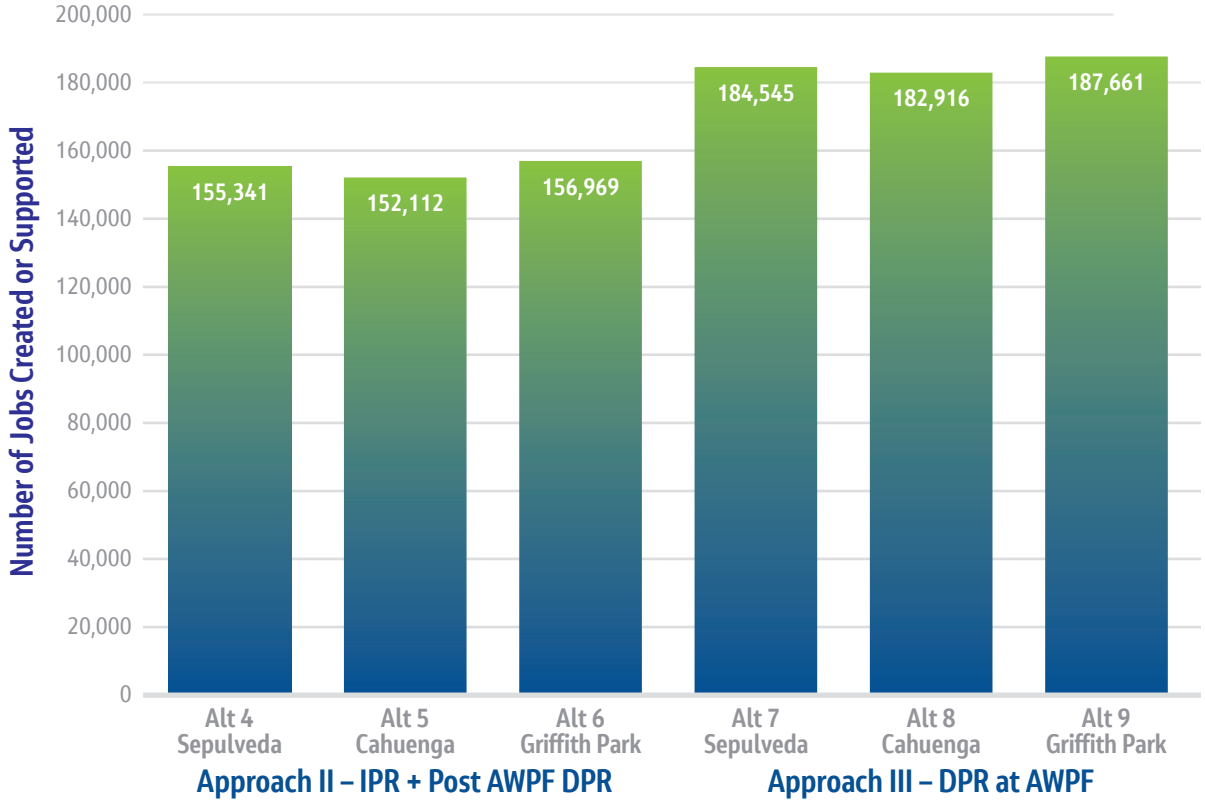
Results

The U.S. Bureau of Economic Analysis Regional Input-Output Modeling System II (RIMS II) was used to assess the economic impact for the screened Program alternatives 4 through 9. The total economic impact is the sum of direct, indirect, and induced effects. Jobs in various industries, including construction, will be generated through direct, indirect, and induced activities stemming from expenditures on Program-related supplies and materials, and household spending. Job creation was determined under various scenarios. The *Economic Benefits TM* (Jacobs 2024e) summarizes the full assessment of Program benefits in terms of job creation at the local and regional levels.

Job Creation through Program Expenditure

In this analysis, a created job is defined as one full-time equivalent position for one person during 1 calendar year. Job creation from the Program will allow LADWP and its partners to implement a workforce development program for long-term City and regional benefit. In addition, LADWP, LASAN, and partners could develop regional educational, job training, and upskilling programs for disadvantaged communities. **Figure 6-6** provides the total jobs that could be created or supported through spending by Program alternatives in the construction phase for the five-county region.

Figure 6-6. Number of Jobs Created or Supported by Program Alternative in Construction Phase

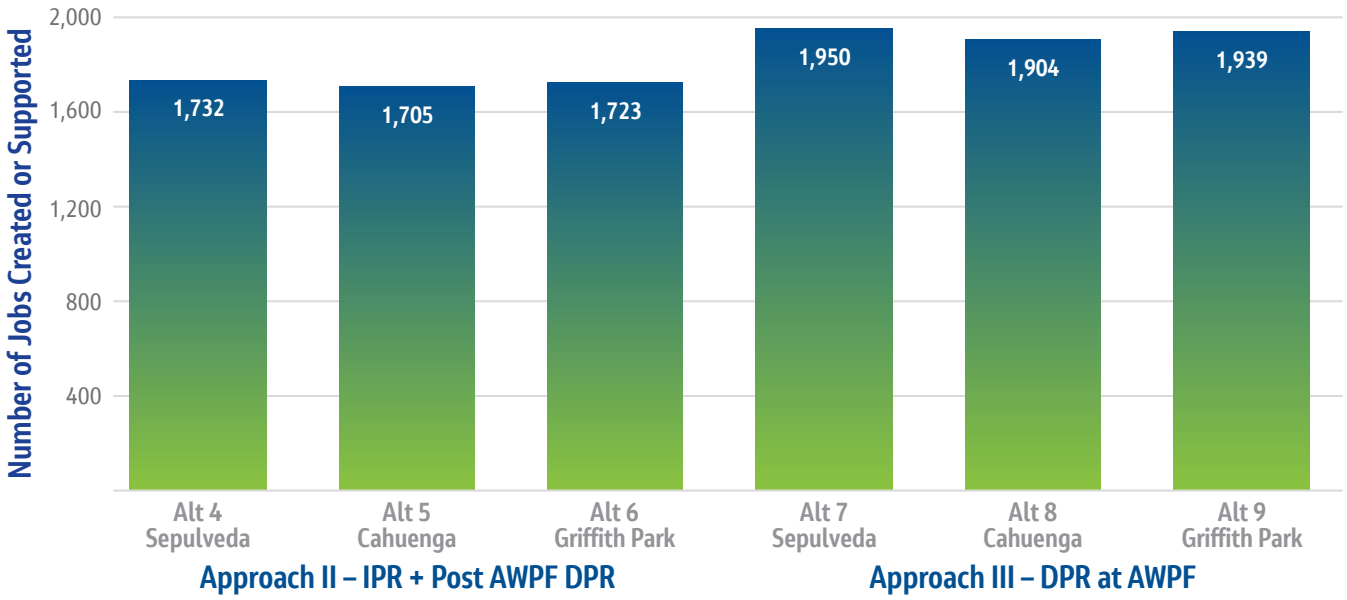


Job Creation in Operational Phase

After the construction is completed and O&M starts, the Program will continue to have a positive recurring impact on the regional economy. The ongoing O&M annual requirements will result in an employment impact (direct, indirect, and induced), with a combination of creating new jobs and helping sustain existing jobs in the Southern California region.

Figure 6-7 provides the number of jobs created and supported through spending by Program alternatives in the operational phase for the five-county region. The job creation estimates for both the construction and operational phases are similar within Approach II (Alternatives 4 to 6) and Approach III (Alternatives 7 to 9).

Figure 6-7. Number of Jobs Created or Supported by Program Alternative in Operational Phase



Direct Economic and Extended Benefits of the Program

The Program will provide direct and indirect (extended) economic benefits to the people who live and work in Los Angeles and the Southern California area. Based on the qualitative assessments, **Table 6-5** summarizes the local and regional direct and extended benefits resulting from the Program's construction expenditures and recurring O&M expenditures.

Table 6-5. Benefits and Local and Regional Impacts of the Program

Category	Benefit Type
Local and Regional Impacts	Economic benefit
	Diverse and resilient economy
	Local jobs creation and support of existing jobs
	Local skilled workforce
	Stable and secure local and regional economy
Sustainable Urban Environment and Economic Value	Localization of jobs and greenhouse gases avoided
	Impact on human health
	Enhanced public spaces

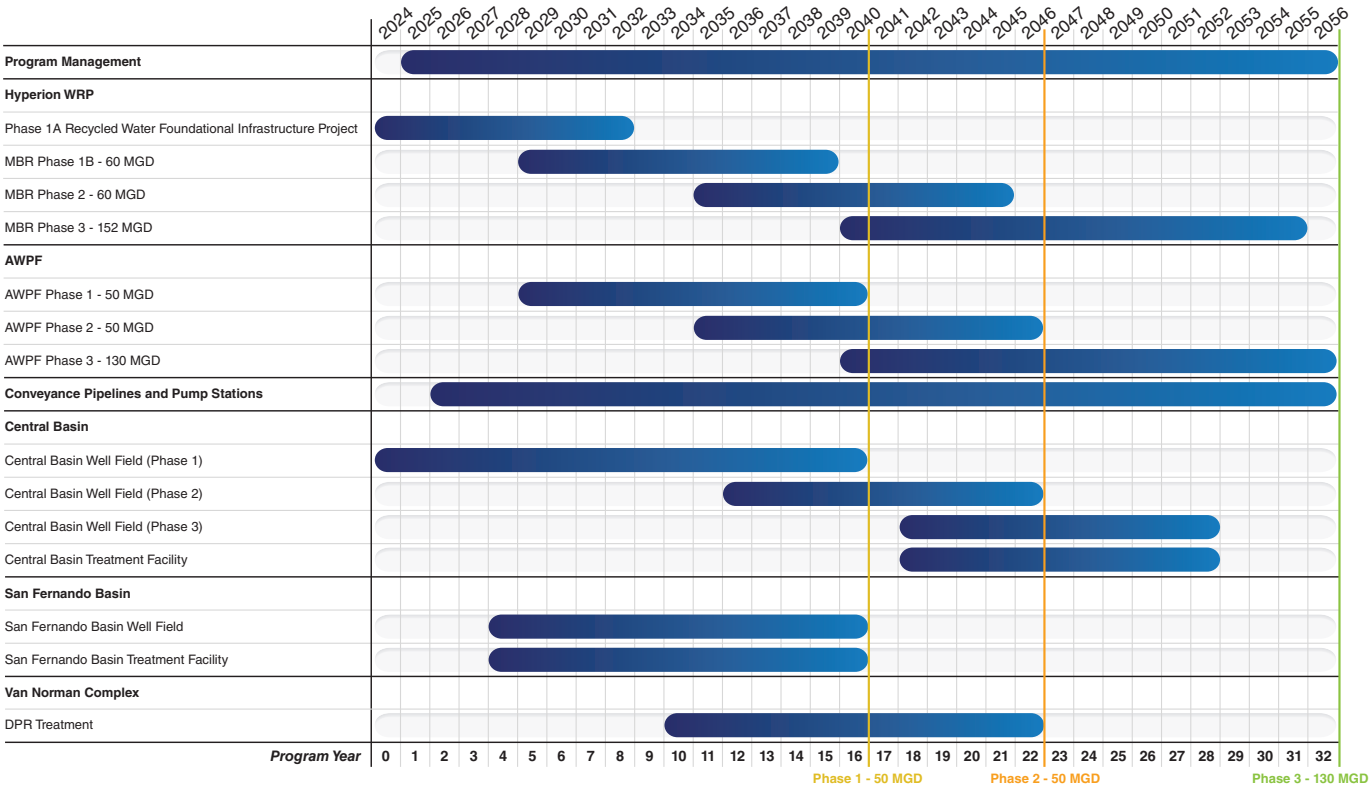
The independent economic analysis using RIMS II shows that the implementation of the Program will result in economic impact in terms of job creation, an opportunity for workforce development, and economic growth and multiple benefits throughout the Los Angeles County and Southern California region, including the five-county region. The job opportunities created by the Program investment will require local actions to develop new strategies to hire, train, and retain a skilled workforce, including local workers, youth, and people re-entering the community after incarceration, across the entire spectrum of occupations.

6.2.5 *SCHEDULE AND PHASING*

Figure 6-8 identifies the proposed phasing implementation. This approach focuses on LADWP's storage and demand options closest to the new AWPF for early delivery to align with Phase 1 of the HWRP conversion to MBR and addition of an AWPF at or near HWRP. This proposed phasing plan allows time for demonstration and approval of post-AWPF DPR options and construction of the long conveyance pipeline north to VNC that is aligned with Phase 2 production.

Given the duration required to construct the pipeline to the north, partnerships could be pursued to use the purified recycled water that would be available for Phases 1 and 2. The main differences among the alternatives are the south to north alignments, as well as the treatment approaches for DPR. Completion of an alignment study will provide the information needed to refine the conveyance schedules. As such, one schedule has been developed to encompass Program delivery based on Approach II, Alternative 6 (Griffith Park Alignment). LADWP should continually refine the schedule as the Program advances.

Figure 6-8. Program Phasing



6.3 PROGRAM ALTERNATIVES SUMMARY

Six alternatives within Approach II – IPR with Post-AWPF DPR and Approach III – DPR at AWPF were selected for additional analyses to further inform each alternative. The results of the additional evaluations include:

- All six alternatives would result in similar production from the AWPF, with production and utilization driven by LAA flow conditions rather than Program alternatives.
- Pure Water Los Angeles supply may reduce the City's long-term usage of purchased imported water from Metropolitan.
- Balancing Program production with other LADWP sources, such as groundwater rights, will be an important step during implementation to avoid competition between sources.
- All six alternatives will provide additional resiliency to LADWP's water supplies by adding a new source of supply, and by providing additional supplies during drought or other emergency scenarios, lessening their potential impact.
- Infrastructure for each alternative was evaluated based on vulnerability, and some differences were identified between the six alternatives. For example, all of the south to north alignments have climate and seismic vulnerabilities, but the Sepulveda alignment is less vulnerable than the Cahuenga and Griffith Park alignments because it has fewer fault crossings and lower flood vulnerability as compared to the other south to north alignments. Recommendations were developed to address these identified areas of vulnerability to improve resiliency, such as a risk-based investment that could be adopted when designing and sizing pipelines to withstand potential earthquake damage.
- The Program will result in significant economic benefits in terms of job creation, an opportunity for workforce development, and economic growth with multiple benefits throughout the Los Angeles County and Southern California region. There is no significant difference within each of the two approaches in terms of economic benefits.
- Before the public outreach effort and detailed conveyance alignment study, Program costs are the primary differentiator between the approaches. Approach II – IPR with Post-AWPF DPR is estimated to have a capital cost that is approximately $4 billion less than Approach III – DPR at AWPF. However, Approach II requires additional validation testing and DDW approval before implementation.

Based on the evaluation results, all six alternatives will be carried forward into the environmental planning process. The Program Implementation Roadmap in Section 7 describes additional analyses that will be important in further evaluating approaches and alternatives to advance the Program.

7. Program Implementation

The MP is a critical step in developing the Pure Water Los Angeles Program. Following this MP, additional evaluations are necessary to further refine the preferred Program alternatives and develop the final Program that will be implemented. This section brings together the governing considerations, future evaluations, and required decisions into a Program Implementation Roadmap that establishes the next steps to define the Program for implementation.

7.1 PROGRAM STRATEGY

The Pure Water Los Angeles Program will diversify the City's water supply portfolio by maximizing beneficial reuse from HWRP. As a result, the Program will increase and optimize the City's local supplies and support the transition to local water by maximizing the production of purified recycled water as part of a diversified water portfolio in an affordable manner to mitigate risks from climate change and facilitate an equitable and resilient future for the region (LADWP 2024a).

The MP brings together the technical components, including:

- The source water (HWRP MBR filtrate)
- The AWPF treats the source and provides the water supply
- Conveyance, storage, demands, and potential post-treatment for RWA DPR

This MP establishes the alternatives under consideration for the structured Program framework. The intent is that this MP will represent a foundational building block for the Program strategy as the Program phases advance to implementation of Pure Water Los Angeles.

The MP approach was to focus on the high "bookend" value for the sizing of all Program components. The MP assumes capacity will be provided for the reuse of all available flows from HWRP. This assumption sets the direction for Program phasing and conservatively establishes the maximum size of Program components for the subsequent environmental planning phase.

Section 7 brings together the governing considerations, decisions, and next steps to advance the Program following MP completion. The MP report culminates with the Program Implementation Roadmap, which sets important decision points on the Program schedule and identifies many of the ensuing work tasks for LADWP to complete moving forward.

With the completion of the MP, LADWP, in partnership with LASAN, will transition to implementing the many evaluations and steps necessary to deliver the Program. The most immediate steps include but are not limited to:

- Establishing LADWP and LASAN agreements, Program governance, and roles and responsibilities, and memorializing these decisions in an overall joint plan
- Continuing collaboration with LASAN and the Mayor's Office Climate Cabinet Water Resilience Working Group on decisions, such as water quality and treatment location
- Conducting community and stakeholder outreach to obtain Program input
- Completing the programmatic environmental planning phase

- Establishing an overall Program management approach
- Conducting the conveyance alignment study
- Continuing discussions with potential partners
- Establishing Program flow capacity and capability
- Defining the individual projects that constitute the Program
- Conducting hydraulic analyses
- Conducting siting and treatment evaluations, including for the AWPF and DPR treatment locations
- Demonstrating and validating treatment performance for the prescribed and alternative DPR treatment approaches under consideration
- Developing a Real Estate Procurement Plan

As these steps are advanced, LADWP should refine the Program phasing, size, cost, and schedule for implementation.

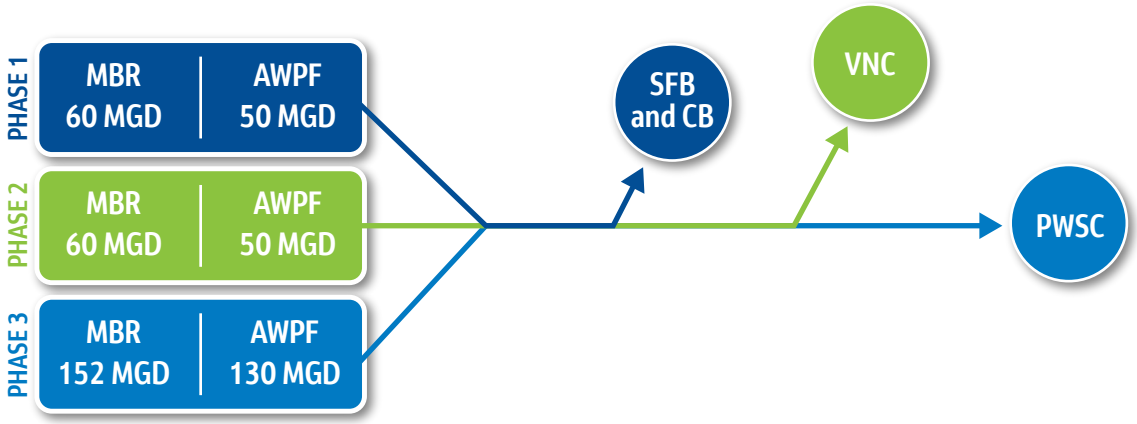
As defined herein, the Program will be implemented in three phases **(Figure 7-1)** that will serve Los Angeles. In the first phase, purified recycled water will be supplied to CB and SFB by 2040. The second phase will follow, providing additional purified recycled water to both SFB and CB, with DPR service to VNC beginning by 2046. The third phase will expand deliveries to SFB, CB, and VNC by 2056, with a potential connection to Metropolitan's PWSC program.

CB and SFB will require IPR-quality water from the AWPF, which allows time for demonstration and approval of post-AWPF DPR options and additional construction of the conveyance pipeline to the north. Given the construction duration for the pipeline to the north, partnerships could be pursued to use the purified recycled water that will be available for Phases 1 and 2.

The number of phases and capacity per phase may evolve as the Program develops. This phasing applies to both Approaches II and III. Phase 1 is for IPR applications and DPR is added as part of Phase 2.

To meet the phasing plan, LADWP, in partnership with LASAN, will need to rapidly take the significant steps necessary to complete the identified evaluations and to manage, finance, administer, permit, and implement the Program and its individual projects.

Figure 7-1. Pure Water Los Angeles Phasing



7.2 RECYCLED WATER REGULATORY AND POLICY CONSIDERATIONS

Implementing Pure Water Los Angeles is a joint effort by LADWP and LASAN. To support the Program advancing, LADWP and LASAN should establish agreements, Program governance, and roles and responsibilities. This should be memorialized in an overall joint plan that addresses the following topics:

- Shared vision and goals
- Communications
- Other partners
- Program timeline
- Financial considerations
- Other topics identified by LADWP and LASAN

Implementing the Program will require planning for the range of regulations related to recycled water, groundwater replenishment, and potable water. Given the regulatory complexity associated with the Program, development of a Program-level permitting plan and project-level permitting plans are recommended. Permitting will require close coordination with DDW and the Los Angeles RWQCB for all phases of the Program.

The Los Angeles RWQCB will be the primary permitting agency for IPR projects with support from DDW, and DDW will be the primary permitting agency for DPR projects with support from the Los Angeles RWQCB. It is recommended to begin engagement with DDW and Los Angeles RWQCB early in the process and continue to engage with them throughout Program implementation. Close coordination with DDW and Los Angeles RWQCB can assist with expediting review of the permitting deliverables and confirming compliance with regulatory requirements.

Additional regulatory requirements and considerations are included in the Potable Reuse Regulations Summary TM (Jacobs and Arcadis 2024b). The following are regulatory considerations included in the Program Implementation Roadmap in Section 7.8.

Phase 1 - Indirect Potable Reuse

For Phase 1 of the Program, CB and SFB would be the only available storage and demand locations, and both are classified as Groundwater Replenishment Reuse Projects (GRRPs) and require IPR-quality water from the AWPF. The first permitting step for the AWPF would be to develop an engineering report for the Los Angeles RWQCB and DDW to document compliance with the applicable regulatory requirements. The treatment technologies for meeting the IPR requirements are well-established with permitted IPR facilities throughout the state. **The assumed treatment train for the AWPF (MBR, RO, and UVAOP) would be able to successfully meet the regulatory requirements for water leaving the AWPF.** The Hyperion MBR Pilot Facility can be used to verify the Phase 1 design parameters for the treatment processes and could also be considered for evaluating DPR treatment processes to facilitate the future evaluation and selection of the DPR location.

Additional GRRP evaluations will be required to confirm compliance with retention time requirements before extraction. In CB, this would involve modeling to locate the injection wells to allow a minimum of 2 months of retention time before the planned new extraction wells. In SFB, the existing extraction well capacity exceeds system demands. As such, new extraction wells are not planned at this time, but retention time to the existing extraction wells must be evaluated. Based on conceptual evaluations, spreading at Pacoima and Hansen Spreading Grounds will provide the required retention time. However, tracer studies will be needed to use the Tujunga Spreading Grounds based on the location of the existing extraction wells. Tracer studies must be initiated before the end of the third month of operation. However, due to the proximity of the extraction wells to the spreading grounds, it is recommended that the tracer study be completed before designing improvements at the Tujunga Spreading Grounds.

Recharge in SFB also needs to consider the impact to the existing remediation facilities. The SFB remediation projects were permitted under DDW's Policy 97-005 for extremely impaired drinking water supplies. Depending on the extent of the contamination plumes when recharge begins, recharge could be used to contain and direct the plumes toward the remediation facility. This potential would have to be verified through additional modeling and analysis.

Contamination conditions similar to SFB have not been reported in CB near the proposed injection and extraction wellfields. It is important to acknowledge that while there is some potential to trigger the 97-005 process in CB, the likelihood remains low in the area of interest. This is because the Program would aim to position extraction well fields away from significant contamination sources and avoid extracting groundwater from depths deeper than those used by existing production wells in the surrounding area. As part of the near-term site investigations led by LADWP, detailed geochemical and groundwater characterization is recommended to inform wellfield site and extraction depth selection.

Phase 2 and 3 – Direct Potable Reuse

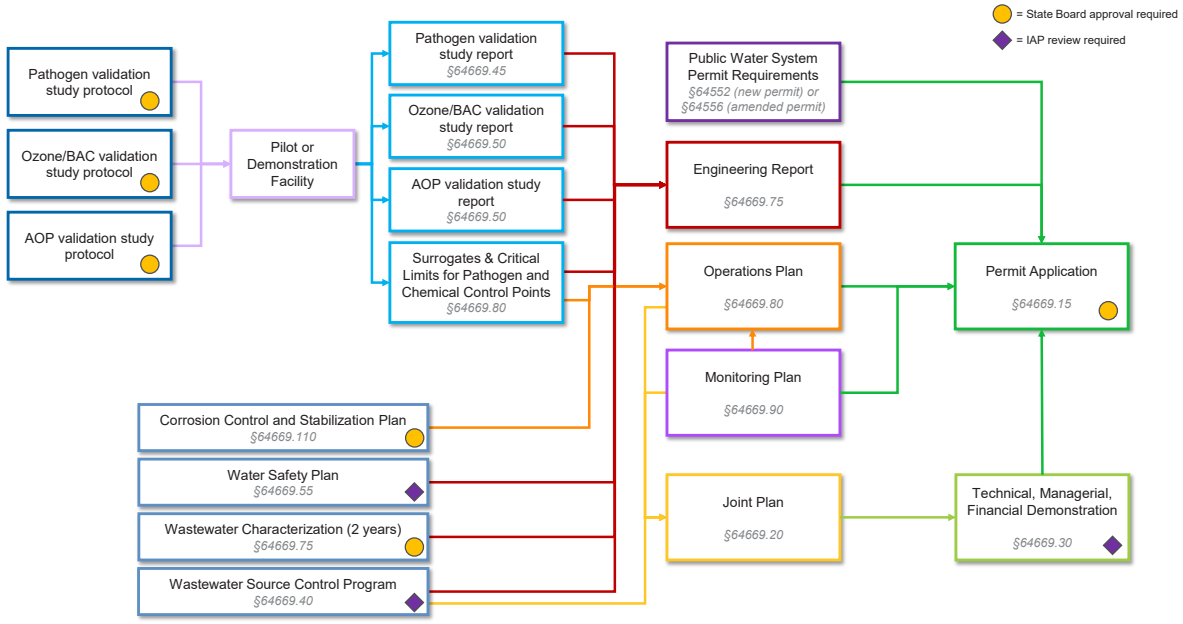
Phase 2 of the Program includes DPR treatment to integrate water at VNC. Due to the recent adoption of the DPR regulations, effective on October 1, 2024, no DPR facilities are currently permitted in California. Thus, implementation of DPR is still an evolving process. Engaging with DDW early is recommended, especially given that approval may be needed under the treatment alternatives clause of the regulation.

DPR will require permitting activities beyond IPR requirements, including additional evaluations and documentation with potential Program partners, including **(Figure 7-2)**:

- Engineering Report
- Operations Plan
- Monitoring Plan
- Joint Plan
- Technical, Managerial, and Financial Demonstration
- Public Water System Amended Permit

The DPR regulations provide a prescribed or default treatment train that includes ozone and BAC upstream of RO. However, the alternative treatment clause would allow for alternative treatment trains if they are proven to provide equal or better public health protection. The screened approaches include

Figure 7-2. Direct Potable Reuse Permit Application Documentation



both Approach II that assumes an alternative treatment train may be used, pending further validation testing and DDW negotiation, with DPR treatment at or near VNC and Approach III that includes the prescribed or default treatment train in the regulations. The alternative treatment train could provide financial benefits, including avoiding overtreatment of water that will be recharged into the ground.

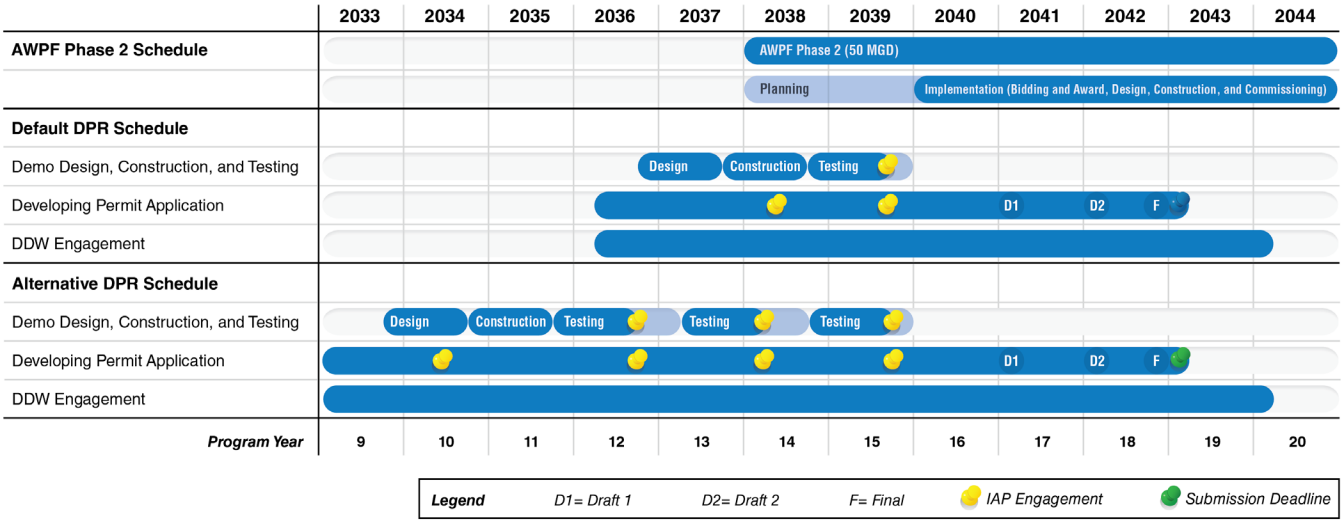
Validation testing at a demonstration facility (demo) and additional evaluations will be required for approval of an acceptable treatment train, and then the costs and benefits of the two approaches can be used to select the preferred DPR approach and location.

Either approach will require validation testing to:

- Confirm the ozone and BAC design parameters
- Evaluate alternative treatment technologies
- Evaluate impacts to LAAFP operations
- Evaluate impacts to the distribution system

The estimated extent of testing will vary, depending on the selected approach. It is estimated that planning and testing for the prescribed or default treatment train would require approximately 4 years for DDW engagement and testing before beginning design of the treatment process **(Figure 7-3).** For an alternative treatment train, approximately 7 years of planning and testing is estimated to be required before starting design. Actual testing and permitting schedules may vary and will also be dependent on the availability of resources and funding. The schedule presented on **Figure 7-3** is based on the latest possible schedule to align permitting with the Phase 2 design and construction schedule. Testing can be initiated earlier in the Program schedule to assist with final selection of the DPR location. The default and alternative train testing can also be completed concurrently to simplify the testing schedule.

Figure 7-3. Conceptual Timeline for Permitting of the Default and Alternative Direct Potable Reuse Treatment Trains



An additional differentiator between Approach II – IPR with post-AWPF DPR and Approach III – DPR at AWPF is the potential for TWA. Under Approach II, the DPR water would be integrated upstream of LAAFP, and from there, the water can reach most of LADWP's distribution system. Because LAAFP is located at the terminus of the planned conveyance system, the DPR implementation schedule will be limited by the design and construction schedule for the conveyance projects and successful demonstration of a post-AWPF DPR treatment train under Approach II.

To potentially expedite integration of DPR water, TWA within the distribution system could be further evaluated. The conveyance pipeline is planned to cross several major distribution trunklines and reservoirs. If DPR is achieved at the AWPF (Approach III), integration into these trunklines and reservoirs could be considered but would have to be balanced with considerations of the following but not limited to factors:

- LADWP policy
- Potential water quality impacts
- Community engagement
- Operational flexibility
- Local demands

DPR will require developing an approved Pathogen and Chemical Control Point Monitoring and Response Plan. The plan will require identifying the time to actuate a diversion or shutoff valve if the limits are not achieved to divert or completely stop the flow to the distribution system. Part of the evaluation will need to identify locations that can accept the full flow from the treatment facilities. These considerations are included in the Program Implementation Roadmap later in this section.

As discussed in Section 3, a DiPRRA is the public water system responsible for compliance with the DPR regulations. LADWP is a public water system in California and holds drinking water supply permits for the components identified within these alternatives. The DPR regulations also require drinking water treatment operator certifications (T-certifications), as well as advanced water treatment operator certifications, as summarized in **Table 7-1**. The Chief Operator over the entire DPR treatment train must be a drinking water Grade 5 Treatment (T5) Operator, with a Shift Operator holding a minimum of a T3 certification.

Table 7-1. DPR Operation Certification Requirements

Operator Requirement	Wastewater Treatment	Advanced Treatment	Drinking Water Treatment
Drinking Water Treatment Certification	Chief Grade T5 Shift Grade T3 (minimum) [a]	Chief Grade T5 Shift Grade T3 (minimum)	Chief Grade T5 Shift Grade T3 (minimum) [a]
Advanced Water Treatment Certification	No [b]	Chief AWT T5 Shift AWT T3 (minimum)	No [b]
24 hour, 7 day staffing	Yes [c]	Yes	Yes [c]

[a] Required if pathogen, chemical, or corrosion control is provided.
[b] AWT certification is not required, unless the facilities provide chemical control.
[c] Assuming pathogen or chemical control is provided.

7.3 APPROACH TO PARTNERSHIPS

The mission of Pure Water Los Angeles is to "partner across the region to build and operate a world-class advanced recycled water system, to replenish local groundwater basins and support future direct potable reuse applications" (LADWP 2024a). Thus, partnerships are an essential element of the Program.

As identified in Goal 2 **(Figure 1-5)**, LADWP seeks to "construct new and upgrade existing City's infrastructure in a cost-effective and responsible manner" (LADWP 2024a). Partnering with regional agencies can leverage existing infrastructure, which can reduce costs. As described in Section 3, LADWP and LASAN plan to partner together to implement the Program, with LASAN as the source water partner, and LADWP is considering several additional regional and local partnerships.

The Program Implementation Roadmap, described in Section 7.8, includes phasing centered around delivery of Pure Water Los Angeles recycled water to LADWP-controlled storage and demand locations based on direction from LADWP. Given the duration required to construct the pipeline to the north, partnerships could be pursued for more use of the purified recycled water that would be available for Phases 1 and 2. There are opportunities to accelerate this phasing by engaging in regional partnerships that could take purified recycled water earlier than the availability of the first LADWP storage or demand locations.

Partnership opportunities with the potential for the highest-volume use of purified recycled water from the Program include:

- West Basin will continue to receive approximately 54 cfs (35 MGD), which may be secondary effluent, MBR effluent, IPR quality, or DPR quality, depending on phasing and ultimate alternative selected. This continued delivery of flow was assumed to precede the Program phases defined in the MP, and to continue through all phases of Program implementation.
- WRD may accept up to 15 cfs (10 MGD) to replace imported water in CB, as well as an additional 31 cfs (20 MGD) toward LADWP's existing rights in CB. An additional opportunity would be to provide flow to support brackish plume remediation in WCB.
- Ongoing partnership discussions with Metropolitan have defined that Metropolitan can receive a constant flow of 73 cfs (47 MGD) to the PWSC program with additional potential flows to the Jensen WTP. Additional details of a potential agreement are part of ongoing discussions.

If LADWP elects to move forward with a potential partnership with West Basin, and if an agreement can be reached with West Basin, LADWP could consider a hybrid plan for the location of the AWPF, with some of the AWPF capacity constructed at the ECLWRF, and some capacity at another location at or near the HWRP (Hazen 2024).

The potential partnership with West Basin also includes an opportunity to consider leveraging existing infrastructure and considering a smaller, 20-MGD AWPF. This smaller AWPF could be accomplished in an earlier time frame, without demolition or disruption to existing operations. In the short-term, this smaller AWPF could serve a number of users and be integrated into a future large-scale AWPF (Hazen 2024).

As the Program moves forward, LADWP plans to continue to advance these potential partnership opportunities and incorporate potential future agreement details into the Program.

7.4 EQUITY ROADMAP

As a foundational element for a successful Program, LADWP developed a proposed Equity Roadmap that incorporates principles from the *LA100 Equity Strategies* document (LADWP 2023) and the national Justice40 Initiative (EPA 2024) for an equitable transition to a sustainable water supply program using purified recycled water. The Equity Roadmap, which is provided in detail in Appendix A, includes a variety of initiatives, studies, and implementation efforts through three phases to help the City reach its equity-related goals.

Through this effort, three core pillars of equity and justice remain as the foundation of this Equity Roadmap, including **(Figure 7-4)**:

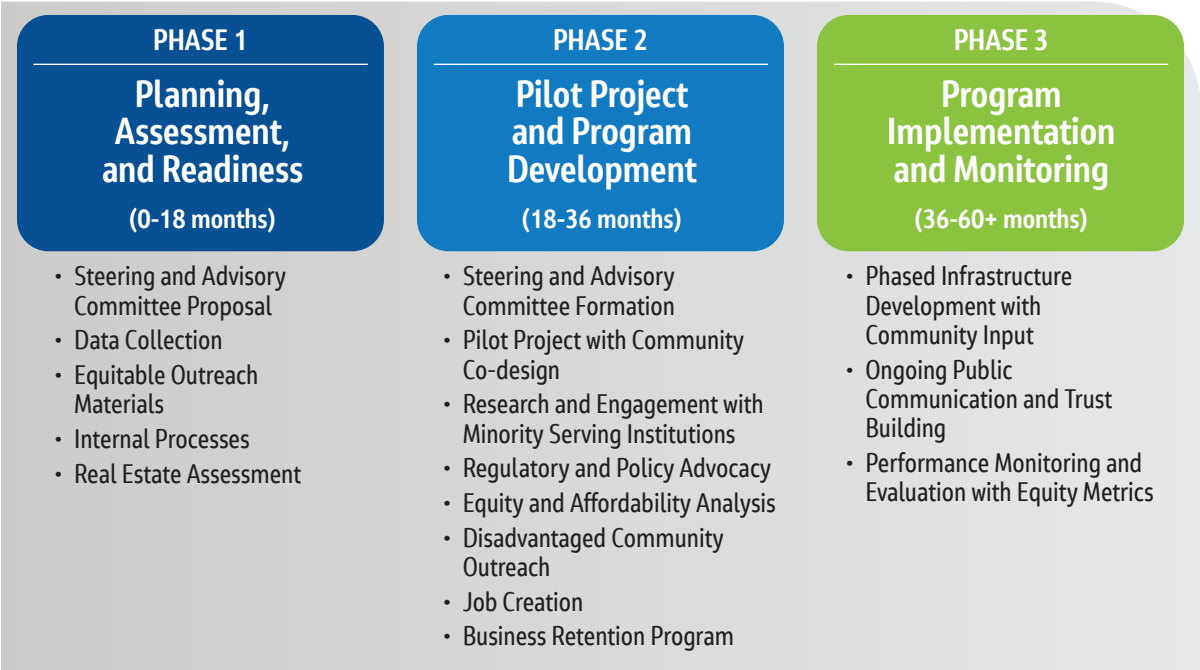
Figure 7-4. Equity and Justice Core Pillars

1. **Recognition Justice:** Acknowledges and addresses historical and systemic inequities, so that marginalized communities are seen, heard, and valued
2. **Procedural Justice:** Promotes fair and transparent decision-making processes that involve all stakeholders, including those traditionally excluded from power structures
3. **Distributive Justice:** Focuses on equitable distribution of benefits and burdens so that the advantages of recycled water programs are shared fairly, and negative impacts are minimized for vulnerable communities

Ultimately, consideration and implementation of these tenets are essential for creating a Program that benefits all members of the community and contributes to a more just and equitable society.

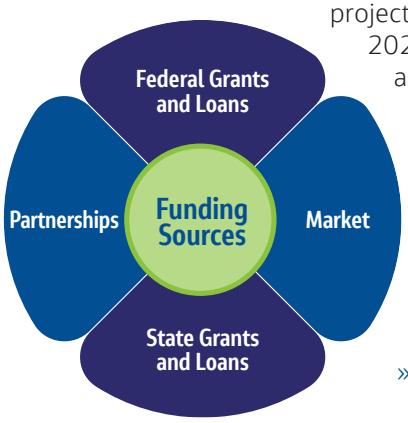
LADWP plans to implement the activities described in three Equity Roadmap phases **(Figure 7-5)** beyond the MP, extending through the CEQA process and Program implementation.

Figure 7-5. Equity Roadmap Phases



7.5 FUNDING OPPORTUNITIES

Because the Program is of significant size, duration, and capital cost, implementation will require an assessment of costs, benefits, and delivery logistics to identify the appropriate sequencing of projects that meets the City's operational, financial, and affordability targets (Jacobs 2024f). Funding applications are coordinated with the Mayor's Office to align pursuits and capitalize on synergies for the benefit of ratepayers. Given the complex nature of LADWP's rate structure, the Financial Services Organization's financial forecasting will inform the final selection of projects and schedules for feasibility and cost-effectiveness.



To minimize ratepayer impacts, an effective long-term funding strategy for the Program will focus on the lowest cost funding and financing options, including:

- » Low interest loans
- » Grants
- » Debt service restructuring

Alternative funding, which is outside of the traditional sources, such as bonds, can help support rate impact optimization. The funding landscape was assessed to identify the variety of sources available to potentially support Program funding. There are currently unprecedented opportunities for water and wastewater project funding and financing for planning, design, and construction. To maximize access to nontraditional reuse funding programs, it is crucial to demonstrate connections between the Program and funding opportunity objectives and goals. While there are significant opportunities for funding, the competition is high, and project readiness leads to a higher probability of funds capture. The *Funding TM* (Jacobs 2024f) provides additional detail.

LADWP will continuously evaluate funding conditions and opportunities throughout the life of the Program to adapt implementation to changes in circumstances. This iterative approach will allow the Program to remain flexible and responsive to evolving financial conditions, market trends, and Program requirements. Regular reviews will facilitate alignment of the funding strategy with LADWP goals and affordability targets.

7.6 REAL ESTATE REQUIREMENTS

The Pure Water Los Angeles Program has specific and substantial real estate requirements. As estimated by LADWP, these include:

- Facilities, such as tanks, pump stations, injection and extraction wells, and treatment plants: Approximately 40 to 60 acres
- AWPF: Approximately 30 acres for DPR facilities
- Learning Center: Up to 5 acres
- Temporary Sites: Varies; additional sites needed for parking mitigation and laydown areas
- Other: Buildings to store materials and buildings for required staffing increases to support Program capacity needs; size to be determined as a function of hiring plans.

Moving forward, LADWP has identified that implementing a holistic real estate procurement strategy offers advantages. This includes coordinated real estate planning and strategy, potential cost savings, centralized risk management, and alignment on needs and schedule. Development of the Real Estate Procurement Plan is an important next step for LADWP to facilitate implementation of the Program.

7.7 ADDITIONAL PROGRAM BENEFITS

In addition to the economic and resiliency benefits of Pure Water Los Angeles identified in Section 6, there are a number of other potential benefits expected to be provided by the Program. **Figure 7-6** summarizes several types of benefits with nontraditional metrics that could be further evaluated for Pure Water Los Angeles. The MP effort estimated traditional metrics that could be easily quantified, such as economic benefits in terms of job creation and resiliency benefits, as in potential cost savings during a seismic disruption of traditional water supplies. But as the Program develops, LADWP may also explore these additional indirect benefits for incorporation into LADWP's materials that are used for outreach and communication. For example, engagement with stakeholders is critical to understanding potential social value benefits, such as the enduring value of enhanced public spaces.

The additional suite of benefits includes nontraditional, socioeconomic benefits that could be communicated as additional drivers for the Program. While job creation was modeled and estimated, benefits from the well-being of employment, training, or other workforce development activities were not captured as part of the MP. Technical topics, such as the value of utilizing water supply that is lower in salinity than the imported supplies, could also be considered in terms of benefits to the region. Many of these benefits could potentially be quantified and possibly even monetized to understand total benefits as compared to the estimated delivery costs. As the Program becomes more defined, these benefits with nontraditional metrics could be further evaluated to understand the overall benefits of Pure Water Los Angeles. LADWP is currently developing a Benefits Register to demonstrate the holistic value of the Program as part of the ongoing Water Research Foundation Project 5196.

Figure 7-6. Identification of Program Benefits

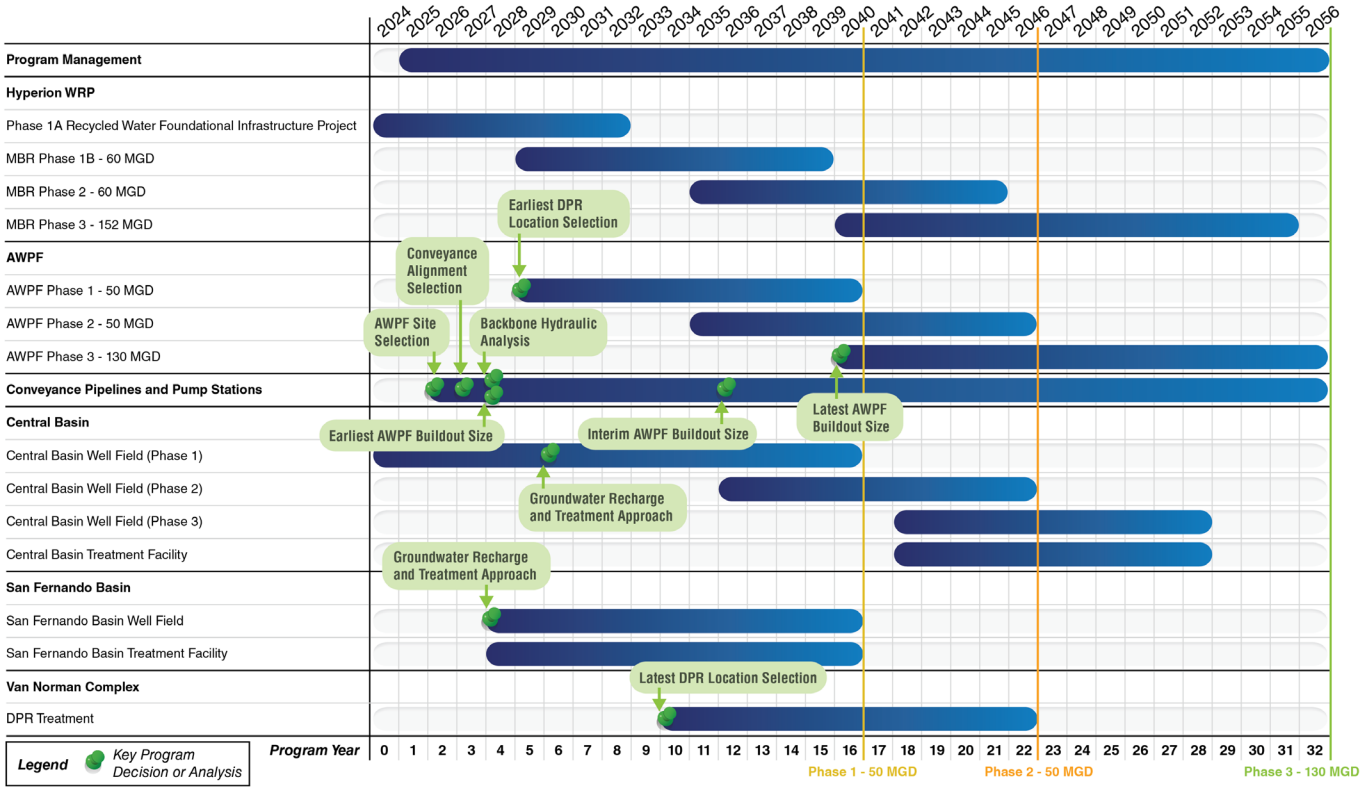
7.8 PROGRAM IMPLEMENTATION ROADMAP

As LADWP moves forward with implementation of the Pure Water Los Angeles Program, there are several decisions needed to define the final Program and main Program components to meet the proposed phasing schedule. This section describes the steps and high-level decisions required during Program planning and implementation.

7.8.1 *PROGRAM TECHNICAL COMPONENT IMPLEMENTATION*

Figure 7-7 shows the proposed Program Implementation Roadmap for implementing the major components or projects within the Program. The roadmap includes the decisions and analyses required to implement the Program. Expediting certain decisions (such as AWPF buildout sizing or DPR location) can be beneficial for optimizing the Program and component designs. Where applicable, **Figure 7-7** identifies both earlier decision points, as well as the latest possible decision point to maintain the Program schedule. The actual Program schedule may vary, depending on availability of resources and Program funding. The roadmap includes project-specific planning, design, and construction within the three defined phases. However, before initiating the project-specific planning, several decisions will be required as the Program is further developed and refined. Continued collaboration with LASAN and the Mayor's Office Climate Cabinet Water Resilience Working Group will be important for completing the identified decisions for the Program.

Figure 7-7. Program Implementation Roadmap for Critical Decisions



The evaluations completed under the MP provide an initial screening-level analysis of each component, but additional planning and technical evaluations will be required to inform the decisions required for implementation. A summary of the evaluations and activities needed to support decision-making was developed for the each of the Program components. The summaries focus on the near-term technical evaluations for each of these components:

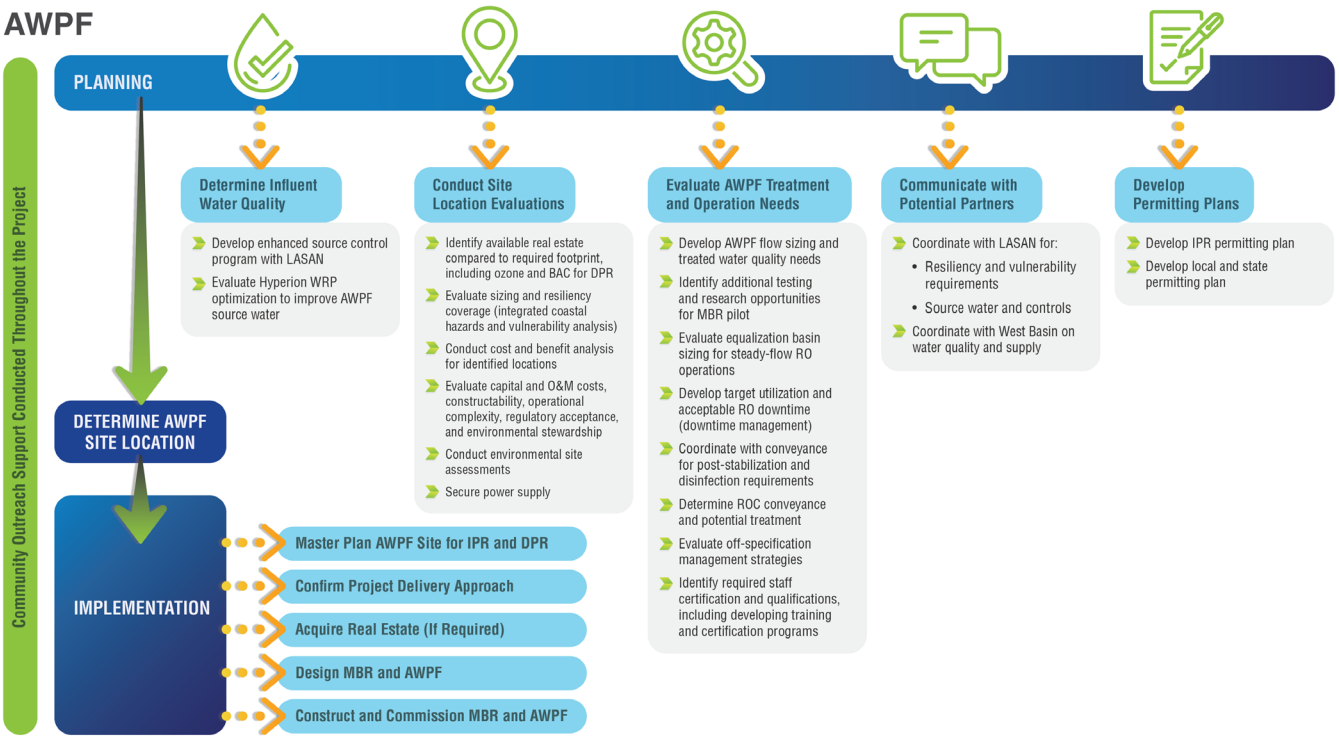
- AWPF
- SFB
- DPR
- CB
- Conveyance

Section 7.8.2 presents some additional Program-level evaluations that will be required.

Advanced Water Purification Facility

HWRP treated water will provide source water to the Program for treatment at the AWPF. With an assumed treatment train already established as IPR with space for future DPR per the prescribed approach, the primary decision for the AWPF is to determine the location. Multiple locations are currently being evaluated for the AWPF and include co-locating the AWPF at the HWRP, as well as at an offsite location (Hazen 2024). Advantages and disadvantages have been identified for each location. However, at the time of the MP, a final location had not been established. The AWPF location will directly impact the conveyance design and is the first decision that must be made to begin project-specific planning and design of both the AWPF and conveyance trunklines. **Figure 7-8** shows the recommended analyses needed to identify the selected location and plan the AWPF design and operations.

Figure 7-8. Evaluations and Activities for Advanced Water Purification Facility Decision Making



Phase 1 of the Program is assumed to produce IPR-quality water from the AWPF. As such, the treatment train for Phase 1 is assumed to be MBR, RO, and UVAOP. The Hyperion MBR Pilot Facility is currently being planned to better develop the process design criteria. This facility also provides opportunities for testing and evaluation of additional treatment processes that could support the future conversion to DPR. It is unknown at this time whether the DPR treatment will be located at the AWPF or VNC. Thus, the potential AWPF sites need to be master planned for IPR treatment as well as the addition of ozone and BAC (and MF ahead of RO) until the DPR location is decided.

The latest schedule for a decision on the location of DPR treatment is estimated to be 2033 for the Program to meet Program phasing. However, an earlier decision on the location of DPR treatment would allow for a more optimized AWPF layout, especially if ozone, BAC, and MF at the AWPF are not required, given the limited available footprint at HWRP or other sites under consideration. For an AWPF at the HWRP, an earlier decision would also be of significant value to LASAN and their strategic master planning of the HWRP site.

In addition to determining the treated water quality for the AWPF, additional evaluations will be required to determine the Program sizing. Program sizing should consider:

- LASAN flow requirements to maintain the ocean outfall that include future climate scenarios
- Results from modeling the City's ability to use Program flows
- Results from monitoring changes to current water supplies and priorities
- City resiliency goals
- Coordination with regional and local partners for additional Program demands
- Off-specification water management

Conveyance

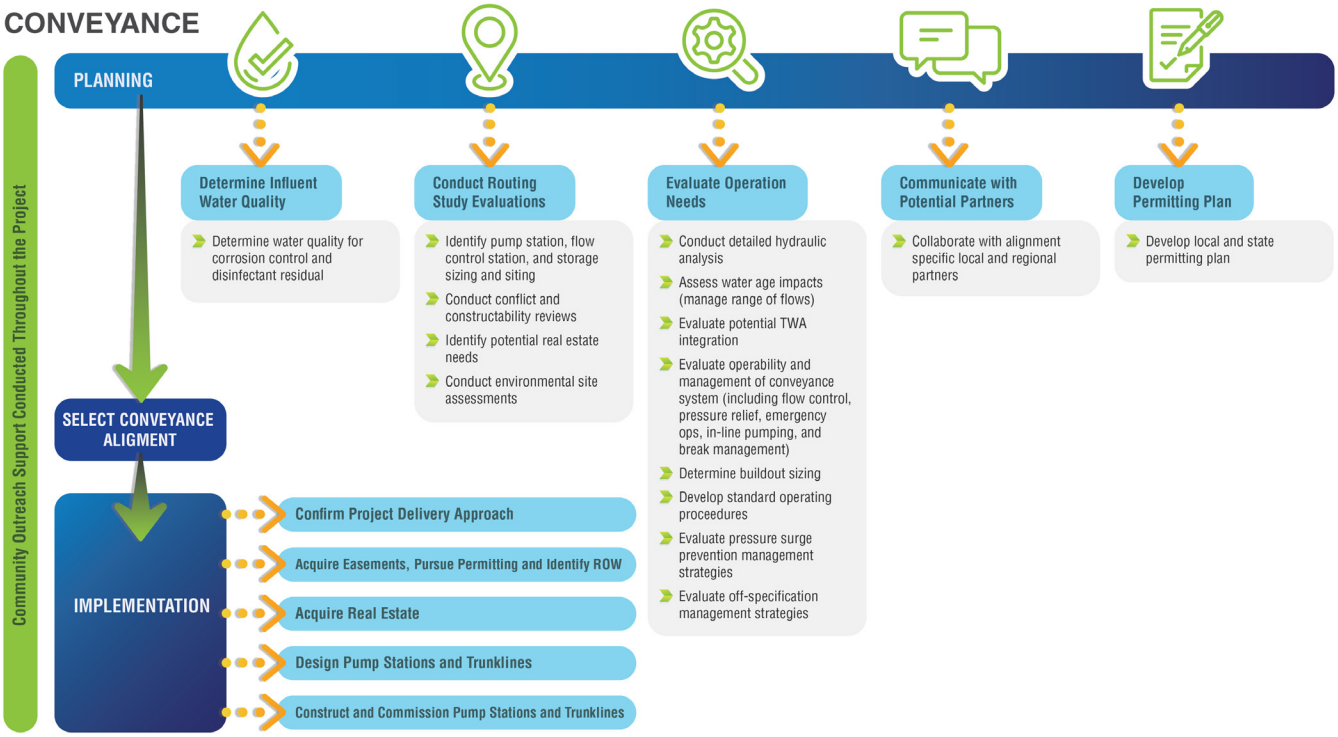
Conveyance design and construction are estimated to be the critical path for AWPF phasing based on access to storage and demand locations. The MP identified three primary south to north alignment alternatives: Sepulveda, Cahuenga, and Griffith Park, that could be used for conveyance, with a range of advantages and considerations based on the conceptual evaluations. The first steps to selecting the final conveyance alignment are to conduct public outreach, develop equity strategies, and complete a detailed routing study to better refine the costs, risks, real estate needs, and constructability of each alternative. To supplement the routing study, additional evaluations include the following:

- Hydraulic modeling to evaluate pipe sizing, pressure relief, storage, flow control stations, and pump stations.
- Considerations for potential TWA integration.
- Developing conveyance management approaches, such as storage, potential in-line pumping, and off-specification water management.

Figure 7-9 shows the recommended analyses needed to identify the final alignment and backbone design and operations.

Once the AWPF site location is known, the conveyance design could begin, pending the final alignment selection, if a common alignment can be used, but the alignment selection must be known before reaching the Sepulveda alignment junction. The ultimate size (flow capacity) of the Program should also be considered during conveyance design. The size of the Program will establish the pipeline sizing, which represents a major portion of the Program cost, and will also impact water quality and water age, off-specification water management, and future flexibility.

Figure 7-9. Evaluations and Activities for Conveyance Decision Making



Central Basin and San Fernando Basin

CB and SFB will be the first storage and demand locations that can accept water from the AWPF. These locations will be GRRP and will require a minimum of IPR-quality water from the AWPF. Despite the AWPF water quality requirements being known, several technical evaluations in each basin are needed before designing the Pure Water Los Angeles facilities **(Figures 7-10 and 7-11)**. The governing decision for both CB and SFB will be to develop the approach to groundwater recharge, extraction, and potential treatment.

Groundwater injection is projected to be important to both basins, as it provides a mechanism for year-round operation compared to using the existing stormwater spreading grounds in SFB that would not be available to accept Pure Water Los Angeles water when stormwater is present.

Pilot well testing is needed to confirm the wellfield details, including:

» Well depth and design criteria, such as screen size and filter packing gradation

» Well injection capacities

» Number of wells required

» Land requirements

Figure 7-10. Evaluations and Activities for Central Basin Decision Making

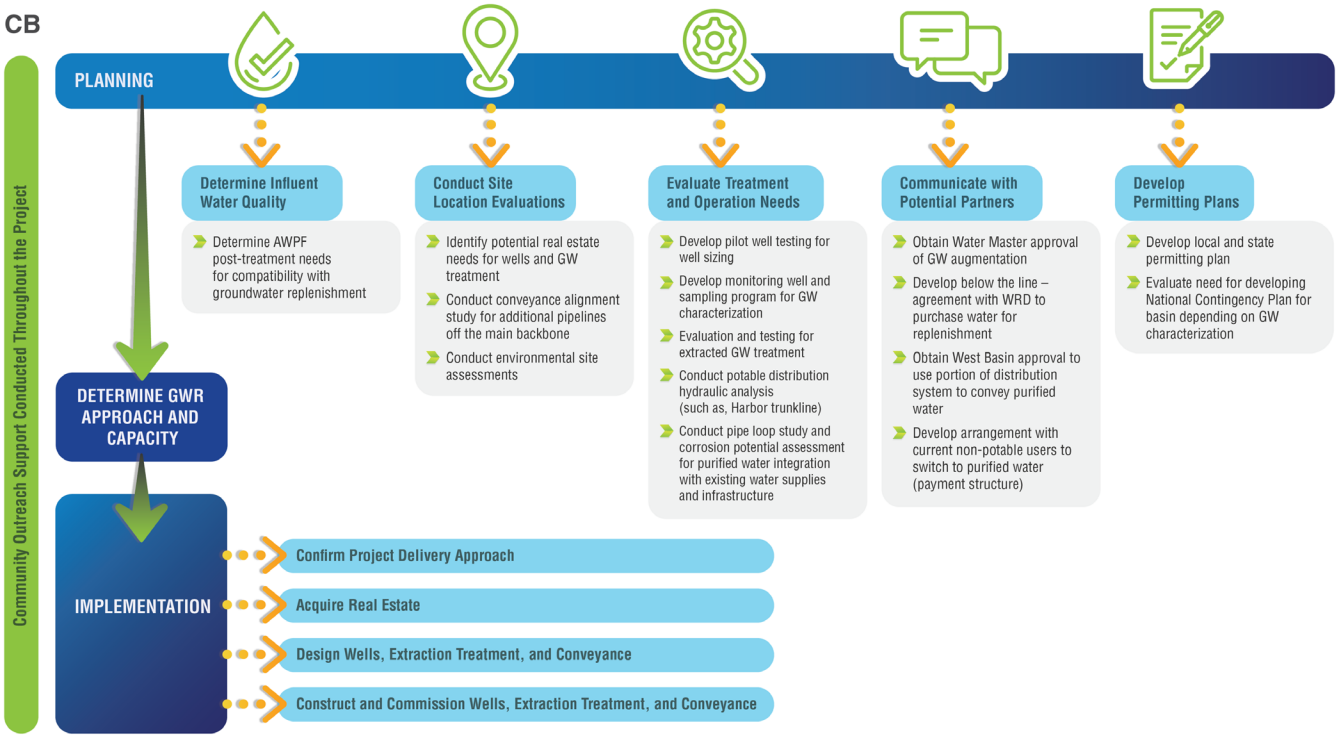
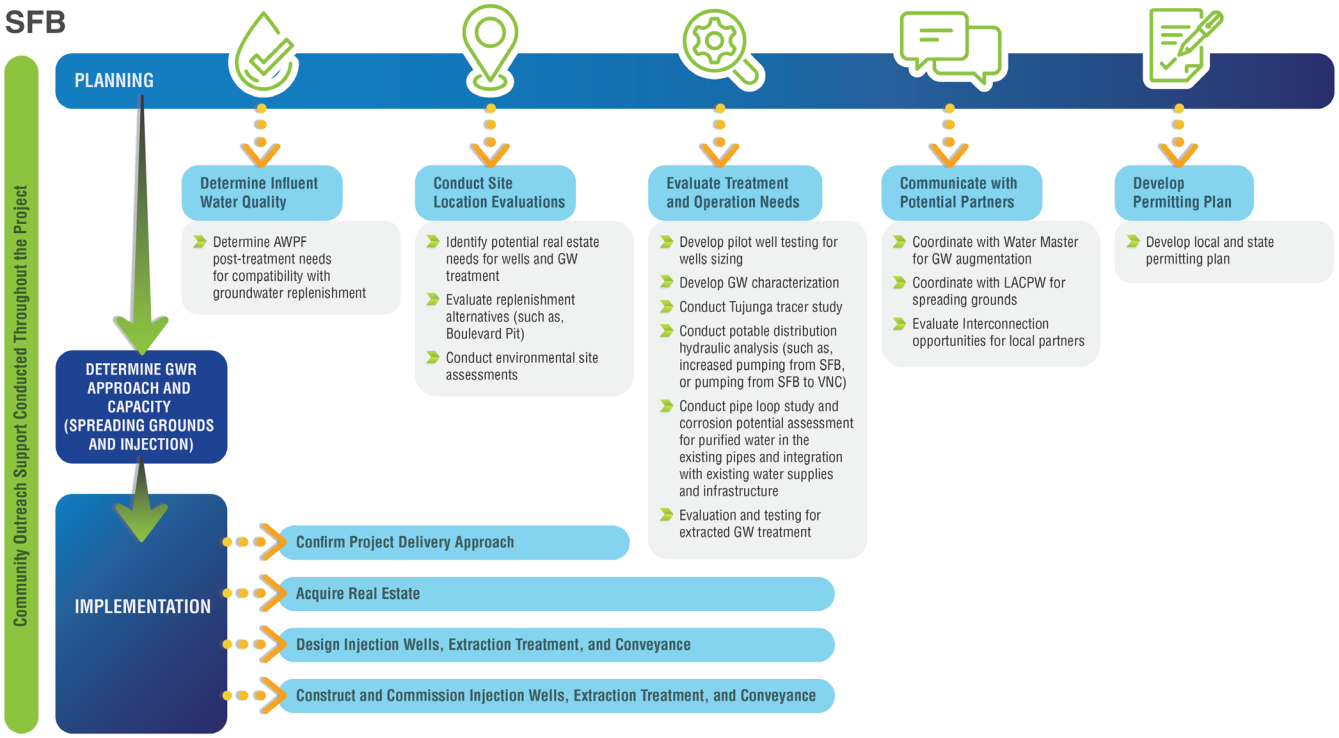


Figure 7-11. Evaluations and Activities for San Fernando Basin Decision Making



This information will directly correspond to the cost and benefit of groundwater injection in these basins. If individual injection well capacities are less than anticipated from the conceptual evaluation, the recharge capacity of the injection wellfield will need to be re-evaluated to optimize cost and minimize operational complexity. To supplement the pilot well testing, additional steps include evaluating the compatibility of the AWPF water with native groundwater and the aquifer matrix, and compliance with the RWQCB basin plans to determine whether any AWPF optimizations or post-treatment will be required. As noted previously, evaluations will also be required to determine the retention time of the injected AWPF water before that water reaches existing or planned extraction wells in the basins; injection locations require input from the Los Angeles RWQCB and Water Master.

After recharge, the Program's purified recycled water will mix with local groundwater. Depending on the native groundwater characteristics and potential contamination, additional treatment of the extracted water may be needed. Groundwater characterization and modeling will be required to evaluate the need for treatment of the water after extraction as well as evaluating potential impacts to existing WTPs.

Direct Potable Reuse

As planned, Phase 2 and Phase 3 of the Program will include DPR to integrate water at VNC. The governing decision for DPR treatment will be the location of treatment at or near the AWPF or VNC. **Figure 7-12** shows the recommended analyses needed to identify the selected location and plan the DPR design and operations. To evaluate post-AWPF DPR, validation testing will be the first step required to determine what treatment processes and monitoring would meet the treatment alternatives clause in the DPR regulations.

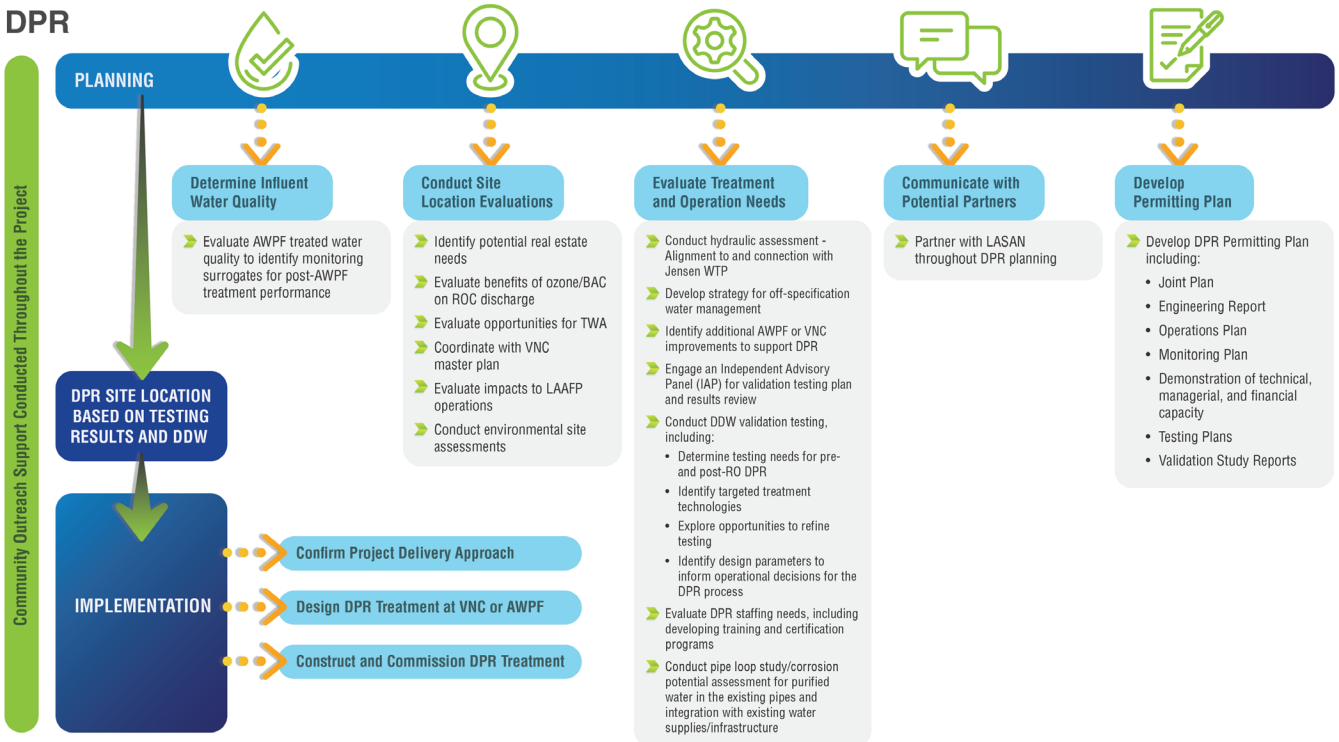
It is estimated that up to 7 years of planning and testing will be required to validate alternative treatment processes. Developing an Independent Advisory Panel (IAP) will be an important step in the process, as the IAP is required by the DPR regulations and will be instrumental in the test plan development and testing results reviews.

Once an accepted treatment approach is known, a detailed evaluation of DPR treatment can be completed, with consideration for:

- Available real estate and impacts to other plant operations
- Potential benefits to the RO concentrate discharge
- Impacts to the LAAFP operations
- Off-specification water management
- Operations staffing

The latest date for the selection of the DPR location is estimated to be 2033. However, an early decision could assist with conveyance sizing based on the flow estimated to reach VNC, optimizing the AWPF layout, and informing HWRP site planning.

Figure 7-12. Evaluations and Activities for Direct Potable Reuse Decision Making



7.8.2 *PROGRAM-LEVEL IMPLEMENTATION*

In addition to the roadmaps for the individual components and the previously described approaches for regulatory, partnerships, equity, funding, and real estate, implementation of the overall Program will require further evaluations in several areas to support the decision-making process for defining the final Program. **Table 7-2** presents an initial list of additional Program-level evaluations that support decision-making and advance the Program. The table presents initial near-term evaluations. Additional evaluations will be required as the Program implementation progresses and as the Program is refined. One important immediate step is the development of a Program Management Framework and approach.

Table 7-2. Program-level Evaluations to Support Decision Making

Program Evaluations	Description
Potable water system modeling for integration	ONAT modeling completed for the MP assumed that the Program flows would be able to supply demands throughout LADWP's distribution system. Additional potable water system modeling is recommended to confirm the impact of integrating the Pure Water Los Angeles water into the distribution system after all treatment requirements are met. This would include flow, pressure, water quality, water age, and the nitrification potential for integration locations. Section 6.2.1 presents additional modeling recommendations.
Future Program adaptability	As part of the MP, various integration locations and strategies were evaluated. TWA and SWA are two integration strategies that were not included in the evaluated alternatives, but it was recognized that these strategies could provide benefits if there are future policy or demand changes. TWA could also potentially provide schedule benefits if it is desirable to LADWP. Continuing to evaluate these strategies could inform the selection of the final alternative.
Integration of water banking strategy	The ability to store water along the LAA is an important factor in how much LAA water must be used during wet years. LAA is a higher-priority supply based on its carbon footprint, cost, and water quality, and that prioritization may result in lower utilization of Program water. Additional storage of LAA water (such as, water banking) could provide additional water supplies during dry years, as well as increase the ability to maximize the use of recycled water
Staff resourcing	The implementation of the Program will require committed LADWP staffing resources for developing the following resources: » Program management » Planning » Design » Construction » Permitting » Funding » Procurement » Operations An evaluation is recommended to develop the necessary staffing resources and coordination with existing resources to determine additional staffing needs.
Energy analysis and greenhouse gas emissions	Controlling energy use and greenhouse gas emissions is a main City goal. IPR and DPR are energy-intensive treatment processes, but IPR and DPR represent a local water supply with less distance for conveyance and pumping. Their overall energy impact can be compared to other imported water supplies that the City relies on, as well as other new water sources (such as, ocean desalination). The energy analysis can also be considered when evaluating alternatives once the alignments and DPR treatment technologies are better defined. Consideration should also be given to efforts to increase renewable energy in the grid.

Pure Water Los Angeles represents a significant undertaking in capacity, cost, partnerships, schedule, and complexity, and is coupled with factors such as budget constraints, workforce shortages, and stringent regulatory requirements. Combined, these considerations necessitate a structured and coordinated approach to Program management for successful implementation. LADWP plans to adopt a Program Management Framework, drawing on the valuable insights and guidance provided by LADWP's Water Research Foundation Project #5196, "One Water Program Management: A Knowledge Base and Guidance Manual," as summarized in this section. Implementing a program management approach is expected to enhance efficiency and effectiveness, improve stakeholder engagement and collaboration, strengthen organizational capacity, and maximize benefits.

LADWP should consider first developing a Program Management Framework as a comprehensive approach to defining, initiating, and delivering the Program. The framework should address integrated planning, collaborative partnerships, risk management, performance measurement, continuous improvement, capacity and capability, addressing challenges, and building trust with the community and key stakeholders.

The transformation of organizational structures is imperative for the successful implementation of large and complex infrastructure programs. To effectively manage the complexity of the Program, LADWP is considering establishing enabling units within its organizational structure. Enabling units are specialized teams or departments within an organization that provide essential resources, expertise, and services to facilitate meeting the objectives of a complex program. By centralizing core functions and assigning dedicated champions, enabling units, such as financial management, legal and regulatory affairs, and outreach, will streamline operations, improve accountability, and align efforts with LADWP's strategic goals.

7.8.3 *PROGRAM IMPLEMENTATION ROADMAP SUMMARY*

This MP report establishes the alternatives under consideration for the structured Program framework. The intent is that this MP will represent a foundational building block for the Program strategy to move forward in subsequent Program phases to implement Pure Water Los Angeles.

To meet the established phasing plan, LADWP will need to take the significant steps necessary to complete the identified evaluations and to manage, finance, administer, permit, and implement the Program and its individual projects. The Program Implementation Roadmap was developed by component to help identify the next steps for the City to implement the Program and make decisions to maintain the Program schedule.

As these steps advance, LADWP should refine the Program phasing, size, cost, and schedule for implementation. Appendix A provides a summary of the Program Implementation Roadmap and the technical evaluations discussed in this section.

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