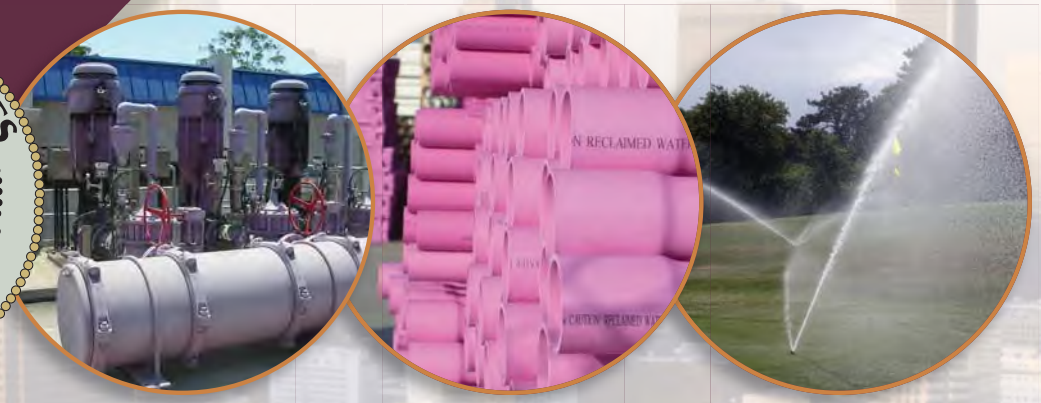
City of Los Angeles

Recycled Water Master Planning

Los Angeles Department of Water and Power
and
Department of Public Works



Non-Potable Reuse Master Planning Report

Prepared by:

RMC in association with CDM Smith

Volume 1 of 3: Report
March 2012

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Non-Potable Reuse
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LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

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Title: Non-Potable Reuse Master Planning Report

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Date: March 2012

Reference:
Task 2: Non-Potable Reuse Master Planning Report
Subtask 8.4 Non-Potable Reuse Master Plan

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Table of Contents

Volume 1 of 3: Report

Appendices

Volume 2 of 3: Appendices A-G

Appendix A Existing and Planned Systems TM
Appendix B Non-Potable Reuse Regulatory and Practices TM
Appendix C Integrated Alternatives Development and Analysis TM
Appendix D NPR Service and Reliability Goals and Criteria TM
Appendix E Cost Estimating Basis for Recycled Water Master Planning TM
Appendix F Satellite Reuse Options TM
Appendix G USC / Exposition Park Satellite Assessment TM

Volume 3 of 3: Appendices H-J

Appendix H Customer List
Appendix I Potential Water Recycling Project Descriptions
Appendix J Detailed Cost Estimates

Tables

Figures

Abbreviations and Acronyms

AF	Acre-Feet
AFY	Acre-Feet per Year
AWTF	Advanced Water Treatment Facility
AWPF	Advanced Water Purification Facility
BOE	Bureau of Engineering, City of Los Angeles
BOS	Bureau of Sanitation, City of Los Angeles
BWP	Burbank Water and Power
CCI	Construction Cost Index
CDPH	California Department of Public Health
CIMIS	California Irrigation Management Information System
CIS	Customer Information System
City	City of Los Angeles
County DPH	LA County Department of Public Health
CRWRF	Carson Regional Water Reclamation Facility
DCTWRP	Donald C. Tillman Water Reclamation Plant
DGB	Dominguez Gap Barrier
DPW	Department of Public Works
ELWRF	Edward C. Little Water Recycling Facility
ENR	Engineering News Record
fps	Feet per Second
ft	Foot
FY	Fiscal Year
GBIS	Glendale Burbank Interceptor Sewer
GHG	Greenhouse Gas
gpm	Gallons per Minute
GWR	Groundwater Replenishment or Groundwater Recharge
HCF	Hundred Cubic Feet
hp	Horsepower
hrs	Hours
HGS	Harbor Generating Station
HTP	Hyperion Treatment Plant
IAA	Integrated Alternatives Analysis
IAP	Independent Advisory Panel
kW-hr	Kilowatt-hour
LACRWAC	Los Angeles County Recycled Water Advisory Committee
LACCD	Los Angeles Community College District

LACMTA	Los Angeles County Metropolitan Transportation Authority
LACSD	Los Angeles County Sanitation Districts
LADPW	Los Angeles Department of Public Works
LADWP	Los Angeles Department of Water and Power
LAGWRP	Los Angeles Glendale Water Reclamation Plant
LARWQCB	Los Angeles Regional Water Quality Control Board
LAUSD	Los Angeles Unified School District
LAX	Los Angeles International Airport
LF	Linear Feet
LVMWD	Las Virgenes Municipal Water District
MBR	Membrane Bioreactor
MF	Microfiltration
MG	Million Gallons
mgd	Million Gallons per Day
NdN	Nitrification Denitrification
NPR	Non-Potable Reuse
O&M	Operation and Maintenance
POLA	Port of Los Angeles
psi	Pounds per Square Inch
PV	Present Value
RMC	RMC Water and Environment
RO	Reverse Osmosis
RWAG	Recycled Water Advisory Group
RWMP	Recycled Water Master Planning
RWQCB	Regional Water Quality Control Board
SGVMWD	San Gabriel Valley Municipal Water District
SJCWRP	San Jose Creek Reclamation Plant
Surcharge	Water Rates Ordinance Water Procurement Adjustment Surcharge
SWRCB	State Water Resources Control Board
TIWRP	Terminal Island Water Reclamation Plant
TM	Technical Memorandum
UV	Ultraviolet
UWMP	Urban Water Management Plan
VGS	Valley Generating Station
WBMWD	West Basin Municipal Water District
WQIP	Water Quality Improvement Project
WRD	Water Replenishment District of Southern California
WRP	Water Reclamation Plant or [LADWP non-potable] Water Recycling Project

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Executive Summary

The Los Angeles Department of Water and Power (LADWP), in partnership with the Los Angeles Department of Public Works (LADPW) Bureau of Sanitation (BOS) and Bureau of Engineering (BOE), developed the Recycled Water Master Planning (RWMP) documents. Specifically, the RWMP process identified projects that will significantly increase the City's recycled water use locally. Recycling more water within the Los Angeles metropolitan area provides a number of benefits. For each acre-foot of recycled water used, an equal amount of imported water is saved. As a local source of water, recycled water is more reliable than imported water and is drought-resistant.

Since the early 1900s, Los Angeles has tapped into a variety of water sources. Today, the City's water comes from Northern California (California Aqueduct); Owens Valley and Mono Lake Basin (Los Angeles Aqueduct); Colorado River (Colorado River Aqueduct); and several local water sources including groundwater aquifers, stormwater capture, and recycled water. But securing water from distant sources has become more restricted and unreliable. LADWP's 2010 Urban Water Management Plan (UWMP) outlines a goal of increasing recycled water to 59,000 acre feet per year (AFY) by 2035 to reduce dependence on imported water.

The RWMP documents include an evaluation of alternatives – strategies that take into account forward-looking groundwater replenishment (GWR) options as well as the more familiar form of recycling water for non-potable reuse (NPR) purposes, such as for irrigation and industry. This NPR Master Planning Report is one element of the RWMP documents. It is a thorough examination of the potential non-potable market across the City and the potential for increased reuse from existing City water reclamation plants as well as from other regional plants.

The results of this analysis will be combined with findings and recommendations of several other technical studies being completed for the RWMP effort. When implemented, the RWMP will provide project alternatives to deliver 59,000 AFY of recycled water in the near-term to offset imported water and potential implementation strategies for long-term concept projects.

ES.1 Introduction

LADWP is implementing its multi-faceted 2010 UWMP to ensure a safe and reliable water supply for future generations of Angelenos. This is a blueprint for L.A.'s water future, and many elements go into such an important plan, such as the RWMP effort.

Figure ES-1 summarizes the City of Los Angeles' RWMP Initiative, which is guiding the development of recycled water planning for the near-term and long-term. The 2010 UWMP includes a near-term goal to develop 59,000 AFY of recycled water by 2035 as a sustainable source of local water. Of this amount, approximately 8,000 AFY is currently used for NPR and for barrier supplement in the Dominguez Gap Barrier. An additional 11,350 AFY of NPR projects are in development. The focus for the near-term is to develop the remaining 39,650 AFY (30,000 AFY from GWR and 9,650 AFY from NPR) of recycled water in Los Angeles to offset 59,000 AFY of imported water. The focus of the long-term is to offset imported water to the extent possible (up to 168,000 AFY) by 2085, fifty years after 2035.

Figure ES-1: Overview of RWMP Components

[1]*Goals are cumulative.*

[2]*Additional Barrier Supplement does not offset imported water in the City of Los Angeles and, moving forward, does not count toward the goal of 59,000 AFY.*

NPR Master Planning Report

The purpose of this NPR Master Planning Report (NPR Report) is to research, identify and develop a "menu" of potential NPR projects at a master planning level that could be implemented across the City and supplied from City or regional water reclamation plants (WRPs) to help meet LADWP's recycled water supply goals. The separate GWR Master Planning Report discusses opportunities for GWR in the San Fernando Basin by utilizing recycled water from the Donald C. Tillman Water Reclamation Plant (DCTWRP). Together, the NPR Master Planning Report and the GWR Master Planning Report provide the City with the framework to achieve 59,000 AFY of water recycling to offset imported water.

The NPR Master Planning Report is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Setting
- Section 3 – Criteria
- Section 4 – Market Assessment
- Section 5 – Supply Assessment
- Section 6 – Systems Development
- Section 7 – Water Recycling Project Descriptions
- Section 8 – Implementation Plan

Recycled Water Master Planning Approach

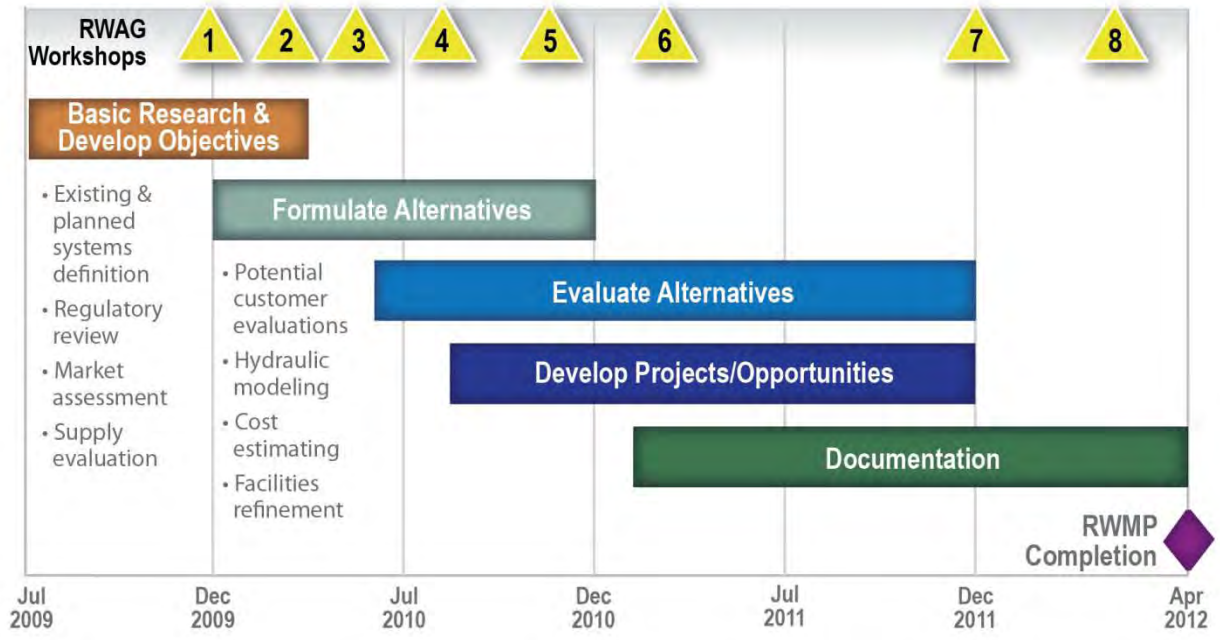
The RWMP multi-year planning process has focused on four major steps:

- Perform basic research and develop planning objectives;
- Formulate alternatives, based upon the research and objectives;
- Evaluate alternatives; and,
- Develop viable projects and opportunities.

Through the Recycled Water Advisory Group (RWAG), stakeholders have been involved in discussions with the recycled water planning team since late 2009. Their input has been folded into each of these major steps, resulting in viable projects and opportunities that include

insights and interests of a very diverse cross-section of the Los Angeles community. **Figures ES-2** illustrates the main RWMP steps and timeline.

Figure ES-2: Recycled Water Master Planning Approach and Schedule



Planning Parameters

Planning parameters are essential for comparing concepts and alternatives. Planning parameters are often distinguishing characteristics or functions.

Planning Objectives

Among the first parameters to be established were the planning objectives. Two threshold objectives were established, which had to be met regardless of the alternative:

- **Threshold Objective 1** – Meet all water quality regulations and health & safety requirements, and use proven technologies.
- **Threshold Objective 2** – Provide effective communication and education on recycled water program.

In addition to the threshold objectives, six additional recycled water planning objectives were established, which include:

- **Objective 1 -** Promote Cost Efficiency
- **Objective 2 -** Achieve Supply and Operational Goals
- **Objective 3 -** Protect Environment
- **Objective 4 -** Maximize Implementation
- **Objective 5 -** Promote Economic and Social Benefits
- **Objective 6 -** Maximize Adaptability and Reliability

Planning Year and Goals

An integrated alternatives analysis was completed to determine the balance between GWR and NPR to meet the City's recycled water goal of 59,000 AFY by 2035. The analysis compared alternatives that comprised different combinations of GWR and NPR, as shown in **Figure ES-3**. The planning objectives listed above were used to evaluate the alternatives.

Figure ES-3: Integrated Alternatives to Reach 50,000 AFY and 59,000 AFY

Note:

1. The original recycled water goal for the RWMP was 50,000 AFY by 2019, which was established before the completion of the 2010 UWMP. The recycled water goal was revised to 59,000 AFY by 2035 with the issuance of the 2010 UWMP. The UWMP reflects realities of funding limitations that were not addressed in the 2008 Water Supply Action Plan. Water rate increases are required to achieve even the revised projections in the UWMP. The integrated alternatives analysis was originally focused on determining the balance of GWR and NPR to achieve 30,650 AFY so that when combined with the 19,350 AFY of existing and planned NPR demands would achieve an overall recycled water goal of 50,000 AFY.

The integrated alternatives analysis concluded that more GWR (Alternative 3) is most beneficial, since this alternative performs better than alternatives with less GWR in terms of capital costs and project implementation. Therefore, the RWMP documents are based on achieving a GWR goal of 30,000 AFY and an NPR goal of 9,650 AFY. When combined with the 19,350 AFY of existing and planned NPR demands, these projects will achieve the City's goal of 59,000 AFY by 2035.

To allow for the most flexibility for implementation, the NPR Master Planning Report identifies over 18,000 AFY of potential NPR projects. NPR projects that are most feasible considering cost and other important criteria will be the ones pursued.

The City relies on a mix of GWR and NPR projects to meet its goals, and has the flexibility to adjust the amount of each eventually implemented. As the recycled water program develops,

the City can revisit the multi-criteria comparison of GWR and NPR to determine whether the GWR project should be expanded an additional 15,000 AFY or less. If the GWR expansion is less than the additional 15,000 AFY, then more NPR projects would be implemented to achieve the goal of 59,000 AFY by 2035.

Potential NPR Systems

In order to meet the City's plan for additional non-potable reuse of 9,650 AFY by 2035, the NPR Report included a thorough examination of the City's non-potable reuse potential. Both market and supply assessments were conducted to evaluate the City's ability to supply and utilize recycled water. Based on those assessments, 11 potential non-potable systems consisting of 38 potential water recycling projects (WRPs) were defined to meet the City's plan for additional non-potable reuse of 9,650 AFY by 2035. **Table ES-1** summarizes the potential demand and cost estimates for the 11 defined potential non-potable systems in addition to the existing and planned systems demand.

Table ES-1: Existing, Planned and Potential Systems

		Demand Estimates (AFY)				Cost for Potential Systems	
Service Area	System	Existing Systems	Planned Systems	Potential Systems	Total	Capital Cost	PV Unit Cost[1]
Harbor	TIWRP[2]	3,000	210	2,132	5,342	$36.8 M	$1,740/AF
	WBMWD[2]	--	9,300	1,199	10,499	$4.9 M	$1,160/AF
	Gateway	--	--	645	645	$6.2 M	$1,180/AF
Metro	LAGWRP[2]	2,430	2,370	3,485	8,285	$42.1 M	$330/AF
	CBMWD[2]	--	--	3,831	3,831	$66.8 M	$1,110/AF
Valley	DCTWRP AWPF	2,300	670	734	3,704	$15.5 M	$600/AF
	DCTWRP T22[2]	1,690	690	3,502	5,882	$110.0 M	$940/AF
	Burbank	--	--	1,808	1,808	$53.7 M	$910/AF
	Las Virgenes[2]	--	--	954	954	$23.7 M	$1,200/AF
Westside	Westside	880	610	568	2,058	$15.9 M	$1,580/AF
	Westwood	--	--	3,185	3,185	$76.0 M	$1,700/AF
Ultimate Total[3]		**10,300**	**13,850**	**18,453**	**42,603**	**$408.8** M	
Planning Total[4]		**8,000**	**11,350**	**9,650**	**29,000**	**$195.3** M	**$990/AF[5]**

Notes:

1. Based on pay-as-you-go funding approach described below.
2. This system includes a WRP that is defined in another system as well.
3. If a WRP is more than one system, the total only includes demand and cost estimates for the WRP associated with one system.
4. Planning Total reduces the Ultimate Total demand estimates to account for: 1) lower actual recycled water sales for the existing system; 2) connection factor for planned systems that assumes all planned customers may not reach their ultimate demand or ultimately connect as customers; and 3) NPR potential systems goal of 9,650 AFY.
5. PV Unit Cost shown for the NPR program is shown in Table ES-2.

An example subset of potential WRPs to achieve 9,650 AFY was combined with existing and planned WRPs to serve as an example of how the LADWP Recycled Water Program can achieve 29,000 AFY by 2035. A summary of the three NPR components totaling 29,000 AFY in the example Recycled Water Program is presented in **Table ES-2**.

Table ES-2: Summary of 29,000 AFY Program Costs

	Existing Projects	Planned Projects	Potential Projects	Total
Annual Yield (AFY)	8,000	11,350	9,650	29,000
Capital Cost	--[a]	$300.2 M	$195.3 M	$495.5 M
Annual O&M	$7.3 M	$10.6 M	$4.5 M	$22.4 M
50-Year Lifecycle Analysis				
			Present Value	$1,475.0 M
			50-Year Project Yield	1,297,830 AF
			PV Unit Cost	**$1,140/AF**

Note:
a. Capital expenditures for work done prior to July 2011 were not included in this assessment.

Financial Analyses

This section presents financial analyses of the NPR program costs (Table ES-2). There are many different ways that the NPR program could be financed, which impacts the total cost of the program. In this section two potential methods are presented, "pay-as-you-go" (no financing) and financing using borrowed funds, with the resulting cumulative cost over a 50-year period. For both evaluations, the projected cumulative cost is compared with projected Tier 1 Metropolitan Water District of Southern California (MWD) imported water cumulative costs.

Pay-As-You-Go Analysis

To determine the cost-effectiveness of the recycled water projects under pay-as-you-go financing, a PV unit cost in dollars per acre-foot ($/AF) for the NPR Program was estimated by taking the sum of the PV costs divided by the sum of water yield over the 50-year life of the program. The PV unit cost for the NPR program is estimated to be $1,140/AF, which includes potential capital and O&M costs (Table ES-2) over the 50-year life of the program. The PV unit cost for MWD Tier 1 water purchases over the same 50-year period is estimated to be $1,366/AF, which is about 20% greater than the estimated PV for the NPR program.

Alternative Financial Analysis (Long-Term Financing)

An alternative funding approach is to borrow money through long-term financing to fund capital expenditures. Borrowing to fund these costs reduces the near-term impact on customer's water rates, but the costs will have to be repaid with interest, but over a long-term period. This approach establishes cumulative cost for the NPR program as $3.34 billion. Comparatively, the cumulative cost of purchasing MWD water is $4.82 billion. The payback year for the NPR program is 2047. A similar cumulative cost analysis for the pay-as-you-go model yields a 50-year NPR program cost of $3.01 billion (payback year of 2043).

Conclusion

In conclusion, cumulative MWD water purchases over a 50-year period are expected to be greater than LADWP's NPR program costs under either financing model. MWD water purchases will be 60% greater under the pay-as-you-go analysis and 44% under the alternative financial analysis. **Over the long term, the NPR program will cost less than the cost of purchasing MWD imported water**.

In addition, there are important operational and reliability benefits that are gained by having an increased amount of local water supplies. Recycled water is not subject to drought or imported water short or long term emergency outages that can significantly reduce MWD's imported water availability to Los Angeles.

Next Steps

Implementation of the GWR project and NPR program will be done concurrently as funding is available. Potential WRPs selected for implementation will consist of cost effective projects with a higher ease of implementation, lower capital costs, and anchor customers with high conversion ratings. Ultimately, LADWP will implement enough WRPs to result in non-potable reuse of at least 29,000 AFY by 2035, including 9,650 AFY of potential NPR projects developed in this report.

Overview of Non-Potable Reuse

Non-potable reuse (NPR) is the use of treated wastewater ("recycled water") for a beneficial use and is a practical, proven way to increase the availability of a safe, reliable, locally controlled water supply. For decades, recycled water has been successfully applied in the U.S. for a wide range of non-potable uses, including:

- Landscape irrigation
- Agricultural irrigation
- Dust control
- Industrial process water
- Power plant cooling water
- Toilet flushing
- Car washing
- Recreational water body augmentation
- Fire protection
- Commercial cleansing
- Construction
- Habitat restoration

The State of California regulates the treatment, use, and discharge of recycled water according to Title 22 of the California Administrative Code ("Title 22"). The statewide Water Recycling Criteria are developed by the California Department of Public Health and enforced by the nine State Regional Water Quality Control Boards. The water reclamation process—the treatment of wastewater to make it reusable according to definable treatment reliability and water quality criteria—includes three steps:

1. Primary Treatment: The mechanical process to remove suspended and settleable solids and organic matter from wastewater, usually by sedimentation.
2. Secondary Treatment: The biological and chemical processes to remove biodegradable organic matter (in solution or suspension) and suspended solids.
3. Tertiary Treatment: Removal of residual suspended solids (after secondary treatment), usually by granular medium filtration, surface filtration, or membranes. Disinfection is also typically a part of tertiary treatment.

Also, nutrient removal is becoming a more common treatment process included after secondary treatment. "Nitrification" is the biological oxidation of ammonia into nitrite and nitrite into nitrate. "Nitrification denitrification (NdN)" is the conversion of nitrogen products (ammonia, nitrate, nitrite) into nitrogen gas. In situations where the quality of the recycled water does not meet criteria for use in certain industrial and other applications, additional advanced treatment,

such as microfiltration (MF) and reverse osmosis (RO), is typically included in the treatment regime. The GWR project proposes to implement an advanced water purification facility (AWPF) that consists of MF, RO, and advanced oxidation process (AOP) to produce purified recycled water to replenish the City's groundwater supplies.

In Los Angeles, recycled water is produced at three water reclamation facilities owned by the City and operated by the Department of Public Works, Bureau of Sanitation: the Donald C. Tillman (DCTWRP), Los Angeles-Glendale (LAGWRP), and Terminal Island Water Reclamation Plants (TIWRP). Secondary treated water is produced at the City's Hyperion Treatment Plant (HTP) and is provided to West Basin Municipal Water District's (WBMWD) Edward Little Water Reclamation Facility (ELWRF) for further treatment to the tertiary level.

ES.2 Existing and Planned Recycled Water Systems

LADWP's recycled water systems are located in four service areas: Harbor, Metro, Valley and Westside. Each service area has one existing recycled water "system"; each system has a unique recycled water supply and is hydraulically independent from the others. A second system in the Harbor Service Area is currently being constructed and will be supplied from WBMWD. The existing and planned systems once expanded will increase recycled water use to a total of 19,350 AFY. The planned systems have a total ultimate demand estimate of 13,850 AFY but the estimate is expected to decrease as additional meetings with planned customers reveal more accurate non-potable demand estimate and, in some cases, eliminate customers due to on-site conversion issues. Therefore, due to these uncertainties, we anticipate the demand estimate for the planned recycled water systems to be 11,350 AFY. As a result, the existing and planned systems demand estimate of 19,350 AFY is carried forward.

Definitions

Existing: LADWP's existing systems and customers discussed in this report consist of the existing recycled water facilities and customers being served as of January 2012.

Planned: Planned projects consist of water recycling projects (WRPs) that are planning, design, or construction stage as of January 2012. Planned customers are customers that have been identified and considered for service by LADWP but are not confirmed for service.

Potential: Potential projects are water recycling projects newly defined in this report and have the potential to help achieve the goal of increasing non-potable reuse an additional 9,650 AFY by 2035. These WRPs would serve potential customers (identified for future planning purposes).

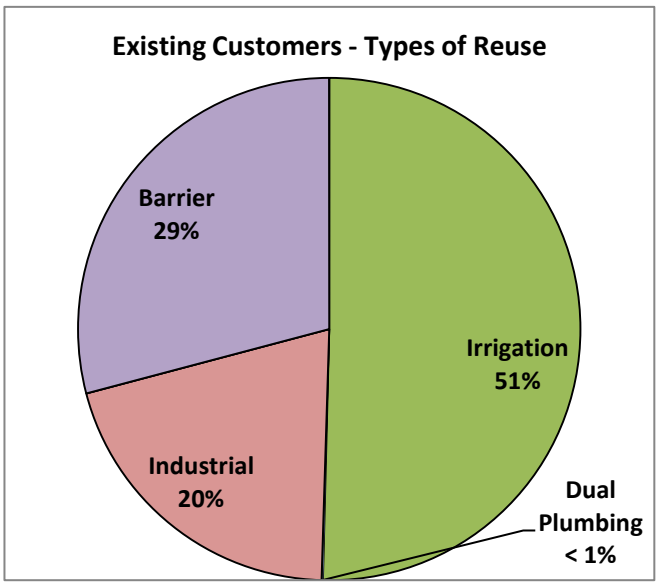
Table ES-2: Existing and Planned Systems Demand

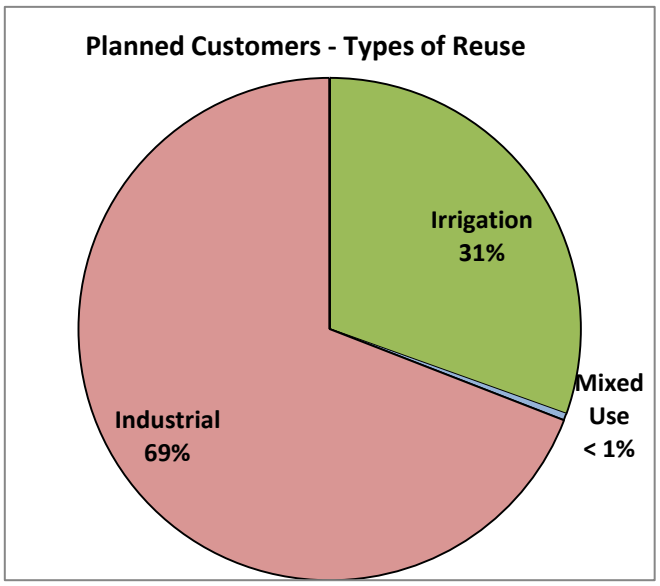
System	No. of Customers			Annual Demand (AFY)		
	Existing System	Planned System	Total	Existing System	Planned System	Total
Harbor, TIWRP	2	4	5[a]	3,000	210	3,210
Harbor, WBMWD	--	8	8	--	9,300	9,300
Metro, LAG	14	27	41	2,430	2,370	4,800
Valley, DCT	12	16	28	3,990	1,360	5,350
Westside, Westside	103	12	115	880	610	1,490
Total, Ultimate	**131**	**67**	**197**[a]	**10,300**	**13,850**	**24,150**
Total, Projected				**8,000**[b]	**11,350**[c]	**19,350**

Notes:

a. Harbor Generating Station is an existing and a planned customer so it is counted once in the total.
b. Recent recycled water sales totaled 8,000 AFY but the ultimate demand estimate for existing customers is 10,300 AFY based on expected sales once all existing customer maximize available supplies.
c. Assumes all planned customers may not reach their ultimate demand or ultimately connect as customers.

Existing customers include golf courses, schools, cooling towers, and a seawater intrusion barrier. Planned customers include additional landscape irrigation and several large industrial customers. A breakdown of the customers by type of reuse can be seen in the following pie charts.





ES.3 NPR Planning Criteria

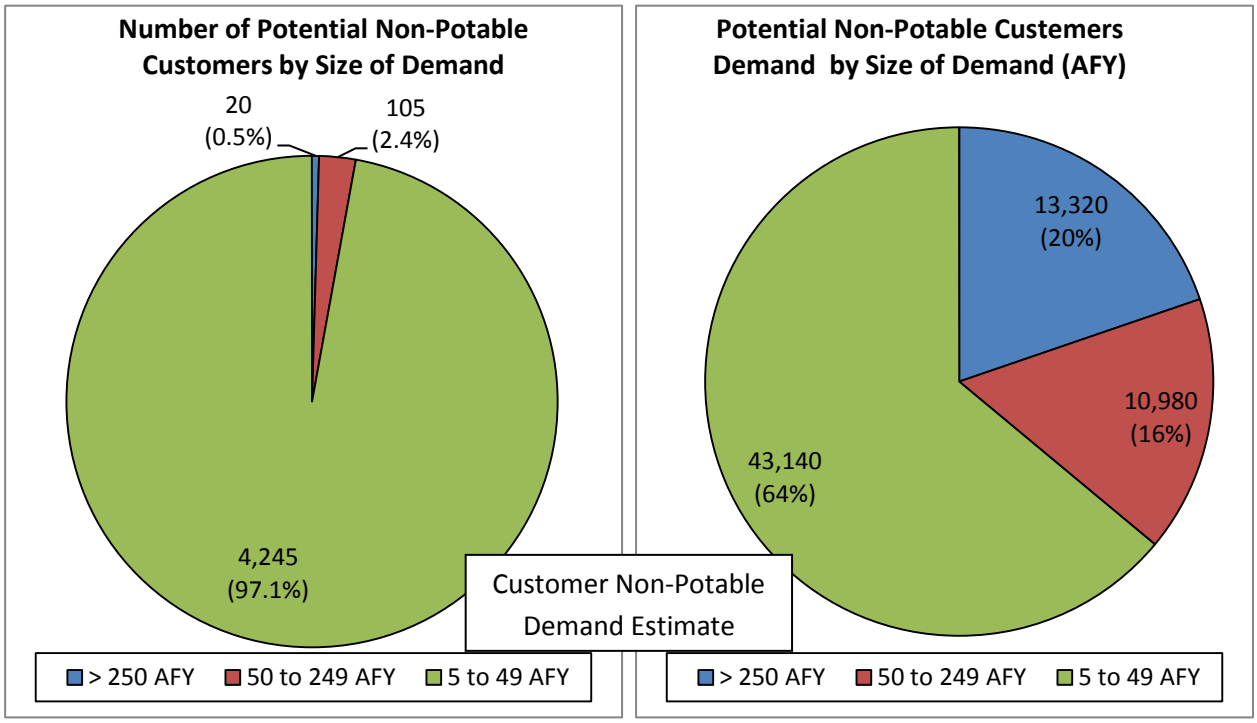
Criteria to define and analyze potential NPR projects were developed for the broad areas of service reliability, planning and design, and cost estimating. Interviews were conducted with selected recycled water suppliers throughout California and beyond to identify the criteria being used to evaluate reliability, planning and designs issues, and potential costs, as well as solutions that these agencies have developed from their past experiences.

Based upon the interviews, three key service reliability factors were identified: Interruptability (or the customer's ability to withstand interruptions); Backup Supply; and Water Quality. Design criteria were developed to help standardize the evaluation and development process. The team focused on pipeline sizing / configuration, facilities and hydraulic criteria, and demand / peaking estimates.

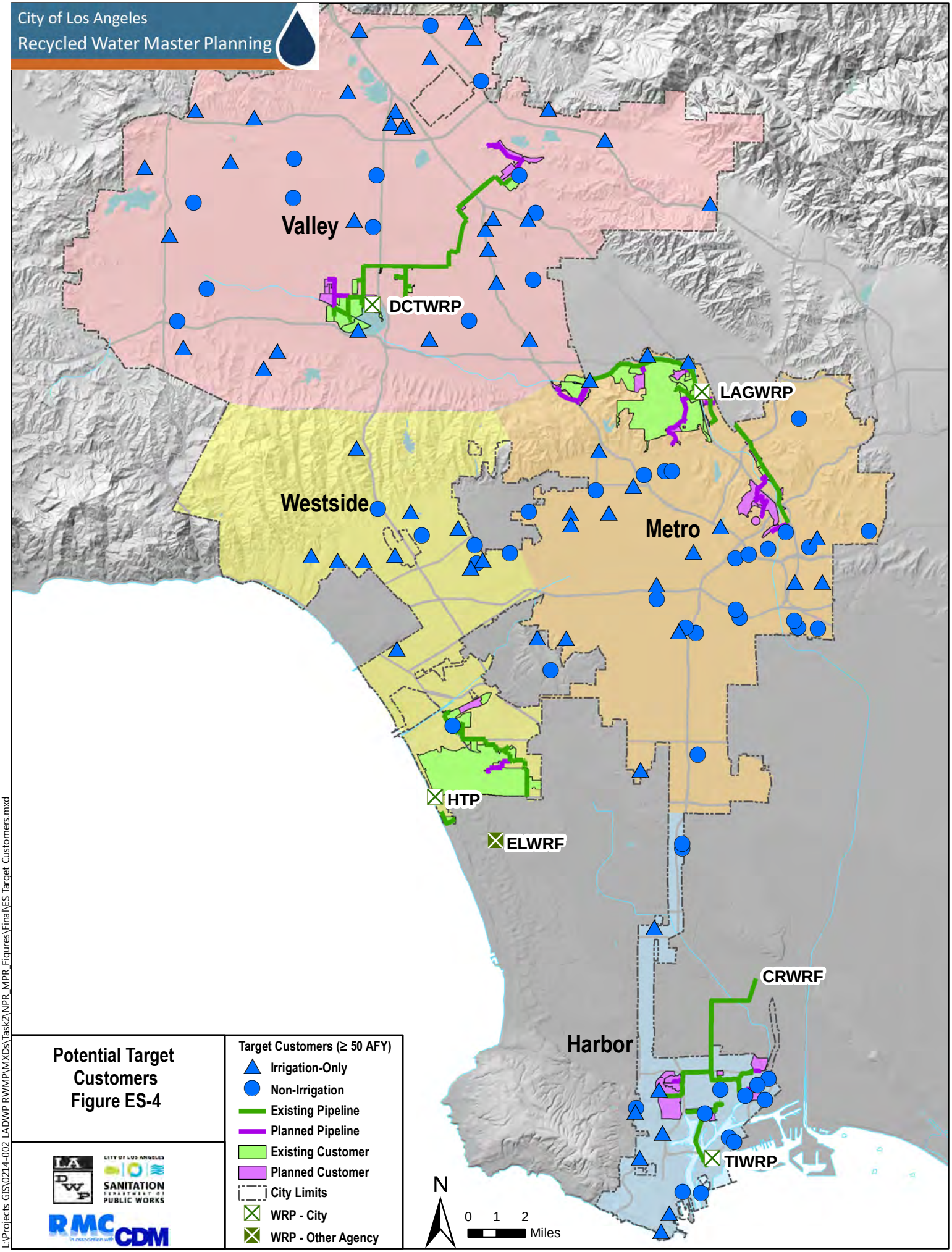
Cost estimating criteria for capital and operation and maintenance costs were developed based on preliminary engineering planning efforts. An additional 30 percent for contingencies is applied to the construction cost estimates and a factor of 30 percent of the estimated project construction costs is used to account for project implementation costs.

ES.4 Market Assessment

An initial list of potential non-potable customers was developed to provide the basis for defining most of the proposed recycled water distribution systems. The primary resource used to develop the list of customers was LADWP's Customer Information System (CIS) database of customer water use and billing records. After a thorough examination of the various customer types and potential water demands, the CIS database was screened from approximately 200,000 accounts to approximately 4,400 potential non-potable customers. In addition to the CIS database, potential customers were identified from customer inquiries, other LADWP databases, and LADWP personnel. As shown in the following pie charts, target **c**ustomers (with non-potable demands greater than 50 AFY) comprise just 3% of the customers but make up 36% of the demand.



As shown in **Figure ES-4**, the Valley Service Area has the most target customers and potential non-potable demand. The Valley Service Area is predominantly comprised of irrigation customers and includes over 50 percent of the total potential irrigation-only demand. In comparison, the Metro service area has slightly fewer target customers but only one third of its demand is irrigation-only.


City of Los Angeles
Recycled Water Master Planning
Valley
Westside
Metro
Harbor
DCTWRP
LAGWRP
HTP
ELWRF
CRWRF
TIWRP
Potential Target Customers
Figure ES-4
Target Customers (≥ 50 AFY)
Irrigation-Only
Non-Irrigation
Existing Pipeline
Planned Pipeline
Existing Customer
Planned Customer
City Limits
WRP - City
WRP - Other Agency
N
0 1 2
Miles
CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS
RMC
in association with
CDM
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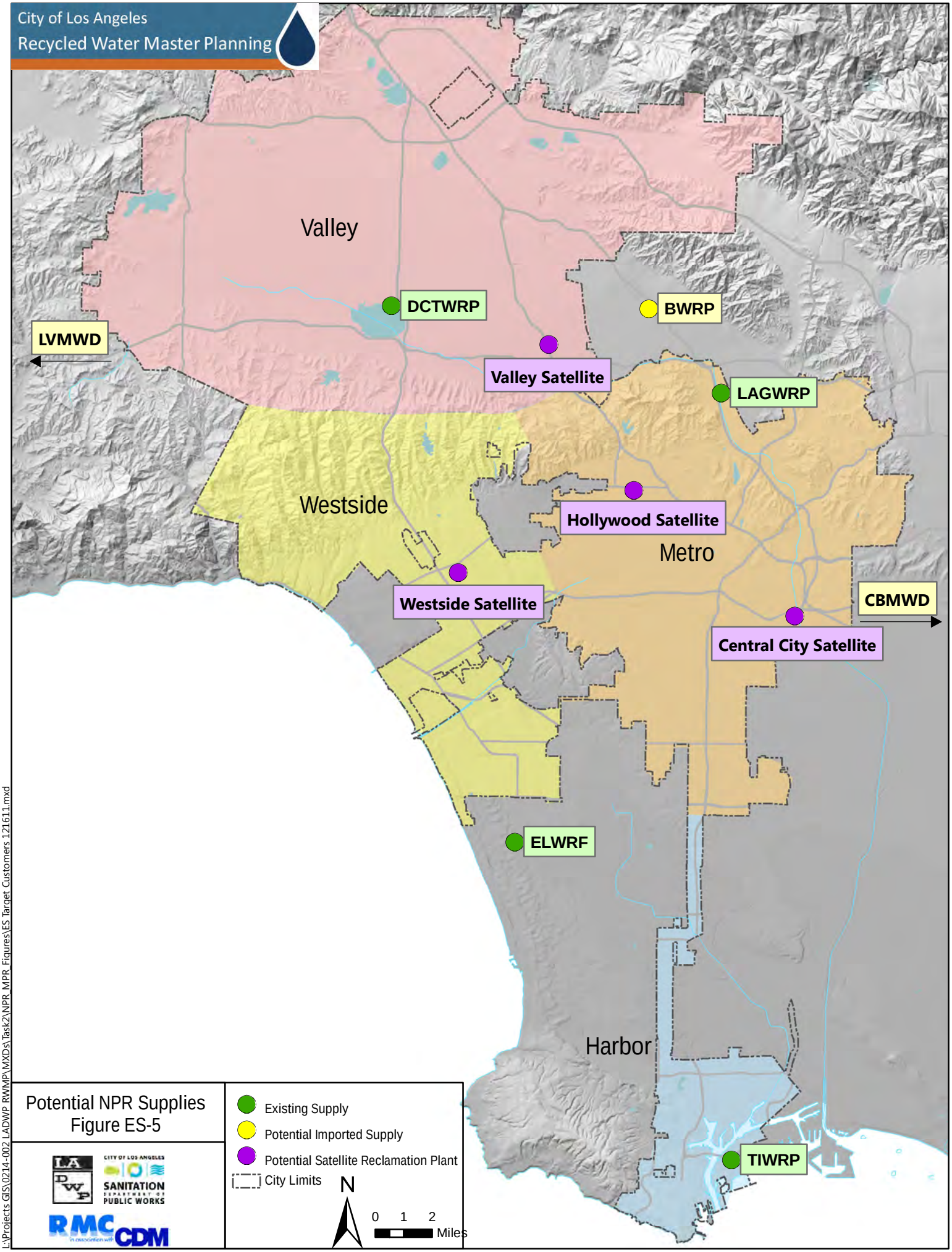
Data Sources: RMC, USGS, LADWP

ES.5 Supply Assessment

The supply assessment analyzed potential recycled water supplies available for potential customers after the supplies are allocated to existing and planned customers, as shown in **Figure ES-5**. In addition to increased deliveries and reuse from the five existing recycled water supplies, potential NPR supplies include importing recycled water from adjacent agencies and new satellite treatment facilities for converting raw wastewater directly for reuse. The analysis resulted in the following preferred supplies for each service area:

- **Harbor Service Area: TIWRP** and **Carson Regional Water Reclamation Facility (CRWRF).** Both potential supplies were found to be viable; however, each has unique challenges that will need to be considered when implementing future recycled water projects in the Harbor Service Area.
- **Metro Service Area: LAGWRP with Potable Water Supplement.** Also, LADWP should consider pursuing discussions with Central Basin Municipal Water District (CBMWD) for purchase of supplies to better define potential costs.
- **Valley Service Area: DCTWRP, Burbank Water and Power (BWP), and Las Virgenes Municipal Water District (LVMWD)**. Each supply can each serve a distinct set of customers so they are not mutually exclusive. Note that DCTWRP is not a feasible supply if the 30,000 AFY GWR Project is implemented.
- **Westside Service Area: ELWRF.** However, it has some of the highest capital costs among preferred supplies so projects in the Westside service area may not be as cost effective compared to other projects.


City of Los Angeles
Recycled Water Master Planning
Valley
Westside
Metro
Harbor
DCTWRP
BWRP
LVMWD
Valley Satellite
LAGWRP
Hollywood Satellite
Westside Satellite
CBMWD
Central City Satellite
ELWRF
TIWRP
Potential NPR Supplies
Figure ES-5
Existing Supply
Potential Imported Supply
Potential Satellite Reclamation Plant
City Limits
N
0 1 2
Miles
SANITATION
DEPARTMENT OF PUBLIC WORKS
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Data Sources: RMC, USGS, LADWP

ES.6 Systems Development

Definitions

Service Area: Contiguous geographic area of the City.

System: A set of hydraulically independent NPR facilities (i.e., pump stations, tanks, and pipelines) with a unique recycled water supply.

Water Recycling Project (WRP): Distinct set of facilities and customers that make up a system.

Non-potable systems were developed through a series of iterative steps that identified systems with the highest likelihood of implementation from an initial list of project options. The first step was to delineate pipeline alignments from potential non-potable supplies along major corridors to serve target customers. Then a hydraulic model was used to define necessary facilities and develop preliminary cost estimates. These systems were refined during the master planning process through updates to facilities, customer demands, and cost estimates. Projects were also screened during the process based on unit costs. The outcome of the systems development process is shown in **Figure ES-6** and summarized below by service area.

- **Harbor Service Area:** Includes three systems (TIWRP, WMBWD, and Gateway) with a total of 12 potential WRPs defining service of approximately 2,900 AFY to potential customers. However, implementation of all the potential Harbor systems is limited by availability and/or cost of potential supplies.
- **Metro Service Area:** Includes two systems (LAGWRP and CBMWD) with a total of eight potential WRPs defining service of approximately 4,900 AFY to potential customers. However, the limited amount of LAGWRP supply resulting from a potable water supplement and the maximum flow available from CBMWD could limit the ultimate build out of the systems.
- **Valley Service Area:** Includes four systems (DCTWRP T22, DCTWRP AWPF, BWP, and LVMWD) with a total of 14 potential WRPs defining service of approximately 6,800 AFY to potential customers. However, the service area would be limited to six potential WRPs with service of approximately 2,800 AFY to potential customers if the 30,000 AFY GWR Project is implemented since the supply from DCTWRP is limited.
- **Westside Service Area:** Includes two systems with a total of four WRPs defining service of approximately 3,800 AFY to potential customers.

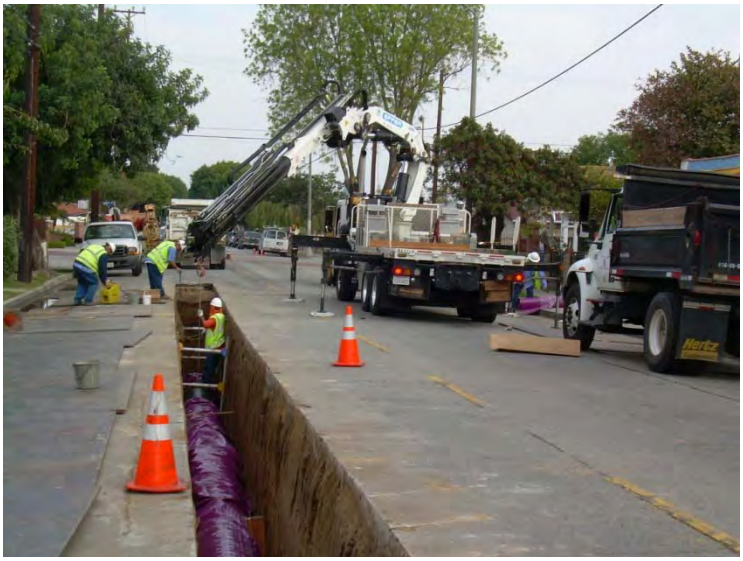
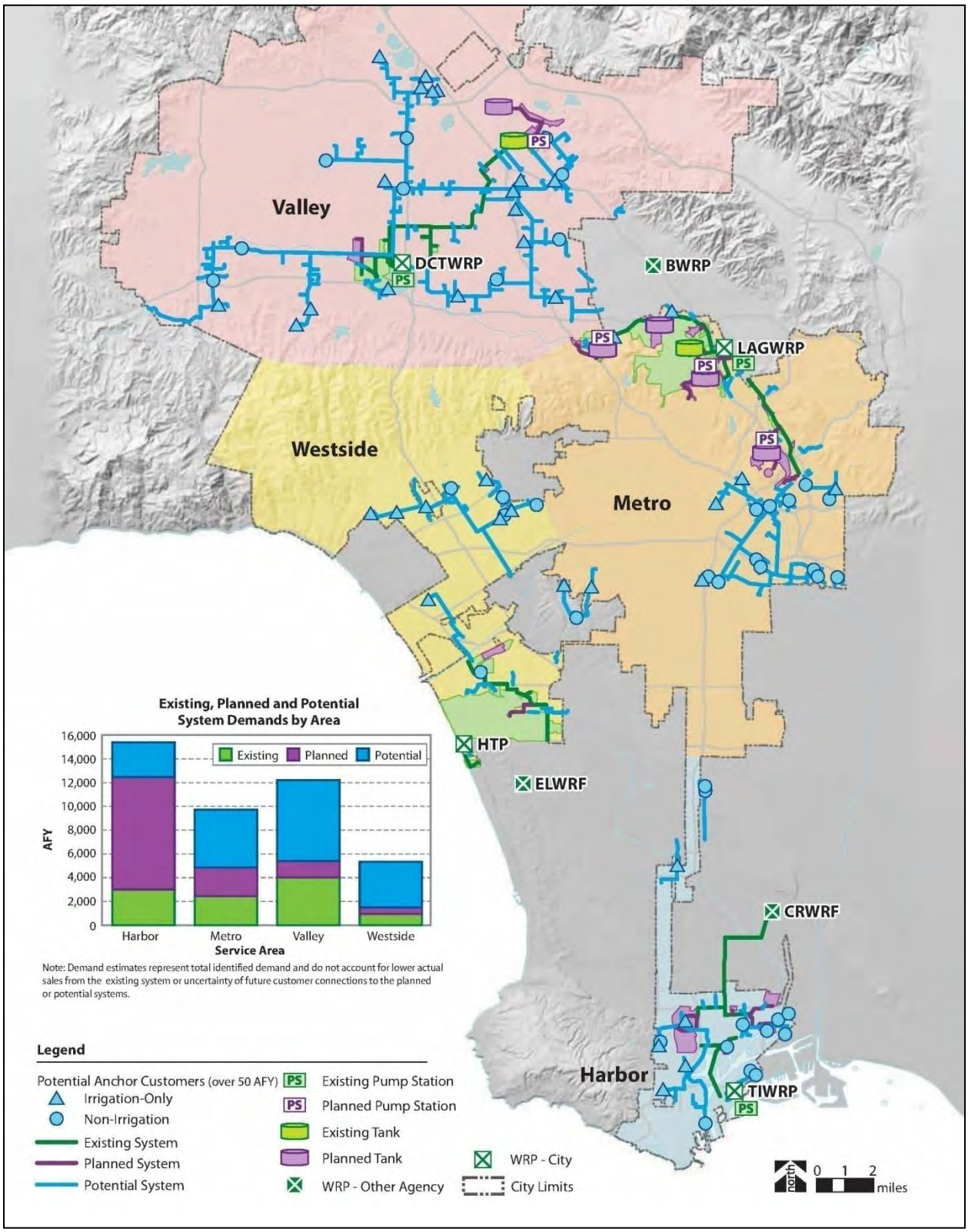


Figure ES-6: Existing, Planned, and Potential Recycled Water Systems



ES.7 Water Recycling Project Descriptions

Eleven systems were defined for the four water service areas. Each is summarized in this section.

Harbor – TIWRP System

The existing TIWRP production capacity is 5.0 mgd, assuming that existing reliability and operational issues with the advanced treatment process are addressed. After existing and planned customers are satisfied, approximately 2.1 mgd remains available for potential recycled water customers, which is insufficient to meet the peak day demand for all of the potential WRPs (2.9 mgd).

All of the WRPs can be implemented independently except for Peck Park WRP, which is dependent on the Port of Los Angeles (POLA) WRP being constructed first. Also, the Ponte Vista and SA Recycling WRPs each have the potential to serve recycled water to adjacent agencies (WBMWD and Long Beach, respectively). The demands for adjacent agencies were not included in the WRPs so future service should be considered before the WRPs are implemented.

Harbor – WBMWD System

The primary consideration for implementation of this system is the availability of CRWRF supply. The projected peak day demand for the planned system matches the planned CRWRF peak season supply so the availability of surplus capacity to serve potential customers appears to be limited. Identification of any surplus will require future monitoring of actual peak day demands. Regarding CRWRF expansion, due to limited available land the feasibility of further expansion cannot be determined until the planned expansion is further developed (i.e. treatment process and associated footprint).

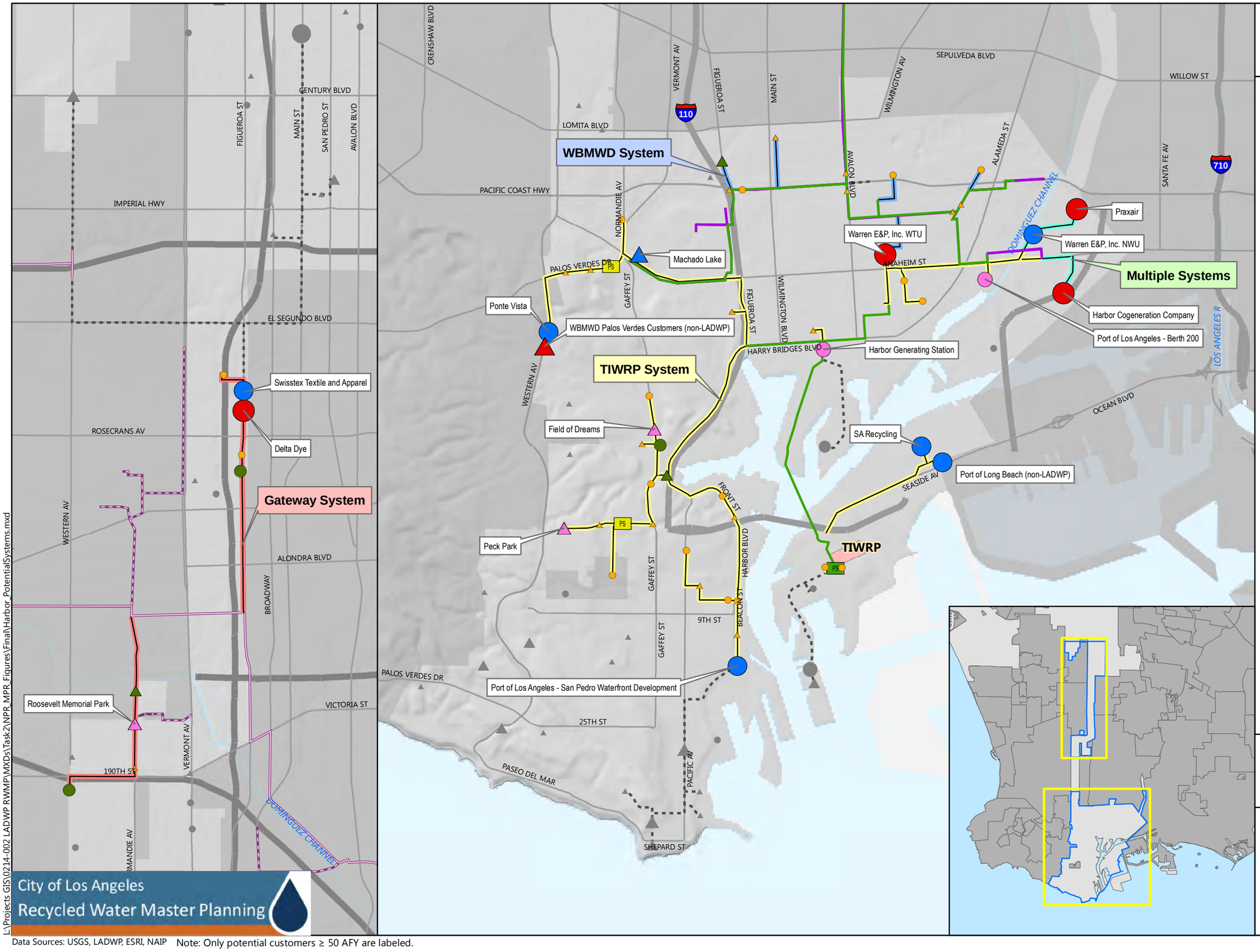
All of the WRPs can be implemented independently but the number and size of WRPs implemented will be dependent on this supply as well as the plan for TIWRP product water since the Harbor East WRP and Warren E&P WRP potential customers could be served by either TIWRP or WBMWD.

Harbor – Gateway System

This system takes advantage of existing WBMWD recycled water infrastructure within the City for LADWP customers that are too far from the City's reclamation plants. In this case, two potential WRPs were defined around three anchor customers within a cost effective distance from WBMWD's Title 22 system.

Each WRP in this system can be implemented independently so the primary consideration for each WRP is the anchor customer's commitment to use recycled water. Also, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.

Potential Systems Harbor Service Area Figure ES-7



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- TIWRP
- WBMWD
- Gateway
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

CITY OF LOS ANGELES
SANITATION
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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

Potential Systems
Metro Service Area
Figure ES-8

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- CBMWD
- LAG
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

0 0.5 1 Miles

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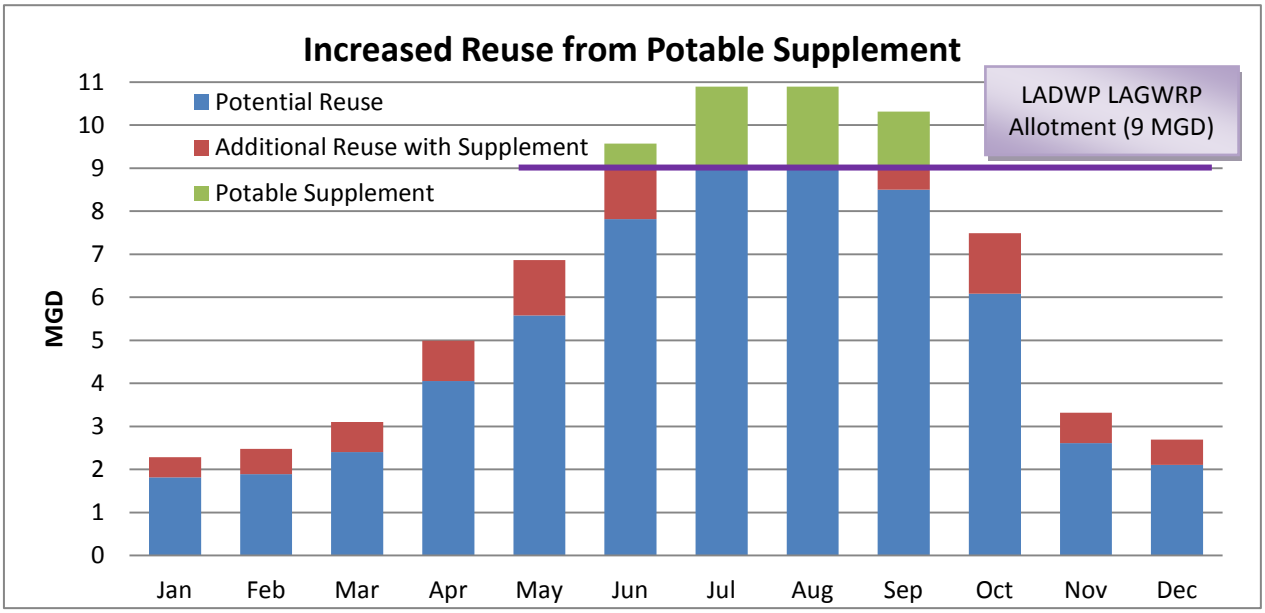
Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

Metro – LAGWRP System

LADWP's allotment from LAGWRP is 9 mgd and the system's planned peak day demand is estimated to use all of LADWP's allotment; however, supplementing the system with potable water to help meet peak day demands would allow for increased recycled water use throughout the remainder of the year while still meeting peak day demands and staying within LADWP's LAGWRP allotment.



Each WRP in this system can be implemented independently except for the Medical Center WRP, which builds off the Atlas Carpets WRP. WRP implementation will be dependent on the availability of peak season supply from LAGWRP. Because the USC WRP is defined as part of the LAGWRP System and the CBMWD System, it can be compared when selecting the WRP to implement for this system.

Metro – CBWMD System

This system would import up to 4 mgd of recycled water from CBMWD's planned recycled water system expansion near the City of Vernon, referred to as the Southeast Water Reliability Project (SWRP) Phase II. The primary considerations for this system are its dependence on CBMWD to construct SWRP Phase II and the associated need for LADWP to commit to a minimum recycled water purchase to support the CBMWD project's implementation.

The customer base for this system has large industrial components that historically can be more challenging to connect and have a more uncertain long-term viability. The customer conversion evaluation effort identified two of the largest customers in the USC WRP (Matchmaster and USC). These customers have expressed support of the use of recycled water. All three anchor customers in the Downtown WRP (LA County Central Plant, Trigen-LA Bunker Hill, and Twin Towers Correctional Facility) had "A" conversion ratings.

The WRPs in this system build on each other starting with the USC WRP. Because the USC WRP is defined as part of the LAGWRP System and the CBMWD System, it can be compared when selecting the WRP to implement for this system.

Valley – DCTWRP AWPF System

The system defines small, cost effective expansions from the existing / planned system to maximize the use of DCTWRP effluent. The system's supply will be AWPF water once the 15,000 AFY GWR Project (Phase 1) is implemented. The primary consideration for this system is the availability of recycled water from DCTWRP. No supply will be available for potential NPR customers if the GWR Project is expanded to 30,000 AFY. Approximately 14 mgd of effluent would be available if only the 15,000 AFY GWR Project (Phase 1) is implemented. The WRPs (and individual laterals within the Laterals WRP) can be implemented independently.

Valley – DCTWRP Title 22 System

This system defines WRPs with the consideration that no potential WRPs may be implemented if the GWR Project is expanded from 15,000 AFY to 30,000 AFY since no surplus flow is projected if the project is implemented. If only the 15,000 AFY GWR Project (Phase 1) is implemented, approximately 14 mgd of effluent would be available from DCTWRP to implement the WRPs. Considering the supply situation, three WRPs (Pierce College, Hansen Connection, and Vulcan) were defined as part of more than one system and can be compared when selecting the WRPs to implement for each system.

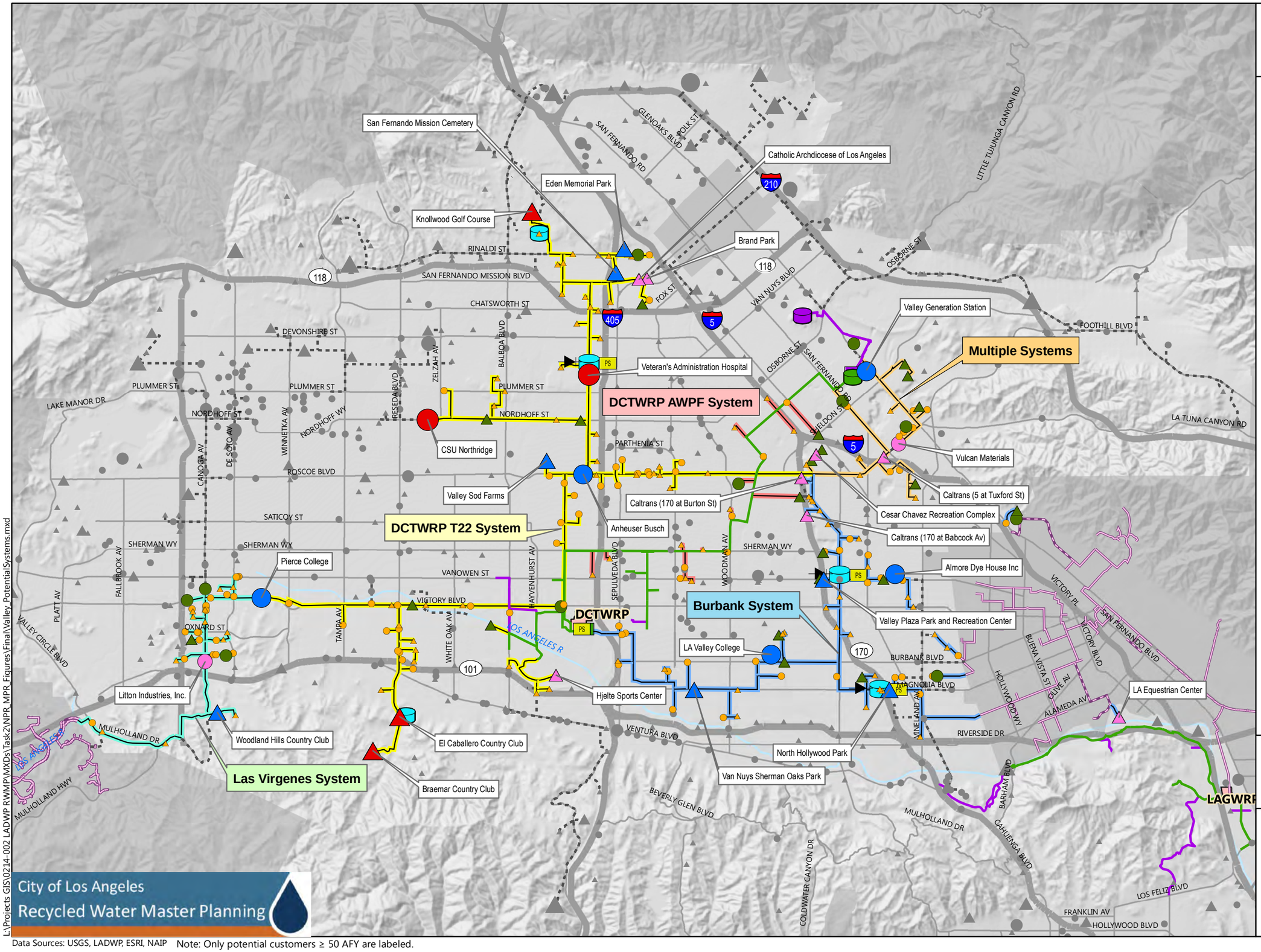
Valley – Burbank System

This system allows LADWP to offset existing imported water demands with recycled water without using DCTWRP effluent, which has been designated for the GWR Project. The City has already committed funds for the Burbank Recycled Water system to be built out to the City's border with Burbank in the southeastern portion of the San Fernando Valley. Burbank can supply up to 3.8 mgd of peak day flow from the Studio District Extension, which is the primary connection point with LADWP. There are also three other smaller connections included in the Laterals WRP. The North Hollywood WRP is the first WRP for this system followed by the Valley College WRP. The Cesar Chavez and DCTWRP Connection WRPs independently build off the Valley College WRP. The Hansen Connection WRP builds off the Cesar Chavez WRP. A new pressure zone is necessary beyond the North Hollywood WRP so only this WRP and the Burbank Laterals WRP can be implemented without a large capital investment.

Valley – Las Virgenes System

Similar to the Burbank System, this system allows LADWP to offset existing imported water demands with recycled water without using DCTWRP effluent, which has been designated for the GWR Project. LVMWD's recycled water system extends close to the City's border with the City of Calabasas and would require minor improvements to be able to supply recycled water to southwestern portion of the San Fernando Valley. The system and WRPs are compared with serving similar customers from DCTWRP but the supply limitations and distance from DCTWRP lower the likelihood that many western San Fernando Valley customers will receive DCTWRP supplies. LVMWD has additional supplies available during off-peak periods but use of these flows would require some type of seasonal storage.

Potential Systems
Valley Service Area
Figure ES-9



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- DCT T22
- DCT AWT
- Las Virgenes
- Burbank
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

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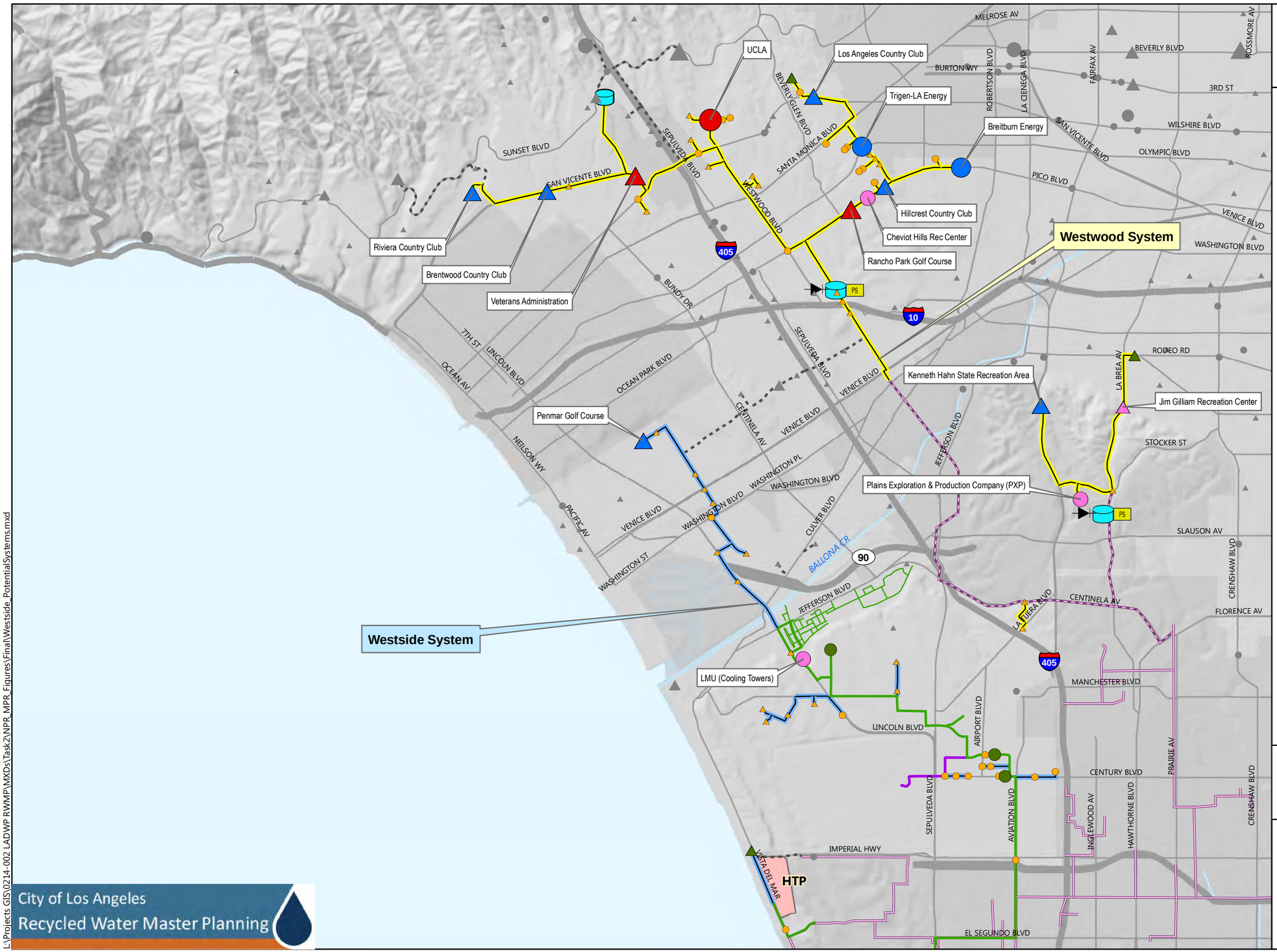
Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

Potential Systems
Westside Service Area
Figure ES-10



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Existing Facilities
- Tank
- PS Pump Station
- Pipeline

Planned Facilities
- Tank
- PS Pump station
- Pipeline

Potential Facilities
- PRV
- PS Pump Station
- Tank

Potential Systems
- Westside
- Westwood
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

Westside – Westside System

This system defines WRPs to build off the existing / planned system with increased use from the existing recycled water supply from WBMWD's ELWRF. Based on discussions with WBMWD, there is adequate supply for identified potential customers from ELWRF; however, the ultimate ELWRF capacity is limited and WBMWD could potentially use all of the supply in the next 10 to 20 years.

Westside – Westwood System

This system defines WRPs to serve the set of large customers in the northern half of the Westside Service Area, which is far from existing recycled water infrastructure. The system uses recycled water produced by WBMWD at their ELWRF in El Segundo and connects to WBMWD's recycled water system at its terminus in Inglewood. The Inglewood extension was originally sized and constructed to accommodate a large LADWP recycled water system in the future.

Implementation of this WRP will require coordination with WBMWD (as the regional wholesaler) and their retailers serving customers in the area (Cal Am and Culver City). The system starts within the WBMWD service area. WBMWD has identified potential non-potable customers in their service area that could be added to the project. This provides an opportunity for cost sharing of capital facilities but implementation is dependent on moving ahead with an agreement with WBMWD, Cal Am, and Culver City.

Each WRP can be implemented independently but each WRP has unique issues. The UCLA WRP has one of the largest potential non-potable demands in this report but all of the anchor customers are located at least 7 miles from the supply (at the WBMWD Inglewood connection) so significant capital investment must be undertaken and extensive temporary construction impacts from pipeline installation prior to connecting any large customers. Within the Kenneth Hahn WRP there are plans to convert the existing oil operations to open space with public access. The park conversion may result in a large demand that could anchor this WRP and provide the opportunity to upgrade the aging irrigation system.

Table ES-3: Summary of Existing, Planned, and Potential Systems

Service Area / System	Demand Estimates (AFY)				Cost for Potential Systems	
	Existing Systems	Planned Systems	Potential Systems	Total	Capital Cost ($M)	PV Unit Cost
Harbor Service Area						
TIWRP System	3,000	210	2,132	5,342	$36.8	$1,740/AF
WBMWD System	--	9,300	1,199	10,499	$4.9	$1,160/AF
Gateway System	--	--	645	645	$6.2	$1,180/AF
Harbor Subtotal[1,2]	**3,000**	**9,510**	**2,881**	**15,391**	**$44.8**	
Metro Service Area						
LAGWRP System	2,430	2,370	3,485	8,285	$42.1	$330/AF
CBMWD System	--	--	3,831	3,831	$66.8	$1,110/AF
Metro Subtotal[1,3]	**2,430**	**2,370**	**5,011**	**9,811**	**$77.9**	
Valley Service Area[4]						
DCTWRP AWPF System	2,300	670	734	3,704	$15.5	$600/AF
DCTWRP T22 System	1,690	690	3,502	5,882	$110.0	$940/AF
Burbank System	--	--	1,808	1,808	$53.7	$910/AF
Las Virgenes System	--	--	954	954	$23.7	$1,200/AF
Valley Subtotal[1,5]	**3,990**	**1,360**	**6,808**	**12,118**	**$192.6**	
Westside Service Area						
Westside System	880	610	568	2,058	$15.9	$1,580/AF
Westwood System	--	--	3,185	3,185	$76.0	$1,700/AF
Westside Subtotal	**880**	**610**	**3,753**	**5,243**	**$91.9**	
Total, Ultimate [1,2,3,4,5]	**10,300**	**13,850**	**18,453**	**42,603**	**$408.8**	
Total, Projected [6,7,8]	**8,000[6]**	**11,350[7]**	**9,650[8]**	**29,000**	**$195.3**	**$990/AF[9]**

Notes:

1. Total and subtotal demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding.
2. Subtotal excludes 1,095 AFY of potential demand and $3.1 M of capital cost for the Harbor East and Warren E&P WRPs in WBMWD System because they are also included in the TIWRP System.
3. Subtotal excludes 2,305 AFY of potential demand and $31.0 M of capital cost for the USC WRP in the LAG System because it is also included in the CBMWD System.
4. Does not include the following alternative systems: Limited DCTWRP T22 System; DCT T22 System with Hansen Tank Connection; and Burbank System with Hansen Tank Connection.
5. Subtotal excludes 190 AFY of potential demand and $10.3 M of capital cost for the Pierce College WRP in the Las Virgenes System because it is also included in the DCTWRP T22 System.
6. Recent recycled water sales totaled 8,000 AFY but the ultimate demand estimate for existing customers is 10,300 AFY based on expected sales once all existing customer maximize available supplies.
7. Assumes all planned customers may not reach their ultimate demand or ultimately connect as customers.
8. Reduced to NPR potential systems goal of 9,650 AFY.
9. Calculation of PV Unit Cost for the NPR program is shown in Table ES-4.

ES.8 Implementation Plan

As discussed in Section ES-1, this NPR Master Planning Report was developed to provide a suite of potential NPR projects to achieve at least 9,650 AFY. When combined with the 19,350 AFY of existing and planned NPR demands and 30,000 AFY from the GWR project, these projects will achieve the City's goal of 59,000 AFY. Implementation of the existing, planned, and potential NPR portion of LADWP's Recycled Water Program is discussed in this section.

LADWP NPR Program

A representative subset of potential WRPs to achieve 9,650 AFY was combined with existing and planned WRPs to form a sample LADWP Non-Potable Recycled Water Program to achieve 29,000 AFY by 2035. A summary of the three components in the sample 29,000 AFY NPR program is presented in **Table ES-4**.

Table ES-4: Summary of 29,000 AFY Program Costs

	Existing Projects	Planned Projects	Potential Projects	Total
Annual Yield (AFY)	8,000	11,350	9,650	29,000
Capital Cost ($M)	--[a]	$300.2[a]	$195.3	$495.5
Annual O&M ($M)	$7.3	$10.6	$4.5	$22.4
50-Year Lifecycle Analysis				
			Present Value ($M)	$1,475.0
			50-Year Program Yield (AF)	1,297,830
			PV Unit Cost ($/AF)	**$1,140**

Note:
a. Capital expenditures for work done prior to July 2011 were not included in this assessment.

The representative subset of potential WRPs was chosen only for purposes of estimating the total possible cost of the NPR System and does not represent the final projects that LADWP may implement in future years. The specific potential NPR projects eventually chosen for implementation will be dependent on a number of factors, including cost effectiveness, constructability, availability of recycled water, and customer viability. These factors will all be evaluated and considered further during the planning, selection and implementation of the Potential NPR projects.

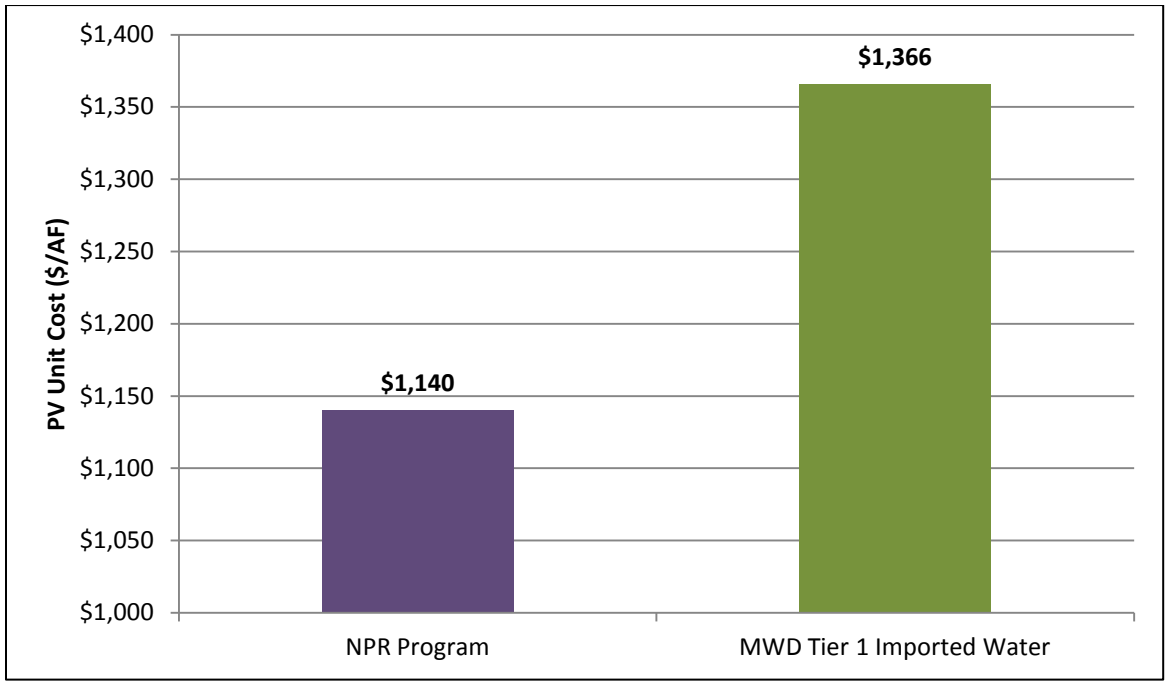
Financial Analysis

This section presents financial analyses of the NPR program costs presented in Table ES-4. There are many different ways that the NPR program could be financed, which impacts the total cost of the program. In this section two potential methods are presented, "pay-as-you-go" (no financing) and financing using borrowed funds, with the resulting cumulative cost over a 50-year period. For both evaluations, the projected cumulative cost is compared with projected Tier 1 Metropolitan Water District of Southern California (MWD) imported water cumulative costs. Historically, LADWP has funded its recycled water projects entirely through its Water Rates Ordinance Water Procurement Adjustment Surcharge (Surcharge) without borrowing money. This is called the "pay-as-you-go" method that provides funding during each of the project's planning, design, and construction phases, and also for ongoing O&M costs.

To evaluate and compare future recycled projects for the RWMP documents, a standard economic method called the present value (PV) approach was used. This approach first estimates future capital and O&M costs for the lifecycle of each project, accounting for inflation. Then all future year O&M and capital costs are brought back to PV terms using a discount rate. To determine the cost-effectiveness of the recycled water projects under pay-as-you-go financing, a PV unit cost in dollars per acre-foot ($/AF) for the NPR program was estimated by taking the sum of the PV costs divided by the sum of water yield over the 50-year life of the program. This PV unit cost was then compared to the PV unit cost of MWD Tier 1 water purchases.

The PV unit cost for the NPR program is estimated to be $1,140/AF, which includes potential capital and O&M costs (Table ES-4) over the 50-year life of the NPR projects. The PV unit cost for MWD Tier 1 water purchases over the same 50-year period is estimated to be $1,366/AF, which is about 20% greater than the estimated PV for the NPR program. The MWD Tier 1 water rates were forecasted based on current MWD rate projections through 2018 (averages 5% per year), historical rate increases (through 2012), and an assumed 5% annual growth from 2019 on. **Figure ES-11** shows the PV unit costs for the imported water rate projections along with the present value unit costs for the NPR program. As shown in the figure, the NPR program costs less than purchasing Tier 1 water from MWD.

Figure ES-11: Unit PV Cost for NPR Program Compared with Projected MWD Tier 1 Imported Water Costs



An alternative funding approach is to borrow money through long-term financing to fund capital expenditures. Borrowing to fund these costs reduces the near-term impact on customer's water rates, but the costs will have to be repaid with interest, but over a long-term period. The same future MWD Tier 1 imported water rates were estimated for the long-term financing option as with the pay-as-you-go analysis, which is based on a 5% annual growth from 2012 to 2061.

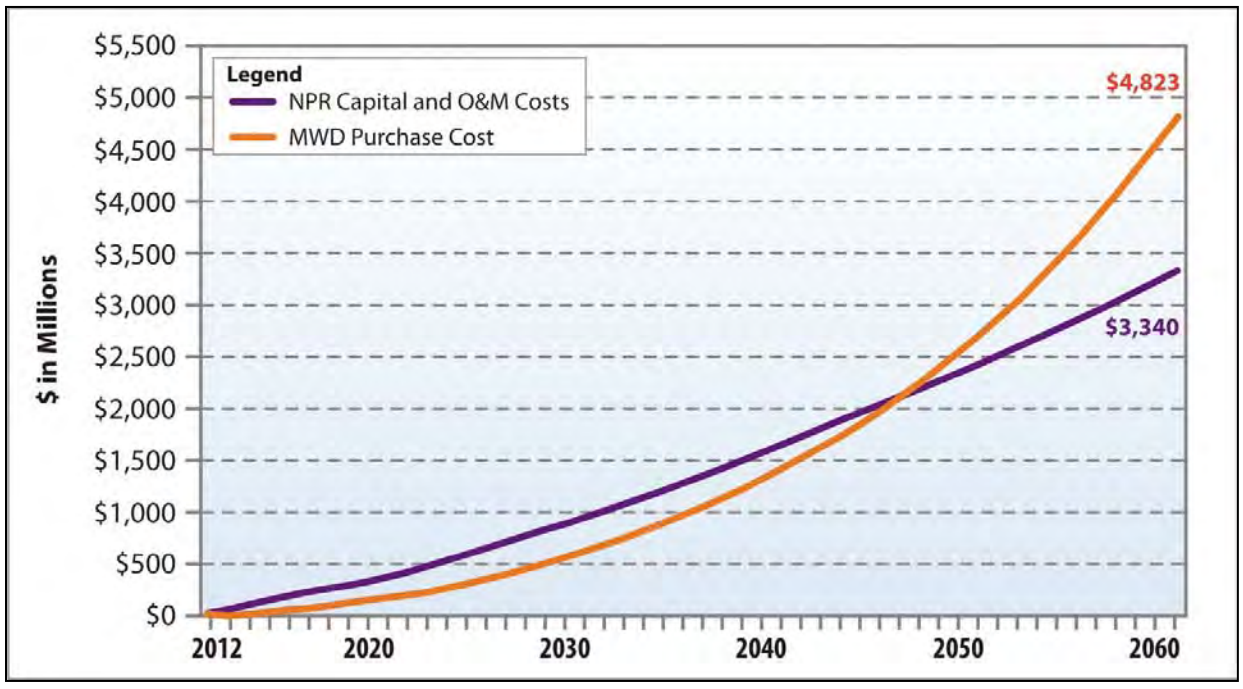
To determine the annual expenditures of the recycled water projects using this alternative funding approach, the following assumptions were made:

1. Sixty percent of capital expenditures are financed over 30 years at 5% interest, resulting in an annual amortized payment
2. The remaining forty percent of capital expenditures plus O&M costs are paid using the "pay as you go" method in each future year
3. All costs include the effects of inflation

The above costs are projected for each year and added together to arrive at a total annual project cost. **Figure ES-12** shows the cumulative annual expenditures over a 50-year period compared to the cumulative costs of purchasing equivalent amounts of Tier 1 MWD water. The same assumption regarding the future cost of MWD water used for the "pay-as-you-go" method described in Section 8.2.1 was used for this comparison.

The cumulative cost for the NPR program is $3.34 billion. Comparatively, the cumulative cost of purchasing MWD water is $4.82 billion. The payback year for the NPR program is 2047. A similar cumulative cost analysis for the pay-as-you-go model yields a 50-year NPR program cost of $3.01 billion (payback year of 2043).

Figure ES-12: Cumulative NPR Program Costs Compared with Projected MWD Water Purchases



In conclusion, cumulative MWD water purchases over a 50-year period are expected to be greater than LADWP's NPR program costs under either financing model. MWD water purchases will be 60% greater under the pay-as-you-go analysis and 44% under the alternative financial analysis. **Over the long term, the NPR program will cost less than the cost of purchasing MWD imported water**.

In addition, there are important operational and reliability benefits that are gained by having an increased amount of local water supplies. Recycled water is not subject to drought or imported water short or long term emergency outages that can significantly reduce MWD's imported water availability to Los Angeles.

Next Steps

Implementation of the GWR project and NPR program will be done concurrently as funding is available. Water recycling projects (WRPs) selected for implementation will consist of cost effective projects with a higher ease of implementation, lower capital costs, and anchor customers with high conversion ratings. Ultimately, LADWP will implement enough WRPs to result in non-potable reuse of at least 29,000 AFY by 2035, including 9,650 AFY of potential NPR projects developed in this report.

Acknowledgments

The RWMP process was commissioned in 2009 through the vision of LADWP, in partnership with the BOS and BOE. Critical to the development of the RWMP documents was a diverse team of contributors and reviewers. The following individuals have dedicated significant time and effort to shaping a reliable, sustainable water future for Los Angeles.

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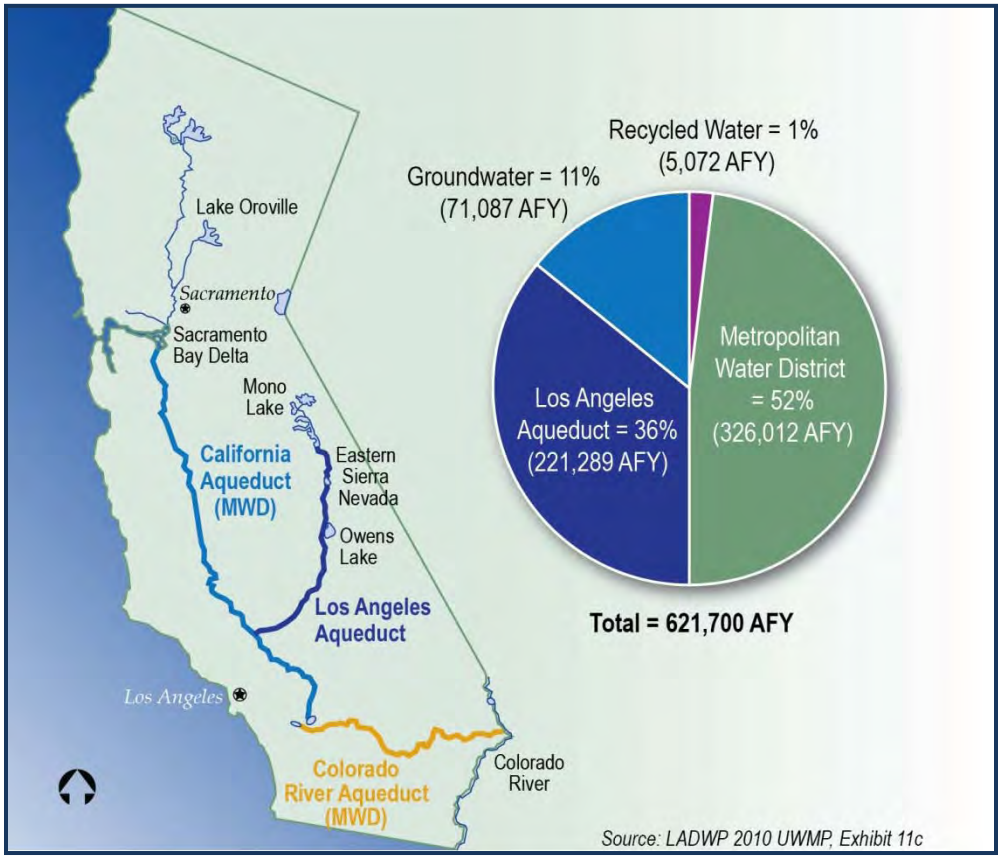
1. Introduction

1.1 Background

The City of Los Angeles (the City), with its location in a naturally dry area with warm temperatures, little rainfall, and few local sources of water, relies heavily on imported water from the Sacramento Delta (California Aqueduct), Eastern Sierra Nevada (Los Angeles Aqueduct), and Colorado River (Colorado River Aqueduct). More recently, local groundwater sources have only accounted for 11 percent of the total supply. These sources of water for the City, and annual average source water distribution for years 2006 to 2010, are illustrated in **Figure 1-1**.

Figure 1-1: Current Sources of Water for City of Los Angeles (FY 2006 to 2010)



The City's imported supplies have been significantly cut in recent years – some by as much as half – due to periods of dry weather and low snowpack, environmental commitments, and judicial decisions. In addition, the City's ability to utilize limited groundwater supplies has been impacted by contamination.

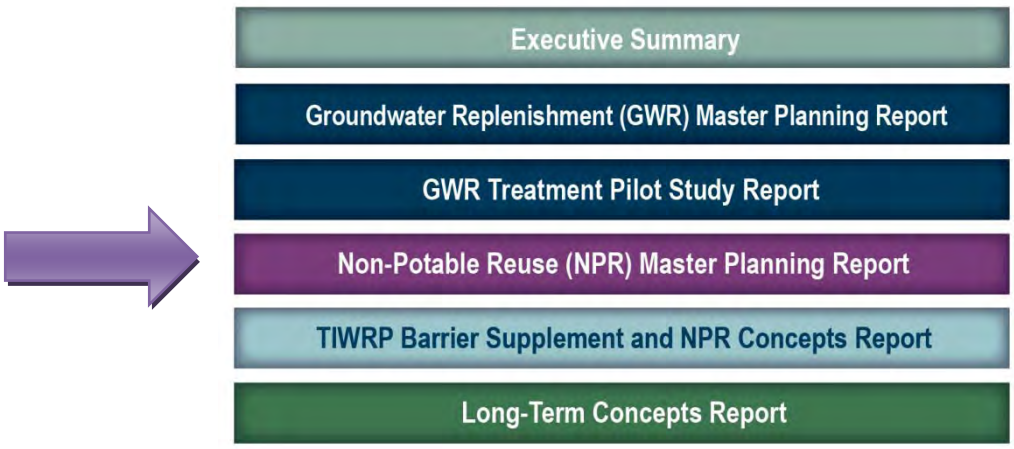
Conservation has helped Angelenos maintain about the same total water use since 1980, despite a population growth of 1 million people. However, conservation alone cannot meet future demands.

The City developed key strategies to secure a more reliable water supply for the City: 1) Increase water conservation, 2) Increase water recycling, 3) Enhance stormwater capture, 4) Accelerate groundwater cleanup, and 5) Green Building Initiatives. These strategies are being implemented through a number of parallel efforts and are documented in the 2010 Urban Water Management Plan (UWMP) for the City. The Los Angeles Department of Water and Power's (LADWP) UWMP outlines a goal of increasing recycled water use citywide to 59,000 acre-feet per year (AFY) by 2035. The City currently delivers approximately 8,000 AFY for non-potable reuse (NPR) and for barrier supplement in the Dominguez Gap Barrier.

LADWP, in partnership with the City of Los Angeles Department of Public Works (LADPW), Bureau of Sanitation (BOS) and Bureau of Engineering (BOE), developed the Recycled Water Master Planning (RWMP) documents to outline strategies to offset imported water demand by utilizing recycled water. Specifically, the RWMP process identified projects to significantly increase the City's recycled water use. Originally, the RWMP was to identify groundwater replenishment (GWR) and NPR projects to achieve 50,000 AFY. But after adoption of the 2010 UWMP, the goal of the RWMP was modified to identify, evaluate, and set a course for achieving a total use of 59,000 AFY[1] by 2035, as well as developing a plan to maximize reuse.

The RWMP documentation includes a series of volumes comprised of an Executive Summary, GWR Master Planning Report, GWR Treatment Pilot Study Testing Report, NPR Master Planning Report, TIWRP Barrier Supplement and NPR Concepts Report, and Long-Term Concepts Report, as well as a series of supporting technical memoranda (TMs). **Figure 1-2** illustrates the organization of these volumes.

Figure 1-2: RWMP Documentation



[1] LADWP has 8,000 AFY of existing recycled water customers, including both NPR and barrier supplement in the Dominguez Gap Barrier. LADWP has identified 11,350 AFY of new customers (19,350 AFY total), which are a portion of the overall 59,000 AFY goal. Therefore, the RWMP documents identify the additional 39,650 AFY of recycled water to meet the overall 59,000 AFY goal.

Figure 1-3 illustrates the breadth and linkage of the various RWMP components.

Figure 1-3: Overview of RWMP Components

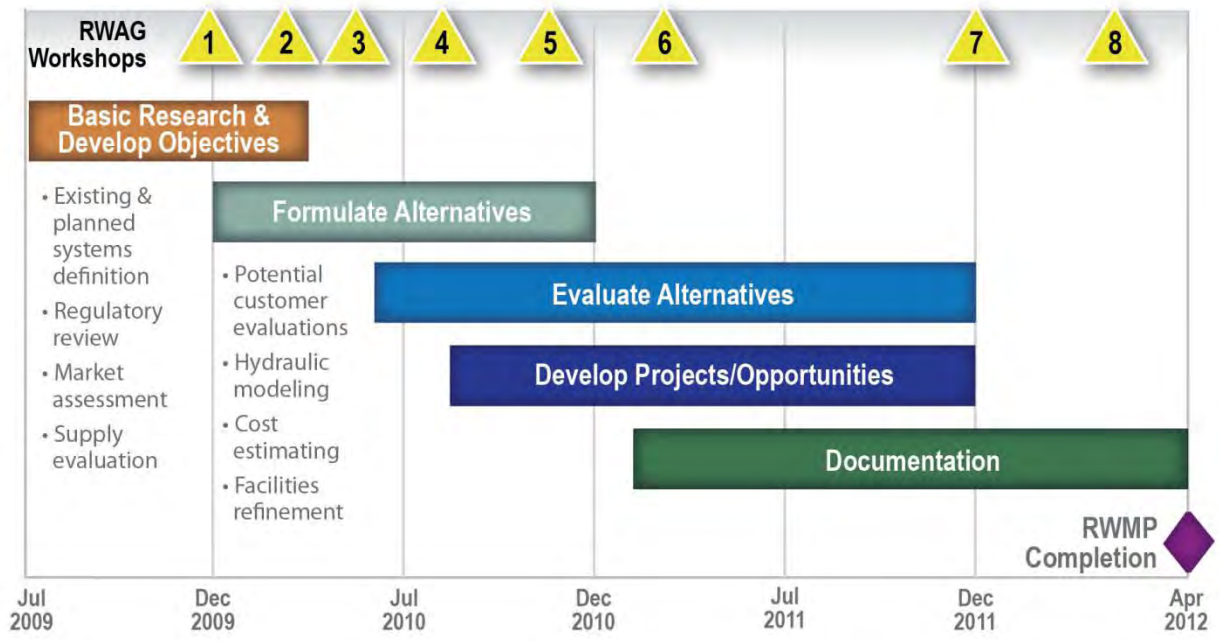
[1]*Goals are cumulative.*

[2]*Additional Barrier Supplement does not offset imported water in the City of Los Angeles and, moving forward, does not count toward the goal of 59,000 AFY.*

1.2 Recycled Water Master Planning Approach

The overall approach for the RWMP was to develop objectives, conduct basic research for GWR and NPR, formulate and evaluate integrated alternatives that include varying amounts of GWR and NPR, and from that analysis develop specific projects/opportunities and the associated master planning reports to implement the opportunities. **Figure 1-4** illustrates the main master planning steps and the timeline.

Figure 1-4: Recycled Water Master Planning Approach and Schedule



An important part of the RWMP is including stakeholders in the development process. In parallel to the RWMP, the City established a Recycled Water Advisory Group (RWAG) comprised of key public stakeholders representing neighborhood councils, environmental groups, industry, homeowners associations, and others. At key steps in the RWMP, the team held workshops with the RWAG to present information and seek feedback, which was then

incorporated into the RWMP documents. In addition, Recycled Water Forums were held throughout the City to inform and receive input from the general public.

In 2010, the City contracted with the National Water Research Institute (NWRI) to establish an Independent Advisory Panel (IAP). Using an IAP increases the credibility of the project by providing an independent evaluation of the technical, regulatory, and health-related elements of the RWMP projects. By establishing the IAP early in the process, the City will have additional flexibility with the project implementation and facility planning issues that may arise during the engineering report.

1.3 Overview of Non-Potable Reuse

Non-potable reuse is the use of treated wastewater ("recycled water") for a beneficial use and is a practical, proven way to increase the availability of a safe, reliable, locally controlled water supply. Recycled water is municipal wastewater that has gone through various treatment processes to meet specific water quality criteria with the intent of being used in a beneficial manner. Recycled water has been used to meet non-potable water demand in many parts of the United States, including California, for decades. It has been successfully applied for a wide range of non-potable uses, including:

- Landscape irrigation
- Agricultural irrigation
- Industrial process water
- Power plant cooling water
- Toilet flushing
- Car washing
- Augmentation of recreational water bodies
- Fire protection
- Commercial cleansing
- Construction, and
- Habitat restoration

The State of California regulates the treatment, use, and discharge of recycled water according to Title 22 of the California Administrative Code ("Title 22"). The statewide Water Recycling Criteria are developed by the California Department of Public Health (CDPH) and enforced by the nine State Regional Water Quality Control Boards. The water reclamation process—the treatment of wastewater to make it reusable according to definable treatment reliability and water quality criteria—includes three steps:

1. Primary Treatment: The mechanical process to remove suspended and settleable solids and organic matter from wastewater, usually by sedimentation.
2. Secondary Treatment: The biological and chemical processes to remove biodegradable organic matter (in solution or suspension) and suspended solids.
3. Tertiary Treatment: Removal of residual suspended solids (after secondary treatment), usually by granular medium filtration, surface filtration, or membranes. Disinfection is also typically a part of tertiary treatment.

Also, nutrient removal is becoming a more common treatment process included after secondary treatment. "Nitrification" is the biological oxidation of ammonia into nitrite and nitrite into nitrate. "Nitrification denitrification (NdN)" is the conversion of nitrogen products (ammonia, nitrate, nitrite) into nitrogen gas. In situations where the quality of the recycled water does not meet criteria for use in certain industrial and other applications, additional advanced treatment, such as microfiltration (MF) and reverse osmosis (RO), is typically included in the treatment

regime. The GWR project proposes to implement an advanced water purification facility (AWPF) that consists of MF, RO, and advanced oxidation process (AOP) to produce purified recycled water to replenish the City's groundwater supplies.

In Los Angeles, recycled water is produced at three water reclamation facilities owned by the City and operated by the Department of Public Works, Bureau of Sanitation: DCTWRP, Los Angeles-Glendale (LAGWRP), and Terminal Island Water Reclamation Plants (TIWRP). Secondary treated water is produced at the City's Hyperion Treatment Plant (HTP) and is provided to West Basin Municipal Water District (WBMWD) at the Edward Little Water Reclamation Facility (ELWRF) for further treatment to the tertiary level.

Recycled water is conveyed to customers with facilities similar to the potable water system (i.e., pump stations, pipelines, and tanks) but the non-potable facilities are completely separate from the potable facilities and designated by a purple color and/or labeled as recycled water. As a result, non-potable reuse projects are commonly referred to as "purple pipe" projects.

1.4 Overview of Document

The purpose of this NPR Master Planning Report is to research, identify and develop a "menu" of potential NPR projects at a master planning level that could be implemented across the City and supplied from City or regional water reclamation plants (WRPs) to help meet LADWP's recycled water supply goals. The separate GWR Master Planning Report discusses opportunities for GWR in the San Fernando Basin by utilizing recycled water from the Donald C. Tillman Water Reclamation Plant (DCTWRP). Together, the NPR Master Planning Report and the GWR Master Planning Report provide the City with the framework to achieve 59,000 AFY of water recycling to offset imported water.

The NPR Master Planning Report is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Setting
- Section 3 – Criteria
- Section 4 – Market Assessment
- Section 5 – Supply Assessment
- Section 6 – Systems Development
- Section 7 – Water Recycling Project Descriptions
- Section 8 – Implementation Plan

1.5 Coordination with Other RWMP Deliverables

Table 1-1 summarizes the TMs that were developed under these task orders and used as the basis for this NPR Master Planning Report. These TMs are included in the appendices.

Table 1-1: Related NPR Master Planning TMs

TM Title	Location in Report
Existing and Planned Recycled Water Systems TM	**Appendix A**; Relevant Findings in Section 2.1
This TM documents the existing and planned project facilities (pipelines, pump stations and storage), identifies the existing customers currently served with recycled water and defines the planned customers and demands.	
NPR Regulatory and Practices TM	**Appendix B**; Relevant Findings in Section 2.2
This TM defines existing recycled water regulatory and practices conditions and identifies items to consider during development of non-potable reuse projects.	
Integrated Alternatives Development and Analysis TM	**Appendix C**
This TM combines independent GWR and NPR preliminary project options into integrated alternatives to meet the near-term RW goals; and compare and rank the integrated alternatives based on City's RWMP objectives. The outcome of the integrated alternatives analysis was to pan for the more aggressive GWR alternative (30,000 AFY), but also identify potential NPR projects to develop in parallel. See Section 1.7.2 for more information.	
NPR Service and Reliability Goals and Criteria TM	**Appendix D**
This TM was prepared to provide the basis for assessment of the reliability of the existing systems. The TM includes summaries of interviews conducted with a select group of recycled water suppliers throughout California and beyond. The intent of the interviews was to identify the criteria that are used in the planning, design, and operations of the respective recycled water systems, the types of reliability issues that have been encountered in these systems, and the solutions that each of these agencies has developed from their past experiences.	
Cost Estimating Basis for Recycled Water Master Planning	**Appendix E**
This TM was developed to describe a cost estimating basis used for the analysis of options and alternatives being developed under the RWMP. Unit costs for the following types of facilities are included in this TM: treatment, pipelines, pump stations, storage, pressure regulating stations, groundwater wells, water purchases, and land acquisition.	
Satellite Reuse Options TM	**Appendix F**
This TM was developed to define potential satellite treatment facilities across the City. The TM included development of four satellite treatment plants that would apply a membrane bioreactor/ ultraviolet disinfection treatment train to treat raw wastewater in order to produce tertiary treated recycled water.	
USC / Exposition Park Satellite Assessment TM	**Appendix G**
This TM was developed to enable the comparison of NPR service to USC and Exposition Park with a satellite reclamation plant to a centralized distribution system (defined in the NPR Master Planning Report).	

1.6 Definitions

This section defines terms commonly used throughout this report:

- **Existing:** LADWP's existing systems and customers discussed in this report consist of the existing recycled water facilities and customers being served as of January 2012.
- **Planned:** Planned systems consist of water recycling projects (WRPs) and customers that are already either in a stage of planning, design, or construction as of January 2012.
- **Potential:** Water recycling projects defined in this report have the potential to help achieve the goal of reusing an additional 39,650 AFY or more of recycled water by 2035. These WRPs would serve potential customers (identified for future planning purposes).
- **Non-LADWP Customer**: A customer that is outside LADWP's service area and has the potential to receive recycled water from an LADWP recycled water system. Non-LADWP customers were not considered for sizing potential facilities.
- **Target Customer:** A potential customer with estimated non-potable demand greater than 50 AFY.
- **Anchor Customer:** A target customer that is associated with a potential WRP.

1.7 Planning Parameters

This section outlines the guiding principles, planning parameters for the RWMP.

1.7.1 Recycled Water Master Planning Objectives

The RWMP team established objectives at the beginning of the planning process for the purpose of establishing criteria by which different alternatives can be compared against each other.

Several guidelines were used when establishing the objectives. The objectives had to be easy to understand, not redundant, measureable with evaluation criteria, and, concise in number. Generally there should be no more than five to eight total. It is also important to note that objectives are not solutions. Objectives define ***what*** the City is trying to achieve through the RWMP, and solutions (i.e., alternatives) represent ***how*** these objectives will be achieved.

Two threshold objectives were established, which had to be met regardless of the alternative:

- **Threshold Objective 1** – Meet all water quality regulations and health & safety requirements, and use proven technologies.
- **Threshold Objective 2** – Provide effective communication and education on recycled water program.

In addition to the threshold objectives, six additional objectives summarized in **Table 1-2** were established. The RWAG assisted in the development of these objectives.

Table 1-2: Recycled Water Planning Objectives

Recycled Water Planning Objectives
1 – Promote Cost Efficiency: Meet the goals of the recycled water program in a cost-effective manner, considering both City and recycled water customer costs.
2 – Achieve Supply and Operational Goals: Meet or exceed water supply targets and operational goals established by the City.
3 – Protect Environment: Develop projects that not only protect the environment, but also provide opportunities to enhance it.
4 – Maximize Implementation: Maximize implementation by minimizing typical hurdles including institutional complexity, permitting challenges, and by maximizing customer acceptance.
5 – Promote Economic and Social Benefits: Provide economic and social benefits in the implementation and operation of recycled water projects
6 – Maximize Adaptability and Reliability: Maximize adaptability and reliability to adapt to uncertainties and to maximize reliability of operations once projects are implemented.

1.7.2 Planning Year and NPR Goals

The initial basis for GWR and NPR Master Planning was to provide a framework to achieve 50,000 AFY. However, as mentioned in Sections 1.1, the City's UWMP calls for 59,000 AFY of imported water supplies to be replaced by recycled water by 2035. Although this RWMP was initially structured to achieve the 50,000 AFY goal, combinations of GWR and NPR alternatives are included to support the UWMP 59,000 AFY goal by 2035.

The City has existing non-potable reuse projects and a barrier supplement project with a combined average annual reuse of 8,000 AFY and has planned non-potable reuse projects that are under construction or in planning/design with an average annual reuse of 11,350 AFY. The total imported water offset capacity of these recycled water projects is 19,350 AFY.

The goal of new recycled water projects, planned as part of the RWMP, is to offset the remaining 39,650 AFY of imported water. **Table 1-3** summarizes the City's recycled water goals.

Table 1-3: City's Recycled Water Project Goals

Recycled Water Projects	Imported Water Offset
"Existing" NPR Projects	**19,350 AFY**
Currently in operation	8,000 AFY
In construction, design, or planning	11,350 AFY
New Recycled Water Projects, planned as part of RWMP	**39,650 AFY**
Total	**59,000 AFY**

When the RWMP was initiated, the recycled water goal was originally 50,000 AFY, which meant that originally 30,650 AFY of new recycled water projects (GWR and NPR) needed to be planned as part of the RWMP. To meet this 30,650 AFY goal, the RWMP team developed and evaluated integrated alternatives comprised of varying amounts of GWR and NPR. The

Integrated Alternatives Development and Analysis TM (**Appendix C**) documents this analysis. As part of the Integrated Alternatives Analysis, three integrated alternatives with different combinations of GWR and NPR projects were evaluated. **Figure 1-5** summarizes the three integrated alternatives developed to offset the initial goal of 50,000 AFY of imported water as well as modifications to achieve the UWMP goal of 59,000 AFY.

Figure 1-5: Integrated Alternatives to Reach 50,000 AFY and 59,000 AFY

Note:

1. The original recycled water goal for the RWMP was 50,000 AFY by 2019, which was established before the completion of the 2010 UWMP. The recycled water goal was revised to 59,000 AFY by 2035 with the issuance of the 2010 UWMP. The UWMP reflects realities of funding limitations that were not addressed in the 2008 Water Supply Action Plan. Water rate increases are required to achieve even the revised projections in the UWMP. The integrated alternatives analysis was originally focused on determining the balance of GWR and NPR to achieve 30,650 AFY so that when combined with the 19,350 AFY of existing and planned NPR demands would achieve an overall recycled water goal of 50,000 AFY.

The integrated alternatives analysis concluded that more GWR (Alternative 3) is most beneficial, since this alternative performs better than alternatives with less GWR in terms of capital costs and project implementation. Alternative 3 also has many benefits for implementation because of having more GWR than NPR, fewer contracts and agreements are needed with outside agencies. With Alternative 3 implementing one larger GWR project rather than many, smaller NPR projects requires fewer projects/contracts; and will also result in fewer public construction impacts due to temporary traffic, noise, odor, and dust caused by construction of NPR pipelines. Therefore, the RWMP documents are based on achieving a GWR goal of 30,000 AFY and an NPR goal of 9,650 AFY. When combined with the 19,350 AFY of

existing and planned NPR demands, these projects will achieve the City's goal of 59,000 AFY by 2035.

To allow for the most flexibility for implementation, the NPR Master Planning Report identifies over 18,000 AFY of potential NPR projects. NPR projects that are most feasible considering cost and other important criteria will be the ones pursued.

The City relies on a mix of GWR and NPR projects to meet its goals, and has the flexibility to adjust the amount of each eventually implemented. As the recycled water program develops, the City can revisit the multi-criteria comparison of GWR and NPR to determine whether the GWR project should be expanded an additional 15,000 AFY or less. If the GWR expansion is less than the additional 15,000 AFY, then more NPR projects would be implemented to achieve the goal of 59,000 AFY by 2035.

2. Setting

The purpose of this section is to provide a summary of the setting for the recycled water master planning effort. This section includes descriptions of the existing and planned recycled water systems and the existing recycled water regulatory setting and practices. This section consists of three sub-sections:

- Existing and Planned Recycled Water Systems (Section 2.1)
- Recycled Water Regulatory Setting (Section 2.2.1)
- Recycled Water Practices (Section 2.2.2)

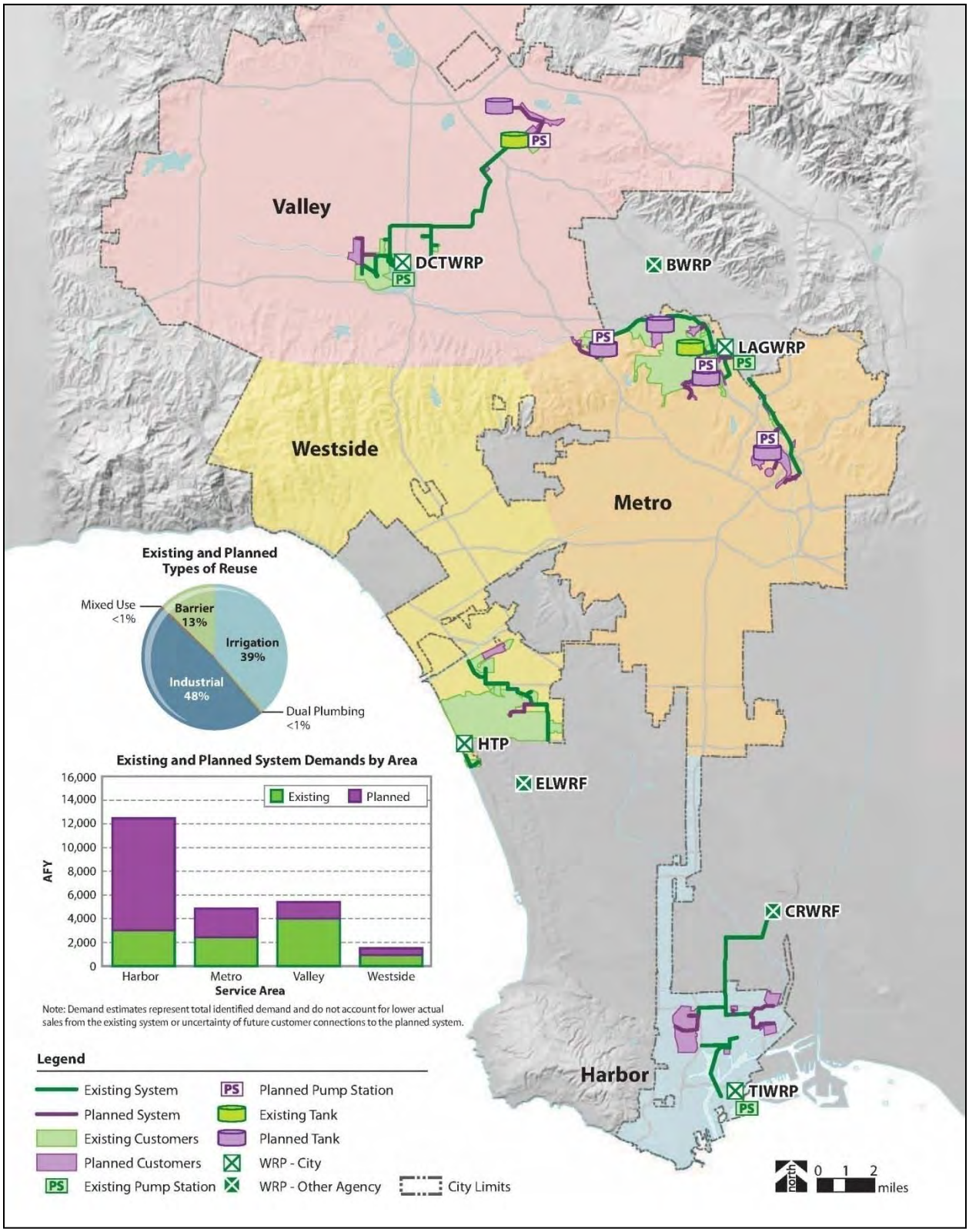
2.1 Existing and Planned Recycled Water Systems

The *Existing and Planned Recycled Water Systems TM* (**Appendix A**) was developed to document the existing and planned project facilities, which include pipelines, pump stations, and storage tanks. The TM also identified the existing customers currently being served with recycled water and the planned customers to be served. For purposes of this report, the existing systems consist of the existing recycled water facilities and customers being served as of January 1, 2012. The planned systems consist of the projects that are already either in construction, design or planning.

The LADWP recycled water projects are located in four service areas: Harbor, Metro, Valley and Westside (**Figure 2-1**). Each service area has at least one existing recycled w ater "system" and each system has a unique recycled water supply that is hydraulically independent from the others. A second system is planned for the Harbor Service Area. The systems are made up of individual "Water Recycling Projects" (WRPs) that are connected to form the systems. This section describes the five existing and planned recycled water systems:

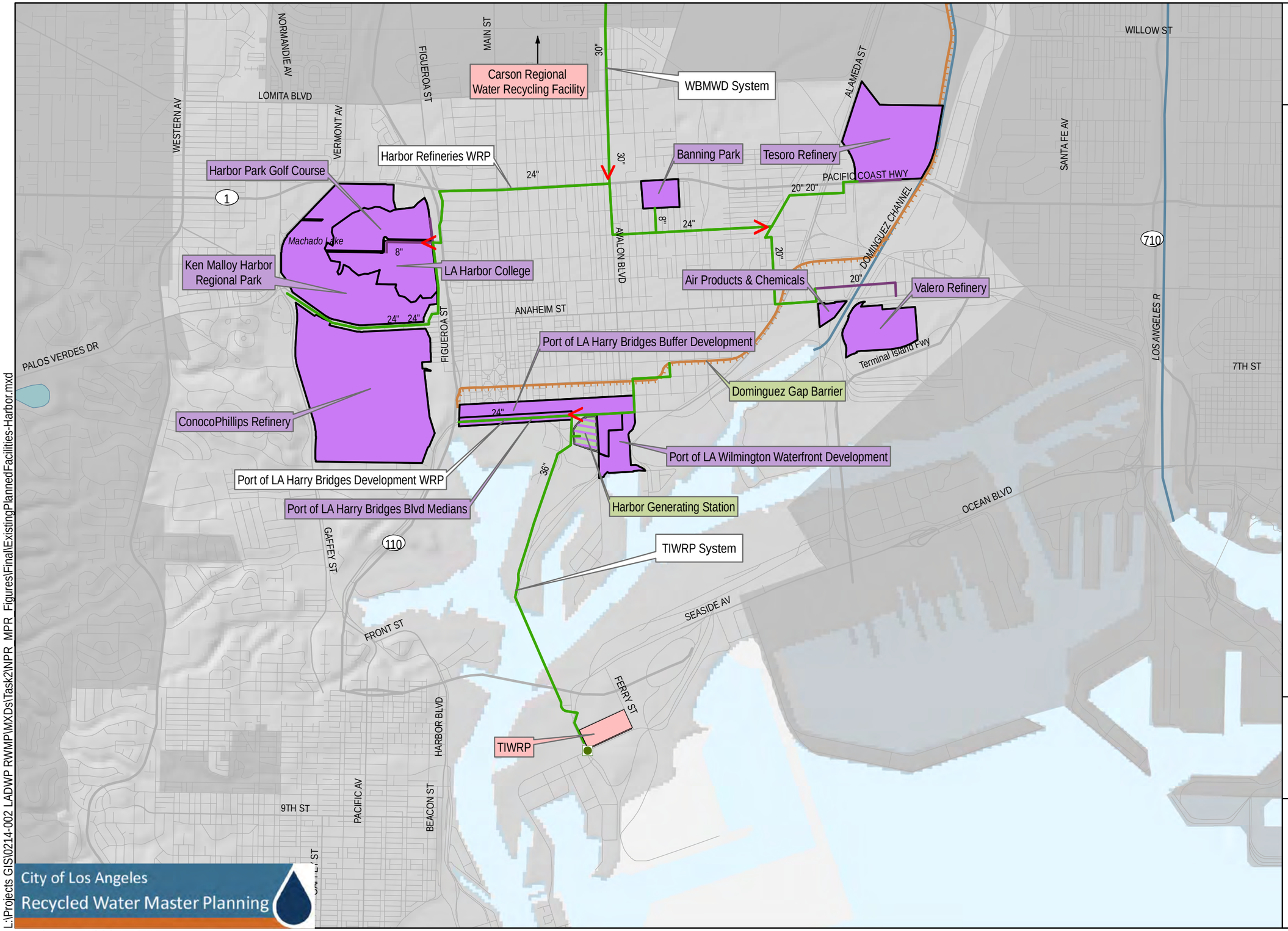
1. Harbor Service Area, TIWRP System (**Figure 2-2**)
2. Harbor Service Area, WBMWD System (**Figure 2-2**)
3. Metro Service Area, LAGWRP System (**Figure 2-3**)
4. Valley Service Area, DCTWRP System **(Figure 2-4**)
5. Westside Service Area, Westside System (**Figure 2-5**)

Figure 2-1: Existing and Planned Recycled Water Systems



Existing & Planned Recycled Water System Harbor Service Area

Figure 2-2



Customers

- Existing Customers
- Planned Customers
- Dominguez Gap Barrier

Facilities

- Planned LADWP Water Recycling Projects (WRP)
- Existing Pump Station
- Existing Pipelines
- Planned Pipelines
- Treatment Plant
- Pipe Size Transition

Other Features

- Major Road
- Local Road
- Waterway
- Water Body
- City of Los Angeles
- Other City/Agency

Note: Pipeline alignments to some planned customers have not been determined.

N 0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

Data Sources: USGS, LADWP

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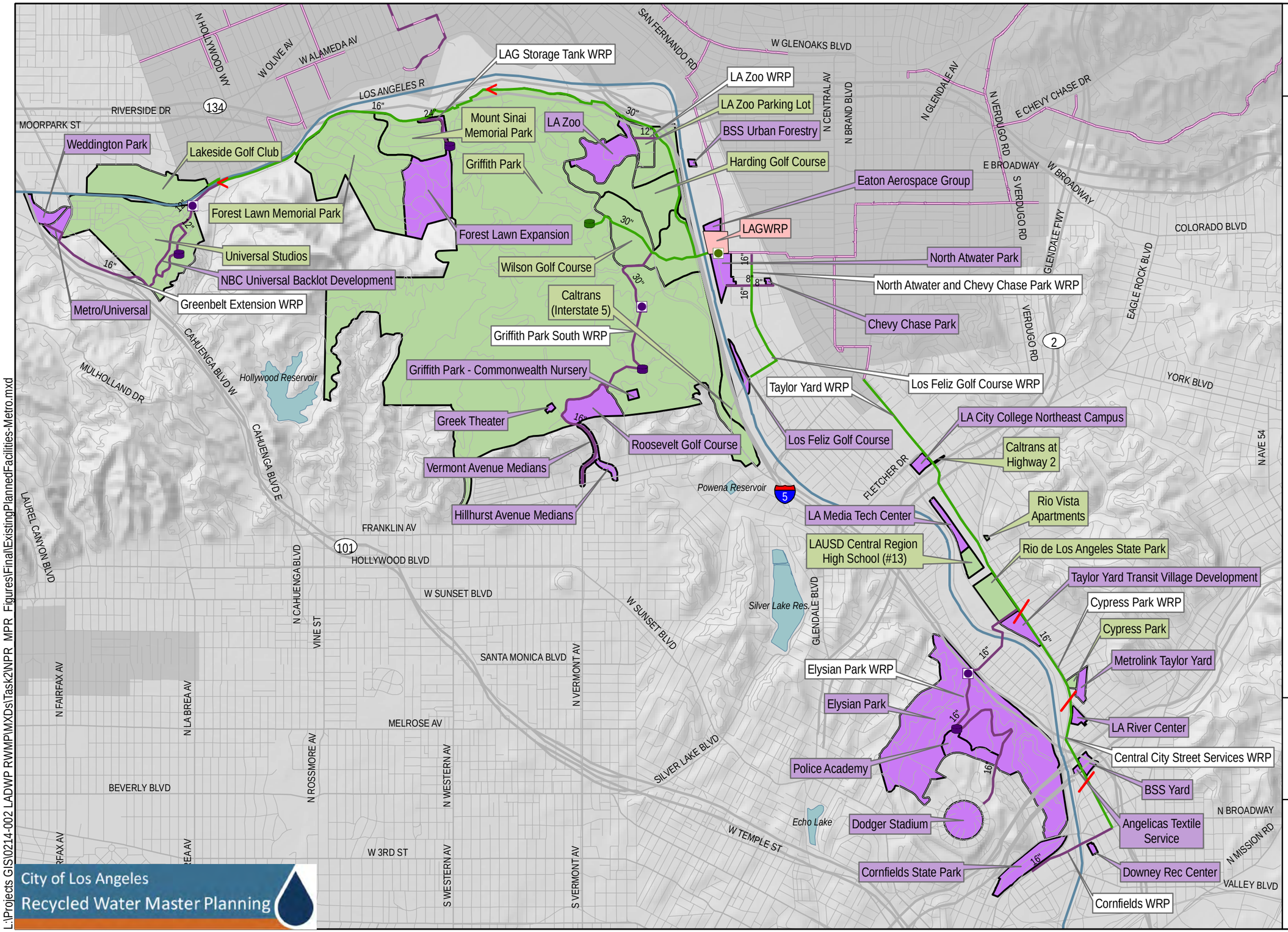
Existing & Planned Recycled Water System Metro Service Area

Figure 2-3



Customers
- Existing Customers
- Planned Customers

Facilities
- Planned LADWP Water Recycling Projects (WRP)
- Existing Storage Tank
- Planned Storage Tank
- Existing Pump Station
- Planned Pump Station
- Existing Pipeline
- Planned Pipeline
- Non-LADWP Existing Pipeline
- Non-LADWP Planned Pipeline
- Treatment Plant
- Pipe Size Transition
- WRP Boundaries

Other Features
- Major Road
- Local Road
- Waterway
- Water Body
- City of Los Angeles
- Other City/Agency

Note: Pipeline alignments to some planned customers have not been determined.

N

0 0.25 0.5 1

Miles

City of Los Angeles
Recycled Water Master Planning

LADWP · City of Los Angeles Sanitation Department of Public Works · RMC in association with CDM

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Data Sources: USGS, LADWP

City of Los Angeles
Recycled Water Master Planning

Existing & Planned Recycled Water System Valley Service Area

Figure 2-4

Garber Street WRP
Hansen Dam Golf Course WRP
Hansen Dam Golf Course
MTA Branford Bus Yard
LA County Flood Control District, Hansen Yard
Valley Generating Station
Branford Park
Cal Trans 405/Sherman
Valley Presbyterian Hospital
LADWP DS 81
Van Nuys Masonic Lodge
Van Nuys Golf Course
Woodley Lakes Municipal Golf Course
Anthony C. Beilenson Park
Mulholland Middle School
First Foursquare Church and Van Nuys Masonic Lodge WRP
First Foursquare Church (Sports Field)
Valley Presbyterian Hospital WRP
LADWP DS 60
Valley High School WRP
CA Air National Guard
St. Elisabeth Church
Valley Alternative High School
Van Nuys High School
Japanese Garden
Delano Park WRP
High Tech High School
MTA Orange Line Busway
Birmingham High School
DCTWRP
Sepulveda Basin Sports Complex
Delano Park
Balboa Sports Complex
Woodley Park/Cricket Fields
Balboa Municipal Golf Course
Lake Balboa
Wildlife Lake
Encino Municipal Golf Course

BRAND BLVD
FOOTHILL BLVD
CHATSWORTH ST
WENTWORTH ST
DEVONSHIRE ST
PLUMMER ST
NORDHOFF ST
PARTHENIA ST
ROSCOE BLVD
SATICOY ST
VENTURA BLVD
LA TUNA CANYON RD
SAN FERNANDO BLVD
VICTORY BLVD
VANOWEN ST
FOX ST
ARLETA AV
VESPER AV
CANTERBURY AV
OSBORNE ST
BRANFORD ST
SHELDON ST
SAN FERNANDO RD
GLENOAKS BLVD
TUXFORD ST
SUNLAND BLVD
WEBB AV
LANKERSHIM BLVD
LAUREL CANYON BLVD
LAND AV
RESEDA BLVD
ZELZAH AV
BALBOA BLVD
VAN NUYS BLVD
WHITE OAK AV
WOODLEY AV
SEPULVEDA BLVD
WOODMAN AV
LOS ANGELES R
118
405
5
170
101
20"
30"
54"
36"
16"
12"
2 - 36"

Customers
- Existing Customers
- Planned Customers

Facilities
- Planned LADWP Water Recycling Projects (WRP)
- Existing Pump Station
- Planned Pump Station
- Existing Storage Tank
- Planned Storage Tank
- Existing Pipelines
- Planned Pipelines
- Treatment Plant
- Pipe Size Transition
- WRP Boundaries

Other Features
- Major Road
- Local Road
- Waterway
- Water Body
- City of Los Angeles
- Other City/Agency

Note: Pipeline alignments to some planned customers have not been determined.

N
0 0.25 0.5 1
Miles

LA DWP
CITY OF LOS ANGELES SANITATION DEPARTMENT OF PUBLIC WORKS
RMC in association with CDM

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Data Sources: USGS, LADWP

Existing & Planned Recycled Water System Westside Service Area

Figure 2-5

Playa Vista Development, Phase 1
Playa Vista Development, Phase 2
Coldwell Banker at Playa
Caltrans at Playa Vista
Ballona Creek
Loyola Marymount University
Central Regional Elementary School #22
Westchester Park
Street Medians
Westchester Golf Course
Emerson Adult College
The Parking Spot
Carl Nielson Youth Park
LAX - Irrigation
LAX - Cooling Towers
Hyperion Treatment Plant
Scattergood Generation Station
ELWRF

PACIFIC AV
VENICE BLVD
WASHINGTON ST
WASHINGTON BLVD
CULVER BLVD
CENTINELA AV
JEFFERSON BLVD
SEPULVEDA BLVD
SLAUSON AV
BLUFF CREEK DR
PLAYA VISTA DR
LA CIENEGA BLVD
LA TIJERA BLVD
FLORENCE AV
PERSHING DR
MANCHESTER AV
FORDHAM RD
LINCOLN BLVD
W 83RD ST
MANCHESTER AVE
MANCHESTER BLVD
LA BREA AV
MARKET ST
W 88TH ST
WILL ROGERS ST
AIRPORT BLVD
W 96TH ST
CENTURY BLVD
PRAIRIE AV
VISTA DEL MAR
IMPERIAL AVE
IMPERIAL HWY
AVIATION BLVD
INGLEWOOD AV
HAWTHORNE BLVD
EL SEGUNDO BLVD
E GRAND AVE

16"
12"
8"
24"
8"
24"

1
90
105

Customers

- Existing Customers
- Planned Customers

Facilities

- Planned LADWP Water Recycling Projects (WRP)
- Existing Pipeline
- Planned Pipeline
- Non-LADWP Existing Pipeline
- Non-LADWP Planned Pipeline
- Treatment Plant
- Pipe Size Transition

Other Features

- Major Road
- Local Road
- Waterway
- Water Body
- City of Los Angeles
- Other City/Agency

Note: Hyperion Treatment Plant is both a source of recycled water and an existing customer.

N 0 0.25 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

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Data Sources: RMC, USGS, LADWP

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2.1.1 Harbor Service Area – TIWRP System

The TIWRP System is supplied with advanced treated recycled water from TIWRP, which utilizes MF followed by RO and then lime addition[2]. The system uses the TIWRP Pump Station for pressure and does not have any tanks. The system primarily supplies this water to the Dominguez Gap Barrier for barrier supplement via well injection. The system is also connected to the LADWP Harbor Generating Station (HGS) through two meters; however, HGS has not been served recycled water in recent years.

In 2011, the Port of Los Angeles (POLA) completed installation of new pipeline to extend the TIWRP System. LADWP plans additional expansion of the system to primarily consist of small extensions and laterals off existing facilities to various POLA sites. There are no new tanks or pump stations for this system and the only new pipelines are customer laterals.

The TIWRP System demands and facilities are summarized in **Table 2-1**.

Table 2-1: Summary of Harbor – TIWRP Existing and Planned System

Stage	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Existing	2	3,000	2.7	1	--	3.7
Planned	4	210	0.4	--	--	--
Total	**5**[a]	**3,210**	**3.1**	**1**	**--**	**3.7**

a. Harbor Generating Station is considered an existing and planned customer so it is counted once in the total.

2.1.2 Harbor Service Area – WBMWD System

The WBMWD System is a new system that will be supplied from the WBMWD Juanita Millender-McDonald Water Recycling Facility, referred to as the Carson Regional Water Reclamation Facility (CRWRF). LADWP is funding a 12 million gallons per day (mgd) expansion of CRWRF to produce nitrified recycled water, a 12 mgd product water pump station at CRWRF, a 1 million gallon (MG) tank at CRWRF, and 3.8 miles of 30-inch diameter pipe from CRWRF to the City's border with Carson.

The system facilities within the City are referred to as the Harbor Refineries WRP and include 7.5 miles of pipe to serve mostly large industrial customers along with some irrigation customers in the City's Harbor Area. Approximately 6.4 miles of this pipe has already been constructed. The planned large industrial customers are: Air Products and Chemicals, ConocoPhillips Refinery, Tesoro Refinery, and Valero Refinery. The WBMWD System demands and facilities are summarized in **Table 2-2**.

[2] The City is currently considering three alternatives for pH and water stabilization in lieu of the current lime addition process: 1) Lime saturators; 2) Calcium chloride and caustic soda; and 3) Decarbonators, calcium chloride, and lime (*Terminal Island AWTF Product Water Stabilization Review TM*, RMC/CDM, 2009).

Table 2-2: Summary of Harbor – WBMWD Existing and Planned System

Stage	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Existing	--	--	--	--	--	6.4
Planned	8	9,300	12.0	1[a]	1[a]	4.9[a]
Total	**8**	**9,300**	**12.0**	**1[a]**	**1[a]**	**11.3[a]**

a. The pump station, storage tank, and 3.8 miles of pipe are located outside of the City limits and will be owned and operated by WBMWD.

2.1.3 Metro Service Area – LAGWRP System

The LAGWRP System is supplied with recycled water from the City's LAGWRP. All wastewater at LAGWRP is treated to a tertiary level, which includes an NdN process prior to the tertiary treatment. Recycled water from LAGWRP is shared equally between the City of Los Angeles and the City of Glendale. Subsequently, the City of Pasadena invested in 30% of the total allotment, leaving Glendale with 20% of the total allotment per Glendale's Reclaimed Water System Participation Agreement No. 15,075 (1993).

The LAGWRP System primarily supplies recycled water to LADWP customers for irrigation of golf courses and cemeteries located in and around Griffith Park. This system, which follows the eastern and northern edges of Griffith Park, has been referred to as the Greenbelt System. Glendale primarily serves recycled water to irrigation customers and the cooling towers of the Glendale Grayson Power Plant.

The LAGWRP Pump Station provides the system with pressure and the Greenbelt Tank allows for gravity feed. The pump station and tank are in the City and supply recycled water to both LADWP and Glendale customers. Glendale also uses booster pump stations and tanks to serve its customers. LADWP does not have any other City-owned tanks or pump stations on this system; however, Universal Studios has a hydraulically connected booster pump at the western end of the system.

The planned expansion of the LAGWRP System consists of small extensions and laterals off existing facilities as well as a large extension south towards Elysian Park. The planned expansion includes several WRPs:

- Central City Street Services
- Cornfields
- Cypress Park
- Elysian Park
- Greenbelt Extension
- Griffith Park South
- LA Zoo
- LA-Glendale Storage
- Los Feliz Golf Course

- North Atwater Park
- Taylor Yard

Of these, six of the WRPs (Central City Street Services, Cornfields, Cypress Park, Los Feliz Golf Course, and North Atwater Park) have installed at least a portion of planned pipeline and a few customers are now receiving recycled water. Four of the planned WRPs (Greenbelt, Griffith Park, LA Zoo, and LAGWRP Storage) extend off the existing LADWP system in and around Griffith Park (referred to as the Greenbelt System), two of the planned WRPs (Los Feliz and North Atwater) extend off the existing Glendale system in the vicinity of LAGWRP, and the remaining five planned WRPs (Central City Street Services, Cornfields, Cypress Park, Elysian Park, and Taylor Yard) extend off the southern extent of the Glendale System along San Fernando Road towards Downtown. Most of the WRPs only consist of pipelines off the existing LADWP or Glendale systems. The following four planned WRPs include new tanks and/or pump stations:

- Elysian Park WRP includes a pump station and a tank in or around the park
- Greenbelt Extension WRP includes a pump station and a tank in or around Universal Studios
- Griffith Park South WRP includes a pump station and a tank in the southern portion of the park
- LA-Glendale Storage WRP includes a new tank near Forest Lawn Memorial Cemetery

The majority of planned customers in the LAGWRP System use water for the irrigation. The types of irrigation customers include parks, golf courses, a cemetery, a zoo, and a residential/commercial development.

The LAGWRP System demands and facilities are summarized in **Table 2-3**.

Table 2-3: Summary of Metro – LAGWRP Existing and Planned System

Stage	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Existing	14	2,430	4.8	1	1	11.4
Planned	27	2,370	4.6	3	4	9.6
Total	**41**	**4,800**	**9.4**	**4**	**5**	**21.0**

2.1.4 Valley Service Area – DCTWRP System

The existing DCTWRP System is supplied with recycled water from DCTWRP. The DCTWRP tertiary treatment process includes an NdN treatment step prior to the tertiary treatment. The system supplies cooling towers at the LADWP Valley Generating Station (VGS) in Sun Valley and recycled water for irrigation of golf courses and parks located adjacent to DCTWRP in the Sepulveda Basin Recreation Area.

The Balboa Pump Station at DCTWRP provides pressure to the system including to the Hansen Tank at VGS, which then supplies recycled water via gravity. The pump station and tank are

connected by 9.5 miles of 54" pipeline and 0.4 miles of 36" pipeline. The pump station and 54" pipeline were originally constructed as part of LADWP's East Valley Water Recycled Water Project in the mid-1990s. The Hansen Area Water Recycling Project – Phase I, which included the Hansen Tank and 36" pipeline, was constructed primarily to provide a reliable supply of recycled water to VGS, though it also serves to improve service reliability to irrigation customers in the Sepulveda Basin.

Recent expansion of the DCTWRP System consists of small extensions and laterals off existing facilities. The planned expansion also includes small extensions and laterals off existing facilities and consists of the following planned WRPs:

- Delano Park
- First Foursquare Church and Van Nuys Masonic Lodge
- Hansen Dam Golf Course
- Garber Street
- Valley High School
- Valley Presbyterian Hospital

All of these planned WRPs except Garber Street and Valley High School have installed at least a portion of planned pipeline and a few customers are now receiving recycled water. Also, all of these planned WRPs except for Hansen Dam Golf Course and Garber Street are extensions off the existing DCTWRP System. The two noted exceptions are WRPs that extend north from the Hansen Tank at VGS. The Hansen Dam Golf Course WRP includes a pump station and the Garber Street WRP includes the tank that the pump station will feed. The majority of planned customers in the DCTWRP System use water for irrigation. The types of irrigation customers include parks, golf courses, and schools. The DCTWRP System demands and facilities are summarized in **Table 2-4**.

Table 2-4: Summary of Valley – DCTWRP Existing and Planned System

Stage	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Existing	12	3,990	6.1	1	1	17.7
Planned	16	1,360	2.5	1	1	4.7
Total	**28**	**5,350**	**8.6**	**2**	**2**	**22.4**

2.1.5 Westside Service Area – Westside System

The existing Westside System is supplied with recycled water from HTP via the WBMWD ELWRF. The system receives recycled water from ELWRF at a connection located at the City's border with El Segundo along Aviation Blvd near the southeast corner of Los Angeles International Airport (LAX). The system does not include any LADWP-operated pump stations or tanks and uses the pressure from the WBMWD recycled water system to serve customers. In 2011, LADWP constructed an oxidation station near Loyola Marymount University to treat recycled water continuing downstream to customers and address odor and color issues

resulting from excessive water age. The oxidation station oxidizes sulfides (which cause "rotten egg" odor), destroys odorous organic compounds, and destroys biofilm and bacteria.

The existing Westside System also includes a connection located at the City's border with El Segundo along Grand Ave, which is southwest of LAX. This portion of the system also does not include any LADWP-operated pump stations or tanks and uses the pressure from the WBMWD recycled water system to serve customers. The system has two customers: LADWP Scattergood Generating Station and HTP.

The majority of customers in the existing Westside System use water for irrigation. The types of irrigation customers include parks, street medians, a university, an airport, and a residential / commercial development.

Expansion of the Westside System primarily consists of small extensions and laterals off existing facilities. The largest planned customers are LAX (for cooling towers) and Playa Vista Phase 2 (for irrigation and dual-plumbing). The remaining customers use water for irrigation. There are no new tanks or pump stations for this system. The only new pipelines are customer laterals. There are no expansion plans for the portion of the system serving HTP and Scattergood. The Westside System demands and facilities are summarized in **Table 2-5**.

Table 2-5: Summary of Westside – Westside Existing and Planned System

Stage	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Existing	103	880	1.7	--	--	15.0
Planned	8	610	0.9	--	--	1.2
Total	**111**	**1,490**	**2.6**	**--**	**--**	**16.2**

2.1.6 Summary of Existing and Planned Systems

The demands and facilities for the combined existing and planned systems are summarized in **Table 2-6**. As shown in the table, an average annual ultimate demand of 24,110 AFY will be met with recycled water assuming that all planned customers are connected. Note that the RWMP documents assumed an existing and planned recycled water use total of 19,350 AFY, based on demands estimated in early 2008. This estimate will continue to be used until planned customers are connected and demand estimates are confirmed by actual reuse.

The customers and facilities for each planned system and planned WRP are further described in the *Existing and Planned Recycled Water Systems TM* (Appendix A).

Table 2-6: Summary of Existing and Planned Systems

System	No. of Customers	Annual Demand (AFY)	Peak Day Demand (mgd)	No. of Pump Stations	No. of Storage Tanks	Miles of Pipe
Harbor, TIWRP	2	3,000	2.7	1	--	3.7
Harbor, WBMWD	--	--	--	--	--	6.4
Metro, LAG	14	2,430	4.8	1	1	11.4
Valley, DCT	12	3,990	6.1	1	1	17.7
Westside, Westside	103	880	1.7	--	--	15.0
Existing Total, Ultimate	**131**	**10,300**	**N/A**	**3**	**2**	**54.2**
Existing Total, Projected[a]		**8,000**				
Harbor, TIWRP	4	210	0.4	--	--	--
Harbor, WBMWD	8	9,300	12.0	1	1	4.9
Metro, LAG	27	2,370	4.6	3	4	9.6
Valley, DCT	16	1,360	2.5	1	1	4.7
Westside, Westside	8	610	0.9	--	--	1.2
Planned Total, Ultimate	**63**	**13,850**	**N/A**	**5**	**6**	**20.4**
Planned Total, Projected[b]		**11,350**				
Existing and Planned Total, Ultimate	**193[c]**	**24,150**	**N/A**	**8**	**8**	**74.6**

a. Recent recycled water sales totaled 8,000 AFY but the ultimate demand estimate for existing customers is 10,300 AFY based on expected sales once all existing customer maximize available supplies.
b. Assumes all planned customers may not reach their ultimate demand or ultimately connect as customers.
c. Harbor Generating Station is an existing and a planned customer so it is counted once in the total.

Existing and planned demands broken down by customer type are shown in **Table 2-7**. The majority of the demands are split between industrial and irrigation (golf courses, parks, and landscaping). The primary planned industrial customers are three refineries (Tesoro, Conoco, and Valero) and a gas separation plant (Air Products) in the planned WBMWD System and the LADWP Valley Generating Station in the existing DCTWRP System.

Table 2-7: Summary of Existing and Planned Customers by Type

Customer Type	Existing		Planned		Total	
	# of Customers	Demand (AFY)	# of Customers	Demand (AFY)	# of Customers	Demand (AFY)
Irrigation	124	5,190	48	4,220	172	9,410
Industrial	1	2,100	13	9,570	14	11,670
Mixed Use	--	--	2	60	2	60
Barrier	1	3,000	--	--	1	3,000
Dual Plumbing	6	10	--	--	6	10
Total, Ultimate	**131[a]**	**10,300**	**63**	**13,850**	**193[a,b]**	**24,150**
Total, Projected		**8,000[c]**		**11,350[d]**		**19,350**

Notes:
a. HTP has both irrigation and dual-plumbed uses so it is counted once in the total.
b. Harbor Generating Station is both an existing irrigation and planned industrial customer so it is counted once in the total.

c. Recent recycled water sales totaled 8,000 AFY but the ultimate demand estimate for existing customers is 10,300 AFY based on expected sales once all existing customer maximize available supplies.
d. Assumes all planned customers may not reach their ultimate demand or ultimately connect as customers.

***Table 2-8*: Summary of Existing and Planned Project Costs**

	Existing Projects	Planned Projects	Total
Annual Yield	8,000 AFY	11,350 AFY	**19,350 AFY**
Capital Cost	$235 M[a]	$300.2 M	**$535.2 M**
Annual O&M	$7.3 M	$10.6 M	**$17.9 M**

Note:
a. Capital expenditures for work done prior to July 2011.

2.2 Recycled Water Regulatory and Practices

The *Non-Potable Reuse Regulatory and Practices TM (***Appendix B**), was prepared to define the existing recycled water regulatory setting and policies and to identify items for consideration during the NPR master planning process. This section summarizes the information presented in this TM.

2.2.1 Recycled Water Regulatory Setting

The major recycled water regulations applicable to the non-potable reuse planning process include:

- California Title 22 and Title 17 regulations
- Waste Discharge Requirements and Water Reclamation Requirements
- California Department of Public Health (CDPH) requirements:
  - *Guidelines for the Preparation of an Engineering Report for the Production, Distribution and Use of Recycled Water* (CDPH, 2001)
  - *Treatment Technology Report for Recycled Water* (CDPH, 2007)
  - *Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-Potable Pipelines* (CDPH, 2003)
- LA County Department of Public Health (County DPH) Requirements
- Los Angeles Regional Water Quality Control Board's (LA RWQCB) Basin Plan and Water Quality Requirements
- State Water Resources Control Board's (SWRCB) Recycled Water Policy
- SWRCB General Landscape Irrigation Permit
- LA RWQCB Non-Irrigation Reuse Order

LADWP is currently in compliance with applicable recycled water regulations. Therefore, their impacts are considered negligible and are not discussed further. Refer to Section 2.3 of Appendix B for more detail on this topic.

A future issue applicable to non-potable reuse is the requirement for the preparation of Salt and Nutrient Management Plans by 2014 under the SWRCB Recycled Water Policy. LADWP is addressing these requirements for the San Fernando Basin and is participating in the development process for the plans of the Central Basin and West Coast Basin. These plans are being led by the Water Replenishment District of Southern California (WRD). No significant requirements are expected to be generated through these plans which would impact LADWP's recycled water program.

2.2.2 Recycled Water Practices

This section summarizes the specific policies applicable to the City's recycled water projects, as presented in the *Non-Potable Reuse Regulatory and Practices Assessment TM* (**Appendix B**). The existing practices conditions addressed in the TM include the following:

- Operating and Design Criteria
- Connection to Recycled Water System
- Customer Agreements

Operating and Design Criteria

The City uses the *Recycled Water Urban Irrigation User's Manual*, published on February 15, 2005 by the Los Angeles County Recycled Water Advisory Committee (LACRWAC) which is the local chapter of the California Section of the WateReuse Association. This manual contains general rules, regulations, and guidelines regarding the safe use of recycled water for landscape irrigation in Los Angeles County. The purpose of the manual is to provide recycled water customers and the site supervisors with information on the day-to-day operation and control of the recycled water system in order to protect the health and welfare of the personnel involved with its use, as well as the general public, and to protect the quality of local water resources.

Connection to Recycled Water System

Connections to the recycled water system includes the following:

- **Use Ordinance**: LADWP Ordinance No. 170435 amended by Ordinance No. 179802 on June 19, 2008, allows for agreements with customers to use recycled water where recycled water service is available for non-potable uses and can be supplied at a reasonable cost. LADWP is encouraging customers to connect to the recycled water distribution system where feasible.
- **Enforcement and Penalties**: LADWP may cease recycled water service to a customer if recycled water use does not comply with Title 22 Water Recycling Requirements, Title 17 backflow prevention requirements, or the LACRWAC "Recycled Water Urban Irrigation User's Manual."

Customer Agreements

LADWP's practice is to develop agreements with individual customers for recycled water service. Each agreement is unique and must be approved by the LADWP Board of Water and Power Commissioners. LADWP is considering developing a standard customer agreement for typical types of customers.

3. Criteria

The purpose of this section is to outline the criteria to define and analyze the non-potable reuse projects for the Master Plan. The discussion of criteria includes the following sections:

- Service Reliability (Section 3.1)
- Planning and Design Criteria (Section 3.2)
- Cost Estimating Basis (Section 3.3)

3.1 Service Reliability

The *Service and Reliability Goals and Criteria TM* (**Appendix D**) was prepared to provide the basis for assessment of the reliability of the existing systems. The TM includes summaries of interviews conducted with a select group of recycled water suppliers throughout California and beyond. The intent of the interviews was to identify the criteria that are used in the planning, design, and operations of the respective recycled water systems, the types of reliability issues that have been encountered in these systems, and the solutions that each of these agencies has developed from their past experiences.

This section summarizes the issues and recommendations for the three top "level of service" areas that were identified during the interviews:

- Interruptability
- Backup Supply
- Water Quality

3.1.1 Interruptability

WBMWD and Sydney Water were the only agencies surveyed that have enacted special provisions for specific customers or customer classes with respect to interruptability. The other agencies treat all customers equally and the system is planned, designed, and operated according to the customer's needs. Some large commercial and industrial customers, such as refineries, however, may require a higher level of service. An approximate range of reliability improvements should be identified with these large customers to minimize interruptions in service and to provide customers the flexibility to withstand interruptions.

3.1.2 Backup Supply

Provisions for backup supply generally took one of two paths for the interviewed agencies: 1) provide a potable water intertie at a recycled water reservoir or supply facility; or 2) require customers to maintain their own potable backups. In general, where recycled water reservoirs are present within a system, the addition of a potable backup at the reservoir would be desirable and recommended, if cost effective. This alternative would provide convenient operational flexibility and typically avoid customer notification for service interruption. Where no system reservoir exists, it is recommended that customers with a high degree of sensitivity to service interruptions be required to maintain backup connections to the potable water system.

Of the five existing and planned LADWP systems, all but LAGWRP have a potable supply backup; however, the capacity of each supply was not confirmed. A backup potable supply for LAGWRP provided from LADWP's River Supply Conduit, located across the LA River from the plant, is currently being investigated.

3.1.3 Water Quality

The requirement to augment recycled water quality to serve specific uses has evolved on a case-by-case basis. As with interruptability, the drive to adopt specific policies relative to water quality is tied to the drive to supply recycled water to sensitive customers. To meet the short- and long-term goals for the use of recycled water, special considerations for addressing water quality on a customer-by-customer basis may be required. In general, the cost of measures to address water quality issues for a specific customer must be balanced against benefits to LADWP of adding this customer to the system.

Potential approaches to address water quality issues associated with recycled product water quality (as opposed to diminished water quality from water age) include adding a treatment step and/or blending with a higher quality water supply. These steps could be taken at the customer site, at a point in the distribution, or at the water reclamation plant. For example, the *Existing System Improvement Projects Recommendations TM* evaluated several treatment alternatives to reduce ammonia for potential use at cooling towers at LAX (a planned customer).

Water age within the distribution system is an issue for many recycled water agencies, though the extent to which it must be addressed depends on the individual system. The system can be configured to help mitigate low demand periods, but agencies have also developed other strategies in dealing with aging water. These strategies include:

- Reduce the amount of storage during low demand periods and phase storage to match demand development
- Increase demand on the system by:
    - Implementing outreach activities to bring online additional customers
    - Flushing the recycled water system during low demand periods to keep water fresh and implementing a flushing program to ensure that the process is regularly performed

3.2 Planning and Design Criteria

Master Planning documents and design criteria were developed to help standardize the evaluation and development process. In this section, the following criteria are discussed:

- Pipeline Sizing and Configuration
- Facilities and Hydraulic Criteria
- Demand / Peaking Assumptions

3.2.1 Pipeline Sizing and Configuration

A critical factor in system performance relative to flow, pressure, and water quality is pipeline sizing. The recommended approach is to size pipelines for peak hour flows and adopt velocity criteria similar to water system design criteria. This approach is widely used by water agencies. Undersized pipelines can limit the capacity for future demand growth as pipeline velocity and pressure losses approach design criteria. On the other hand, oversized pipelines can create water quality issues as water age exceeds the residual disinfection. As a result, implementation of NPR projects must balance the need to serve customers in the near-term under satisfactory water age conditions while allowing for the opportunity for growth in the future even though the prospects for system growth are hard to predict at this time.

System looping is an approach that provides the ability to plan a system for both future and initial demands while increasing the system reliability. Looping ultimately requires more pipelines to be constructed while allowing for initial pipeline phases to be smaller than if sized to serve both initial and future demands initially. Since the system expansions in this Master Plan are linear, looping was not included.

3.2.2 Facilities and Hydraulic Criteria

Table 3-1 presents criteria for facilities development during the master planning process. Hydraulic criteria used to evaluate the existing, planned, and potential systems via a hydraulic model are included in **Table 3-2**.

Table 3-1: Facilities Development Criteria

Category	Item	Value
Pipeline		
	Design Flow	Peak hour conditions
	Material	Ductile iron or Steel (for high pressure or close to potable)
	Pressure class (Minimum)	Schedule 150 (psi)
	Diameters considered	6”, 8”, 12”, 16”, 20”, 24”, 30”, 36”, 42”, 48”, 54”
Storage		
	Design Flow	Peak day volume
	Material: ≤ 1.5 MG	Welded steel / bolt-up steel
	> 1.5 MG	Reinforced / prestressed concrete
	Freeboard	3 ft
	Minimum Level	1 ft
Pump Station & Customer Booster Pumps		
	Design Flow	Peak hour conditions
	Pump curves	Standard
	Backup pumps	One, equivalent to the largest HP pump
	Backup power	Dedicated diesel generator at least the size of the largest duty pump

Table 3-2: Hydraulic Modeling Criteria

Category, Item	Value	Comments
Pipeline Velocity		
Max	8 fps	For hourly peak. To be used as an indicator to increase pipe size.
Min	1 fps	
Goal	3 to 5 fps	
Head Loss		
Max	10 ft	per 1,000 ft
C value	120 130	Ductile iron Steel
Service Pressure (*Meet or exceed existing customer potable water pressure)*		
Absolute Max	150 psi	Only to be applied under extenuating circumstances, such as crossings. Includes the use of higher pressure pipe.
Typical Max	130 psi	
Typical Min	80 psi	Design to meet existing potable water pressure
Min	40 psi	Add customer booster pump for service lower than existing potable water pressure. Only to be applied under extenuating circumstances, such as elevated, end-of-line location.
Min to Air Gap	20 psi	For on-site storage facilities
Water Age		
Avg. Winter Day	< 48 hours	Tank operations to be managed to reduce storage volume and, therefore, increase turnover during winter.
Avg. Summer Day	< 24 hours	Higher temperatures in summer require lower age limits.
Surge Pressure	within 10% of operating pressures	

3.2.3 Non-Potable Reuse Demand and Peaking Assumptions

This section provides a summary of the general assumptions used in calculating a customer's initial non-potable water demand and in estimating system-wide seasonal demands. Additional discussion of customer demands is included in Section 4 – Market Assessment.

Non-Potable Reuse Demand Assumptions

The potential non-potable average annual water demand is calculated in one of three ways:

- From meter data obtained from LADWP's historic water records
- From communications with the customer and their assessment of water demands
- From demand assumptions for each type of use based on landscape and/or facility size on aerials

Where information was available, existing water use is based on three years of historic water records, typically from 2006 to 2008. This information was supplemented or replaced in some cases based on customer input. In particular, customers typically had demand estimates for specific types of commercial / industrial uses (i.e. cooling towers, laundry, dyeing, boiler feeds, toilet flushing, etc.) and there were many cases where irrigation customers had or planned to implement permanent water conservation measures, such as replacing sod with native landscape or replacing inefficient sprinkler systems.

Unit demand assumptions were applied to supplement demand estimates based on historical water use or when demand information was not available through water use records or from the customer. This approach was only used for large customers with cooling towers and irrigation since the information needed to utilize this approach (total AF, building size, etc.) could be obtained from aerial images (such as Google Earth). **Table 3-3** provides a summary of the unit demand assumptions used for cooling towers and irrigation.

Table 3-3: Non-Potable Reuse Unit Demand Assumptions

Type of Water Use	Unit Demand Assumption
Cooling Towers	
At central plant connected to system wide HVAC system	30 AFY / central plant
For small office or building under 3 stories tall	10 AFY / building
For large office or building greater than 3 stories tall	25 AFY / building
For a large hospital	50 AFY / hospital
Irrigation (by region)	
Coastal regions (Westside and Harbor service areas)	
School, park, sports field, other landscaped area	2.0 AFY / acre irrigated
Golf course	3.0 AFY / acre irrigated
Inland regions (Metro and Valley service areas)	
School, park, sports field, other landscaped area	2.5 AFY / acre irrigated
Golf course	3.5 AFY / acre irrigated
Agriculture, dust control	1.5 AFY / acre irrigated

HVAC - Heating and Ventilation, Air-Conditioning

Non-Potable Reuse Peaking Assumptions

Seasonal peaking factors are used to adjust the annual average demand estimates for seasonal variations. Typically, irrigation and cooling tower demands increase with hotter temperatures and decrease during cooler temperatures. In addition, precipitation lowers irrigation demands. On the other hand, commercial / industrial can be constant or vary throughout the year depending on activities specific to the customer. Hourly peaking factors, on the other hand, are used to adjust the daily demand estimates for different types of customers, depending on the daily time of recycled water use. Generally, irrigation customers are required to operate at night for public health purposes while commercial/ industrial customers operate during business hours. The peak hour demand estimate for a system is the larger of the peak hour demand during the day and the peak hour demand during the night.

Seasonal and hourly peaking factors were developed and applied based on customer type. Seasonal demands and time of use estimates were requested from customers during customer site visits or calls. The customer database, which is described in Section 4.1, includes customer-specific information when it was provided. The peak day demand, however, represents a managed system-wide peaking factor and is not customer specific. All non-potable users in the database were assigned seasonal demand and time of use peaking factors based on their customer type:

- **Irrigation:** includes golf courses, parks, schools, sports fields, other landscaped areas
- **Commercial/Industrial:** includes cooling towers, dyeing processes, laundry operations
- **Mixed-Use:** for customers with both commercial/industrial and irrigation uses

Irrigation seasonal peaking factors were based on regional evapotranspiration rates and meter records. Seasonal variation estimates based on meter records were not as reliable as originally hoped since meters were only read on a bimonthly basis and the dates did not match up between multiple customers. Monthly evapotranspiration and precipitation records from three California Irrigation Management Information System[3] (CIMIS) stations were reviewed: Santa Monica (peak month factor = 2.3), Long Beach (2.1), and Glendale (2.6). Based on CIMIS factors and billing records, a peak summer day factor for irrigation customers of 2.2 was assumed.

Commercial / Industrial seasonal peaking can vary based on customer-specific operations. In addition, cooling tower water demands are always impacted by the ambient temperature. Cooling towers are the predominant facilities for potential use of recycled water for commercial / industrial customers. Therefore, a seasonal peaking factor of 1.3 was applied to all commercial / industrial customers.

Mixed use customers have both irrigation and commercial/ industrial uses (primarily cooling towers). The demand estimates for each of these uses was separated when the information was available (either from the customer or from an aerial). Demand estimates for most mixed use customers were not separated. The typical amount of irrigation vs. commercial / industrial uses at mixed use customers varies across the City. For example, irrigation demands usually outweigh cooling tower demands in the Valley service area while cooling tower demands

[3] CIMIS is a California Department of Water Resources program that manages a network of over 120 automated weather stations across the State.

usually outweigh irrigation demands in the Metro service area. For simplicity, the mixed use peaking factors assume a 50/50 split between the two types of uses. The generic values for each customer category for the Master Planning documents are summarized in **Table 3-4**.

Table 3-4: Demand / Use Factors Criteria for LADWP RWMP

		Customer Type		
		Irrigation-only	**Industrial-only**	**Mixed-use**
Peaking Factors	**Peak Summer Day (vs. Avg Annual)**	2.2	1.3	1.7
	Hours per Day / Time of Day	8 hours (10pm-6am)	12 hours (8am-8pm)	24 hours
	Peak Hour (vs. Peak Day)[2] [=24/Hours per Day]	3	2	1
	Peak Hour (vs. Avg Annual) [=Peak Summer Day * Peak Hour]	6.6	2.6	1.7
	Avg Winter Day (vs. Avg Annual)[1]	0.5	0.7	0.6
Operational Time	**Days per Week**	7	6 (Mon.-Sat.)	7

Note:

1. Average winter day peaking factors to be used for winter water age calculations.
2. Customers with on-site storage will use a 1.0 peak hour / peak day factor.

As a reference, peaking factors used for other recycled water master plans in the region are summarized in **Table 3-5**. These peaking factors are similar to the factors applied for this Master Planning document.

Table 3-5: Peaking Factors from other Recycled Water Master Plans

		Customer Type		
	References:	**Irrigation-only**	**Mixed-use**	**Industrial-only**
Peak Summer Day Ratio (vs. Average Annual)	*1*	2.5	1.7	1.3
	2	2.4	--	1.24
	3	2.51	--	--
	4	2.5	--	--
Peak Hour Ratio (vs. Peak Day) / Period of Operation	*1*	3.0/8 hrs	--	2.4/10 hrs
	2	2.4/10 hrs	--	1.33/18 hrs
	3	3.0/8 hrs	--	--
	4	2	--	--
Peak Hour Ratio (vs. Average Annual)	*1*	7.5	--	3.1
	2	5.8	--	1.6
	3	7.5	--	--
	4	5	--	--

References:

1. *West Basin Municipal Water District Recycle Water Master Plan (2009).* Peaking factors were derived from historical customer data and assumed period of operation was 9 pm to 5 am for irrigation customers and 7 am to 5 pm for industrial customers.
2. *Central Basin Municipal Water District Recycle Water Master Plan (2008).* Irrigation peaking factors were derived from evapotranspiration and precipitation data in the Los Angeles Basin. Industrial peaking factors were estimated from historical consumption data for major potential industrial recycled water customers. Also, a 1.0 peak hour factor was applied for customers with on-site storage.
3. *Burbank Water and Power Recycle Water Master Plan (2007).* Seasonal peaking factor based on daily SCADA pumping production for their existing system, excluding the Magnolia Power Plant (MPP). The hourly peaking factor was based on a "typical" irrigation schedule.
4. *Las Virgenes Municipal Water District Recycle Water Master Plan (2007).* Seasonal peaking factor based on recycled water billing records and hourly peaking factor based on hourly pump station and storage records for all customers. Therefore, the hourly factor includes more than just irrigation-only customers.

The seasonal and daily peaking factors presented in **Table 3-4** were applied to all customers in the customer database based on the customer types listed in **Table 3-6** unless more specific information was obtained from individual customers.

Table 3-6: Default Demand / Time of Use Factors by Customer Type

Customer Type	Seasonal Peaking Factor Category	Daily Peaking Factor Category	Days per Week
Caltrans	Irrigation	Day	7
Car Wash	Industrial	Day	7
Cemetery	Irrigation	Night	7
Church	Irrigation	Night	7
College	Mixed-use	24-hours	7
Commercial	Mixed-use	24-hours	6
Dyeing	Industrial	24-hours	6
Food/Beverage	Industrial	Day	6
Golf	Irrigation	Night	7
Hospital	Mixed-use	24-hours	7
Hotel	Mixed-use	24-hours	7
Industrial	Industrial	Day	6
Landfill	Irrigation	Day	7
Laundry	Industrial	Day	6
Nursery	Irrigation	Night	7
Other Landscape	Irrigation	Night	7
Other Private	Mixed-use	24-hours	7
Other Public	Mixed-use	24-hours	7
Park	Irrigation	Night	7
Pharmaceutical	Industrial	Day	6
Prison	Industrial	24-hours	7
LACMTA	Mixed-use	24-hours	6
Residential (Multi-Dwelling)	Irrigation	Night	7
School	Irrigation	Night	7

Note: See Table 3-4 for actual times and days assumed for "Time of Use" and "Days per Week"

3.3 Cost Estimating Basis

Estimated capital and operation and maintenance (O&M) costs for the RWMP are based on the cost criteria and unit costs defined in the *Cost Estimating Basis for Recycled Water Master Planning TM* (**Appendix E**). The following sub-sections briefly summarize the key cost criteria and unit cost factors from this TM that were used to develop the estimated costs for the Master Planning documents.

3.3.1 Cost Estimating Criteria

Cost Estimate Class

Cost estimates developed for the Master Planning documents were developed based on preliminary engineering planning efforts, and as such, are considered to be Order of Magnitude estimates as defined by the *American National Standards Institute (ANSI)* Standard Z94.0 in 1972. Budget Level estimates were prepared when sufficient information was available and the increased level of effort to prepare an estimate was appropriate.

The preparation of a Budget Level estimate requires, at a minimum, the use of flow sheets, layouts, and major equipment quantity, type, and sizing details. Typically, a Budget Level estimate is provided at the end of the preliminary design phase. In cases where the project is not defined to a level of detail to support a detailed cost estimate, such as this report, an Order of Magnitude estimate may be warranted. The accuracy range for Budget Level estimates is -15% to +30% while it is -30% to +50% for Order of Magnitude estimates. Estimates prepared in this report are primarily considered Order of Magnitude estimates.

Unit costs developed for most of the expected project components are discussed below. In some cases, project definitions may require cost estimates for project components not identified in the *Cost Estimating Basis for Recycled Water Master Planning TM* and efforts were made to develop a similar level of estimate based on the available information and within the scope of this study.

Project Contingency

Project or program contingencies are defined as unknown or unforeseen costs. The amount of contingency applied to an estimate is typically based on the level of project definition. For planning studies, typical project contingencies can range between 20 and 50 percent for construction cost estimates and up to 30 percent for O&M cost estimates. For the non-potable reuse systems, an additional 30 percent for contingencies is applied to the construction cost estimates based on Budget Level and Order of Magnitude estimates. No contingencies are included for O&M cost estimates since they are based off of similar LADWP facilities in operation.

Implementation Factors

In order to capture the entire capital costs, project implementation costs factors are included. While these costs can vary greatly from project to project and from component to component, it is most common to assume a standard factor on the estimated construction costs across all projects and project types when analyzing alternatives. In addition, it is necessary to allow for many uncertainties associated with conceptual level project definitions by applying appropriate

contingencies. The following list enumerates the additional services and contingencies for which factored costs are provided in the estimate:

- Planning, Environmental Documentation, and Permits
- Engineering Services (Pre-Construction)
- Engineering Services during Construction
- Construction Management and Inspection
- Legal and Administrative Services
- Field Detail Allowance
- Market Adjustment Factor

Due to the variability in the project types, a wide range of costs is likely to exist. In addition, the services may vary from project to project depending on a variety of factors, including project complexity and need. Using the factors and contingencies listed previously, estimation of implementation costs could vary from as low as 25 percent of the estimated project construction cost to as high as 85 percent. For this study, a factor of 30 percent of the estimated project construction costs is used to account for these additional services.

Other Costs (Not Included in Estimates)

Several additional components may be needed to support the development of major recycled water supply facilities. Because most of these items are unique and project specific, they should be applied on a project-by-project basis. Therefore, no costs were included in the cost estimates identified above for the following items:

- Maintenance Road Access
- Power Transmission Lines
- Overall Program Management
- Public Information Program
- "Other" costs, including environmental mitigation and permitting costs; special legal, administrative, or financial assistance; easements or rights-of-way; expediting costs such as separate material procurement contracts

3.3.2 Engineering Economics

The following sub-sections discuss the necessary engineering economic factors utilized as part of developing the unit costs and are used to analyze the estimated costs for each of the alternatives. Items covered in this section are:

- Engineering News Record's Construction Cost Index
- Inflation / Escalation
- Planning Period
- Project Financing and Discount Rate
- Useful Life of Facilities
- Lifecycle Cost Approach

Engineering News Record's Construction Cost Index

To develop unit costs for the various project components, it is common to utilize previous unit cost information as well as recent project data for calibration of the derived cost curves. A commonly available barometer to convert the historical cost data to current price levels is the *Engineering News Record's* (ENR) Construction Cost Index (CCI). The costs in this report are based on an ENR Los Angeles CCI for January 2011 of 10,000.30.

Inflation / Escalation

Escalation of capital and O&M costs is based on the average of the annual Consumer Price Index for the last 10 years (2001 to 2011) for Los Angeles, Riverside, and Orange County, California. As noted on the Bureau of Labor Statistics website on January 2011, this 10-year average is 2.8 percent. Escalation of recycled water purchase prices was assumed to be higher than the historical inflation rate due to several factors, including increasing scarcity and new capital investment requirements. The rates for these factors are shown in **Table 3-7**.

Table 3-7: Escalation Rates

Type of Factor	Rate
Capital and O&M Escalator	3.0%
Recycled Water Purchase Escalator	4.0%

Planning Period

The planning period for the purposes of evaluating potential non-potable projects is assumed to be 50 years. The base year for these projects for the purposes of the calculations is 2015, which is anticipated to be the start of implementation of the first potential projects. The planning period for the potential projects will end in 2064.

Project Financing and Discount Rate

The financing components include the rate to borrow money (interest rate), the payback period, and the discount rate. Historically, LADWP has funded its recycled water projects without borrowing money. This is called the "pay-as-you-go" method that provides funding during each of the project's planning, design, and construction phases, and also for ongoing O&M costs. As the RWMP was being developed, LADWP was planning on paying for the potential NPR projects with the "pay-as-you-go" method with funds collected through the existing Water Rates Ordinance Water Procurement Adjustment Surcharge. Under this method, no borrowing would be necessary and, therefore, there is no interest rate or payback period.

However, recently LADWP decided to consider funding a portion, if not a majority, of the costs for the potential NPR projects by borrowing money through long-term financing. This will allow LADWP to leverage borrowed money to fund the program that could potentially reduce impacts to the LADWP customer's water rates. A comparison of this funding method with the "pay-as-you-go" method is described in Section 8.2.

The discount rate is used to bring future dollars back to a present value, reflecting the time value of money. The discount rate is generally equal to the borrowing interest rate when projects require debt financing. Under the "pay-as-you-go" method the discount rate was set to

equal inflation. The discount rate for the debt service financing method was set equal to the borrowing interest rate.

Useful Life of Facilities

The useful life of facilities will vary based on several factors, including: type of facility, operating conditions, design life, and maintenance upkeep. Structural components of most facilities are typically designed to last 50 years or longer. However, mechanical and electrical components tend to have a much shorter lifespan and typically require replacement or rehabilitation at regular intervals. Based on typical operating conditions and maintenance practices, an estimated percentage for each facility type is used to distinguish between the structural portions (50-year) and the mechanical and electrical portions (20-year) typical of each facility type.

Based on the 50-year planning period for facilities, components with a 20-year useful life will be replaced at 20 and 40 years and at the end of the planning period will have 10 years of useful life remaining (20 years life expectancy minus 10 years remaining planning period). **Table 3-8** presents the assumed useful life period splits for each type of facility and the percent of the capital cost assigned to structural components versus mechanical/electrical components.

Table 3-8: Useful Life of Facilities

Type of Facility	% of Capital Cost for 50-Year Life (for Structural Components)	% of Capital Cost for 20-Year Life (for Mechanical and Electrical Components)
Treatment Plant [a]	50%	50%
Pump Station	50%	50%
Storage	90%	10%
Pipeline [b]	100%	--
Pressure Reducer	50%	50%

Notes:

a. More refined estimates of the useful life of treatment plant facilities and wells were applied when more accurate information was available.

b. LADWP's pipeline projected life is 100 years; however, for the lifecycle costs analyses, pipeline projected life was assumed to be 50 years.

Lifecycle Cost Approach

It is important that the selection of an engineering alternative is not based solely on the lowest initial or capital cost, but also considers all future costs over the useful life of all projects in that alternative. Lifecycle costs analysis is a standard technique used in engineering economic analyses for comparing cost effectiveness of alternatives. It reflects both capital and O&M costs over the useful life of the alternatives. It reflects not only future inflation, but the time value of money. Because of these factors, lifecycle costs analysis was selected as the economic method to compare the costs of the alternatives.

Costs of potential non-potable projects are defined by using the calculated unit lifecycle cost, which is the present value (PV) of the capital plus O&M costs divided by the project yield over

the planning period. The steps necessary to execute a lifecycle cost and examples are included in Section 2.3.6 of the *Cost Estimating Basis for Recycled Water Master Planning TM* (**Appendix E**).

3.3.3 Construction and O&M Unit Cost Basis

Construction costs are estimated for each component and are based on experience with similar projects as well as standard engineering planning cost curves. Where possible, unit costs have been calibrated with historical LADWP construction estimates and cost data. Definitions of the project components are derived from the capacity information, GIS data, hydraulic model results, and other preliminary engineering available at the time of the analysis and formation of the alternatives. Basic construction costs cover the materials, equipment, labor, and services necessary to build the potential projects or components. In addition, all unit construction costs include contractor overhead, bonds & insurance, and mobilization. Unit costs given herein are intended to represent the cost of installation by LADWP or BOS crews. **Table 3-9** summarizes the unit construction costs used to develop the non-potable reuse systems.

Table 3-9: Construction Costs Summary

Category	Item	Unit Construction Cost
Pipelines		
By Diameter	6" and 8"	$24/in-dia/LF
	10" and 12"	$20/in-dia/LF
	16" and 20"	$18/in-dia/LF
	24", 30", 36", 42", 54", 60"	$16/in-dia/LF
Major Crossings	Trenchless	$3.9 M (lump sum)
	Bridge	$1.5 M (lump sum)
Pump Stations		
Product Water	Cost based on formula (See **Appendix E**)	
Influent Wastewater	Capacity (mgd)	$41,000/mgd
Storage Facilities		
Distribution System Tanks	< 0.75 MG	$4/gallon
	0.75 – 1.5 MG	$3/gallon
	> 1.5 MG	$2/gallon
Wastewater Equalization Basin		$1.5/gallon
Pressure Regulating Stations		
	8" or less	$220,000/Station
	9" to 12"	$300,000/Station
	13" to 24"	$350,000/Station
	25" to 32"	$600,000/Station

Note: All costs are in January 2011 dollars.

O&M costs are derived from experience on similar projects and standard engineering planning methods and cost curves. Where possible, costs have been calibrated using existing LADWP and BOS data, including data on power costs, labor rates, etc. Operating costs are defined as labor, material, equipment, and outside services necessary for routine operating functions. Outside services include electric power and chemicals. Maintenance expenses include all costs

associated with the routine servicing and repair of facilities required on an annual basis. **Table 3-10** summarizes the unit O&M costs used to develop the non-potable reuse systems.

Table 3-10: O&M Costs Summary

Category	Unit O&M Cost
Pipelines	
Up to 60" Diameter	$0.6/LF
Tunneling (≥ 96" Diameter)	0.5% of construction costs
Pump Stations	
O&M	$10,000 + 5% of construction costs
Electricity	$0.12/KW-hr
Storage Facilities	
Distribution System Tanks	$75,000 per tank
Wastewater Equalization Basin	0.5% of construction costs
Pressure Regulating Stations	
All sizes	$20,000 per station
Water Purchases	
Burbank WP	$0/AF
CBMWD	$500/AF
Las Virgenes MWD	$500/AF
TIWRP – AWTF	$1,300/AF
WBMWD – ELWRF	$800/AF
WBMWD – CRWRF	$728/AF

Note: All costs are in January 2011 dollars.

4. Market Assessment

This section documents how the potential target non-potable customers were identified and summarizes the initial list of potential target customers. (Target customers are customers with non-potable demands greater than 50 AFY.) The target non-potable water customers will provide the basis for identifying most of the potential recycled water distribution systems.

4.1 Development of Potential Non-Potable Customer Database

The primary resource used to develop the non-potable database was LADWP's Customer Information System (CIS) database, which is the primary location for customer water use and billing records. The CIS database was filtered through a series of steps (described below) to generate a functional non-potable database that was used to support development of non-potable reuse projects. The CIS database information was supplemented from various sources, including other LADWP databases, correspondence with LADWP, and customer personnel. Four primary steps were taken to reduce the CIS database from approximately 200,000 accounts to approximately 4,380 customers. These steps are discussed in detail in Sections 4.1.1 through 4.1.4.

4.1.1 Initial Database Screening

LADWP provided three queries of the CIS database. Each query started with a different date and included 14 billing periods that represented either monthly (14 months) or bimonthly (28 months) historical water use. Each snapshot covered approximately 200,000 accounts. Three snapshots were provided so that at least 3 years (2006 to mid-2009) of water use data could be analyzed. In total, LADWP provided 593,772 individual records, or roughly three records for each account.

The first step in creating the non-potable database was to select accounts with potable demands greater than 2.5 AFY and without single family residential rate codes. The specific LADWP rate codes included were 31, 35, 38, 43, 44, and 47, as described in **Table 4-1**. This reduced the number of accounts from approximately 200,000 to approximately 50,000.

Table 4-1: LADWP Rate Codes

Included in Non-Potable Database	Rate Code	Rate Schedule	Description
⊗	31	C	Commercial, Industrial, and Governmental
	32	E	Private Fire Protection Service
⊗	33	B	Multi-Dwelling Residential
	34	C	Temporary Construction Service
⊗	35	F	Publicly Owned Grounds & Publicly Sponsored Agriculture
⊗	38	F	Youth Sports & Community Gardens
	40	C	Purpose of Enterprise
⊗	43	C	Commercial, Industrial, and Governmental-Outside the City
⊗	44	D	Reclaimed Water Service
⊗	47	C	Combined Domestic & Fire Service
	48	C	Temporary Construction Service-Outside the City
	49	C	Combined Domestic & Fire Service-Outside the City

Note: Rate code 44 (reclaimed water service) was included in the database but excluded from the market assessment since these customers already use recycled water.

The next step in creating the non-potable database involved combining the three CIS queries for the 50,000 accounts remaining after the initial screening to create a single set of monthly water use data covering a three year time period for each account.

LADWP billing periods were not the same for all customers (i.e., some were monthly, some were bimonthly, and some were several months) so each query for each account covered different time periods. The time periods also overlapped for many customers. Therefore, the three sets of data were reconciled by converting the billing periods to monthly use data and then combining each set of water use data so that each account number is represented by a single set of monthly data that covered the time periods from the three original queries.

4.1.2 Database Consolidation

The next step in developing the non-potable database was to associate multiple accounts with individual customers, since some customers have more than one meter or account serving their property or business. Therefore, multiple accounts for the same customer were merged to create a single record for each customer. The total consumption for each customer was then determined by adding the monthly consumption for each account number. Using this approach, the number of records was reduced from 50,000 accounts to 14,600 customers.

Then customers were screened based on a minimum average annual potable demand of 5 AFY. The earlier screening applied a minimum demand of 2.5 AFY for individual accounts so that customers with total demands greater than 5 AFY (once accounts were combined) were not eliminated. This step reduced the non-potable database from approximately 14,600 customers to 8,700 customers with a total potable demand of approximately 190,000 AFY.

4.1.3 Characterizing Accounts

The next step in developing the non-potable database was characterizing each of the remaining 8,700 customers to facilitate estimating demands. New fields were added to the database to further characterize each customer. The primary fields added to the database were "service area", "regular name", "customer type", and "owner". These fields are discussed further in this section and full list of fields in the database in listed in **Table 4-2**.

Table 4-2: Customer Database Fields

Database Field	Description	Source
Address	Address of one of the customer's meters	CIS Database
Connection Time Frame	Existing, Planned or Potential	RMC (manual)
Conversion Cost / AFY Rating	Conversion unit cost rating	Customer TM
Conversion Likelihood Rating	Conversion likelihood rating	Customer TM
Customer Name	Customer name	RMC (auto and manual)
Customer Type	Type of customer (irrigation-only, etc.)	RMC (auto and manual)
Demand Source	Initial source of demand; See "Reason" for more detail	RMC (manual)
District	Service Area (Valley, Harbor, Metro, Westside)	CIS Database
Initial Conversion Rating	Initial conversion rating	Initial Customer TM
Initial Target List	Value = 1 if a Target Customer; > 50 AFY "Planning Demand"	RMC (auto)
Jurisdiction	City, County, Federal, private, etc.	RMC (auto and manual)
Label ID	Unique Customer ID	RMC (auto)
Non Pot Demand DB	Calculated NPR demand based on "NPR Reduction Factor" (AFY)	= "Pot Demand DB" * "NPR Reduction Factor"
NPR Reduction Factor	Non Potable Reduction Factor, Based on customer Type	RMC (manual)
Planning Demand (AFY)	Average annual recycled water demand (AFY)	RMC (manual updates)
Planning Demand (MGD)	Average annual recycled water demand (mgd)	= AFY to mgd conversion
Pot Demand DB	Average annual total potable water demand (AFY)	CIS Database
Reason	Additional Notes Regarding the Customer	RMC (manual)
SUM_DEM_AFY	Summer Season Demand (AFY)	= "Planning Demand" * "SUM_PF"
SUM_DEM_MGD	Summer Season Demand (mgd)	= AFY to mgd conversion
SUM_PF	Summer Season Peaking Factor, based on customer type	RMC (auto)
System1	System associated with the customer	RMC (GIS)
System2	System associated with the customer	RMC (GIS)

Anchor Customer	Value = 1 if an Anchor Customer; > 50 AFY "Planning Demand" and associated with a potential project	RMC (auto)
Time_Day	Time of Day, based on customer Type	RMC (auto) or Customer TM
Typ_Use	Type of Water Use, based on Customer Type (Irrigation-only, Industrial-only, Mixed-Used)	RMC (auto and manual)
Unique Customer ID	Unique Customer ID	CIS Database (Customer Account Number)
WIN_DEM_AFY	Winter Season Demand, (AFY)	= "Planning Demand" * "WIN_PF"
WIN_PF	Winter Season Peaking Factor, based on customer type	RMC (auto)
WRP1	WRP associated with the customer	RMC (GIS)
WRP2	WRP associated with the customer	RMC (GIS)
Zip	Zip Code of one of the customer's meters	CIS Database

Service Area

The LADWP potable water system consists of four service areas. The first digit in the account number designates the district as follows:

- 1 = Metropolitan Los Angeles (Metro)
- 2 = Harbor / San Pedro (Harbor)
- 3 = San Fernando Valley (Valley)
- 4 = West Los Angeles (Westside)

The service areas were assigned automatically to each account based on the account number. A small number of accounts required corrections after identifying errors when the accounts were mapped.

Regular Name

Many of the account names in the database for a single customer were not the same and, as a result, a new field called “regular name” was created and manually entered to allow for automatic combinations of accounts.

Customer Type

Customer Type assignments were made to assist in developing non-potable estimates and to facilitate characterization of the database, production of database reports, and production of GIS graphics. Each customer was assigned one of the customer types listed below:

- Caltrans
- Car Wash
- Cemetery
- Church
- LACMTA
- Landfill
- Laundry
- Nursery

- College (or University)
- Commercial
- Dyeing
- Food & Beverage
- Golf Course
- Hospital
- Hotel
- Industrial
- Other Landscape
- Park
- Pharmaceuticals
- Prison
- Private, Other
- Public, Other
- Residential (Multi-Dwelling)
- School (K to 12 and adult education)

Owner

Owner assignments were conducted to facilitate characterization of the database, production of database reports, and production of GIS graphics. Each customer was assigned one of the owners listed below:

- City (of Los Angeles)
- County (of Los Angeles)
- Federal
- LACCD (LA Community College District)
- LACMTA
- LADWP
- LAUSD
- Non-LAUSD (school)
- Public
- Private
- State (of California)

Results of Characterization

Characterization of the non-potable database allowed for the non-potable database to be sorted into service areas and to separate out the irrigation-only customers. The results are shown in **Table 4-3**. The values show that the majority of potable customers and potable demands are located in the Metro and Valley service areas. An important difference between the two areas is that the Valley Service Area has over twice as much irrigation-only demand. Also, the Valley Service Area has over half the irrigation-only demand across the City. This suggests that the Valley Service Area has the most potential for non-potable reuse.

Table 4-3: Potable Demands in the Non-Potable Database

Service Area	Identified Customers[1]		Subset of Irrigation-Only Customers[2]	
	No. of Customers	Potable Demand	No. of Customers	Potable Demand
Harbor	293	8,224 AFY	49	2,354 AFY
Metro	3,839	73,617 AFY	239	8,526 AFY
Valley	3,722	83,012 AFY	483	20,188 AFY
Westside	815	24,335 AFY	98	6,612 AFY
Total	**8,669**	**189,188 AFY**	**869**	**37,680 AFY**

Notes:

1. Only includes potable customers without single family residential rate codes and with annual average demands greater than 5 AFY and does not include existing and planned recycled water customers.
2. Irrigation-only customers include the following customer types: Caltrans, cemeteries, churches, golf courses, landfills, nurseries, parks and other landscape. Schools are mixed use customers and therefore are not included.

4.1.4 Non-Potable Demand Estimation

The final step was calculating demands based on customer characteristics and then screening for customers with average annual demands greater than 5 AFY. This step reduced the non-potable database to 4,380 customers. Non-potable demand estimates were developed from the potable demand records in two steps:

- Initial calculation of non-potable demand as a percentage of potable use based on the customer type; and
- Manually revise the initial calculated non-potable demands as needed for larger users with information collected from other sources (i.e., LADWP, customers, etc.).

Each step is discussed in more detail in the following sub-sections.

Initial Calculation of Non-Potable Demand

The first step in estimating non-potable demand was applying a non-potable percentage adjustment to the potable demands. This was done automatically by assigning non-potable adjustment values to each customer type. The non-potable adjustment was based on two factors: 1) portion of the total potable use that could probably use non-potable water; and 2) the likelihood that the specific customer would agree to use the non-potable water.

For example, a hotel may use potable water for landscape irrigation, cooling towers, laundry, food preparation, and for bathrooms. The non-potable uses among these are landscape irrigation, cooling towers, laundry, and toilet flushing. The portion that is landscape irrigation is dependent on the setting and in many locations within Los Angeles is very low. The cooling towers provide an opportunity to use recycled water but raise issues about conversion (discussed next). The laundry services for many hotels are performed off-site so many locations within Los Angeles do not have a laundry demand. Finally, toilet flushing with non-potable water would require dual plumbing within the building and is not considered cost effective for existing buildings, so this demand is not included for all existing customers.

The likelihood of conversion was estimated based on cost effectiveness of conversion (including financial incentives). A variety of customer concerns arise when considering conversion to non-potable water, including additional treatment requirements and the need to separate internal water supply systems between recycled water and potable water. For example, golf courses may require greens to remain on higher quality potable water while the remainder of the course is irrigated with recycled water. Also, many buildings have cooling towers located on the roof and non-potable service to the cooling tower would require installation of a new and potentially costly non-potable line.

A non-potable adjustment from potable demands was determined by combining the two factors discussed above. The estimates are summarized by customer type in **Table 4-4** and the rationale for each is discussed below.

Table 4-4: Potable to Non-Potable Demand Conversion Factors

Type of Customer	Estimated % Non-Potable	Estimated % Likelihood of Conversion	Combined % Non-Potable Adjustment
Caltrans	100%	100%	**100%**
Car Wash	95%	95%	**90%**
Cemetery	100%	100%	**100%**
Church	60%	85%	**50%**
Coin-Operated Laundry	0%	N/A	**0%**
College / University	33%	75%	**25%**
Commercial	20%	75%	**15%**
Dyeing	95%	50%	**50%**
Food, Beverage, Pharmaceutical	10%	50%	**5%**
Golf Course	95%	95%	**90%**
Hospital	20%	75%	**15%**
Hotel	20%	75%	**15%**
Industrial	95%	50%	**50%**
LACMTA	100%	100%	**100%**
Landfill	100%	100%	**100%**
Laundry	95%	50%	**50%**
Nursery	50%	95%	**50%**
Other Landscape	95%	95%	**90%**
Other Private	-	-	**50%**
Other Public	-	-	**50%**
Park	95%	95%	**90%**
Prison	25%	75%	**20%**
Residential (Multi-Dwelling)	20%	50%	**10%**
School	60%	85%	**50%**

The following provides a rationale for each of the non-potable adjustments noted in Table 4-4:

- *Large Landscape (Caltrans, Park, Golf Course, Cemetery, Landfill, Other Landscape) and Car Wash*: The primary water use for large landscape customers is non-potable but do include some potable uses, primarily for drinking and washing. Similarly, most customers should have a separate irrigation system so conversion would be relatively simple, but some irrigation systems may have unforeseen cross connections or hose bibs and golf courses may require greens to remain on higher quality potable water while the remainder of the course is irrigated with recycled water.
- *Church, School*: These customers have a lot of indoor uses (e.g., food preparation, drinking, washing, etc.) and most have outdoor irrigation uses. The irrigation uses should be relatively simple to convert if separate irrigation systems are in place; however, many schools were constructed before this approach became common. Also, the outdoor areas of some schools are paved and therefore have limited irrigation potential.

- *Coin-Operated Laundry:* Water use at these sites is usually directly used and contacted by the general public so public health concerns eliminate this use of non-potable water from consideration.
- *College / University:* The primary water uses at colleges are for living facilities, buildings, central plants, landscape irrigation, and food preparation. Of these, the majority of non-potable use potential is for cooling at central plants and landscape irrigation. The percentage of use between these water uses varies between each campus. For example, University of Southern California has a high living facilities demand while Pierce College has significant agricultural irrigation demands. So, 33% was applied as an average non-potable percentage to all universities. A likelihood of conversion factor of 75% was applied because most of the universities were developed over many decades so non-potable conversion may be expensive.
- *Commercial Building:* The primary water uses at commercial buildings are cooling towers, landscape irrigation, and for bathrooms. These customers have similar potential non-potable characteristics as hotels so the same factors were applied. (See description below).
- *Food, Beverage, Pharmaceutical:* Public health would preclude non-potable water use by these customers due to public health issues resulting from the end use of the products produced by these customers. Therefore, the primary non-potable use potential for these customers is limited to cooling towers. However, since these customers tend to use a large amount of potable water, many already reuse their own process water on-site for non-potable uses, thus limiting their potential demand for non-potable water from outside sources.
- *Hospital:* The primary water uses at hospitals are cooling towers, landscape irrigation, medical processes, and for bathrooms. These customers have similar potential non-potable characteristics as hotels and commercial buildings except that the cooling towers tend to be larger and, as a result, tend to be located on the ground instead of on the roof. So, a higher likelihood of non-potable conversion was applied.
- *Hotel:* The primary water uses at hotels are landscape irrigation, cooling towers, laundry, food preparation, and for bathrooms. The portion that is landscape irrigation is dependent on the setting and in many locations within Los Angeles is very low. The cooling towers provide an opportunity to use recycled water but many buildings have cooling towers located on the roof and non-potable service to the cooling tower would require installation of a new and potentially costly non-potable line. The laundry services for many hotels are performed off-site so many locations within Los Angeles do not have a laundry demand. Finally, toilet flushing with non-potable water would require dual plumbing within the building and is not considered cost effective for existing buildings.
- *Industrial (Laundry, Dye House, Cooling Plant):* These customers should be able to replace potable water with non-potable water since the water supply systems are generally separated from the potable system and the processes can accept non-potable water quality. These customers do have some potable water needs, primarily for drinking and washing. Therefore, a 95% factor was applied to the non-potable percentage. Some of the customers cannot accept non-potable water quality without additional treatment or (as is the case with many dye houses) cannot accept the risk that water quality changes may

have on their product. In addition, the cost of water relative to other budgetary items at some of the industries is already low enough that financial incentives are not compelling reasons to convert to non-potable water, and risks associated with altering current processes to accommodate this conversion. Therefore, a 50% likelihood of conversion rate was applied.

- *LACMTA:* The primary water use is landscape irrigation and equipment (buses) washdown. The water supply systems for these uses are typically separated from the potable system so a 100% factor was applied to the non-potable percentage and 100% factor was applied to likelihood of conversion rate.
- *Nursery:* The location of the primary water use at nurseries is outdoors, and would be considered non-potable, but some plants at nurseries are sensitive to water quality and would not be able to use tertiary treated water without additional treatment. Therefore, a non-potable portion of potable demand of 50% was applied.
- *Other Private:* This category was assigned to customers similar to "other public" customers but without a public entity name in the database. The same rational was applied for the total conversion rate of 50%. (See the following description).
- *Other Public:* This category was assigned to customers that were more difficult to quickly ascertain the type of water use based on readily available information. This generally applied to customers with potable demands below 25 AFY because additional time was spent trying to identify type of use for customers with demands greater than 25 AFY. For a customer to be labeled "other public," the database name included the name of a public entity. A general 50% total conversion rate was applied so that the customer would remain in the database and the type of use could be further investigated if the adjusted demand was high enough and/or the customer is located near a potential project.
- *Prison:* The primary water uses at prisons are cooling towers, laundry, food preparation, and bathrooms. These customers have similar potential non-potable characteristics as commercial buildings and hotels, so the same factors used in those cases were applied to the analysis of prisons.
- *Residential (Multi-Dwelling):* Customers in this category were generally homeowners associations. Their primary non-potable demand is landscape irrigation in common areas but can be difficult to convert due to the number of individual meters and potential for cross connections.

Non-Potable Conversion Results

Demand estimates based on percent non-potable calculations for target customers were then revised if additional information was provided from LADWP or the customer. The composition of the database sorted by service area is presented in **Table 4-5**. As shown in the table, the Valley and the Metro Service Area have the most non-potable demand. The Harbor and Westside service areas have a higher percent of non-potable demand; however, the total non-potable demand is much lower than the Valley Service Area.

Table 4-5: Potable to Non-Potable Demand Conversion Results

Service Area	Potable Demand (AFY)	Non-Potable Demand (AFY)	Percent of Potable Demand
Harbor	9,000	4,000	48%
Metro	73,000	31,000	43%
Valley	83,000	35,000	42%
Westside	24,000	12,000	48%
Total	**189,000**	**82,000**	**45%**

Note: Potable demand only includes potable customers with non-single family residential rate codes with annual average demands greater than 5 AFY and does not include existing and planned recycled water customers. Demands are rounded to the nearest thousand.

The number of non-potable customers and total demand for various demand ranges are shown in **Figure 4-1** and **Figure 4-2**, respectively. The customers with non-potable demands greater than 50 AFY comprise just 3% of the customers but 36% of the demand. This distribution of demand is typical of non-potable demands in other settings, where large users make up the majority of non-potable demand. These customers, which are referred to as potential "target" customers, will be the foundation of the potential non-potable reuse distribution system to be developed. They are discussed in more detail in Section 4.2.

Figure 4-1: Number of Potential Non-Potable Customers

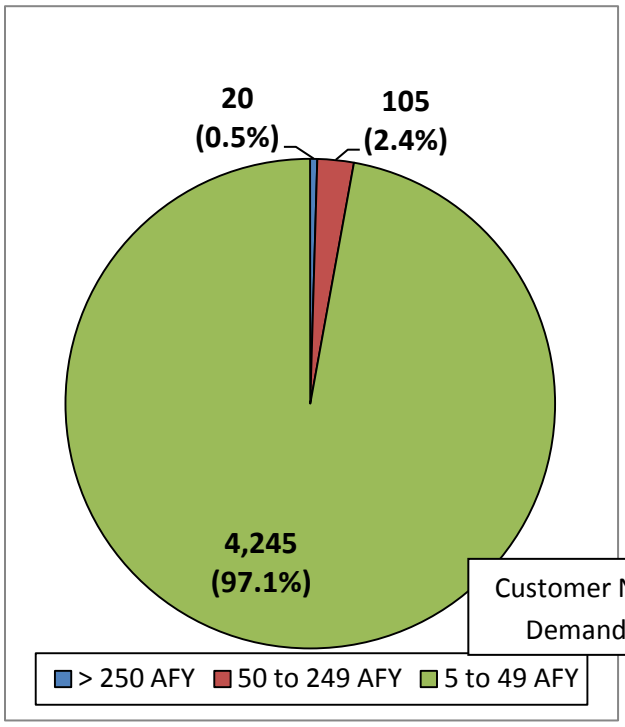
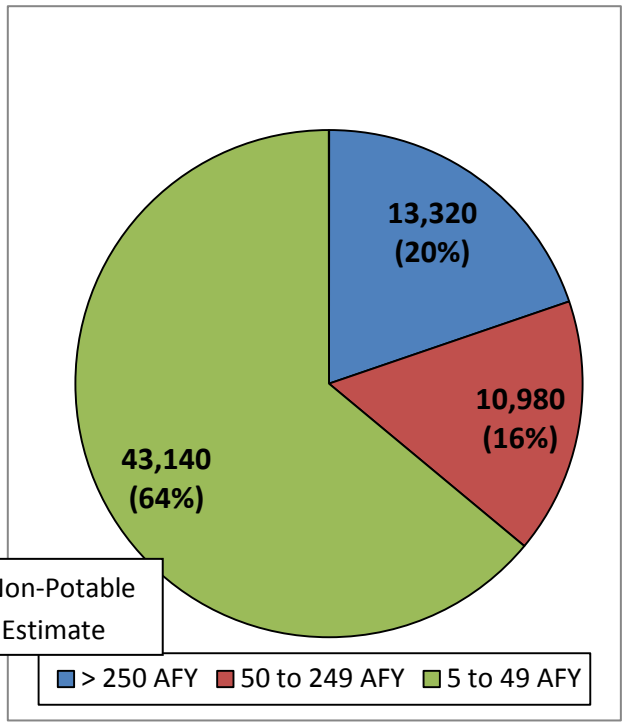


Figure 4-2: Potential Non-Potable Demand (AFY)



4.1.5 New Development and Non-LADWP Customers

New development, including planned new schools, parks, and housing developments, should also be considered for non-potable reuse projects. However, incorporation of these customers can be complicated because often the capacity of project facilities may need to be increased to accommodate future flow but there is a risk that the future demand may never materialize. In addition, the added capacity will increase cost and the oversized facilities may create operational issues (e.g. odor or water age) for the project until those demands come on line.

New development customers identified during the master planning process with potential non-potable demands greater than 5 AFY are included in the database. Those new customers that, according to LADWP, have a high likelihood of occurring are included in potential projects. Customers with a lower certainty of implementation may be considered for sizing potential facilities if located within an economical distance from potential projects.

Also, there may be potential non-potable customers located outside of LADWP's service area yet still be within an economical distance from an LADWP recycled water system. In this scenario, LADWP would sell or exchange recycled water with the appropriate water agency in that area. These customers are labeled as "Non-LADWP" customers. Non-LADWP customers were not considered for sizing potential facilities but should be considered in the future if financial commitments for the LADWP facilities are obtained from the appropriate agency.

4.2 Potential Target Customers

The market assessment process described in Section 4.1 resulted in 116 "potential target customers", which are defined as customers with estimated non-potable demands greater than 50 AFY. These customers make up 36 percent of the total non-potable volumetric demand but are only 3 percent of the total number of non-potable customers. They are summarized in **Table 4-6** and **Figure 4-3** and are listed by service area in **Tables 4-9 through 4-12**. All potential non-potable customers in the database are presented by service area in **Figure 4-4** through **Figure 4-7** and all potential target customers are labeled.

Table 4-6: Summary of Potential Target Customers

Service Area	No. of Potential Target Customers	Potential Irrigation-Only Customers		Potential Mixed Use / Industrial Customers		Total Estimated Demand
		No.	Demand (AFY)	No.	Demand (AFY)	
Harbor	20	8	619	12	2,118	2,737
Metro	34	14	1,420	20	3,363	4,783
Valley	44	30	5,268	14	1,916	7,184
Westside	18	12	2,255	6	1,055	3,310
Total	**116**	**64**	**9,562**	**52**	**8,452**	**18,014**

Note: Irrigation-only customers include the following customer types: Caltrans, cemeteries, churches, golf courses, landfills, nurseries, parks and other landscape.

Table 4-7: Potential Target Customers-Harbor Service Area

Customer	Customer Type	Potable Demand (AFY)	Non-Potable Demand (AFY)
Angels Gate Park	Park	93	84
Delta Dye	Dyeing	319	270
Federal Correction Institute	Prison	248	50
Field of Dreams Park	Park	59	50
Fort MacArthur	Other Landscape	143	50
Harbor Cogeneration Company	Power	133	330
Harbor Generating Station*	Power	124	80
Jesse Owens Park / Maggie Hathaway GC	Park/Golf	73	65
Machado Lake	Park	--	140
Peck Park	Park	89	70
Ponte Vista	Residential	--	100
Port of Los Angeles	Mixed Use	511	--
Berth 200	Industrial	--	50
San Pedro Waterfront Development	Mixed Use	--	168
Praxair	Industrial	300	250
Pro Wash Inc	Laundry	56	120
Roosevelt Memorial Park	Cemetery	67	60
SA Recycling	Industrial	113	105
Swisstex Textile and Apparel	Dyeing/Laundry	120	180
Warren E&P	Industrial	41	--
Wilmington Townlot Unit (WTU)	Industrial	--	375
North Wilmington Unit (NWU)	Industrial	--	140
Total for Potential Harbor Target Customers		**2,489**	**2,737**

Note: An asterisk indicates that the revised non-potable demand value excludes existing and/or planned demand.

Table 4-8: Potential Target Customers-Metro Service Area

Customer	Customer Type	Potable Demand (AFY)	Non-Potable Demand (AFY)
American Linen Supply	Laundry	108	100
Atlas Carpet Mills	Dyeing	238	310
Boyle Heights Development	Mixed Use	--	150
Cedars Sinai Medical Center	Hospital	532	50
Children's Hospital	Hospital	362	54
CSU-Los Angeles	College	344	125
Deluxe Laboratories	Industrial	276	130
Dye House, The	Dyeing	95	140
E&C Fashion	Dyeing/Laundry	148	90
Echo Park	Park	327	50
Evergreen Cemetery	Cemetery	67	70
Expo Park	Park	146	140
Ferraro Soccer Field	Park	--	60
Hollenbeck Park	Park	87	70
Hollywood Bowl	Park	71	50
Hollywood Forever Cemetery	Cemetery	111	96
Kaiser Hospital	Hospital	500	75
LA County Central Plant	Cooling	495	230
LAC and USC Medical Center	Hospital	727	50
Lakeside Golf Club*	Golf	--	200
Lewco Linen Supply	Laundry	125	100
Lincoln Park	Park	133	115
MacArthur Park	Park	94	85
Matchmaster	Dyeing	1069	800
Occidental College	College	277	50
Pan Pacific Park	Park	79	71
Rosedale Cemetery	Cemetery	79	70
S. Wonny Apartments	Residential	835	83
Seoul Texprint	Dyeing	105	64
Trigen-LA – Bunker Hill	Industrial	119	100
Twin Towers Correctional Facility	Prison	1575	95
USC Main Campus	College	1302	530
Washington Garment	Dyeing/Laundry	247	120
Wilshire Country Club	Golf	235	260
Total for Potential Metro Target Customers		**10,908**	**4,783**

Note: An asterisk indicates that the revised non-potable demand value excludes existing and/or planned demand.

Table 4-9: Potential Target Customers-Valley Service Area

Customer	Customer Type	Potable Demand (AFY)	Non-Potable Demand (AFY)
Almore Dye House	Dyeing	269	230
Angeles National Golf Course	Golf	436	400
Anheuser Busch	Food/Bev	5,816	130
Braemar Country Club	Golf	448	300
Brand Park	Park	58	50
Caltrans at Babcock Street	Caltrans	58	60
Caltrans at Burton Street	Caltrans	75	50
Caltrans at Tuxford Street	Caltrans	23	60
Cascades Golf Club	Golf	238	250
Catholic Archdiocese of Los Angeles	Other Landscape	114	50
Cesar Chavez Recreation Complex	Park	--	90
Chaminade College Prep School	School	52	50
CSU Northridge	College	814	340
Eden Memorial Park	Cemetery	254	225
El Caballero Country Club	Golf	226	290
El Cariso County Park/ Golf Course	Park/Golf	313	400
Hjelte Sports Center	Park	39	90
Knollwood Golf Course	Golf	313	280
LA Equestrian Center	Other Landscape	--	70
LA Valley College	College	127	100
Lanark Park	Park	52	50
Litton Industries, Inc.	Industrial	109	75
Medtronic MiniMed	Industrial	107	50
Middle Ranch	Other Landscape	132	260
Mountain Gate Country Club	Golf	799	570
North Hollywood Park	Park	131	100
Oakwood Cemetery	Cemetery	131	100
Olive View UCLA Medical Center	Hospital	311	110
Pierce College	College	281	190
Porter Ranch Development Co.	Residential	1072	107
Porter Valley Country Club	Golf	170	350
Pratt & Whitney Rocketdyne	Industrial	70	70
San Fernando Mission Cemetery	Cemetery	207	200
Spectrolab	Industrial	129	50
Sylmar Park	Park	67	60
Valley Plaza Park and Recreation Center	Park	--	130
Van Nuys Sherman Oaks Park	Park	203	105
Valley Generating Station*	Power	138	150
Valley Sod Farms Inc.	Other Landscape	147	140
Veterans Administrative Hospital	Hospital	64	320
Veterans Memorial Park	Cemetery	403	150
Verdugo Hills Golf Course	Golf	150	51

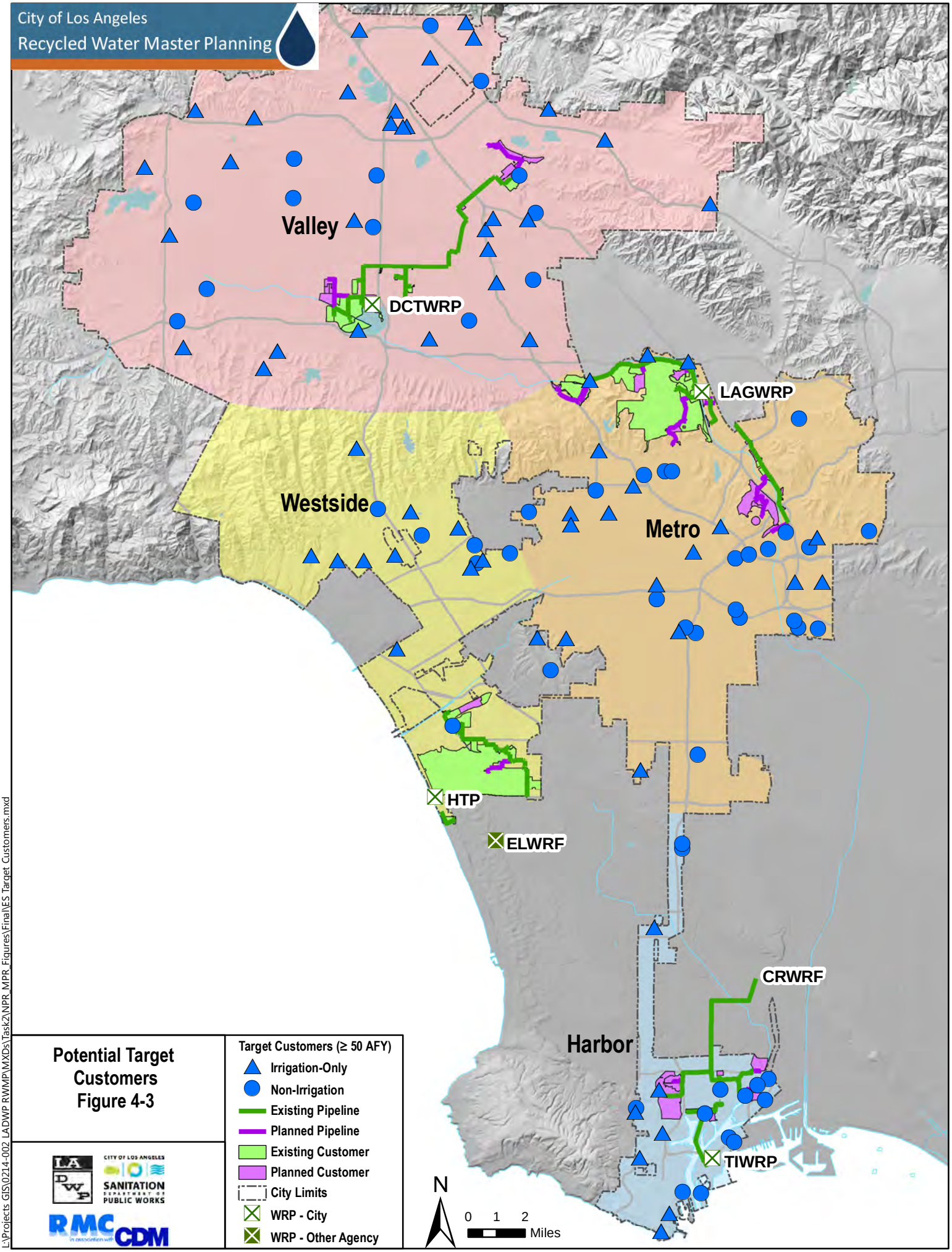
Customer	Customer Type	Potable Demand (AFY)	Non-Potable Demand (AFY)
Vulcan Materials	Industrial	1065	51
Woodland Hills Country Club	Golf	280	230
Total for Potential Valley Target Customers		**15,891**	**7,184**

Note: An asterisk indicates that the revised non-potable demand value excludes existing and/or planned demand.

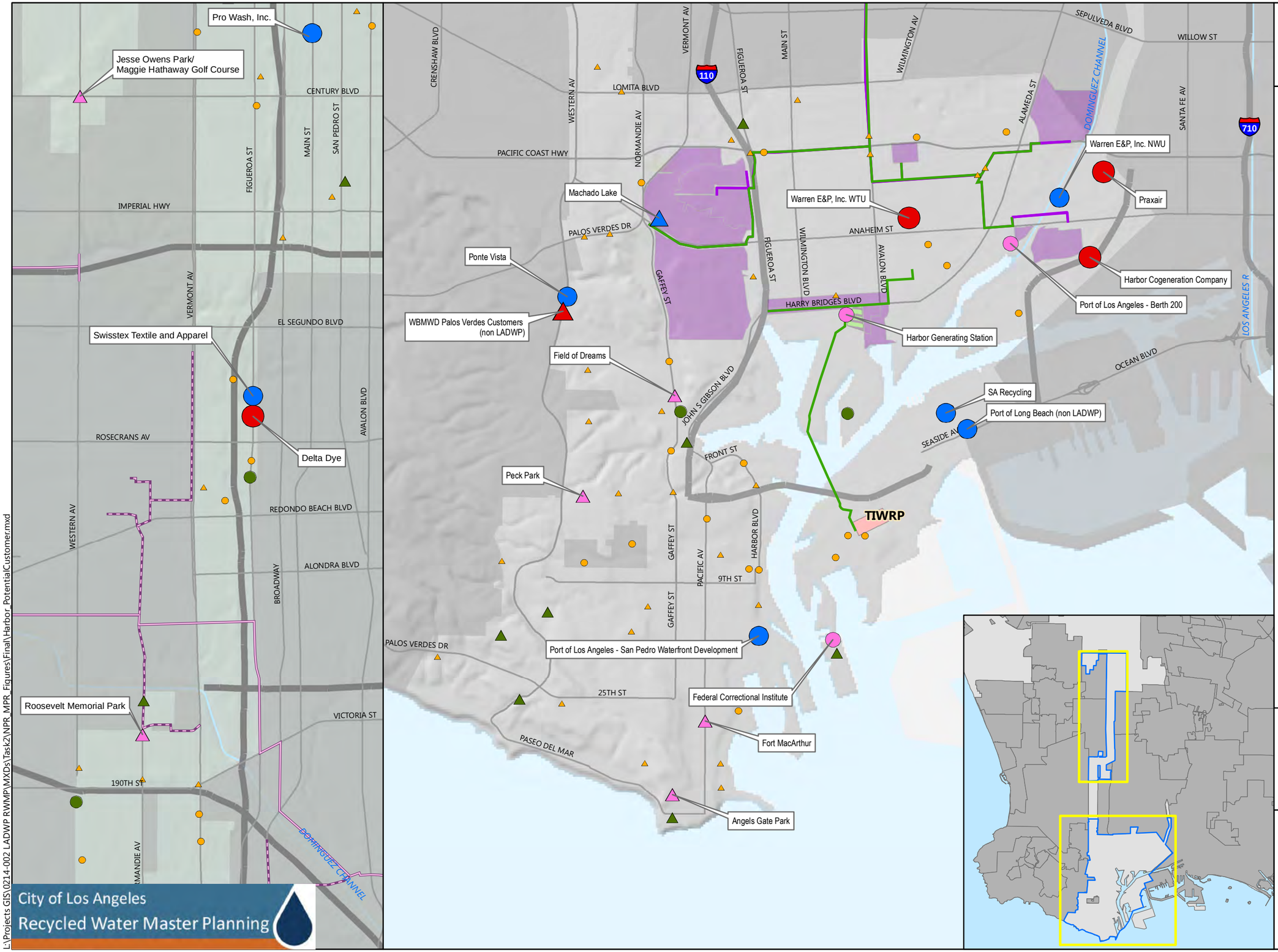
Table 4-10: Potential Target Customers-Westside Service Area

Customer	Customer Type	Potable Demand (AFY)	Non-Potable Demand (AFY)
Bel Air Country Club	Golf	347	260
Breitburn Energy	Industrial	181	165
Brentwood Country Club	Golf	377	230
Cheviot Hills Rec Center	Park	--	70
Getty Center	Mixed use	249	80
Hillcrest Country Club	Golf	183	170
Jim Gilliam Recreation Center	Park	84	75
Kenneth Hahn State Recreation Area	Park	140	160
Loyola Marymount University, Cooling Towers*	Industrial	421	50
Los Angeles Country Club	Golf	176	140
Penmar Golf Course	Golf	111	100
Plains Exploration & Production Co. (PXP)	Industrial	--	50
Rancho Park Golf Course	Golf	483	390
Riviera Country Club	Golf	200	180
Trigen-LA Energy	Industrial	242	170
UCLA	College	2740	540
Veterans Administration	Other Landscape	1932	430
Will Rogers State Historic Park	Park	83	50
Total for Potential Westside Target Customers		**7,949**	**3,310**

Note: An asterisk indicates that the revised non-potable demand value excludes existing and/or planned demand.


City of Los Angeles
Recycled Water Master Planning
Valley
Westside
Metro
Harbor
DCTWRP
LAGWRP
HTP
ELWRF
CRWRF
TIWRP
Potential Target Customers
Figure 4-3
Target Customers (≥ 50 AFY)
Irrigation-Only
Non-Irrigation
Existing Pipeline
Planned Pipeline
Existing Customer
Planned Customer
City Limits
WRP - City
WRP - Other Agency
N
0 1 2
Miles
CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
SANITATION
RMC
CDM
L:\Projects GIS\0214-002 LADWP RWMP\MXDs\Task2\NPR_MPR_Figures\Final\ES Target Customers.mxd
Data Sources: RMC, USGS, LADWP

Target Customers
Harbor Service Area
Figure 4-4



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Recycled Water Facilities
- Existing RW Pipeline
- Planned Pipeline
- Existing Non-LADWP Pipeline
- Planned Non-LADWP Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Features
- Major Road
- Waterway
- Treatment Plant
- City of Los Angeles

N

0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

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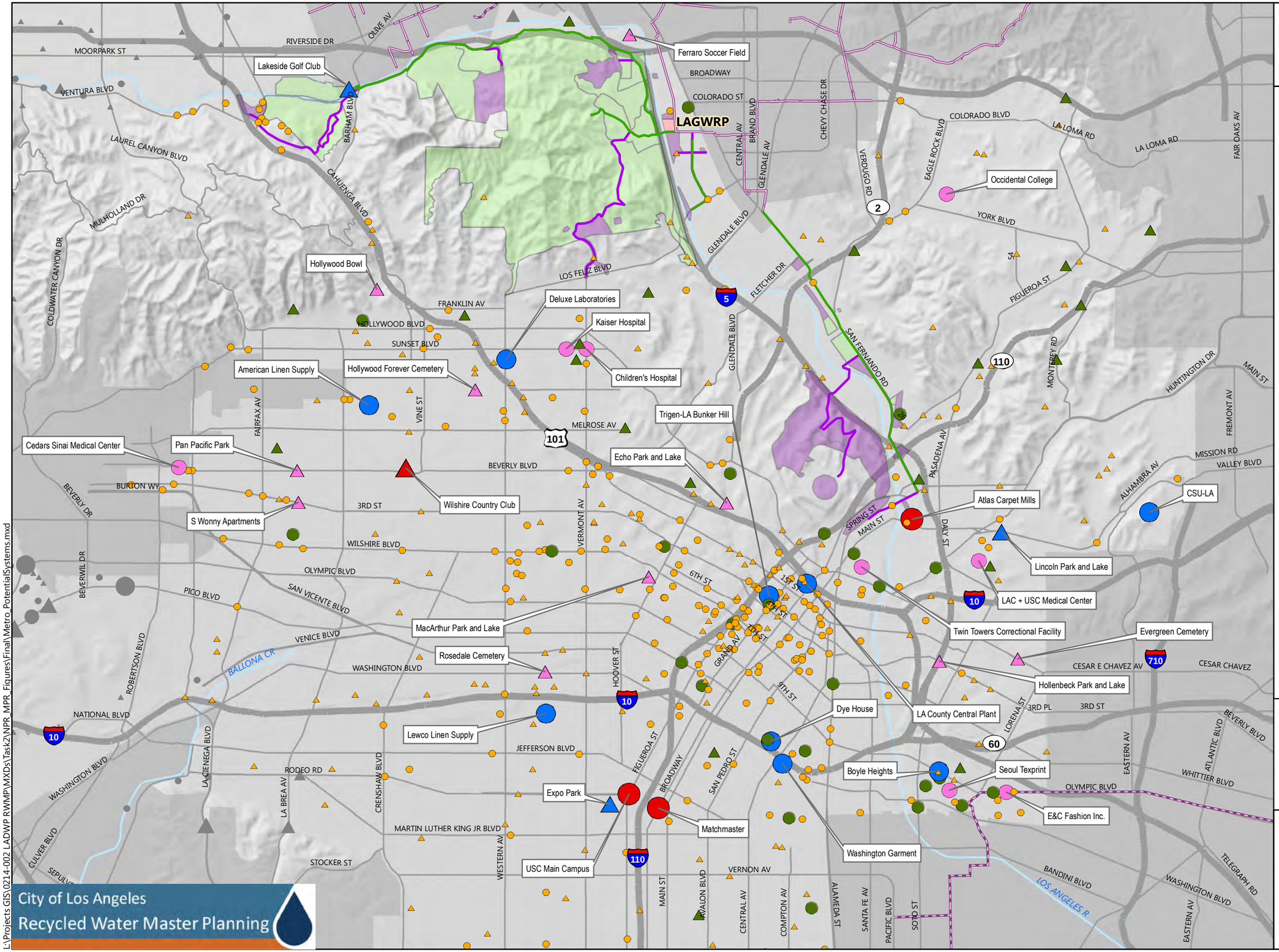
Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only target customers ≥ 50 AFY are labeled

Target Customers
Metro Service Area
Figure 4-5



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Recycled Water Facilities
- Existing RW Pipeline
- Planned Pipeline
- Existing Non-LADWP Pipeline
- Planned Non-LADWP Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Features
- Major Road
- Waterway
- Treatment Plant
- City of Los Angeles

N

0 1 2 Miles

City of Los Angeles
Recycled Water Master Planning

LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

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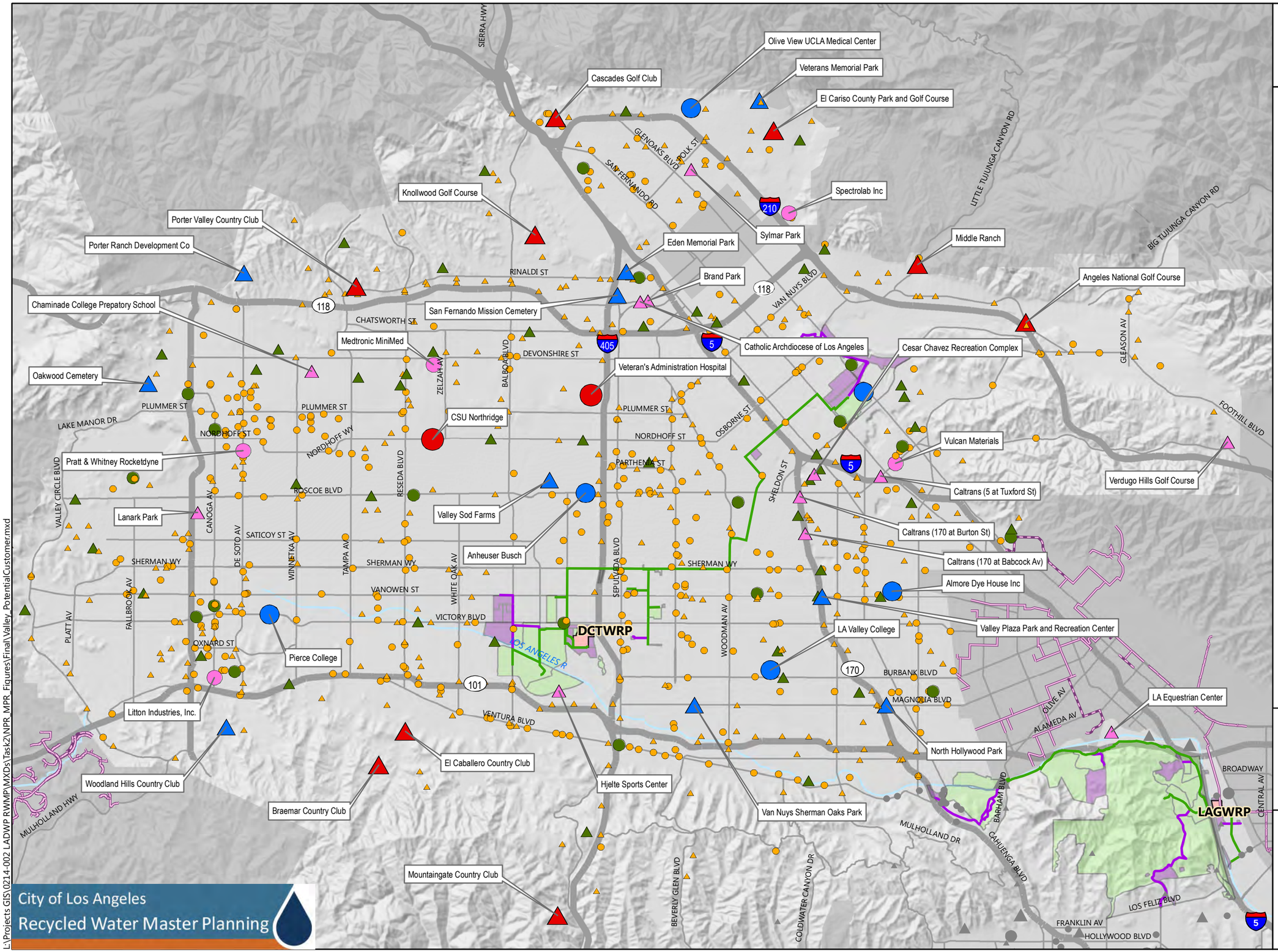
Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only target customers ≥ 50 AFY are labeled

Target Customers
Valley Service Area
Figure 4-6



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Recycled Water Facilities
- Existing RW Pipeline
- Planned Pipeline
- Existing Non-LADWP Pipeline
- Planned Non-LADWP Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Features
- Major Road
- Waterway
- Treatment Plant
- City of Los Angeles

N

0 1 2 Miles

City of Los Angeles
Recycled Water Master Planning

LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

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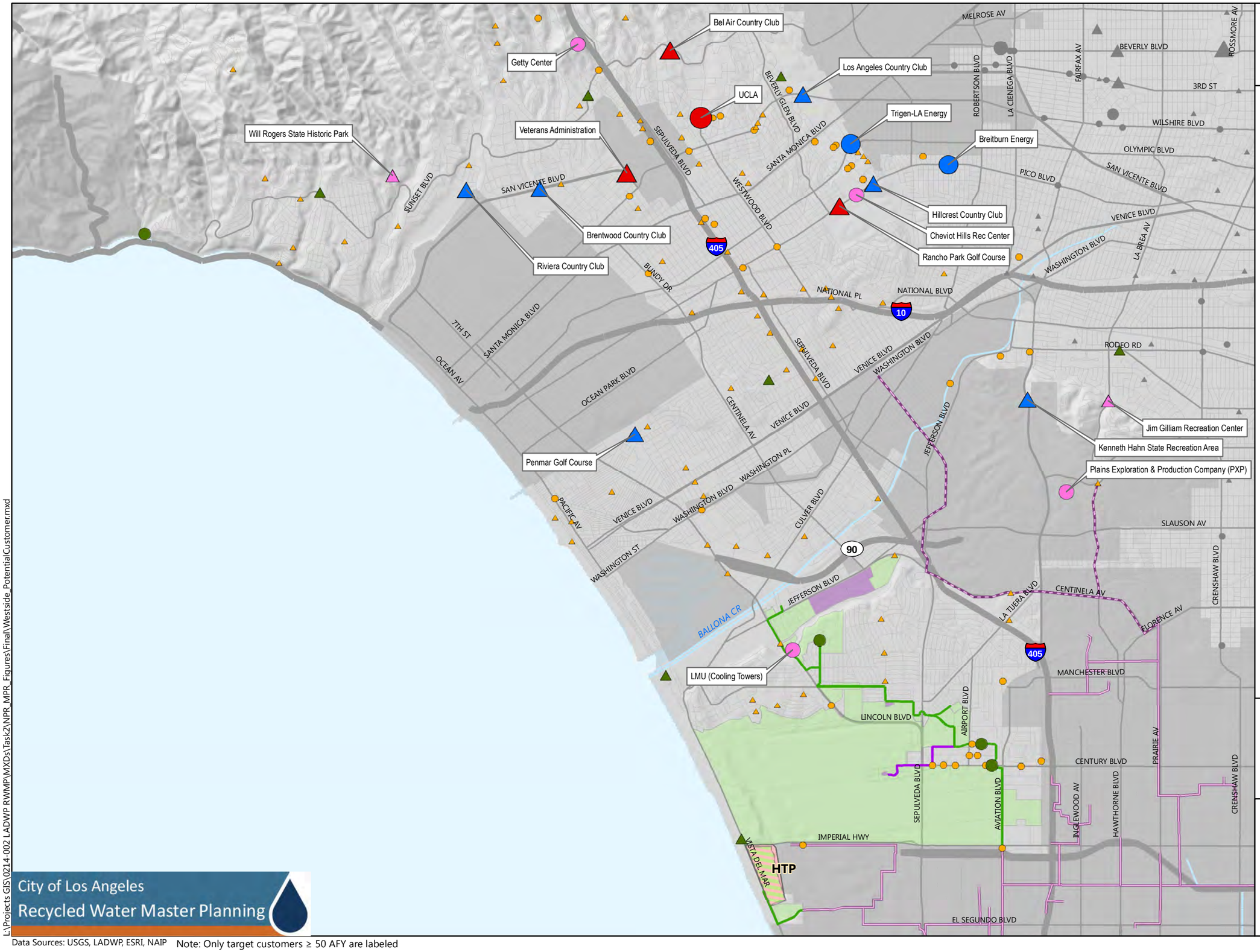
Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only target customers ≥ 50 AFY are labeled

Target Customers
Westside Service Area
Figure 4-7



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Recycled Water Facilities
- Existing RW Pipeline
- Planned Pipeline
- Existing Non-LADWP Pipeline
- Planned Non-LADWP Pipeline

Exisiting/Planned Customers
- Existing Customer
- Planned Customer

Other Features
- Major Road
- Waterway
- Treatment Plant
- City of Los Angeles

N

0 1 2 Miles

City of Los Angeles
Recycled Water Master Planning

LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only target customers ≥ 50 AFY are labeled

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5. Supply Assessment

This section describes the potential recycled water supplies available for potential customers in each service area after the supplies are allocated to existing and planned customers. This section describes the NPR supply options (Section 5.1), their associated evaluation criteria and performance measures (Section 5.2), results of the analysis (Section 5.3) and recommendations (Section 5.4).

The existing recycled water supplies include the following:

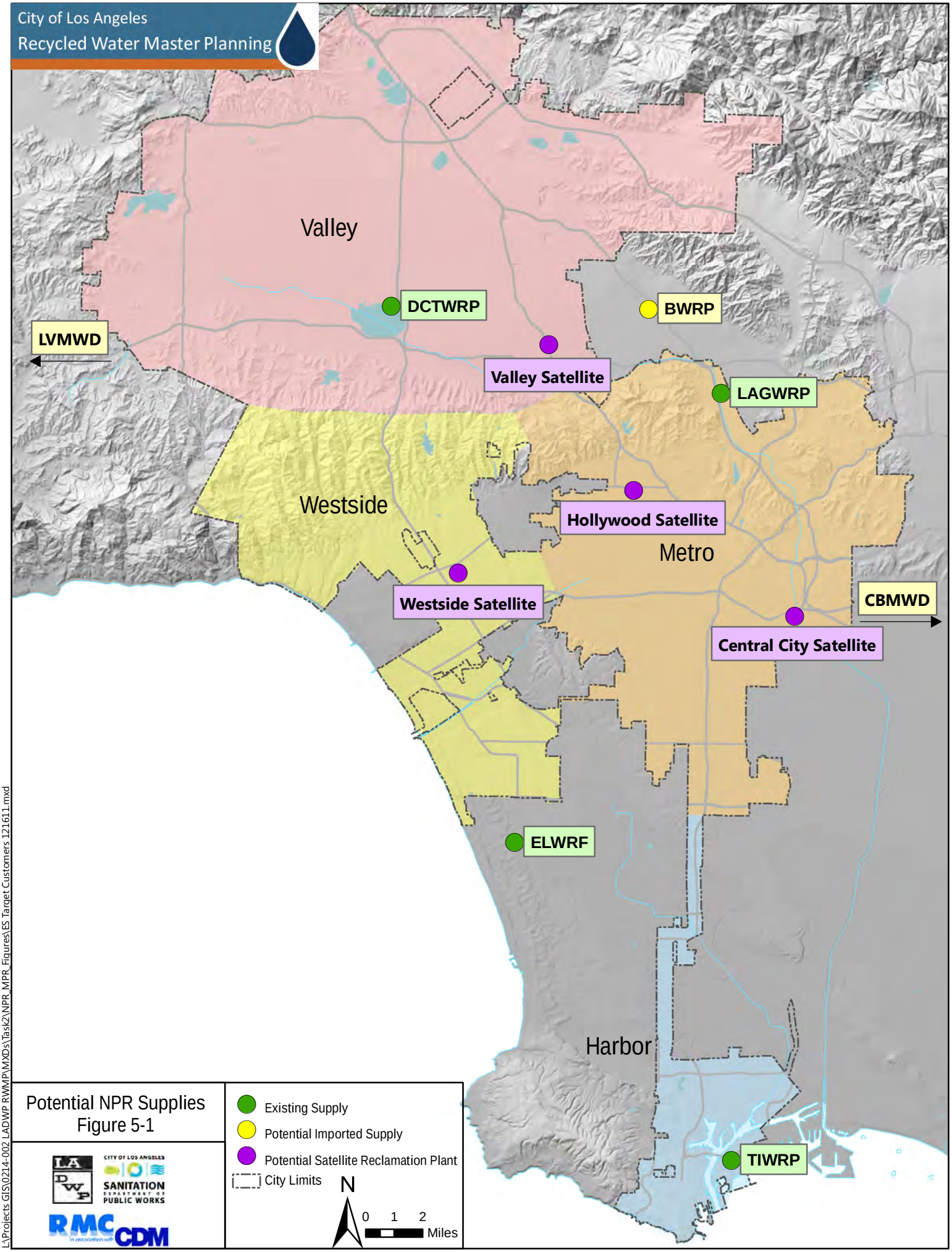
1. Terminal Island Water Reclamation Plant (TIWRP) for the Harbor-TIWRP System
2. Carson Regional Water Reclamation Facility[4] (CRWRF), which nitrifies tertiary effluent from ELWRF for the Harbor-WBMWD System. CRWRF is owned and operated by WBMWD.
3. Los Angeles-Glendale Water Reclamation Plant (LAGWRP) for the Metro-LAGWRP System
4. Donald C. Tillman Water Reclamation Plant (DCTWRP**)** for the Valley-DCTWRP System
5. Edward C. Little Water Recycling Facility (ELWRF), which receives secondary effluent from the Hyperion Treatment Plant (HTP), for the Westside-Westside System. ELWRF is owned and operated by WBMWD.

Potential NPR supplies include three possibilities:

1. Increased deliveries and reuse from existing sources listed above.
2. Importing recycled water from adjacent agencies. In addition to WBMWD, three agencies were considered as potential suppliers: Burbank Water and Power (BWP), Central Basin Municipal Water District (CBMWD), and Las Virgenes Municipal Water District (LVMWD).
3. New satellite treatment facilities for converting raw wastewater directly for reuse. Four new satellite treatment facilities were considered across the City: two in the Metro service area, one in the Valley service area, and one in the Westside service area.

A description for each of the recycled water supplies considered for potential projects is included in the next section and shown in **Figure 5-1**.

[4] Also referred to as the Juanita Millender-McDonald Water Treatment Facility.



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Data Sources: RMC, USGS, LADWP

5.1 Potential Non-Potable Supplies

The characteristics of each potential non-potable supply are discussed in this section. The supplies are presented in groups:

- Existing and Planned Non-Potable Supplies; and
- Potential New Non-Potable Supplies

5.1.1 Existing and Planned Non-Potable Supplies

This section describes the potential for use of existing and planned supplies to serve potential customers. The supplies included are:

- Terminal Island Water Reclamation Plant
- Carson Regional Water Reclamation Facility
- Los Angeles-Glendale Water Reclamation Plant
- Donald C. Tillman Water Reclamation Plant
- Edward C. Little Water Recycling Facility

Terminal Island Water Reclamation Plant

TIWRP currently supplies approximately 3,000 AFY primarily to the DGB. Once planned projects are considered, demand from TIWRP will be approximately 3,210 AFY. It is assumed that the peaking factor to deliver water to DGB is minimal so the average annual demand of 3,210 AFY is equivalent to a daily flow rate of 2.9 mgd. There are ongoing efforts to address existing reliability issues to enable TIWRP to consistently produce its design production capacity of 5 mgd. These issues are anticipated to be addressed prior to implementation of potential projects. After accounting for 2.9 mgd of existing and planned demands and assuming a plant capacity of 5 mgd, 2.1 mgd would be available for potential customers.

LADWP currently reimburses BOS for costs associated with operating the AWTF at TIWRP. Based on historical operational costs and projected costs once reliability and operational issues are addressed, a unit cost of approximately $1,300/AF is anticipated as the cost for the TIWRP to produce water at its design production capacity.

Additional supply from TIWRP could be made available for potential customers by either reducing deliveries to DGB (particularly during the peak NPR season) or by expanding the treatment plant to apply advanced treatment to all flows, which would result in a 7.5 mgd expansion to 12.5 mgd of product water. The TIWRP AWTF expansion option was developed as part of the TIWRP Barrier Supplement and Non-Potable Reuse Concepts Report, which is also considering the market for TIWRP AWTF product beyond potential non-potable customers. Therefore, the TIWRP AWTF expansion option was not considered further in this report but is noted as a potential source to supply the additional potential long-term non-potable customers remaining after the TIWRP AWTF existing capacity is exhausted.

Carson Regional Water Reclamation Facility

LADWP is currently funding a 12-mgd capacity expansion of CRWRF to produce nitrified tertiary effluent for delivery of 9,300 AFY primarily to large industrial customers. The CRWRF pump station is included in the expansion plans and is assumed to provide a pressure of approximately 132 psi at the plant to provide sufficient pressure to planned customers in the Harbor-WBMWD System. Based on peak season demand estimates for the system, planned customers would require all 12.0 mgd of CRWRF supply during the peak season. Therefore, the use of additional recycled water from CRWRF would require another expansion.

In addition to the 12 mgd expansion of CRWRP, there is potential for an additional 5 mgd expansion. The *WBMWD Capital Implementation Plan for Recycled Water Systems* (Carollo, 2009) included an expansion project to 17 mgd to meet new WBMWD non-potable demands and planned LADWP demands. The availability of supply from this expansion for use by LADWP could not be determined for this report but should be investigated in the future.

The purchase price of nitrified water from CRWRF (from WBMWD) under the planned expansion is estimated to be $800/AF based upon discussions between LADWP and WBMWD.

Los Angeles-Glendale Water Reclamation Plant

LAGWRP currently supplies 2,430 AFY and up to 4.8 mgd to non-potable customers. Once planned projects are considered, it will serve approximately 4,800 AFY and up to 9.3 mgd. LAGWRP produces up to 18 mgd tertiary treated product water. LADWP has access to 50% of the product water (9 mgd). As a result, no remaining peak day supplies are projected to be available from LAGWRP for LADWP unless a potable water supplement is provided during peak periods or LAGWRP is expanded.

The number of customers that can be served is limited to the peak period supply available to meet peak period demand. Supplementing the peak period supply with potable water allows more customers to be connected to the recycled water system and results in higher deliveries of recycled water during non-peak periods. In fact, supplementing the peak demand period with up to 2 mgd of potable water could result in an additional 500 AFY of recycled water use from 250 AFY of potable water supplement.

Two options for expansion of LAGWRP were defined in the Long-Term Concepts Report. LAGWRP Expansion Option 1 expands LAGWRP influent capacity by 12 mgd resulting in a 9 mgd production expansion with equalization, while Option 2 expands LAGWRP influent capacity by 28 mgd resulting in a 22 mgd production expansion. The large increase in influent flows under Option 2 cannot be achieved until the Glendale Burbank Interceptor Sewer (GBIS) is constructed, which is not scheduled to occur until at least 2030. Both expansion options were considered as viable potential supplies with the understanding that Option 2 could not be implemented until at least 2030.

The estimated capital cost (including construction contingency and implementation factor) for Option 1 is $83 million and for Option 2 is $187 million. The estimated annual O&M cost for LAGWRP is approximately $0.76 per 1,000 gallons of product water based on historical LAGWRP operating costs, as described in the Long-Term Concepts Report.

Donald C. Tillman Water Reclamation Plant

DCTWRP currently supplies an annual average of 3,990 AFY and a peak supply up to 6.2 mgd to non-potable customers and, once planned projects are considered, it will serve approximately 5,310 AFY and up to 8.7 mgd. DCTWRP tertiary effluent has several existing and planned uses that were assumed to take priority over service to potential non-potable customers: 1) in-plant reuse; 2) lake flows (which continue to the Los Angeles River); 3) existing and planned non-potable customers; and 4) 15,000 AFY GWR Project (Phase 1).

As shown in **Table 5-1**, no surplus tertiary effluent from DCTWRP is projected once the GWR Project achieves a yield of 30,000 AFY in 2035. Approximately 14 mgd of tertiary effluent would be available if the GWR Project Phase 2 (30,000 AFY) is not implemented; however, no surplus tertiary effluent is projected if GWR Project Phase 2 (30,0000 AFY) is implemented.

Table 5-1: DCTWRP Flow Commitment Assumptions

DCTWRP Influent	64 mgd[1]	80 mgd[1]
DCTWRP Effluent (Title 22 Recycled Water)	59 mgd[1]	73 mgd[1]
In-Plant Reuse	2 mgd[1]	2 mgd[1]
Flows to Lakes and LA River[2]	27 mgd	27 mgd
Influent to AWPF for 15,000 AFY GWR Project (Phase1) and Existing and Planned NPR (5,000 AFY)	30 mgd[1]	30 mgd[1]
Remaining Flow after 15,000 AFY GWR Project (Phase 1)	**--**	**14 mgd**
Influent to AWPF for 30,000 AFY GWR Project (Additional 15,000 AFY)	--	14 mgd
Remaining Flow after 30,000 AFY GWR Project (Phase 2)	**N/A**	**--**

Notes:
1. Refer to Tables 3-6 and 3-7 in the Groundwater Replenishment Master Planning Report for assumptions for these values.
2. Assumed flow to Lakes and LA River, based on 2006 Integrated Resources Plan Draft Environmental Impact Report.

Edward C. Little Water Recycling Facility

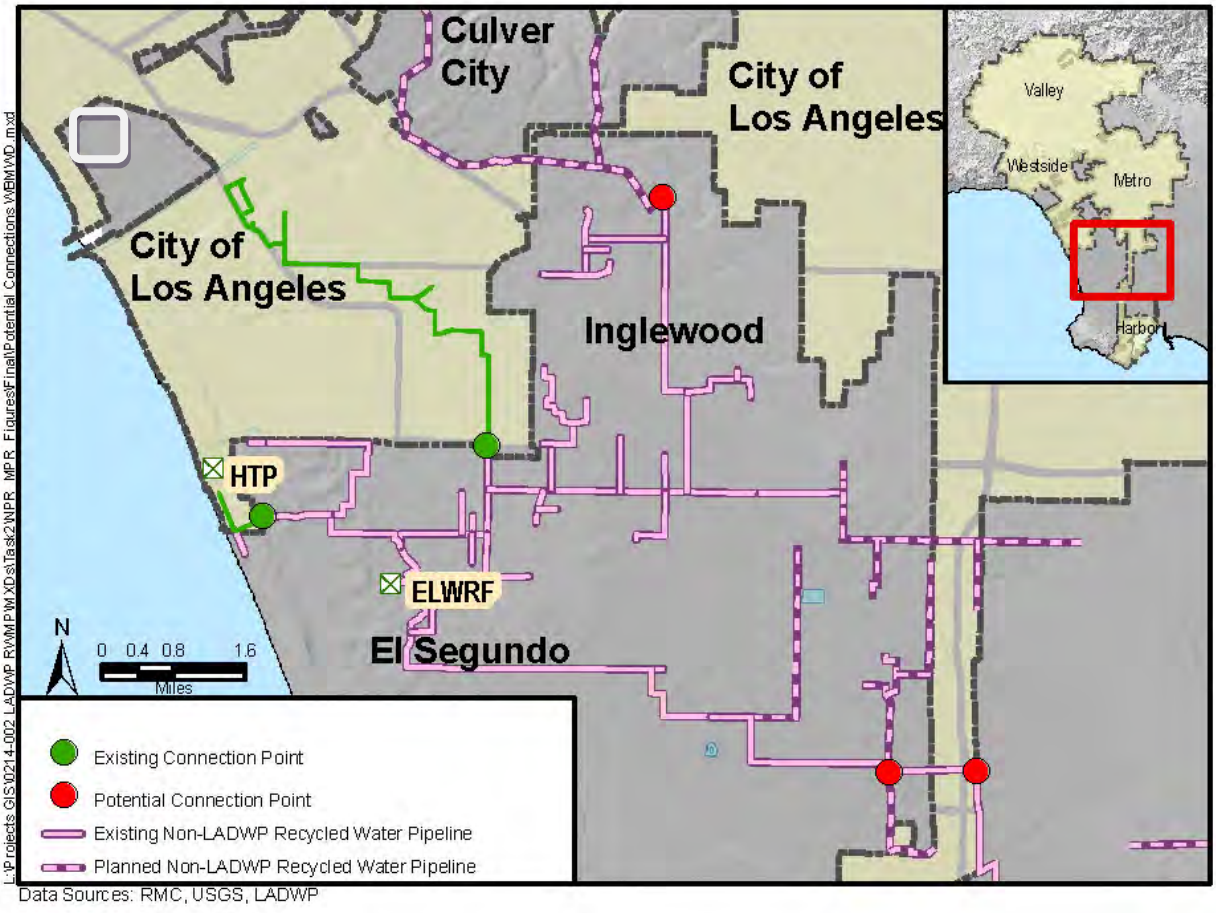
ELWRF currently provides tertiary treated water to WBMWD's Title 22 Distribution System. ELWRF existing deliveries include 880 AFY and up to 1.7 mgd to LADWP non-potable customers. Once planned projects are considered, deliveries will increase to approximately 1,490 AFY and up to 2.6 mgd. Based on discussions with WBMWD, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.

LADWP has two existing service connections with the WBMWD that serve the Westside System and are located at the City's border with El Segundo: 1) along Aviation Blvd near the southeast corner of LAX; and 2) along Grand Ave, which is southwest of LAX. As shown in **Figure 5-2**, there are several other potential connection points in the WBMWD system. The primary option to serve a large amount of recycled water is the terminus point in Inglewood, which was

originally planned for an LADWP service connection. LADWP could use this connection point to serve potential customers in the Westside or Metro Service Area. Based on hydraulic modeling conducted as part of the *WBMWD Capital Implementation Plan for Recycled Water Systems* (Carollo, 2009), the West Basin Title 22 Distribution System is assumed to provide a pressure of approximately 83 psi during the day and 93 psi during the night at the Inglewood connection point. The WBMWD distribution system crosses the Harbor Gateway area of Los Angeles and would be a potential supply point for LADWP customers in that area.

The purchase price of tertiary-treated product water from ELWRF (from WBMWD Title 22 Distribution System) is estimated to be $728/AF, based on the existing purchase price of the same water for the existing Westside service area.

Figure 5-2: Potential Non-Potable Supply Interconnection Points – WBMWD



5.1.2 Potential New Non-Potable Supplies

This section describes the potential use of new supplies to serve potential customers. The supplies included are:

- Burbank Water and Power
- Central Basin Municipal Water District

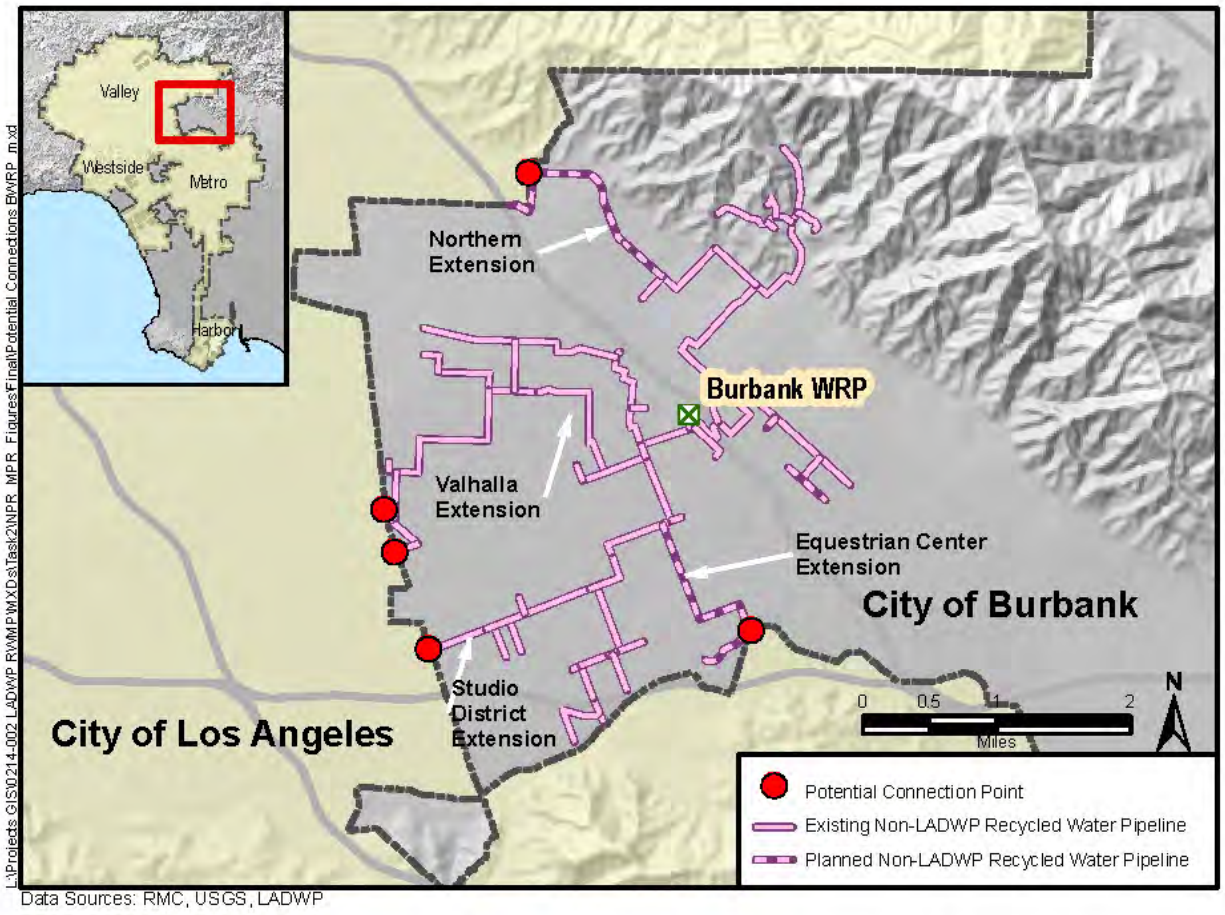
- Las Virgenes Municipal Water District
- Satellite Treatment Plants

Burbank Water and Power

Burbank Water and Power (BWP) has an agreement with LADWP to deliver tertiary treated product water from the Burbank Water Reclamation Plant to BWP's western border for use within the City. BWP's recycled water system has several locations in the eastern San Fernando Valley where their planned non-potable system approaches the City border and BWP has surplus capacity in the following pipeline extensions (**Figure 5-3**):

- Studio District
- Valhalla (two potential connection points)
- Northern
- Equestrian Center

Figure 5-3: Potential Non-Potable Supply Interconnection Points – Burbank



As shown in **Table 5-2**, BWP has estimated that they can provide up to 3.8 mgd of recycled water during the peak season from two pipelines (Valhalla and Studio District) that terminate near their border with Los Angeles in the North Hollywood area. The flow and pressure

estimates were based on upsizing BWP's pipelines to accommodate future LADWP flows. LADWP is paying BWP for the cost to upsize their pipelines, as summarized in **Table 5-2**. In exchange for getting recycled water from BWP, LADWP will provide BWP with groundwater storage credit.

Table 5-2: Potential Burbank Non-Potable Supplies

Pipeline	Peak Day Flow (gpm)			Peak Day Pressure (psi)[2]		Upsize Payment
	Day[1]	Night[1]	Average	Day	Night	
Valhalla (12" Pipeline)	200	750	380	110	95	$0.5 M
Studio District (16" Pipeline)	2,430	2,000	2,290	93	83	$1.3 M
Total	**2,630**	**2,750**	**2,670**	**N/A**	**N/A**	**$1.8 M**

Notes:
1. Agreement calls for a minimum of 2,100 gpm during the day and 800 gpm during the night.
2. Agreement calls for a minimum pressure of 90 psi.

The Northern Extension pipeline is currently under construction and has enough capacity to serve a limited number of LADWP customers, such as Woodbury University, but not enough for a larger expansion into Los Angeles. A pipeline is being planned with the potential to serve a limited number of LADWP customers in the vicinity of the Los Angeles Equestrian Center.

Central Basin Municipal Water District

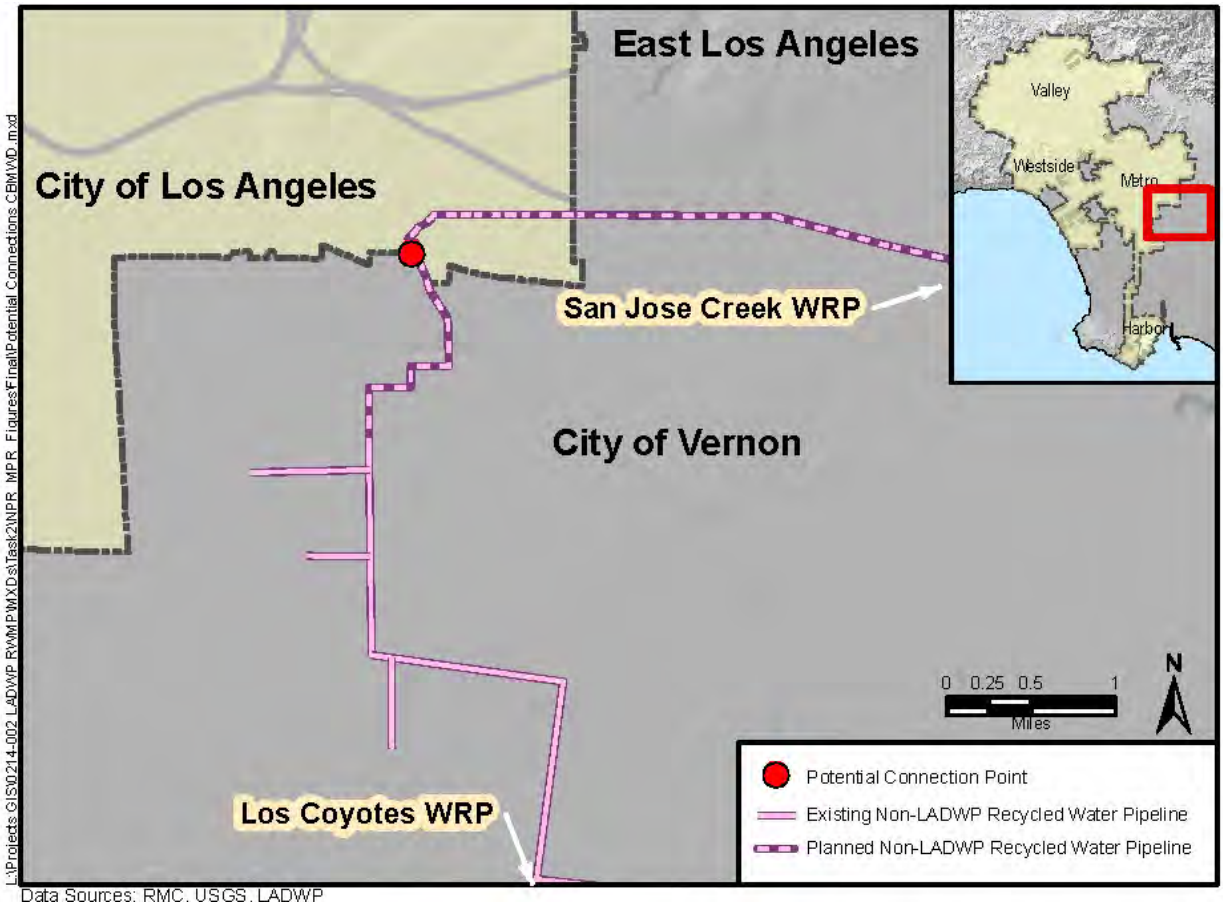
Currently, CBMWD purchases tertiary treated recycled water produced by Los Angeles County Sanitation Districts (LACSD) at the San Jose Creek Water Reclamation Plant (SJCWRP) and the Los Coyotes Water Reclamation Plant (LCWRP). CBMWD recently completed construction of Phase 1 of the Southeast Water Reliability Project, which conveys recycled water to the City of Montebello. Phase 2 of the project, which is already designed, would convey recycled water to Vernon by connecting to their existing recycled water pipeline. A portion of the Phase 2 pipeline would enter the City and provides an opportunity for LADWP to purchase recycled water from CBMWD, as shown in **Figure 5-4**.

LADWP has held initial discussions with CBMWD about the availability and cost of recycled water once the SWRP pipeline is completed. According to preliminary meetings with CBMWD staff, LADWP could potentially purchase up to 4 mgd of this water from CBMWD once the Southeast Water Reliability Project is fully implemented.

The potential customers identified in the southern portion of the Metro service area, which is closest to the potential CBMWD interconnection point, have a weighted average peak day factor of 1.5 (based on 4,000 AFY average annual demand and 5.4 mgd peak day demand). Therefore, a peak season supply of 4.0 mgd would result in the ability to meet an annual average demand of 2,990 AFY.

CBMWD's standard recycled water fee is $477/AF plus $20/AF for sales outside CBMWD service area, so $500/AF was assumed as the purchase price for this supply. CBMWD indicated that a minimum purchase of recycled water at this rate could support implementation of Phase 2 of SWRP; however, the guaranteed minimum annual purchase volume was not specified.

Figure 5-4: Potential Non-Potable Supply Interconnection Point – CBMWD



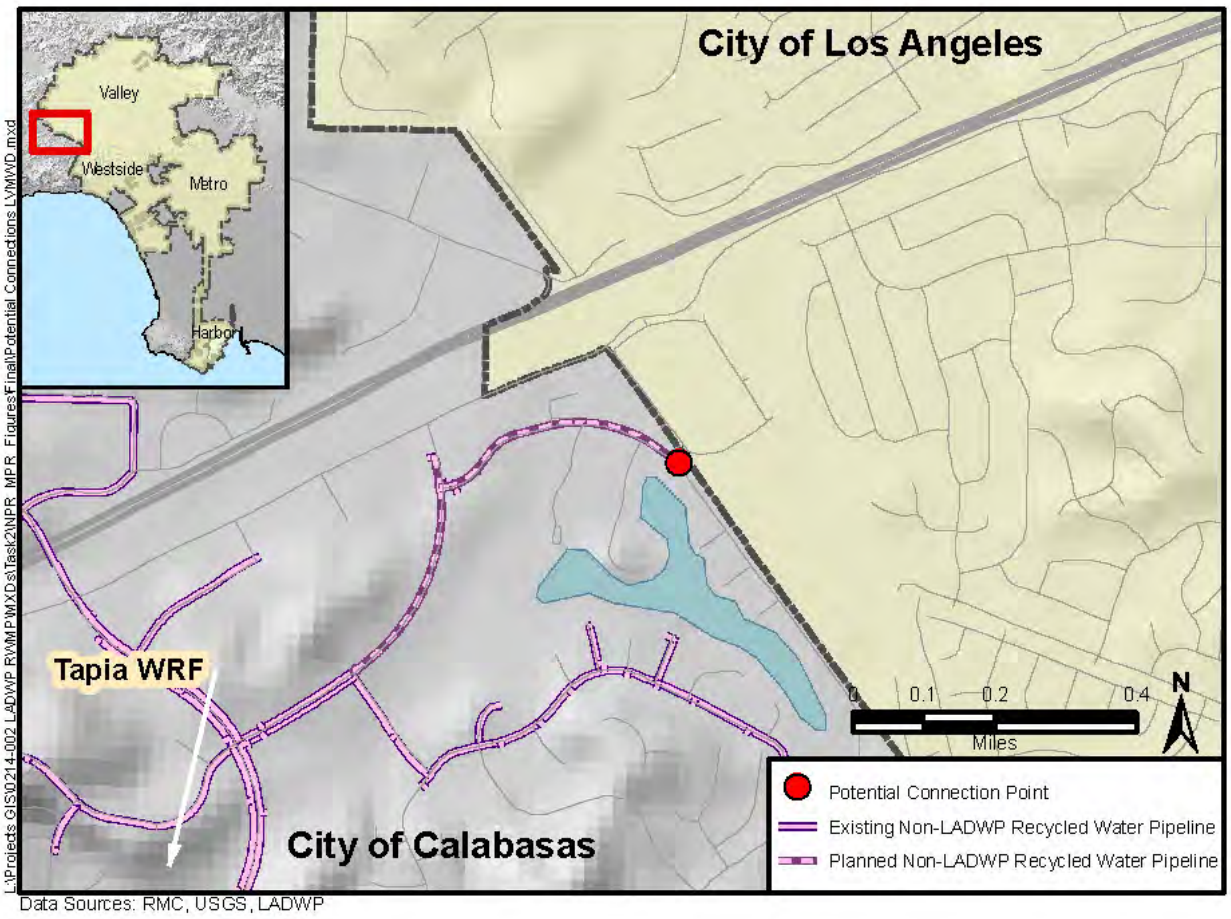
Las Virgenes Municipal Water District

Las Virgenes Municipal Water District's (LVMWD) receives recycled water from the Tapia WRF. Their eastern service area borders the City along southwestern portions of the San Fernando Valley, in the City of Calabasas, as shown in **Figure 5-5**. The LVMWD Recycled Water Master Plan (2007) identified the potential to serve LADWP customers near their border and a recent analysis by LVWMD evaluated service options to meet the estimated peak day demand of 0.43 mgd for Woodland Hills Country Club (which has an annual average demand of 250 AFY). The study determined that LVMWD could supply up to 1,800 gpm for four hours, the country club's typical irrigation period, to LADWP at 100 psi during the peak season if upgrades to the LVMWD recycled water system are implemented. The upgrades include installation of approximately 1 mile of 14" pipe to the City's border and approximately 1 mile of 12" pipe in parallel with LVMWD's existing Eastern Recycled Water System. The construction cost of these upgrades within LVMWD service area was estimated to be $2.5 million. LADWP would also need to purchase the recycled water from LVMWD. The discussion and framework for this recycled water agreement have not yet been pursued.

LVMWD has additional supplies available during off-peak periods but use of these flows would require some type of seasonal storage. LVMWD is currently investigating the feasibility of implementing a seasonal storage reservoir that would hold approximately 2,500 AF.

LVWMD expressed interest in having LADWP as a potential partner in their recycled water seasonal storage reservoir plans. However, the concept was not developed far enough to be evaluated in these planning documents.

Figure 5-5: Potential Non-Potable Supply Interconnection Point – LVMWD



Satellite Treatment Plants

The *Satellite Reuse Options TM* (**Appendix F**) was developed to define potential satellite treatment facilities across the City. The TM included development of four satellite treatment plants that would use a membrane bioreactor (MBR) / ultraviolet (UV) disinfection treatment train to produce tertiary treated recycled water from raw wastewater. The four areas evaluated were (Figure 5-1): 1) Central City; 2) Hollywood; 3) Valley; and 4) Westside.

For each area, the TM identified several potential sites but did not recommend a specific site. The treatment plants were sized to meet the peak season flow for potential non-potable customers in the area. The size and cost of each treatment plant are summarized in **Table 5-3**.

Table 5-3: Potential Satellite Treatment Plants

Area	Capacity	Yield	Capital Cost	O&M Cost	Unit Cost
Metro, Central City	5.4 mgd	4,000 AFY	$104.6 M	$2.0 M/yr	$1,400/AF
Metro, Hollywood	2.2 mgd	1,300 AFY	$44.9 M	$0.9 M/yr	$1,800/AF
Valley, Southeast	3.8 mgd	2,100 AFY	$77.1 M	$1.4 M/yr	$1,900/AF
Westside, Rancho Park	5.2 mgd	2,900 AFY	$98.7 M	$1.9 M/yr	$1,800/AF

Note: Refer to *Satellite Reuse Options TM* (**Appendix F**) for additional information.

5.1.3 Summary of Potential NPR Supplies

The supplies discussed in Section 5.1 are summarized in **Table 5-4**.

Table 5-4: Summary of Potential NPR Supplies

Supply	Available Supply	Cost	Notes
Existing / Planned Supplies			
Terminal Island WRP	2.1 mgd	$1,300/AF	Capacity dependent on future DGB commitments; Expansion potential considered in the TIWRP Barrier Supplement and Non-Potable Reuse Concepts Report
Carson Regional WRF	up to 5 mgd	$800/AF	WBMWD has identified uses for the remaining potential 5 mgd
Los Angeles-Glendale WRP	--	--	No peak season capacity after planned customers are connected
LAGWRP Potable Water Supplement	500 AFY	--	Up to 2 mgd of potable water supplement allows for additional recycled water use
LAGWRP Expansion Option 1	9 mgd	See Notes	Cost: Capital = $83 M; O&M = $0.76/kgal
LAGWRP Expansion Option 2	22 mgd	See Notes	Cost: Capital = $187 M; O&M = $0.76/kgal; Requires GBIS to be constructed
Donald C. Tillman WRP	--	--	14 mgd may be available in 2035 if only 15,000 AFY GWR Project (Phase 1) is implemented
Edward C. Little WRF	N/A	$728/AF	Capacity is limited; WBMWD could use all of the supply in the next 10 to 20 years
Potential Regional Supplies			
Burbank WP	3.8 mgd	$2.5M	Purchase includes groundwater credit exchange from LADWP
Central Basin MWD	4.0 mgd	$500/AF	Guaranteed minimum annual purchase volume required but not specified
Las Virgenes MWD	0.4 mgd	$500/AF	Capacity calculated based on 1,800 gpm over 4 hours
Potential Satellite Treatment Plants			
Metro, Central City	5.4 mgd	$1,400/AF	Refer to *Satellite Reuse Options TM* for all satellite treatment options (**Appendix F**)
Metro, Hollywood	2.2 mgd	$1,800/AF	
Valley, Southeast	3.8 mgd	$1,900/AF	
Westside, Rancho Park	5.2 mgd	$1,800/AF	

5.2 Evaluation Criteria

This section describes the evaluation approach for the potential NPR supplies analysis. As discussed in Section 1.6.1, the RWMP team established objectives at the beginning of the planning process. In addition to the two threshold objectives, which were necessary to fulfill, six other objectives were established (Table 1-2).

Evaluation criteria and performance measures were defined specifically for the potential NPR supplies analysis. The two threshold objectives do not have evaluation criteria or performance measures because they must be met by all alternatives in order to proceed. The evaluation criteria for the potential NPR supplies analysis, which were structured around the six RWMP objectives, are presented in **Table 5-5**.

Table 5-5: Potential NPR Supplies Evaluation Criteria and Performance Measures

RWMP Objectives	Evaluation Criteria
1. Promote Cost Efficiency	Present Value Unit Cost
2. Achieve Supply & Operational Goals	Meet long-term goals Wastewater system benefits
3. Protect Environment	Open space impacts Traffic impacts Greenhouse gas emissions
4. Maximize Implementation	Public acceptance Customer acceptance Institutional complexity Permitting risk / requirements Ability to expedite
5. Promote Economic & Social Benefits	Temporary job creation Permanent job creation Environmental justice
6. Maximize Adaptability & Reliability	Recycled water supply reliability Water age

The following sections provide detailed descriptions of the evaluation criteria and performance measures.

5.2.1 Objective 1 – Promote Cost Efficiency

One evaluation criterion is used for Objective 1 – Promote Cost Efficiency: Present Value (PV) Unit Cost.

Present Value Unit Cost

The PV unit cost for each alternative considered in this evaluation is the present value over 50 years (as of January 2011) divided by the recycled water yield over 50 years, represented in $/AF. For detailed discussion of the assumptions and calculation methods used for the PV unit cost estimate, see the Cost Estimating Basis for Recycled Water Master Planning TM (Appendix E).

5.2.2 Objective 2 – Achieve Supply & Operational Goals

Two evaluation criteria were used for Objective 2 – Achieve Supply & Operational Goals:

- Meet long-term goals; and,
- Wastewater system benefits.

Meet Long-Term Goals

The performance measure for this criterion was the benefit to implementation of long-term projects since the creation of treatment plant capacity for near-term projects could create supplies for use in long-term projects. A qualitative numeric value from 1 (low benefit to long-term goals) to 5 (high benefit to long-term goals) was determined for this criterion.

Wastewater System Benefits

The performance measure for this criterion was a combination of TIWRP discharge benefits through increase reuse from TIWRP and reduction of flows in the HTP wastewater system to benefit collection system capacity. A qualitative numeric value from 1 (low wastewater system benefits) to 5 (high wastewater system benefits) was determined for this criterion.

5.2.3 Objective 3 – Protect Environment

Three evaluation criteria were used for Objective 3 – Protect Environment:

- Open space impacts;
- Traffic impacts; and,
- Greenhouse gas emissions.

Open Space Impacts

The performance measure for this criterion was the area of open space lost due to construction of the recycled water supply. More acres of open space lost results in less environment protected. This evaluation criterion was scored based on the acreage of area that will be converted for use as a treatment plant with the larger area converted scoring the worst.

Traffic Impacts

The performance measure for this criterion was length of new pipelines since all of the pipeline construction was expected to occur in public streets and would cause temporary traffic impacts during construction. This evaluation criterion was scored based on the miles of new pipeline required to convey the supply to a common point of comparison within each service area. More new pipelines results in more potential traffic impacts and more environmental impact.

Greenhouse Gas Emissions

This evaluation criterion ranks alternatives based on the amount of greenhouse gas (GHG) emitted for each supply on unit basis. More GHG emissions results in more impact to the environment. The GHG emissions that result from the operation of treatment plants and pump stations were calculated from the electricity usage of these systems. The evaluation did not

include the potential reduction in GHG emissions due to a reduction in imported water because this was common to all alternatives. The emissions calculated were carbon dioxide, methane, and nitrous oxide, which each converted to metric tons of carbon dioxide equivalents.

5.2.4 Objective 4 – Maximize Implementation

Five evaluation criteria were used for Objective 4 – Maximize Implementation:

- Public acceptance;
- Customer acceptance;
- Institutional complexity;
- Permitting risk / requirements; and,
- Ability to expedite.

Public Acceptance

This evaluation criterion assesses public acceptance of the new permanent, aboveground facilities and temporary construction impacts. For example, new satellite treatment plants (and associated large permanent, aboveground facilities) would have the lowest acceptance while supplies requiring only new pipeline (and associated temporary construction impacts) would have the highest acceptance.

Note that this performance measure was a proxy for public acceptance since we have not specifically solicited public comments on each supply option and actual public outreach is being conducted concurrently. Any recommended supply options will need to be incorporated into the ongoing outreach program to gain public comments.

Customer Acceptance

This evaluation criterion assesses customer acceptance of the recycled water quality. The water quality for all of the supply options considered should not be an issue for the majority of customers but higher levels of treatment than tertiary sand filtration, such as MBR/UV, NdN, and MF/RO, provide a higher quality product that some customers require. As with public acceptance, note that this performance measure was a proxy for customer acceptance since we have not specifically solicited customer feedback on each supply option.

Institutional Complexity

This evaluation criterion ranks alternatives based on the complexity of operating relationships with outside agencies. Many of the supplies considered originates from treatment plants operated outside the City so purchase agreements were required to obtain the supplies and any outside agency does not necessarily prioritize the City's interests first. In order to make NPR operations as efficient as possible, large number of operating contracts/agreements with multiple outside agencies was discouraged.

Permitting Risk / Requirements

The permitting process can affect the implementation of an alternative due the risk associated with the impacts permits could have to time and cost considerations and sheer number of

permits required. A qualitative numeric value from 1 (high permitting risk / requirements) to 5 (low permitting risk / requirements) was determined for this criterion.

Ability to Expedite Implementation

This evaluation criterion ranks alternatives based on their ability to be online quickly so that LADWP could have some "early wins" and lower the risk of not being able to meet the 2035 UWRMP recycled water goal. A qualitative numeric value from 1 (low ability to expedite) to 5 (high ability to expedite) was determined for this criterion.

5.2.5 Objective 5 – Promote Economic & Social Benefits

Three evaluation criteria were used for Objective 5 – Promote Economic & Social Benefits:

- Temporary job creation;
- Permanent job creation; and
- Environmental justice

Temporary Job Creation

In economic development studies, job creation was used as an indicator of economic benefit. This evaluation criterion ranks alternatives based on the number of temporary jobs that will be created for the design and construction of the NPR supply options. Temporary job creation was estimated based on the total capital cost of the project. It was assumed that 7.2 direct and indirect jobs were created for every million dollars in construction spending, where a job was defined as one year of full-time work. This factor comes from the *Estimated San Francisco Jobs Created by Capital Spending* document written by the Office of the City Administrator in San Francisco on February 25th, 2009. It references the REMI Policy Insight Model. This factor was supported by the American Recovery and Reinvestment Act as part of the Senate Stimulus Bill, which allocates $1.4 billion of capital investment for "water reclamation and reuse projects". The bill estimates that this money will generate 11,500 direct new private sector jobs or 8.2 direct jobs per million dollars of capital investment.

Permanent Job Creation

This evaluation criterion ranks alternatives based on the number of permanent jobs that will be created for the operation and maintenance of the NPR and GWR facilities. A "Yes" or "No" was assigned to each supply based on whether permanent jobs would be created by this supply. The basis for a "yes" assignment was the creation of a new treatment plant, expansion of an existing treatment plant, or construction of a seasonal storage seasonal storage reservoir. Note that the yes/no approach was a simple approach since calculation of permanent job creation estimates can be complicated.

Environmental Justice

This evaluation criterion ranks alternatives based on the environmental justice effects of the new permanent above-grade facilities, primarily new or expanded treatment plants, included in each NPR supply option. Below-grade piping projects were not considered because their temporary effects were covered by the Construction Impacts evaluation criterion. A "Yes" or "No" was assigned to each supply based on whether the supply required a new or expanded

treatment plant in a census tract designated as low-income and/or minority community parcels/tracts.

5.2.6 Objective 6 – Maximize Adaptability & Reliability

Two evaluation criteria were used for Objective 6 – Maximize Adaptability & Reliability:

- Recycled water supply reliability; and,
- Water age.

Recycled Water Supply Reliability

This evaluation criterion ranks alternatives based on the reliability of the water supply option once it was online. Reliability issues primarily include the availability of the supply to be produced from the treatment plant and the amount of redundancy built into the treatment plant. A qualitative numeric value from 1 (low water supply reliability) to 5 (high water supply reliability) was determined for this criterion.

Water Age

This evaluation criterion ranks alternatives based on the potential for water quality issues associated with water age, which usually arises in non-potable reuse systems with long stretches of pipe without many customers and/or low demands at the end of systems. A qualitative numeric value from 1 (high water age) to 5 (low water age) was determined for this criterion.

5.3 Results

Each of the supplies described in Section 5.1 were assigned scores for each of the evaluation criteria. The results of the decision modeling are discussed in the following sections by service area.

5.3.1 Harbor Service Area

Approximately 3,300 AFY of potential demand was identified in the Harbor Service Area in Section 6.2.1 (Table 6-1) with an estimated peak day demand of 5.0 mgd. This demand can be divided into two clusters of customers:

- Harbor Gateway: 560 AFY (0.8 mgd peak day demand)
- Harbor Core (vicinity of existing and planned systems): 2,735 AFY (4.2 mgd)

For the Harbor Gateway area, the only realistic supply option is from the existing WBMWD recycled water system supplied from ELWRF, which crosses this stretch of the City, as shown in Figure 5-2.

For the Harbor Core area, as discussed in Section 5.1.1, the existing capacity at TIWRP could provide a peak season supply of 2.1 mgd. Therefore, TIWRP existing capacity could meet approximately half of the identified demand in the Harbor Core area. The remaining peak season demand of approximately 2.1 mgd could be met through either reduced peak season

deliveries to DGB, TIWRP expansion, CRWRF expansion (discussed in Section 5.1.1). The TIWRP expansion option is evaluated further in the TIWRP Barrier Supplement and Non-Potable Reuse Concepts Report but is not included in this report as a potential NPR supply source. The CRWRF expansion and reduction in peak season deliveries to DGB are not evaluated in this report but may have validity in future evaluations.

5.3.2 Metro Service Area

Approximately 5,800 AFY of potential non-potable demand was identified in the Metro Service Area in Section 6.3.1 (Table 6-3) with an estimated peak day demand of 8.8 mgd. The customers could be roughly divided into three clusters:

- Metro-LAGWRP System Laterals: 800 AFY (1.2 mgd peak day demand)
- Central City (downtown and south of downtown): 3,800 AFY (5.1 mgd)
- Hollywood: 1,200 AFY (2.0 mgd)

Potential non-potable supplies to meet these demands are discussed by cluster in the following sections.

Metro-LAGWRP System Laterals

The Metro-LAGWRP System laterals demand of 800 AFY could primarily be supplied from existing LAGWRP supplies; however, LAGWRP has limited peak season supplies so another supply would be needed to meet all potential lateral demands. The LAGWRP Potable Water Supplement option could meet a portion of the estimated demand. And approximately half of the demand (for potential customers such as Atlas Carpet Mills, Lincoln Park, and USC/County Medical Center) is located near the southern portion of the system, which terminates at Cornfields State Park just north of downtown so these customers could potentially be served from the supply selected for the Metro Central City area, which is discussed in the following section.

Central City

The Central City area (including south of downtown) has an estimated potential demand of approximately 3,800 AFY and peak season demand 5.1 mgd and could be supplied at least partially from five recycled water supplies:

- ELWRF: From the Inglewood Connection, which is located southwest of downtown
- CBMWD: Planned connection located southeast of downtown from Phase II of the Southeast Water Reliability Project
- LAGWRP-Expansion Option 1: Located at the terminus of planned system located north of downtown
- LAGWRP Potable Water Supplement: Located at the terminus of planned system located north of downtown
- Central City Satellite: Located south of downtown, near USC

Observations from the Metro Service Area, Central City supply options evaluation include:

- LAGWRP Potable Water Supplement has the lowest cost
- LAGWRP Potable Water Supplement, ELWRF, and CBMWD have higher ability to promptly implement and higher permitting scoring since a new or expanded treatment plant is not necessary
- LAGWRP Potable Water Supplement, ELWRF, and CBMWD have higher public acceptance and higher environmental justice scoring since a new treatment plant in a low-income and/or minority census tract is not required
- LAGWRP Potable Water Supplement, CBMWD, LAGWRP Expansion Option 1 and Central City Satellite have higher water quality benefits since they all include nitrogen removal treatment steps
- LAGWRP Expansion Option 1 and Central City Satellite have higher wastewater system benefits due to the creation of additional upstream treatment capacity
- LAGWRP Potable Water Supplement, LAGWRP Expansion Option 1, and Central City Satellite have lower institutional complexity since they are City-operated

Overall, LAGWRP Potable Water Supplement benefits outweigh the benefits of ELWRF and CBMWD. Between ELWRF and CBMWD, CBMWD has a few small benefits over ELWRF, particularly cost and water quality, which makes CBMWD the preferred supply after LAGWRP Potable Water Supplement for the Central City portion of the Metro service area. The primary disadvantage of CBMWD is the limited water supply during peak season and that Phase II of the Southeast Water Reliability Project must still be constructed.

Metro Service Area, Hollywood

The Hollywood area has an estimated potential non-potable demand of approximately 1,200 AFY and peak season demand of 2.0 mgd. This area can be supplied from two recycled water supplies:

- LAGWRP-Expansion Option 1: Located at a terminus of the planned system along the southern border of Griffith Park
- LAGWRP Potable Water Supplement: Located at a terminus of the planned system along the southern border of Griffith Park
- Hollywood Satellite

Observations from the Metro Service Area, Hollywood supply options evaluation include:

- LAGWRP Potable Water Supplement has the lowest costs while LAGWRP Expansion Option 1 has similar, though slightly lower, costs than Hollywood Satellite
- LAGWRP Potable Water Supplement has higher ability to implement, higher public acceptance, lower open space impacts, and lower permitting issues than the other options

Overall, LAGWRP Potable Water Supplement is the preferred supply for the Hollywood portion of the Metro service area.

5.3.3 Valley Service Area

Approximately 11,300 AFY of potential non-potable demand was identified in the Valley Service Area in Section 6.4.1 (Table 6-5) with an estimated peak day demand of 20 mgd. The average annual demand and peak day demands for potential customers far exceed the following available supplies, which could potentially supply recycled water to Valley potential customers:

- DCTWRP (14 mgd if GWR Phase 2 is not implemented): Located in the central part of the Valley
- LAGWRP-Expansion Option 1 (9 mgd) and LAGWRP-Expansion Option 2 (22 mgd): Located outside the southeast corner of the Valley
- LAGWRP Potable Water Supplement (up to 500 AFY): Located outside the southeast corner of the Valley
- Burbank (3.8 mgd): Located in the southeast corner of the Valley
- LVMWD (0.5 mgd): Located in southwest corner of the Valley
- Southeast Valley Satellite (3.0 mgd): Located in the southeast corner of the Valley

Since the range of capacities for potential supplies is between 0.5 mgd to 22 mgd, two different groupings of total demand values were created to simplify the evaluation:

- Large Valley Service Area: supply to meet a large portion (over half) of potential non-potable demand in the service area.
- Small Valley Service Area: supply to meet a small portion (less than half) of potential non-potable demand in the vicinity of the supply location.

The "Large" evaluation considered DCTWRP and LAGWRP Expansion Option 2. The "Small" evaluation considered all the supplies listed above except for LAGWRP Expansion Option 2. Each evaluation is discussed in the following sections

Large Valley Service Area

The Large Valley Service Area supply options include DCTWRP (14 mgd) and LAGWRP Expansion Option 2 (22 mgd). Neither supply can meet all identified demands. For proper comparison with DCTWRP, an 8-mile, 24" distribution pipeline from LAGWRP to the eastern Valley and an expanded LAGWRP pump station were added to LAGWRP Expansion Option 2 to account for facilities required to convey LAGWRP effluent to the Valley Service Area.

Observations from the Large Valley Service Area supply options evaluation include:

- DCTWRP has lower costs, lower greenhouse gas (GHG) emissions, lower permitting issues, higher public acceptance, and higher ability to expedite than LAGWRP Expansion Option 2 since it is an existing treatment plant and is in closer proximity to potential customers
- LAGWRP Expansion Option 2 has higher wastewater system benefits and economic benefits since it is an expanded, upstream treatment plant
- Both supplies have potential fatal flaws:

- The DCTWRP supply of up to 14 mgd would only be available if GWR Phase 2 is not implemented.
- LAGWRP cannot produce up to 22 mgd without the construction of GBIS, which is not scheduled to occur until at least 2030.

Overall, DCTWRP benefits outweigh LAGWRP; therefore, DCTWRP is the preferred supply for a large project in the Valley service area. However, both supplies have fatal flaws that may preclude implementation of a large NPR project in the Valley service area.

Small Valley Service Area

The intent of the Small Valley Service Area supply evaluation is to compare other potential supplies with DCTWRP. This comparison is useful in the event that DCTWRP effluent is not available due to implementation of GWR Phase 2.

The potential Small Valley Service Area potential supplies include:

- DCTWRP (14 mgd if GWR Phase 2 is not implemented)
- LAGWRP Expansion Option 1 (9 mgd)
- LAGWRP Potable Water Supplement (up to 500 AFY)
- Burbank (3.8 mgd)
- LVMWD (0.5 mgd)
- Southeast Valley Satellite (3.0 mgd)

Note that a 1.5-mile, 16" pipeline from the western terminus of the existing Metro-LAGWRP System (near Lakeside Golf Club) to the eastern Valley area and an expanded LAGWRP pump station were added to the LAGWRP Expansion Option 1 for proper comparison with the other supplies, which are already located in the Valley Service Area. Observations from the supply options evaluation for the Valley Service Area include:

- DCTWRP, Burbank, and LVMWD have lower costs, lower permitting issues, higher public acceptance, higher ability to expedite, and higher ability to promptly implement since a new or expanded treatment plant or new seasonal storage reservoir was not necessary
- LAGWRP Potable Water Supplement, LAGWRP Expansion Option 1, and Valley Satellite have higher wastewater system benefits and higher economic benefits due to the addition of upstream treatment plant capacity
- DCTWRP, LAGWRP Potable Water Supplement, LAGWRP Expansion Option 1, and Valley Satellite have lower institutional complexity since they are City-operated

Overall, DCTWRP benefits outweigh the benefits of the other supplies; however, this supply would not be available if GWR Phase 2 is implemented so the Burbank and LVMWD are also recommended for the Small Valley Service Area. Since the three supplies enter the Valley Service Area at three distinct locations, all three could be implemented to serve small demands in the Valley service area.

5.3.4 Westside Service Area

Approximately 3,500 AFY of potential non-potable demand was identified in the Westside Service Area in Section 6.5.1 (Table 6-7) with an estimated peak day demand of 6.3 mgd. The demands can be divided into three clusters:

- Westside System Laterals: 200 AFY (0.4 mgd)
- Kenneth Hahn: 400 AFY (0.7 mgd)
- North of I-10: 2,900 AFY (5.2 mgd)

The Westside System Laterals could be served by the same existing supply: ELWRF from the LAX Connection. The Kenneth Hahn area could be served from ELWRF from the nearby Inglewood Connection.

North of I-10 could be supplied by ELWRF from either a new system from the Inglewood Connection or an extension of the existing system from the LAX Connection. Initial hydraulic modeling results indicated that the Inglewood Connection is preferred. The other supply option is a new satellite treatment plant in the in the Rancho Park area. For proper comparison, a 7-mile, 24" pipeline from the Inglewood Connection to Rancho Park was added to the ELWRF supply. There is a potential to upsize the pipeline and cost-share with WBMWD to serve their potential customers in the Culver City area but an LADWP-only option was assumed for simplicity.

Observations from the Northern portion of the Westside Service Area supply options evaluation include:

- ELWRF has a lower cost than Westside Satellite due to the high cost of constructing a new treatment plant
- ELWRF is attractive due to high potential for rapid implementation, a high level of public acceptance, and the ability to be expedited since it is an existing supply and would avoid the myriad of issues required to construct a new treatment plant in a developed, mostly residential area
- Westside Satellite has lower traffic impacts due to avoidance of new pipeline construction, lower GHG emissions due to avoidance of pumping water from HTP, lower institutional complexity since all facilities will be City-operated, and lower water age issues due to the proximity of the supply compared with ELWRF
- Westside Satellite has higher customer acceptance due to a higher quality product water than ELWRF and higher economic benefits due to operation of a new treatment plant

ELWRF was the preferred supply for the Westside service area primarily due to lower cost; however, it has one of the highest costs among potential supplies in the other service areas so potential projects in the Westside service area may not be as cost effective. Note that the Westside Satellite option could be implemented in a more cost effective manner if the supply did not have to meet peak day demands since the doubling of demands in the summer causes the satellite plant capacity to remain unused through the remainder of the year. Also, supplying only a limited number of customers, such as a few golf courses in the area, may reduce the size enough to reduce local impacts and associated opposition.

5.4 Key Findings and Conclusions

Key findings and conclusion from the analysis for each of the six areas are presented in this section. Based on the observations described in Section 5.2, the preferred supplies for each analysis are:

- **Harbor Service Area:** Both potential supplies, TIWRP and CRWRF, were found to be viable; however, each potential supply has pros and cons that will be considered when implementing future recycled water projects in the Harbor Service Area.
- **Metro Service Area, Central City:** The preferred supply for the Central City portion of the Metro service area is LAGWRP Potable Water Supplement; however, it is recommended that LADWP pursue discussion with CBMWD for purchase of supplies to better define potential costs.
- **Metro Service Area, Hollywood:** The preferred supply for the Hollywood portion of the Metro service area is LAGWRP Potable Water Supplement; however, it costs more to supply this area compared with Central City due to higher pumping requirements and the supply is limited so implementation in the Central City area should be a higher priority.
- **Large Valley Service Area:** The preferred supply for a large portion of demands in the Valley service area is DCTWRP; however, both supplies considered in this analysis (DCTWRP and LAGWRP) have potential fatal flaws that may preclude implementation of a large NPR project in the Valley service area. The DCWRP fatal flaw is due to providing DCTWRP supply for GWR Phase 2, which is more cost effective than NPR.
- **Small Valley Service Area:** The preferred supplies for a small portion of demands in the Valley service area is DCTWRP, Burbank, and LVMWD. Each supply can each serve a distinct set of customers so all three could be implemented independently.
- **Westside Service Area:** The preferred supply for the Westside service area was ELWRF; however, it has one of the highest costs among recommended supplies so NPR projects in the Westside service area may not be cost effective.

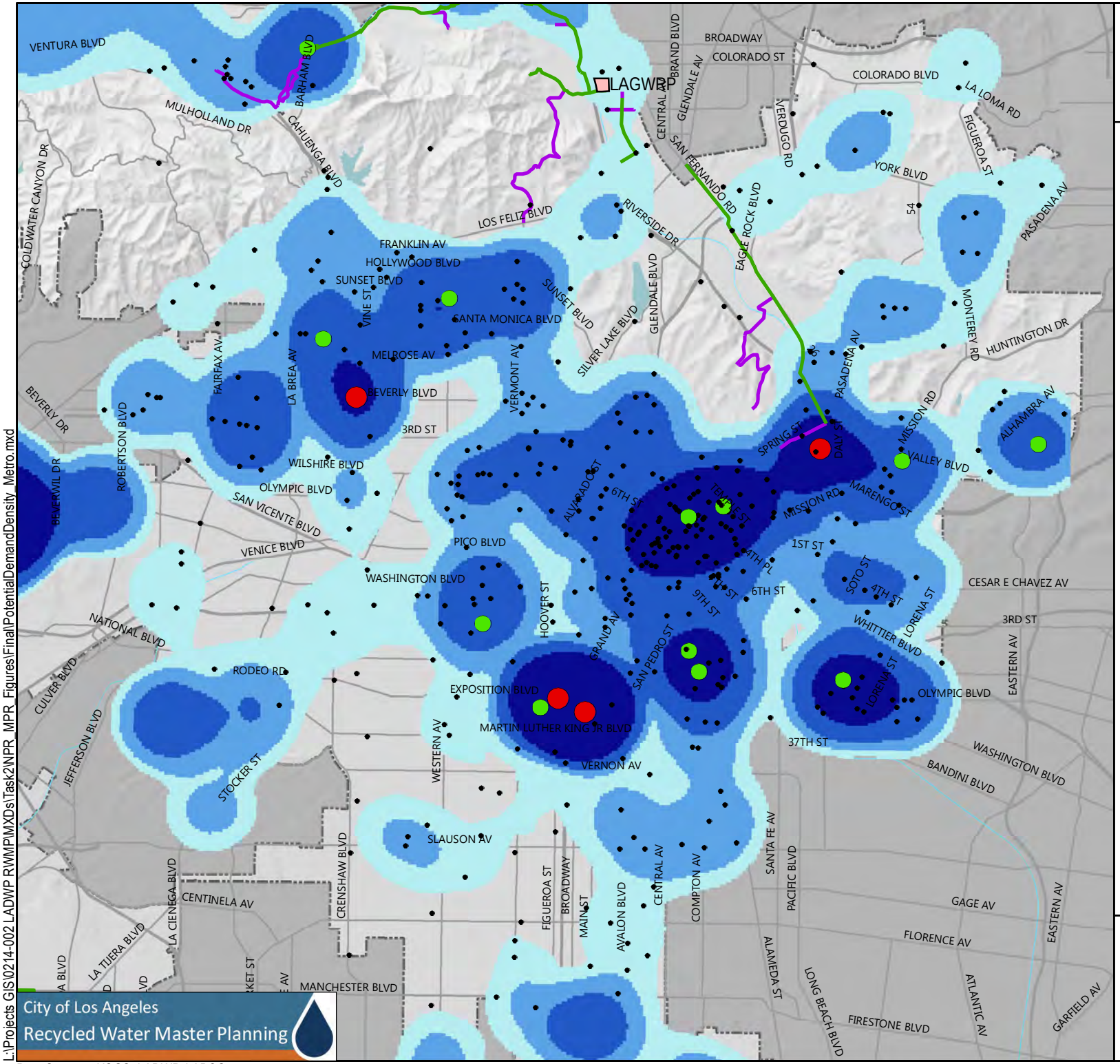
6. Systems Development

This section explains the steps taken to develop potential NPR systems and defines the potential Water Recycling Projects (WRPs) comprised therein. Each system and associated potential WRPs, with updated costs and demands, are described in detail in Section 7. The approach used to define systems is presented first, followed by the development process used for each service area.

6.1 Approach

Non-potable systems were developed through a series of iterative steps that were applied to identify systems that have the highest likelihood of implementation from an initial list of preliminary project options. The steps taken were:

1. Develop "preliminary project options:"
    - Delineate pipeline alignments from potential non-potable supplies along major corridors to serve target customers ($\geq$ 50 AFY) or high density demand clusters ($\geq$ 50 AFY per square mile). See **Figures 5-1**, **5-2**, and **5-3** for demand densities for the Metro, Valley, and Westside Service Areas. (The Harbor Service Area was omitted due its small size).
    - Define facilities based on spreadsheet hydraulic modeling and define costs estimates based on these facilities.
    - Screen the list of preliminary project options by unit cost.
2. Define "potential NPR systems:"
    - Define facilities through an initial round of hydraulic modeling with InfoWater.
    - Update cost estimates for potential WRPs based on facilities defined from the initial round of hydraulic modeling and updated cost estimating criteria.
    - Screen potential WRPs by unit costs where potential non-potable demand exceeds non-potable supplies.
    - Review in detail each remaining WRP within the initial systems, including customer non-potable demand estimates, customer type and demand patterns, pressure zones, service pressures, facility locations, and available non-potable supplies.
    - Refine facilities through a final round of hydraulic modeling with InfoWater.
    - Update cost estimates based on refined facilities from final round of hydraulic modeling and updated cost estimating criteria.



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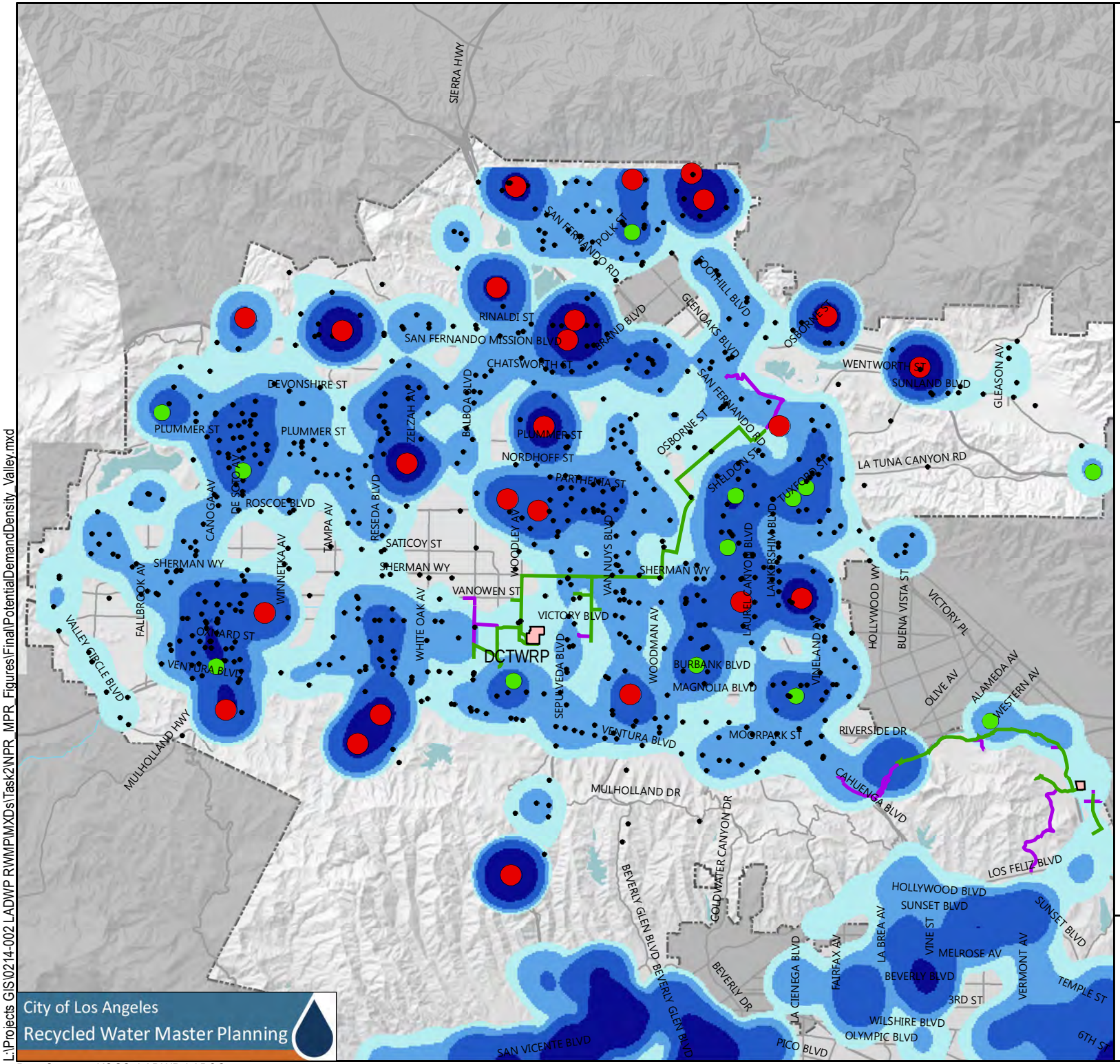
Data Sources: USGS, LADWP, LABOS



Demand Densities
Valley Service Area
Figure 6-2

Potential Customer

- ≤ 50 AFY
- > 50 AFY
- > 100 AFY

Potential Demand Density (AFY/sq. mi.)

- > 25
- > 50
- > 100
- > 250

Recycled Water Facilities

- Existing Pipeline
- Planned Pipeline
- Treatment Plant

Other Features

- City of Los Angeles
- Major Road
- Other City

N

0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, LABOS

LA DWP
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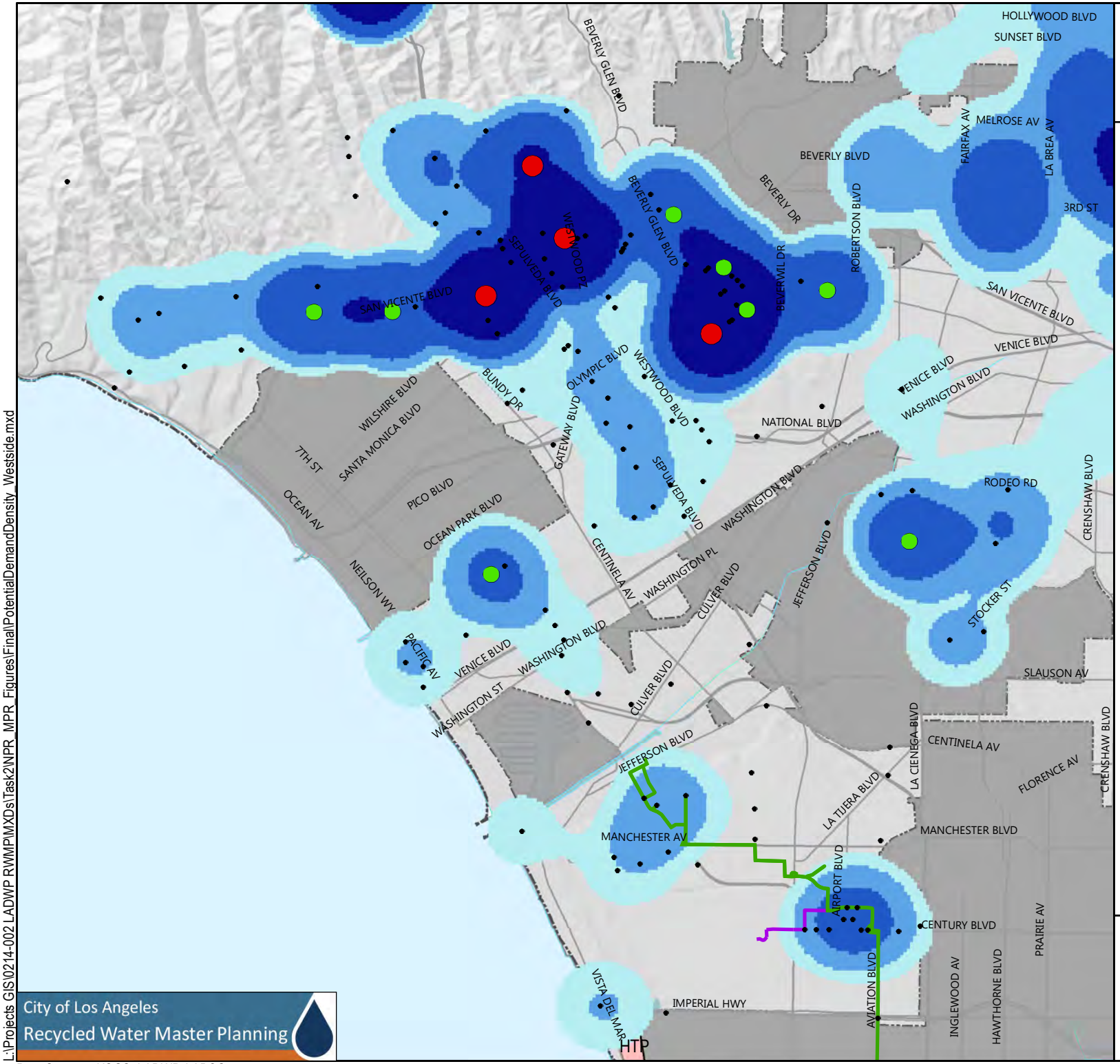
RMC in association with CDM



Demand Densities
Westside Service Area
Figure 6-3

Potential Customer

- ≤ 50 AFY
- > 50 AFY
- > 100 AFY

Potential Demand Density (AFY/sq. mi.)

- > 25
- > 50
- > 100
- > 250

Recycled Water Facilities

- Existing Pipeline
- Planned Pipeline
- Treatment Plant

Other Features

- City of Los Angeles
- Major Road
- Other City

N

0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, LABOS

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6.2 Harbor Service Area

This section describes the development of the three Harbor Service Area systems:

- Harbor-TIWRP System (existing)
- Harbor-WBWMD System (planned)
- Harbor-Gateway System

6.2.1 Preliminary Project Options

As summarized in **Table 6-1**, 12 preliminary project options that serve approximately 3,300 AFY were identified as a first step in the development of NPR Systems and WRPs. Cost and demands for each WRP were further refined during the development of the RWMP.

Table 6-1: Summary of Preliminary Project Options – Harbor Service Area

Option No. [a]	Supply Source	Unit Cost ($/AF) [b]	Total Demand (AFY) [c]	Potential Target Customers	Carried Forward?	Associated WRP Name
H-L-TI	TIWRP	$1,500	300	Warren E&P	Yes	a) Warren E&P b) Laterals
H-L-WB	WBMWD	$1,200	485	Warren E&P	Yes	a) Warren E&P b) Laterals
H-1	TIWRP	$3,200	80	Federal Correctional Institute	No	N/A
H-2	TIWRP	$1,600	650	SA Recycling and POLB	Yes	SA Recycling
H-3a	TIWRP	$2,700	635	POLA and City parks	Yes	a) POLA b) Peck Park
H-3b	WBMWD	$2,200	635	Same as H-13a	No	N/A
H-4a	TIWRP	$1,900	560	Harbor Cogen. and Praxair	Yes	Harbor East
H-4b	WBMWD	$1,400	190	Harbor Cogeneration	Yes	Harbor East
H-5	TIWRP	$2,600	155	Ponte Vista	Yes	Ponte Vista
H-6	TIWRP	$2,400	190	Machado Lake	Yes	Ponte Vista
H-7	WBMWD	$1,300	505	Swisstex, Delta Dye	Yes	Swisstex
H-8	WBMWD	$3,000	60	Jesse Owens Park	No	N/A
Total			**3,300[d]**			

Notes:

a. "a" and "b" options serve the same primary customers from a different supply source than the other option with the same number.
b. Unit cost based on facilities to serve customers with demand estimates greater than 25 AFY.
c. Includes customers with non-potable demand estimates greater than 5 AFY.
d. Demand total only includes the most cost effective option when there are multiple preliminary project options serving a single customer. Demand values for indicated segments are not included in the total calculations because their inclusion count customer demands twice. Total values are rounded to the nearest hundred.

Of the twelve preliminary project options identified, two projects were screened based on unit costs greater than $3,000/AF. Of the 10 remaining, one project option (H-3b) was not carried forward because it was more expensive than the project option with an alternative supply (H-3a).

6.2.2 Potential Systems

The preliminary project options that were carried forward were used as starting point to define potential systems. The following is an overview of the development of the three potential Harbor systems.

Potential Harbor-TIWRP System

Six preliminary project options with a total demand of 2,500 AFY were carried forward to make up the Potential Harbor-TIWRP System. TIWRP, the non-potable supply for this system, is limited to 2.1 mgd for potential customers during the peak season. Therefore, all the preliminary project options carried forward from the previous step were included in the initial hydraulic model runs for the initial system, though some initial potential WRPs were removed due to the limited available supply.

After several hydraulic scenarios, the Harbor-TIWRP System met all applicable hydraulic criteria; however, several revisions were made after reviewing the preliminary cost estimates for each WRP:

- Project Option H-13a (POLA WRP) was split into three parts after LADWP review of preliminary results. The first portion would serve POLA San Pedro Waterfront since they have committed to using recycled water and LADWP plans to provide recycled water to the site. The two other portions-Peck Park and Angels Gate-would build off the POLA segment. After reviewing the costs of each portion, the Angels Gate portion was removed from further consideration due to high costs.
- Warren E&P was split off from Project Option H-L-TI (Laterals WRP) into its own WRP since both Harbor systems have potential non-potable service connections available near existing pipelines. Ultimately, it would likely only be connected to one system.
- Preliminary Project Options H-5 and H-6 were combined to form the Ponte Vista WRP.
- Port of Long Beach (500 AFY) was removed from the SA Recycling WRP (Project Option H-2) until a resolution is identified on how to equitable offset potable water between LADWP and Long Beach Water. The Port of Long Beach is addressed in the Plan as a "Non-LADWP" customer so that it will be revisited in the future.

Three hydraulic model scenarios were evaluated with an increasing number of potential WRPs included so that project phasing could be refined to determine if and when certain major upgrades to the existing system would be prompted. For example, elevated system storage is needed once a certain volume of irrigation customers are connected. Additionally, some customers along the western edge of the service area require a higher head than can be supplied by the TIWRP Pump Station.

In total, seven potential WRPs were defined for Harbor-TIWRP System with a total demand of 2,130 AFY. Two of the potential WRPs (Warren E&P and Harbor East), which have a total demand of 1,174 AFY, were also included in the Harbor-WBMWD System for comparison.

Potential Harbor-WBMWD System

Two project options were carried forward for the WBWMD System and the laterals project option (Project Option H-L-WB) was divided into two WRPs. Warren E&P was split off into its own WRP since both Harbor systems have potential non-potable service connections available near existing pipelines. Ultimately, it would likely only be connected to one system.

In total, three potential WRPs were defined for Harbor-WBMWD System with a total demand of 1,200 AFY. Two of the potential WRPs (Warren E&P and Harbor East), which have a total demand of 1,095 AFY, were also included in the Harbor-TIWRP System for comparison. Also, prior to committing service to the potential Harbor-WBMWD customers, the availability of recycled water from CRWRF, the ability to increase production through expansion, and whether or not additional supply from CRWRF is more cost effective than expanding supply from TIWRP, must be addressed.

Harbor-Gateway System

Project Option H-7 was carried forward and consists of two laterals off the existing WBMWD Title 22 Distribution System that crosses the City in the Harbor Gateway area. The two laterals were defined as separate potential WRPs:

- Swisstex WRP
- Roosevelt Cemetery WRP

In total, two potential WRPs were defined for Harbor-Gateway System with a total demand of 650 AFY. This system was not included in the hydraulic model since the WBMWD hydraulic model was not available.

Summary

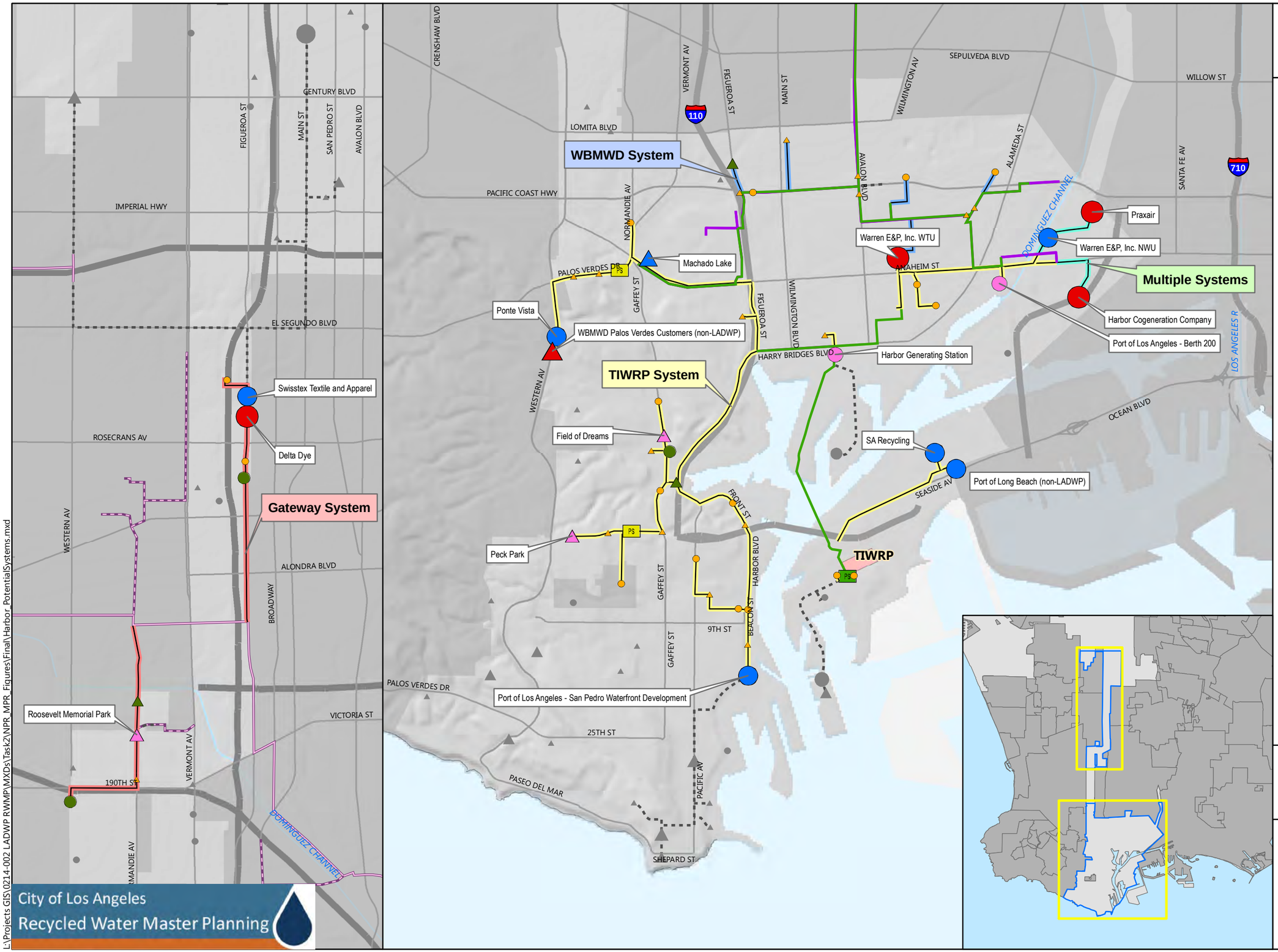
In total, the Harbor Service Area includes three systems with 12 potential WRPs defining service of approximately 2,900 AFY to potential customers, as shown in **Table 6-2**. Two potential WRPs (Harbor East and Warren E&P) are defined in two systems for comparison pending resolution of potential supply limits associated with TIWRP and CRWRF. **Figure 6-4** shows the Harbor Service Area systems. The systems are described in more detail in Chapter 7.

Table 6-2: Summary of Potential WRPs-Harbor Service Area

WRP Name	Total Demand (AFY)	Peak Day Demand (mgd)	Anchor Customers
Harbor-TIWRP System			
Harbor East*	799	0.93	Harbor Cogeneration, Praxair, POLA-Berth 200, Warren E&P – NWU
Laterals	109	0.14	Harbor Generation Station
Peck Park	194	0.35	Peck Park, Field of Dreams
POLA	268	0.42	POLA-San Pedro Waterfront
Ponte Vista	281	0.50	Machado Lake, Ponte Vista
SA Recycling	105	0.12	SA Recycling
Warren E&P*	375	0.44	Warren E&P – WTU
Subtotal	**2,132**	**2.90**	
Harbor-WBMWD System			
Harbor East*	720	0.84	Harbor Cogeneration, Praxair, Warren E&P-NWU
Laterals	104	0.19	None
Warren E&P*	375	0.44	Warren E&P – WTU
Subtotal	**1,199**	**1.46**	
Harbor-Gateway System			
Roosevelt	123	0.22	Roosevelt Memorial Park
Swisstex	523	0.61	Swisstex, Delta Dyeing
Subtotal	**645**	**0.83**	
Harbor Total	**2,881**	**N/A**	

Note: Harbor Total Demand is less than the sum of each system because the Harbor East and Warren E&P potential WRPs are defined in the TIWRP and WBMWD systems. The WBMWD System includes 1,095 AFY of annual average demand included in TIWRP System. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Potential Systems
Harbor Service Area
Figure 6-4



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- TIWRP
- WBMWD
- Gateway
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

0 0.5 1 Miles

City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

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6.3 Metro Service Area

This section describes the development of two potential Metro systems:

- Metro-LAGWRP System (existing)
- Metro-CBWMD System

6.3.1 Preliminary Project Options

As summarized in **Table 6-3**, 17 preliminary project options that serve approximately 5,800 AFY were identified as a first step in the development of NPR Systems and WRPs. Cost and demands for each WRP were further refined during the development of the RWMP.

Table 6-3: Summary of Preliminary Project Options – Metro Service Area

Option No. [a]	Supply Source	Unit Cost ($/AF) [b]	Total Demand (AFY) [c]	Potential Target Customers	Carried Forward?	Associated WRP Name
M-L	LAGWRP	$1,300	100	Existing/Planned Laterals	Yes	Laterals
M-1a	CBMWD	$1,100	1,980	USC, Matchmaster	Yes	USC
M-1b	WBMWD	$1,300	1,700	same as M-11a	No	N/A
M-2a	M-1 Supply	$1,200	930	Trigen-LA, County Cooling Plant	Yes	Downtown
M-2b	LAGWRP	$1,000	910	same as M-12a	Yes	Downtown
M-3	M-1 Supply	$2,000	160	Lewco, Rosedale Cemetery	No	N/A
M-4	M-2 Supply	$1,800	230	Echo Park, MacArthur Park	Yes	Echo Park
M-5	LAGWRP	$1,200	965	Wilshire G.C.	Yes	Hollywood
M-6	LAGWRP	$2,500	185	Cedars Sinai Hospital	No	N/A
M-7a	CBMWD	$1,200	785	County General, Atlas	No	N/A
M-7b	LAGWRP	$900	625	same as M-17a	Yes	Atlas Carpets
M-8	CBMWD	$2,500	185	Hollenbeck Park	No	N/A
M-9a	LAGWRP	$2,500	120	CSU-Los Angeles	No	N/A
M-9b	SGVMWD	$1,800	100	same as M-19a	Yes	CSU-LA
M-10	LAGWRP	$3,400	115	Occidental College	No	N/A
Total			**5,800[d]**			

Notes:

a. "a" and "b" options serve the same primary customers from a different supply source the other option with the same number.
b. Unit cost based on facilities to serve customers with demand estimates greater than 25 AFY.
c. Includes customers with non-potable demand estimates greater than 5 AFY.
d. Demand total only includes the most cost effective option when there are multiple preliminary project options serving a single customer. Demand values for indicated segments are not included in the total calculations because their inclusion count customer demands twice. Total values are rounded to the nearest hundred.

Of the 15 preliminary project options identified, 10 had unit costs less than $2,000/AF. Of those 10, two project options (M-1b and M-7a) were not carried forward because it was more expensive than the project option with an alternative supply (M1a and M-7b, respectively).

Also, the anchor customer Project Option M-9b is CSU-Los Angeles, which is located near the City's border with the City of Alhambra, and approximately 2 miles east of the closest potential anchor customers and at a higher elevation. The Monterey Park Golf Course, with a non-potable demand estimate of 265 AFY, is located adjacent to the college and is identified as an anchor recycled water customer for the San Gabriel Valley Municipal Water District (SGVMWD). The project is identified in the Central Basin Municipal Water District's Recycled Water Master Plan Update (MWH, 2008); however, SGVMWD indicated that there are currently no imminent plans to implement this project. Therefore, the potential WRP was not carried forward but is noted for potential future coordination between LADWP and SGVMWD.

Seven preliminary project options were carried forward as potential WRPs for the initial round of hydraulic modeling with InfoWater.

6.3.2 Potential Systems

The preliminary project options that were carried forward were used as starting point to define potential systems. The following is an overview of the development of the three potential Metro Systems.

Metro-LAGWRP System

The five preliminary project options carried forward with LAGWRP as the supply formed the Metro-LAGWRP System. As discussed in Section 5.1, the planned customer demands are projected to consume all of LADWP's recycled water allotment from LAGWRP during the peak season. However, if not all of the planned customers actually connect, or if their peak season demands are lower than anticipated, there may still be LAGWRP supply available for potential customers. In addition, the LAGWRP Potable Water Supplement option could meet a portion of the demand (up to 500 AFY). Therefore, many potential WRPs that could be supplied from LAGWRP as well as CBMWD or WBMWD were carried forward so that a complete comparison could be conducted between the three water sources.

Several delivery scenarios were conducted for the Metro-LAGWRP System and they met all applicable hydraulic criteria assuming the supply is available from LAGWRP. Several revisions were made to preliminary project options after:

- Two potential target customers (Lakeside Golf Course expansion and Bette Davis Park) were added to the Laterals WRP (Project Option M-L)
- Project Option M-7b was split into two potential WRPs (Atlas Carpets and County General) to be able to define a separate WRP to serve the largest potential customer in the project option: Atlas Carpets.
- The USC WRP was added to the LAGWRP system for comparison with the same WRP in the CBMWD system.
- Limited LAGWRP supply with a Potable Water Supplement led to the elimination of three potential WRPs once the cost of an LAGWRP expansion was considered. Two

potential WRPs that could be served by LAGWRP or CBMWD (Downtown and Echo Park) were not carried forward since the CBMWD supply would be more cost effective than an LAGWRP expansion. The Hollywood WRP was eliminated due to its relatively higher unit cost compared with serving a similar demand in the Downtown area and the WRP was not cost effective when the cost to expand LAGWRP was included.

In total, four potential WRPs were defined for Metro-LAGWRP System with a total demand of 3,465 AFY. The largest WRP (USC), which has a total demand of 2,345 AFY, was also included in the Metro-CBMWD System for comparison. Also, prior to committing service to the potential Metro-LAGWRP customers, the availability of recycled water from LAGWRP or potable water supplement during the peak season must be addressed.

Metro-CBMWD System

The three preliminary project options carried forward with CBMWD as the supply formed the Metro-CBMWD System. The supply was estimated to be limited to 4 mgd but the upper limit of available supply was not established so, initially, the system evaluated serving more demand than supply.

Several delivery scenarios were conducted for the Metro-CBMWD System and they met all applicable hydraulic criteria if more than 4 mgd of CBMWD supply is available. The potential WRPs that could be served by CBMWD or LAGWRP (Downtown and Echo Park) were carried forward for the CBMWD System since the CBMWD supply would be more cost effective than an LAGWRP expansion. Also, an LAGWRP Connection WRP was added to provide a hydraulic connection between the potential CBMWD System and the planned LAGWRP System.

In total, four potential WRPs were defined for Metro-CBMWD System with a total demand of 3,780 AFY. The largest WRP (USC), which has a total demand of 2,590 AFY, was also included in the Metro-LAGWRP System for comparison. This system is dependent on implementation of CBMWD's SWRP Phase II as well as a guaranteed annual minimum purchase from LADWP.

Summary

In total, the Metro Service Area includes two systems with a total of eight potential WRPs defining service of approximately 4,900 AFY to potential customers, as shown in **Table 6-4**. However, the limited amount of LAGWRP supply resulting from a potable water supplement will limit the ultimate buildout of the Metro-LAGWRP System and the maximum flow available from CBMWD could limit the ultimate buildout of the Metro-CBMWD System. One WRP (USC) is defined in two systems for comparison pending resolution of unknowns associated with LAGWRP and CBMWD supply options. **Figure 6-5** shows the Metro Service Area Systems. The systems are described in more detail in Chapter 7.

Table 6-4: Summary of Potential WRPs – Metro Service Area

WRP Name	Total Demand (AFY)	Peak Day Demand (mgd)	Potential Anchor Customers
Metro-LAGWRP System			
Atlas Carpets	310	0.36	Atlas Carpet
Laterals	565	1.00	Lakeside Golf Course, Bette Davis Park
Medical Center	264	0.47	County General Hospital, USC Hospital, Lincoln Park
USC	2,345	3.09	USC, Matchmaster, Expo Park, Dye House, Washington Garment, Trigen-LA, County Cooling Plant, Twin Towers Jail, Boyle Heights
Subtotal	**3,485**	**4.92**	
Metro-CBMWD System			
Downtown	884	1.18	Trigen-LA, County Cooling Plant, Twin Towers Jail
Echo Park	282	0.51	Echo Park, MacArthur Park
LAGWRP Connection	60	0.07	None
USC	2,605	3.50	USC, Matchmaster, Expo Park, Dye House, Washington Garment, Seoul Texprint, E&C Fashion, Boyles Heights
Subtotal	**3,831**	**5.26**	
Total	**5,011**	**N/A**	

Note: Metro Total Demand is less than the sum of each system because the USC WRP is defined in both systems. The WRP in the LAGWRP System includes 2,305 AFY of annual average demand included in the CBMWD System. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Potential Systems
Metro Service Area
Figure 6-5

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- CBMWD
- LAG
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

0 0.5 1 Miles

LA DWP

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City of Los Angeles
Recycled Water Master Planning

LAGWRP

LAG System

CBMWD System

Lakeside Golf Club

Echo Park and Lake

Atlas Carpet Mills

Lincoln Park and Lake

Twin Towers Correctional Facility

MacArthur Park and Lake

LA County Central Plant

LAC + USC Medical Center

Trigen-LA Bunker Hill

Dye House

Washington Garment

Boyle Heights

USC Main Campus

Expo Park

Matchmaster

Seoul Texprint

E&C Fashion Inc.

RIVERSIDE DR
MOORPARK ST
OLIVE AV
VENTURA BLVD
BARHAM BLVD
CAHUENGA BLVD
MULHOLLAND DR
SAN FERNANDO RD
BROADWAY
COLORADO ST
LOS ANGELES R
CENTRAL AV
BRAND BLVD
GLENDALE AV
CHEVY CHASE DR
VERDUGO RD
COLORADO BLVD
CALIFORNIA BLVD
LA LOMA RD
FAIR OAKS AV
YORK BLVD
MISSION ST
FIGUEROA ST
LOS FELIZ BLVD
FLETCHER DR
FRANKLIN AV
HOLLYWOOD BLVD
SUNSET BLVD
VERMONT AV
VINE ST
MELROSE AV
SILVER LAKE BLVD
MONTEREY RD
HUNTINGTON DR
MAIN ST
FREMONT AV
MISSION RD
VALLEY BLVD
ALHAMBRA AV
BEVERLY BLVD
ROSSMORE AV
LA BREA AV
FAIRFAX AV
BURTON WY
3RD ST
WESTERN AV
WILSHIRE BLVD
OLYMPIC BLVD
SAN VICENTE BLVD
LA CIENEGA BLVD
CRENSHAW BLVD
VENICE BLVD
BALLONA CR
PICO BLVD
WASHINGTON BLVD
ROBERTSON BLVD
NATIONAL BLVD
JEFFERSON BLVD
RODEO RD
EXPOSITION BLVD
MARTIN LUTHER KING JR BLVD
HOOVER ST
FIGUEROA ST
BROADWAY
MAIN ST
SAN PEDRO ST
CENTRAL AV
ALAMEDA ST
1ST ST
6TH ST
7TH ST
9TH ST
GRAND AV
ALVARADO ST
SPRING ST
TEMPLE ST
SANTA FE AV
LOTO ST
4TH ST
3RD PL
LORENA ST
CESAR E CHAVEZ AV
EASTERN AV
WHITTIER BLVD
ATLANTIC BLVD
OLYMPIC BLVD

2 5 101 10 110 710 60 54

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

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6.4 Valley Service Area

This section describes the development of the four potential Valley systems:

- Valley-DCTWRP AWPF System (existing)
- Valley-DCTWRP T22 System
- Valley-Burbank System
- Valley-LVMWD System

6.4.1 Preliminary Project Options

As summarized in **Table 6-5**, 16 preliminary project options that serve approximately 13,900 AFY were identified as a first step in the development of NPR Systems and WRPs. Cost and demands for each WRP were further refined during the development of the RWMP.

Table 6-5: Summary of Preliminary Project Options – Valley Service Area

Option No. [a]	Supply Source	Unit Cost ($/AF)[b]	Total Demand (AFY) [c]	Primary Customers	Carried Forward?	Associated WRP Name
V-L-DCT	DCTWRP	$700	400	Laterals	Yes	DCTWRP Laterals
V-L-BWP	BWP	$700	30	Woodbury Univ.	Yes	Burbank Laterals
V-11	DCTWRP	$1,000	1,470	Pierce College, Two CCs	Yes	a) Reseda Park b) Braemar c) Pierce College
V-12a	DCTWRP	$1,700	450	Woodland Hills CC	Yes	Woodland Hills
V-12b	LVMWD	$1,500	270	same as V-12a	Yes	Woodland Hills
V-13	DCTWRP	$2,400	550	Oakwood Cemetery	No	N/A
V-14	DCTWRP	$1,000	2,485	Knollwood GC, CSUN	Yes	Knollwood
V-15	DCTWRP	$1,500	570	Porter Valley CC	Yes	Porter Valley
V-16	DCTWRP	$1,700	340	Cascades GC	No	N/A
V-17	DCTWRP	$2,000	325	Chaminade School	No	N/A
V-18a	DCTWRP	$1,700	1,660	El Cariso & Angeles GC	No	N/A
V-18b	DCT-AWPF	$1,500	1,500	same as V-18a	No	N/A
V-19	DCT-AWPF	$600	845	Vulcan Materials	Yes	Vulcan
V-20	DCTWRP	$1,800	745	Mountaingate CC	No	N/A
V-21a	DCTWRP	$1,500	820	East Valley	No	N/A
V-21b	BWP	$1,500	1,425	same as V-21a	Yes	a) North Hollywood b) Valley College c) Cesar Chavez
Total			**11,300**[d]			

Notes:

a. "a" and "b" options serve the same primary customer(s) from a different supply source than another option with the same number and lower unit cost.
b. Unit cost based on facilities to serve customers with demand estimates greater than 25 AFY.
c. Includes customers with non-potable demand estimates greater than 5 AFY.
d. Demand total only includes the most cost effective option when there are multiple preliminary project options serving a single customer. Demand values for indicated segments are not included in the total

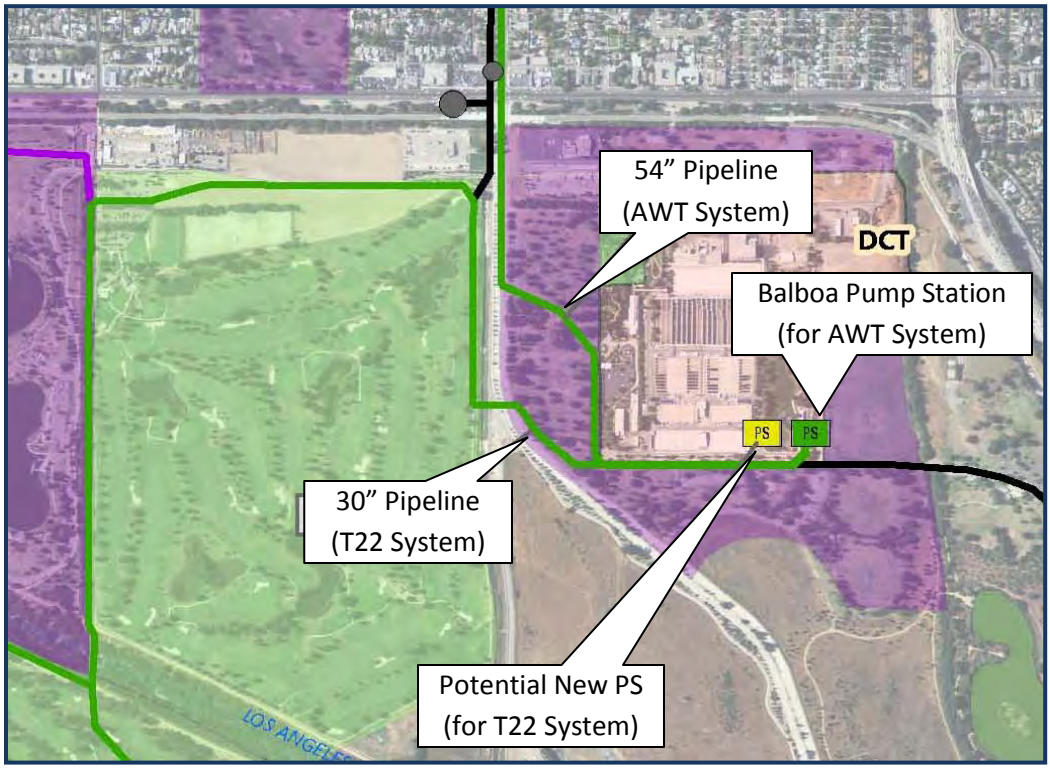
calculations because their inclusion count customer demands twice. Subtotal values are rounded to the nearest hundred.

Of the 16 preliminary project options identified, 15 had unit costs less than $2,000/AF so one option was eliminated; however, the Valley Service Area is supply limited so six preliminary project options with unit costs below $2,000/AF and located in outlying areas were not carried forward.

6.4.2 Potential Systems

The preliminary project options that were carried forward were used as starting point to define potential systems. Note that the existing Valley-DCTWRP AWPF System uses tertiary product from DCTWRP but the potential system is being developed under the assumption that the system will convert to AWPF product water from DCTWRP once the Valley GWR Project is on-line. The Valley-DCTWRP T22 System was created with tertiary effluent from DCTWRP as the supply source. As shown in **Figure 6-6**, the DCTWRP AWPF System would continue to use the 54" pipeline that connects the Balboa Pump Station at DCTWRP to the Hansen Tank at Valley Generating Station and adjacent to the Hansen Spreading Grounds, which will be used by the Valley GWR Project. The DCTWRP T22 System would use the 30" pipeline that tees off the 54" pipeline near the Balboa Pump Station to serve non-potable customers in the Sepulveda Basin and surrounding areas with DCTWRP tertiary effluent. The DCTWRP T22 System requires a new pump station to feed to the 30" pipeline and the tee would need to be closed off to the AWFP product water with the DCTWRP tertiary effluent.

Figure 6-6: Existing and Potential Facilities for DCTWRP Systems



The following is an overview of the development of the four potential Valley systems.

Valley-DCTWRP AWPF System

The two preliminary project options carried forward with DCTWRP AWPF product as the supply formed the Valley-DCTWRP AWPF System. The two potential WRPs formed from the preliminary project options were:

- DCTWRP AWPF Laterals
- Vulcan

The customers associated with the laterals project option (V-L-DCTWRP) were divided between customers located along the DCTWRP AWPF System and DCTWRP T22 System. The primary consideration for this system is the lack of supply from DCTWRP if the 30,0000 AFY GWR Project is implemented.

Valley-DCTWRP T22 System

The four preliminary project options carried forward with DCTWRP tertiary product as the supply formed the Valley-DCTWRP T22 System. After several hydraulic scenarios, the system met all applicable hydraulic criteria; however, several revisions were made:

- The customers associated with the laterals project option (V-L-DCTWRP) were divided between customers located along the DCTWRP AWPF System and DCTWRP T22 System.
- Project Option V-11 (west from DCTWRP) was divided into three potential WRPs – Reseda Park, Braemar, and Pierce College-each with a different anchor customer to better define potential phasing of project implementation in the future.
- Project Option V-14 (north from DCTWRP) was divided into three potential WRPs-VA Hospital, Knollwood, and Porter Valley-to represent the three pressure zones defined during initial modeling and likely phases of project implementation in the future. The Porter Valley WRP was not ultimately carried forward due to the limited supply available from DCTWRP.

The Hansen Connection WRP was added as a means to connect DCTWRP tertiary product with the Hansen Tank instead of AWPF product water (via the DCTWRP AWPF System) to the non-potable customers upstream of the Hansen Tank. Use of tertiary water would avoid the cost to expand the AWPF capacity and O&M costs to produce AWPF product water. Also, more water would be available from DCTWRP due to the avoidance of brine production, which accounts for an approximate 21% loss.

In addition to the Hansen Connection WRP, seven potential WRPs were defined for Valley-DCTWRP T22 System with a total demand of 3,500 AFY. One WRP (Pierce College) was also included in the Valley-Las Virgenes System for comparison. The primary consideration for this system is the lack of supply from DCTWRP if the 30,000 AFY GWR Project is implemented.

Valley-Burbank System

Two preliminary project options were carried forward with a supply from the Burbank WRP to form the Valley-Burbank System. The Burbank System includes five potential connection points

at the City border (Studio District, Equestrian, Valhalla (2), and Northern Burbank; see **Figure 5-3** for these locations). All of these connections are included as part of the Laterals WRP and the Studio District connection is used for all other potential WRPs. After several hydraulic scenarios, the system met all applicable hydraulic criteria; however, several revisions were made:

- Project Option V-11 was divided into three potential WRPs-North Hollywood, Valley College, and Cesar Chavez-to represent the three pressure zones defined during hydraulic modeling and likely phases of project implementation in the future.
- Two potential WRPs were added to the system:
    - DCTWRP Connection WRP to connect the Burbank system to DCTWRP
    - Hansen Connection WRP to connect the Burbank system to Hansen Tank

The DCTWRP Connection WRP was created to allow the ability to deliver surplus Burbank supplies to DCTWRP (for non-potable reuse or GWR) and to be able to deliver surplus DCTWRP supplies to the Valley-Burbank System.

The Hansen Connection WRP was added as a means to connect DCTWRP tertiary product with the Hansen Tank instead of AWPF product (via the DCTWRP AWPF System) to the non-potable customers upstream of the Hansen Tank. Use of tertiary water would avoid the cost to expand the AWPF capacity and O&M costs to produce the water. Also, more water would be available from DCTWRP due to the avoidance of brine production, which accounts for an approximate 21% loss.

In addition to the DCTWRP Connection WRP and the Hansen Connection WRP, four potential WRPs were defined for Valley-Hansen System with a total demand of 1,810 AFY. One WRP (Pierce College) was also included in the Valley-Las Virgenes System for comparison.

Valley-Las Virgenes System

One project was carried forward to form the Valley-Las Virgenes System with a supply from the Tapia WRP and delivery to the City's border using LVMWD's recycled water system. This system was not included in the hydraulic model initially because the understanding at the time was that there was no surplus recycled water available from LVWMD during the peak season until a seasonal storage reservoir is constructed. However, subsequent modeling by LVMWD indicated the availability of up to approximately 0.5 mgd without the need for seasonal storage so the System was carried forward. Also, the Pierce College WRP was added to the Valley-Las Virgenes System to provide an alternative method to serve Pierce College than from the DCTWRP T22 System.

The LVMWD supply could potentially increase by 2,500 AFY in the future if a seasonal storage reservoir is constructed; however, this supply was not included in this Plan due to its tentative status.

Summary

In total, the Valley Service Area includes four systems with 14 potential WRPs defining service of approximately 7,000 AFY to potential customers, as shown in **Table 6-6**. Each system will be limited by the availability of supplies:

- DCTWRP Title 22 or AWPF (14 mgd available if GWR Phase 2 is not implemented; otherwise no surplus supply)
- Burbank-Studio District Connection (3.8 mgd peak season supply)
- LVMWD (0.5 mgd peak season supply)

The Hansen Connection WRP is defined in two systems for comparison between Title 22 water deliveries to Hansen Tank with planned AWPF water deliveries to Hansen Tank. Figure **6-7** shows the Valley Service Area Systems. The systems are described in more detail in Section 7.

Table 6-6: Summary of Potential WRPs - Valley Service Area

WRP Name	Total Demand (AFY)	Peak Day Demand (mgd)	Potential Anchor Customers
Valley-Burbank System			
Cesar Chavez	767	1.29	Almore Dye House, Caltrans (2), Cesar Chavez Rec.
Laterals	233	0.43	Woodbury University, LA Equestrian Center
North Hollywood	137	0.26	North Hollywood Park
Valley College	670	1.24	Valley College, Valley Plaza Park, Van Nuys Park
Subtotal	**1,808**	**3.22**	
Valley-DCTWRP AWPF System			
Laterals	438	0.68	Valley Generating Station
Vulcan	296	0.47	Vulcan Materials
Subtotal	**734**	**1.15**	
Valley-DCTWRP T22 System			
Braemar	707	1.36	Braemar CC, El Caballero CC
Knollwood	1,074	2.09	Knollwood GC, Eden Memorial Park, San Fernando Mission Cemetery, Catholic Archdiocese of LA
Laterals	195	0.37	Hjelte Sports Center
Pierce College	261	0.40	Pierce College
Reseda Park	88	0.17	Reseda Park
VA Hospital	1,177	1.87	Valley Sod, Anheuser Busch, CSUN, VA Hospital
Subtotal	**3,502**	**6.26**	
Valley-Las Virgenes System			
Pierce College	666	1.04	Pierce College, Litton Industries
Woodland Hills	288	0.56	Woodland Hills Country Club
Subtotal	**954**	**1.60**	
Valley Total	**6,808**	**N/A**	

Note: Valley Total Demand is less than the sum of each system because the Pierce College WRP is defined in the DCTWRP T22 and Las Virgenes systems. The DCTWRP T22 System includes 190 AFY of annual average demand (for Pierce College) included in Las Virgenes System. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

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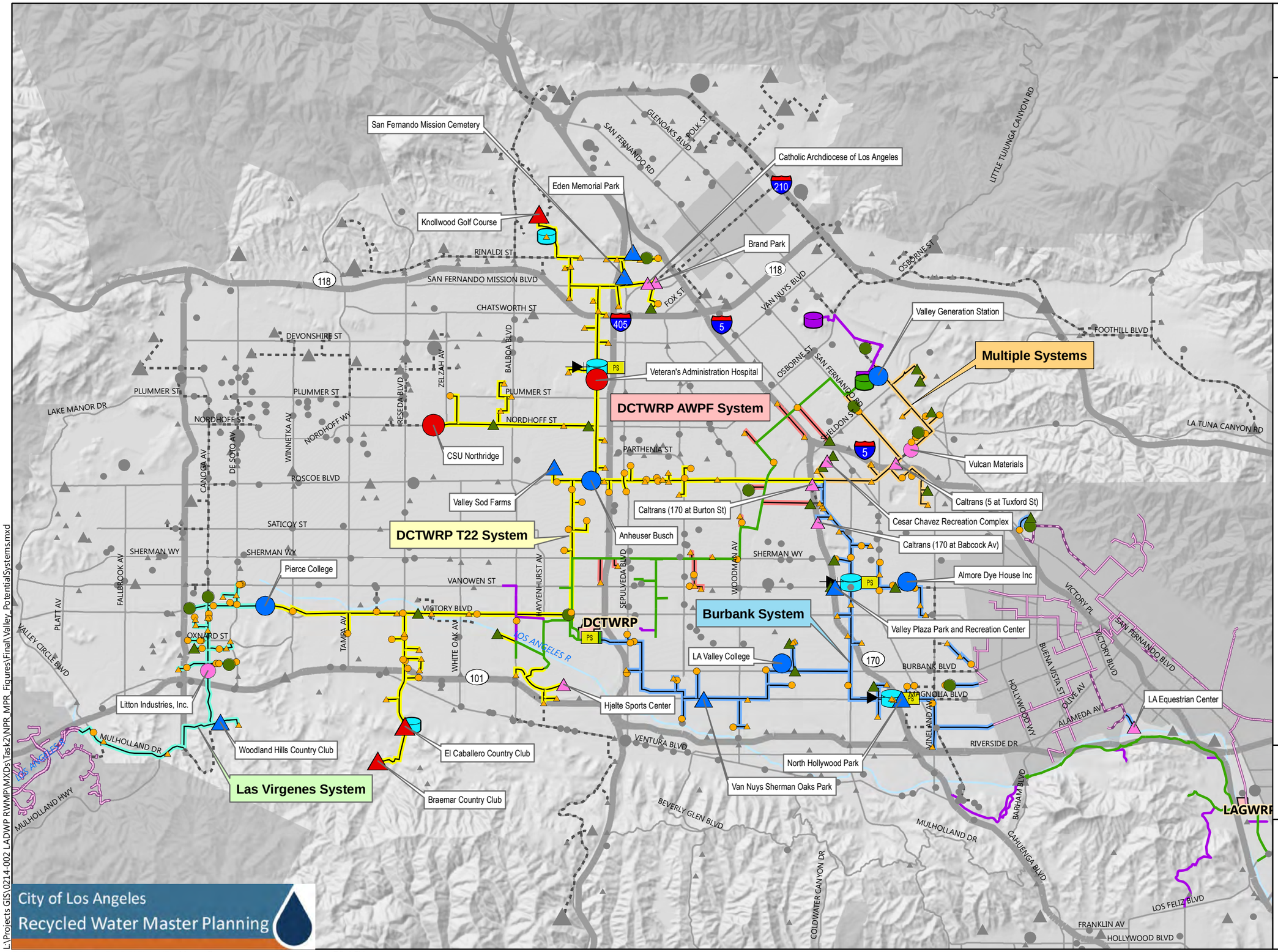
Potential Systems
Valley Service Area
Figure 6-7



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential Systems
- DCT T22
- DCT AWT
- Las Virgenes
- Burbank
- Multiple Systems
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

N

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

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6.5 Westside Service Area

This section describes the development of the two potential Westside systems:

- Westside – Westside System (existing)
- Westside – Westwood System (existing)

6.5.1 Preliminary Project Options

As summarized in **Table 6-7**, seven preliminary project options that serve approximately 3,500 AFY were identified as a first step in the development of NPR Systems and WRPs. Cost and demands for each WRP were further refined during the development of the RWMP.

Table 6-7: Summary of Preliminary Project Options – Westside Service Area

Option No. [a]	WBMWD Connection Point	Unit Cost ($/AF)[b]	Total Demand (AFY)[c]	Potential Target Customers	Carried Forward?	Associated WRP Name
W-L	LAX	$1,100	125	Off Existing / Planned System	Yes	Laterals
W-1	Inglewood	$1,500	2,650	UCLA, VA, and 6 golf courses	Yes	UCLA
W-2	Inglewood	$2,200	340	Bel Air CC and Getty Museum	No	N/A
W-3	Inglewood	$5,700	85	Will Rogers State Park	No	N/A
W-4a	Inglewood	$2,700	125	Penmar Golf Course	No	N/A
W-4b	LAX	$3,000	150	same as W-14a	Yes	Penmar
W-5	Inglewood	$1,700	200	Kenneth Hahn State Park	Yes	Kenneth Hahn
Total			**3,500[d]**			

Notes:

a. "a" and "b" options serve the same primary customer(s) from a different supply source than another option with the same number and lower unit cost.
b. Unit cost based on facilities to serve customers with demand estimates greater than 25 AFY.
c. Includes customers with non-potable demand estimates greater than 5 AFY.
d. Demand total only includes the most cost effective option when there are multiple preliminary project options serving a single customer. Demand values for indicated segments are not included in the total calculations because their inclusion count customer demands twice. Subtotal values are rounded to the nearest hundred.

Of the seven preliminary project options identified, three had unit costs less than $2,000/AF and, therefore, three were carried forward as potential WRPs.

6.5.2 Potential Systems

The preliminary project options that were carried forward were used as starting point to define potential systems. The following is an overview of the development of the two potential Westside Systems.

The main evaluation conducted for the Westside System was a comparison of service to the UCLA WRP from the WBMWD Inglewood Connection or from the terminus of the existing Westside System near Playa Vista. The initial round of hydraulic modeling results found that head loss through the existing Westside-Westside System terminus reduced service pressures to existing and planned customers and required higher pressure boosting to serve the UCLA WRP customers in comparison with pressure boosting required for the Inglewood connection. Therefore, the WBMWD Inglewood Connection was carried forward as the supply for the UCLA WRP as part of the Westside-Westwood System.

Also, the Penmar WRP was included pending the successful implementation of the Penmar Water Quality Improvement Project, dry weather stormwater reuse for irrigation.

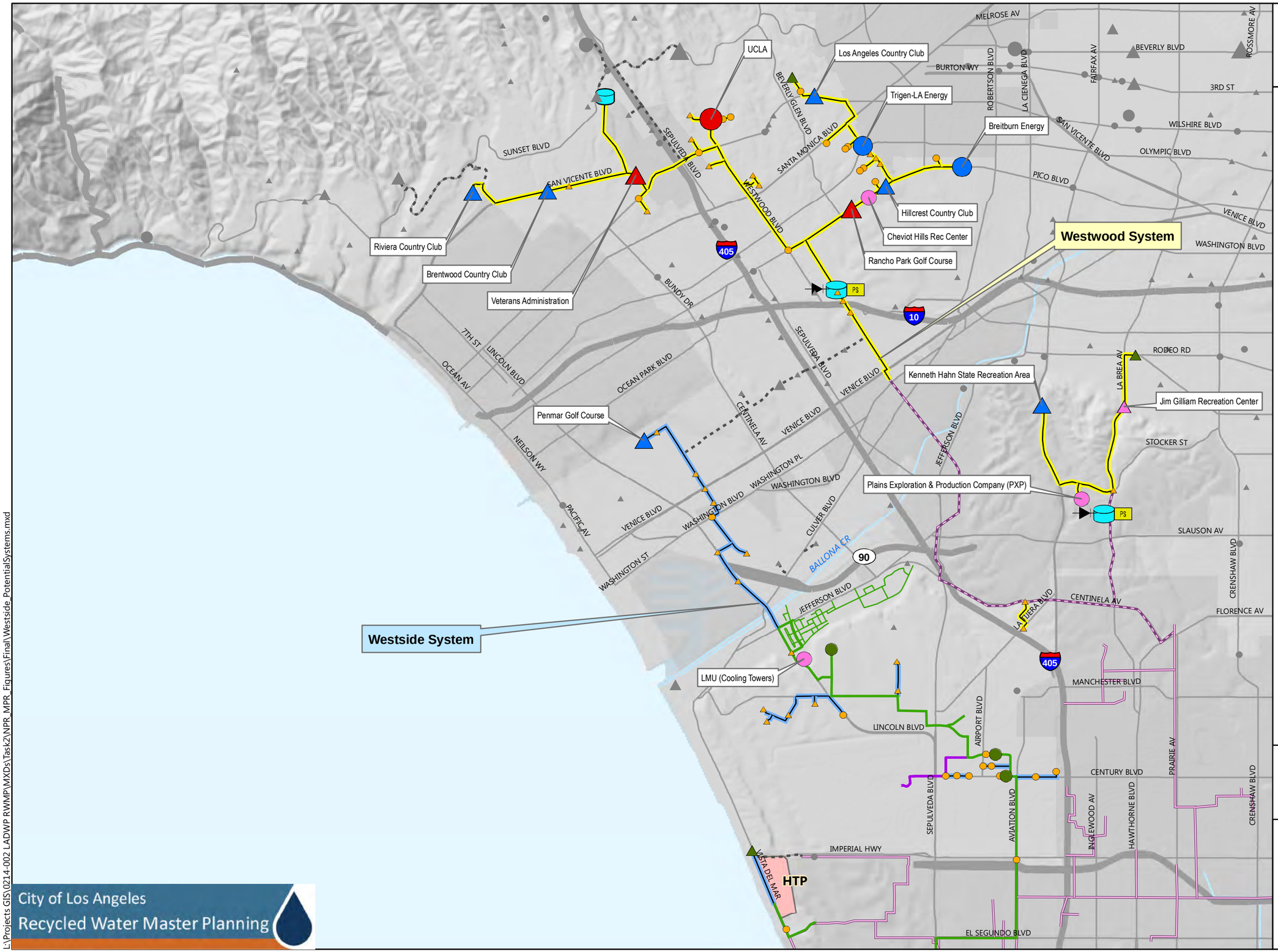
Summary

In total, the Westside Service Area includes two systems with a total of four potential WRPs defining service of approximately 3,800 AFY to potential customers, as shown in **Table 6-8**. **Figure 6-8** shows the Westside Service Area Systems. The systems are described in more detail in Chapter 7.

Table 6-8: Summary of Potential WRPs - Westside Service Area

WRP Name	Total Demand (AFY)	Peak Day Demand (mgd)	Potential Anchor Customers
Westside-Westside System			
Laterals	390	0.61	LMU (cooling towers)
Penmar	177	0.35	Penmar Golf Course
Subtotal	**567**	**0.96**	
Westside-Westwood System			
Kenneth Hahn	349	0.64	Kenneth Hahn Rec. Area, PXP, Jim Gilliam Rec. Center
UCLA	2,836	4.80	UCLA, VA, Brentwood CC, Riviera CC, Bel Air CC, Hillcrest CC, Los Angeles CC, Rancho Park GC, Trigen-LA, Breitburn Energy
Subtotal	**3,185**	**5.44**	
Westside Total	**3,752**	**N/A**	

Potential Systems
Westside Service Area
Figure 6-8



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Existing Facilities
- Tank
- PS Pump Station
- Pipeline

Planned Facilities
- Tank
- PS Pump station
- Pipeline

Potential Facilities
- PRV
- PS Pump Station
- Tank

Potential Systems
- Westside
- Westwood
- Previously Considered

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Other Features
- Major Road
- Other City

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled.

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6.6 Summary of Potential Systems

A summary of potential systems is provided in **Table 6-9** and shown in **Figure 6-9**.

Table 6-9: Summary of Potential NPR Systems

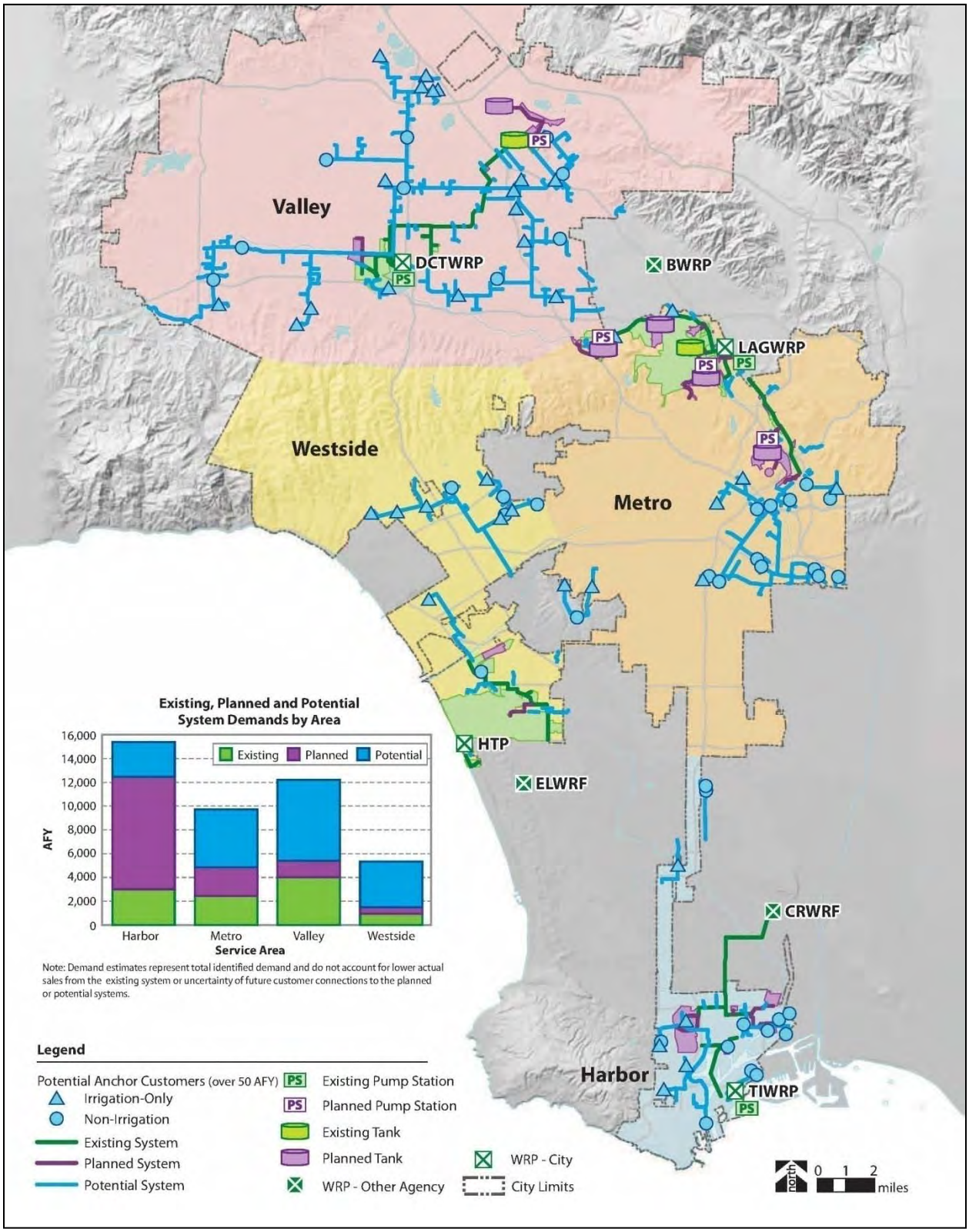
Service Area	System	WRP	Potential Demand (AFY)	Peak Day Demand (mgd)
Harbor Service Area	TIWRP System	Harbor East*	799	0.93
		Laterals	109	0.14
		Peck Park	194	0.35
		POLA	268	0.42
		Ponte Vista	281	0.50
		SA Recycling	105	0.12
		Warren E&P*	375	0.44
		TIWRP Subtotal	**2,132**	**2.90**
	WBMWD System	Harbor East*	720	0.84
		Laterals	104	0.19
		Warren E&P*	375	0.44
		WBMWD Subtotal	**1,199**	**1.46**
	Gateway System	Roosevelt	123	0.22
		Swisstex	523	0.61
		Gateway Subtotal	**645**	**0.83**
	Harbor Total[1,2]		**2,881**	**N/A**
Metro Service Area	LAGWRP System	Atlas Carpets	310	0.36
		Laterals	565	1.00
		Medical Center	264	0.47
		USC	2,345	3.09
		LAGWRP Subtotal	**3,485**	**4.92**
	CBMWD System	Downtown	844	1.18
		Echo Park	282	0.51
		LAGWRP Connection	60	0.07
		USC	2,605	3.50
		CBMWD Subtotal	**3,831**	**5.27**
	Metro Total[1,3]		**5,011**	**N/A**

Service Area	System	WRP	Potential Demand (AFY)	Peak Day Demand (mgd)
Valley Service Area	Burbank System	Cesar Chavez	767	1.29
		Laterals	233	0.43
		North Hollywood	137	0.26
		Valley College	670	1.24
		Burbank Subtotal	**1,808**	**3.23**
	AWPF System	Laterals	438	0.68
		Vulcan	296	0.47
		AWPF Subtotal	**734**	**1.15**
	DCTWRP T22 System	Braemar	707	1.36
		Knollwood	1,074	2.09
		Laterals	195	0.37
		Pierce College	261	0.40
		Reseda Park	88	0.17
		VA Hospital	1,177	1.87
		DCTWRP T22 Subtotal	**3,502**	**6.26**
	Las Virgenes System	Pierce College	666	1.04
		Woodland Hills	288	0.56
		Las Virgenes Subtotal	**954**	**1.60**
	Valley Total[1,4]	**Valley Total**	**6,808**	**N/A**
Westside Service Area	Westside System	Laterals	390	0.61
		Penmar	177	0.35
		Westside Subtotal	**567**	**0.96**
	Westwood System	Kenneth Hahn	349	0.64
		UCLA	2,836	4.80
		Westwood Subtotal	**3,185**	**5.44**
	Westside Total	**Westside Total**	**3,752**	**N/A**
Citywide Total[1]			**18,453**	**N/A**

Notes:

1. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.
2. Harbor Total Demand is less than the sum of each system because the Harbor East and Warren E&P potential WRPs are defined in the TIWRP and WBMWD systems. The WBMWD System includes 1,095 AFY of annual average demand included in TIWRP System.
3. Metro Total Demand is less than the sum of each system because the USC WRP is defined in both systems. The WRP in the LAGWRP System includes 2,305 AFY of annual average demand included in the CBMWD System.
4. Valley Total Demand is less than the sum of each system because the Pierce College WRP is defined in the DCTWRP T22 and Las Virgenes systems. The DCTWRP T22 System includes 190 AFY of annual average demand (for Pierce College) included in Las Virgenes System.

Figure 6-9: Summary of Existing, Planned, and Potential Systems



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7. Water Recycling Project Descriptions

Eleven potential recycled water systems were defined in Section 6 for the four service areas. Section 7 describes the 38 potential Water Recycling Projects (WRPs) that make up the systems. Many of the potential WRPs are named after the potential anchor customers. The systems and associated potential WRPs are:

Harbor – TIWRP System

- Harbor East WRP*
- Laterals
- Peck Park WRP
- POLA WRP
- Ponte Vista WRP
- SA Recycling WRP
- Warren E&P WRP*

Harbor – WBMWD System

- Harbor East WRP*
- Laterals
- Warren E&P WRP*

Harbor – Gateway System

- Roosevelt WRP
- Swisstex WRP

Metro – LAGWRP System

- Atlas Carpets WRP
- Laterals
- Medical Center WRP
- USC WRP*

Metro – CBMWD System

- Downtown WRP
- Echo Park WRP
- LAGWRP Connection WRP
- USC WRP*

Valley – DCTWRP AWPF System

- Laterals
- Vulcan WRP

Valley – DCTWRP T22 System

- Braemar WRP
- Knollwood WRP
- Laterals
- Pierce College WRP*
- Reseda Park WRP
- VA Hospital WRP

Valley – Burbank System

- Cesar Chavez WRP
- Laterals
- North Hollywood WRP
- Valley College WRP

Valley – Las Virgenes System

- Pierce College WRP*
- Woodland Hills WRP

Westside – Westside System

- Laterals
- Penmar WRP

Westside – Westwood System

- Kenneth Hahn WRP
- UCLA WRP

Note: Asterisk indicates that the WRP is evaluated under multiple systems.

7.1 Harbor – TIWRP System

The potential Harbor – TIWRP System includes potential WRPs to maximize the use of recycled water from TIWRP. The existing TIWRP production capacity is 5.0 mgd, assuming that existing reliability and operational issues with the advanced treatment process are addressed. After existing and planned customers are satisfied, approximately 2.1 mgd remains available for potential recycled water customers. Additional supply from TIWRP can be created by decreasing the deliveries to DGB during peak demand periods or by expanding the treatment plant to apply advanced treatment to all flows, resulting in a 7.5 mgd expansion to 12.5 mgd of product water. The TIWRP AWTF expansion option was developed as part of the TIWRP Barrier Supplement and Non-Potable Reuse Concepts Report; therefore, the TIWRP AWTF expansion option was not considered further in this report.

Note that the Harbor East and Warren E&P WRPs are defined as part of both the Harbor – TIWRP System and the Harbor – WBWMD System so that they can be compared when selecting the potential WRPs to implement for each system.

Table 7-1: Harbor – TIWRP System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Harbor East	799	0.71	0.93	$11.84	$1.08	$1,620
Laterals	109	0.10	0.14	$0.62	$0.15	$1,420
Peck Park	194	0.17	0.35	$5.93	$0.33	$2,380
POLA	268	0.24	0.42	$8.49	$0.37	$1,990
Ponte Vista	281	0.25	0.50	$7.03	$0.43	$2,070
SA Recycling	105	0.09	0.12	$1.85	$0.15	$1,710
Warren E&P	375	0.33	0.44	$1.01	$0.50	$1,370
Potential Total	**2,132**	**1.90**	**2.90**	**$36.77**	**$3.00**	**$1,740**
Existing System	3,000	2.68	2.68	--	--	--
Planned System	210	0.19	0.37	--	--	--
System Total	**5,342**	**4.77**	**5.95**	**--**	**--**	**--**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix** I for individual WRP descriptions.

Implementation Considerations

The peak day demand for all of the potential WRPs (2.9 mgd) exceeds the available peak season supply from TIWRP (2.1 mgd). Also, the available peak season supply needs to be confirmed based on delivery projections for the DGB. In addition to a TIWRP expansion, the TIWRP Barrier Supplement and Non-Potable Reuse Concepts Report is evaluating the size of the recycled water market in the Harbor area beyond the non-potable reuse identified here. The conclusions of this assessment will help determine how many of these potential WRPs are ultimately implemented.

Potential System
Harbor TIWRP
Figure 7-1

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Laterals
- Harbor East WRP
- POLA WRP
- Peck Park WRP
- Ponte Vista WRP
- SA Recycling WRP
- Warren E&P WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown.

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All of the potential WRPs can be implemented independently except for Peck Park WRP, which is dependent on the Port of Los Angeles (POLA) WRP being constructed first. Also, the Ponte Vista and SA Recycling WRPs each have the potential to serve recycled water to adjacent agencies (WBMWD and Long Beach, respectively). The demands for adjacent agencies were not included in the potential WRPs so future service should be considered before the potential WRPs are implemented.

Customers

Table 7-2: Harbor – TIWRP System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating Initial[2]	Conversion Rating Compre-hensive[3]
Harbor East WRP		**799**	**0.71**	**0.93**		
Harbor Cogeneration Company	Industrial	330	0.29	0.38	A	--
Praxair	Industrial	250	0.22	0.29	B	--
Warren E&P, Inc. NWU	Industrial	140	0.12	0.16	A	A,B
Port of Los Angeles-BERTH 200	Industrial	50	0.04	0.06	--	New[4]
Non-Anchor Customers (2)		29	0.03	0.03		
Laterals WRP		**109**	**0.10**	**0.14**		
Harbor Generating Station	Industrial	80	0.07	0.09	B	--
Non-Anchor Customers (4)		29	0.03	0.05		
Peck Park WRP		**194**	**0.17**	**0.35**		
Field of Dreams	Irrigation	50	0.04	0.10	A	--
Peck Park	Irrigation	70	0.06	0.14	A	--
Non-Anchor Customers (7)		74	0.07	0.11		
POLA WRP		**268**	**0.24**	**0.42**		
Port of Los Angeles-San Pedro Waterfront	Mixed-Use	168	0.15	0.25	--	New[4]
Non-Anchor Customers (7)		100	0.09	0.17		
Ponte Vista WRP		**281**	**0.25**	**0.50**		
Machado Lake	Irrigation	140	0.12	0.27	A	--
Ponte Vista	Mixed-Use	100	0.09	0.15	--	New[4]
Non-Anchor Customers (4)		41	0.04	0.06		
SA Recycling WRP		**105**	**0.09**	**0.12**		
SA Recycling	Industrial	105	0.09	0.12	A	--
Warren E&P WRP		**375**	**0.33**	**0.44**		
Warren E&P-WTU	Industrial	375	0.33	0.44	A	A,B
Total[5]		**2,132**	**1.90**	**2.90**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. New development customers do not require conversions so they all receive "A" ratings.
5. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

In addition to these customers, this system includes the potential to deliver recycled water to two regional water agencies:

- Long Beach Water Department as part of the SA Recycling WRP
- West Basin Municipal Water Department as part of the Ponte Vista WRP

These customers have the potential to be anchor customers but were labeled as "Non-LADWP" since they would not offset LADWP potable demand and the likelihood of service is harder to assess since they are not LADWP customers and interagency agreements are required.

Facilities

The Harbor – TIWRP System was evaluated in various hydraulic scenarios with the hydraulic model under two general sets of facility conditions:

- Existing TIWRP pump station (head = 194 ft; HGL = 210 ft)
- New TIWRP pump station (head = 260 ft) combined with a tank at a ground elevation of 250 ft

The addition of a tank was driven by the need to mitigate the diurnal demand variation of the system, which includes an additional 400 AFY of irrigation demand. The new pump station was added to supply the new tank. The screening of these customers for the ultimate system reduced the peak hour demand so that the existing TIWRP pump station clearwell can handle the smaller diurnal variation.

For the Harbor – TIWRP System, the existing pump station can provide at least 60 psi to customers up to an elevation of 60 ft, which includes the majority of potential customers. The only anchor customers at an elevation above 60 ft are Ponte Vista and Peck Park. Those customers could each be provided adequate pressure with a booster pump sized for their demand. The estimated booster pump size for each customer is:

- Ponte Vista Booster Pump Station: 220 ft of head with a capacity of 610 gpm (includes Rolling Hills Prep School)
- Peck Park Booster Pump Station: 300 ft of head with a capacity of 860 gpm

A new pump station at TIWRP (head = 260 ft) and tank at Peck Park would increase the service pressure to all customers by approximately 30 psi and allow for some pipeline segments to be reduced by managing peak hour flows. The affect of this approach on each facility is:

- **Peck Tank:** The tank is 0.5 MG with a ground elevation of 250 ft and overflow elevation of 280 ft. Peck Park was selected as a potential location because it is public land and has a range of elevations (80 ft to 330 ft). An exact site for the tank was not evaluated. An alternative site near the intersection of Palos Verdes Drive and Western Avenue was evaluated as part of an initial hydraulic modeling scenario, but the Peck Park location works better hydraulically with the rest of the system.
- **New TIWRP Pump Station:** The pump station would have **t**wo pumps (plus one standby) each with 260 ft head at 1,750 gpm.

The new pump station and tank approach results in higher capital and O&M costs so the Harbor – TIWRP System was defined assuming continued use of the existing pump station plus two booster pump stations.

Costs

Table 7-3: Harbor – TIWRP System – Summary of Potential WRP Costs

Item \ WRP	Harbor East	Laterals	Peck Park	POLA	Ponte Vista	SA Recycling	Warren E&P	Total
Annual Yield (AFY)	799	109	194	268	281	105	375	2,132
Capital Cost ($M)								
Storage Tanks	--	--	--	--	--	--	--	--
Pump Stations	--	--	$0.82	--	$0.63	--	--	$1.45
PRVs	--	--	--	--	--	--	--	--
Pipelines	$7.01	$0.36	$2.69	$5.02	$3.53	$1.09	$0.60	$20.30
Subtotal	*$7.01*	*$0.36*	*$3.51*	*$5.02*	*$4.16*	*$1.09*	*$0.60*	*$21.76*
Construction Cont.	$2.10	$0.11	$1.05	$1.51	$1.25	$0.33	$0.18	$6.53
Subtotal	*$9.11*	*$0.47*	*$4.56*	*$6.53*	*$5.41*	*$1.42*	*$0.78*	*$28.29*
Implementation	$2.73	$0.14	$1.37	$1.96	$1.62	$0.43	$0.23	$8.49
Total	**$11.84**	**$0.62**	**$5.93**	**$8.49**	**$7.03**	**$1.85**	**$1.01**	**$36.77**
Annual O&M Cost ($M/yr)								
Facility O&M	$1.08	$0.15	$0.33	$0.37	$0.43	$0.15	$0.50	$3.00
RW Cost	--	--	--	--	--	--	--	--
Total	$1.08	$0.15	$0.33	$0.37	$0.43	$0.15	$0.50	$3.00
50-Year Present Value Analysis								
Present Value ($M)	$64.52	$7.77	$23.04	$26.71	$29.05	$8.95	$25.61	$185.57
Total Yield (AF)	39,948	5,459	9,697	13,419	14,065	5,250	18,750	106,588
PV Unit Cost ($/AF)	**$1,620**	**$1,420**	**$2,380**	**$1,990**	**$2,070**	**$1,710**	**$1,370**	**$1,740**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

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7.2 Harbor – WBMWD System

The potential Harbor – WBMWD System includes potential WRPs to expand recycled water use from CRWRF, although, the availability of any surplus planned capacity cannot be confirmed. There may be an opportunity to expand CRWRF so defining potential WRPs that could be served by this supply will support this evaluation. Also, there are two potential WRPs, Harbor East and Warren E&P, that are defined as part of both the Harbor – TIWRP System and the Harbor – WBMWD System so that the two supply options can be compared when selecting the potential WRPs to implement for this system.

Table 7-4: Harbor – WBMWD System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Harbor East	720	0.64	0.84	$2.80	$0.58	$1,150
Laterals	104	0.09	0.19	$1.79	$0.09	$1,460
Warren E&P	375	0.33	0.44	$0.27	$0.30	$1,080
Potential Total	**1,199**	**1.07**	**1.46**	**$4.86**	**$0.97**	**$1,160**
Existing System	--	--	--	--	--	--
Planned System	9,300	8.30	12.0	--	--	--
System Total	**10,499**	**9.36**	**13.46**	**--**	**--**	**--**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions. Harbor East WRP has less demand than the TIWRP System version because it does not include Port of Los Angeles – Berth 200 and two non-anchor customers.

Implementation Considerations

The primary consideration for implementation of the Harbor – WBMWD System is the availability of CRWRF supply. The projected peak day demand for the planned system matches the planned CRWRF peak season supply so the availability of surplus capacity to serve potential customers appears to be limited. Identification of any surplus will require future monitoring of actual peak day demands. Regarding CRWRF expansion, due to limited available land the feasibility of further expansion cannot be determined until the planned expansion is further developed (i.e. treatment process and associated footprint).

The number and size of potential WRPs implemented will be dependent on both the plan for TIWRP product water (since the Harbor East WRP and Warren E&P WRP can be served by either TIWRP or WBMWD). The Harbor East WRP in the Harbor-WBMWD System is compelling because there is a possibility that cost of the Dominguez Channel crossing could be shared with the planned crossing to potentially serve Valero. A primary disadvantage however, is that Praxair, a potential customer, and one of the major industrial customers in the Harbor East WRP has water quality needs that may be better served by the TIWRP product, which is more highly treated than the CRWF product. However, Praxair may require further treatment over and above the treatment supplied by either TIWRP or CRWRF.

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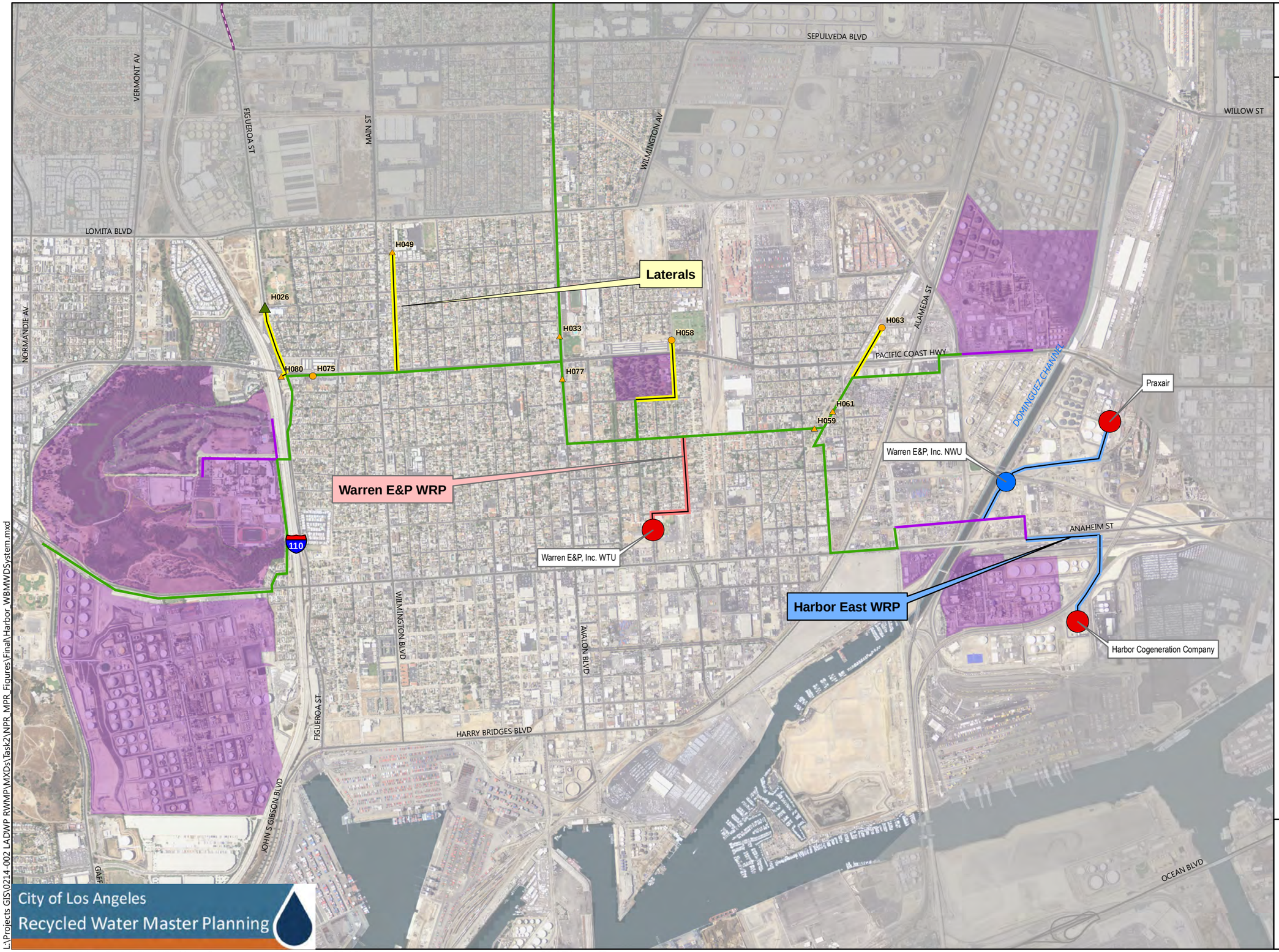
Potential System
Harbor WBMWD
Figure 7-2



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- PS Pump Station
- Existing RW Pipeline

Planned Facilities
- Tank
- PS Pump station
- Pipeline

Potential Facilities
- Tank
- PS Pump Station
- PRV

Potential System
- Laterals
- Harbor East WRP
- Warren E&P WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.25 0.5 Miles

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-5: Harbor – WBMWD System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Harbor East WRP		**720**	**0.64**	**0.84**		
Harbor Cogeneration Company	Industrial	330	0.29	0.38	A	--
Praxair	Industrial	250	0.22	0.29	B	--
Warren E&P – NWU	Industrial	140	0.12	0.16	A	A,B
Laterals WRP		**104**	**0.09**	**0.19**		
Non-Anchor Customers (10)		104	0.09	0.19		
Warren E&P WRP		**375**	**0.33**	**0.44**		
Warren E&P – WTU	Industrial	375	0.33	0.44	A	A,B
Total[4]		**1,199**	**1.07**	**1.46**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system uses surplus capacity from the planned CRWRF expansion (treatment and pump station) and planned pipelines. For this reason, no new major facilities are included in the system; however, if a further CRWRF expansion is deemed feasible and cost effective, then the CRWRF Pump Station would need to be expanded. Otherwise, no new major facilities are included in this system.

Costs

Table 7-6: Harbor – WBMWD System – Summary of Potential Costs

Item \ WRP	Harbor East	Laterals	Warren E&P	Total
Annual Yield (AFY)	720	104	375	1,199
Capital Cost ($M)				
Storage Tanks	--	--	--	--
Pump Stations	--	--	--	--
PRVs	--	--	--	--
Pipelines	$1.66	$1.06	$0.16	$2.88
Subtotal	*$1.66*	*$1.06*	*$0.16*	*$2.88*
Construction Cont.	$0.50	$0.32	$0.05	$0.86
Subtotal	*$2.15*	*$1.38*	*$0.21*	*$3.74*
Implementation	$0.65	$0.41	$0.06	$1.12
Total	**$2.80**	**$1.79**	**$0.27**	**$4.86**
Annual O&M Cost ($M/yr)				
Facility O&M	$0.01	--	--	$0.01
RW Purchase Cost	$0.58	$0.08	$0.30	$0.96
Total	**$0.58**	**$0.09**	**$0.30**	**$0.97**
50-Year Present Value Analysis				
Present Value ($M)	$41.53	$7.59	$20.34	$69.46
Total Yield (AF)	36,000	5,188	18,750	59,938
PV Unit Cost ($/AF)	**$1,150**	**$1,460**	**$1,080**	**$1,160**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.3 Harbor – Gateway System

The potential Harbor – Gateway System takes advantage of existing WBMWD recycled water infrastructure within the City for LADWP customers that are too far from the City's reclamation plants. In this case, two potential WRPs were defined around three anchor customers within a cost-effective distance from WBMWD's Title 22 system.

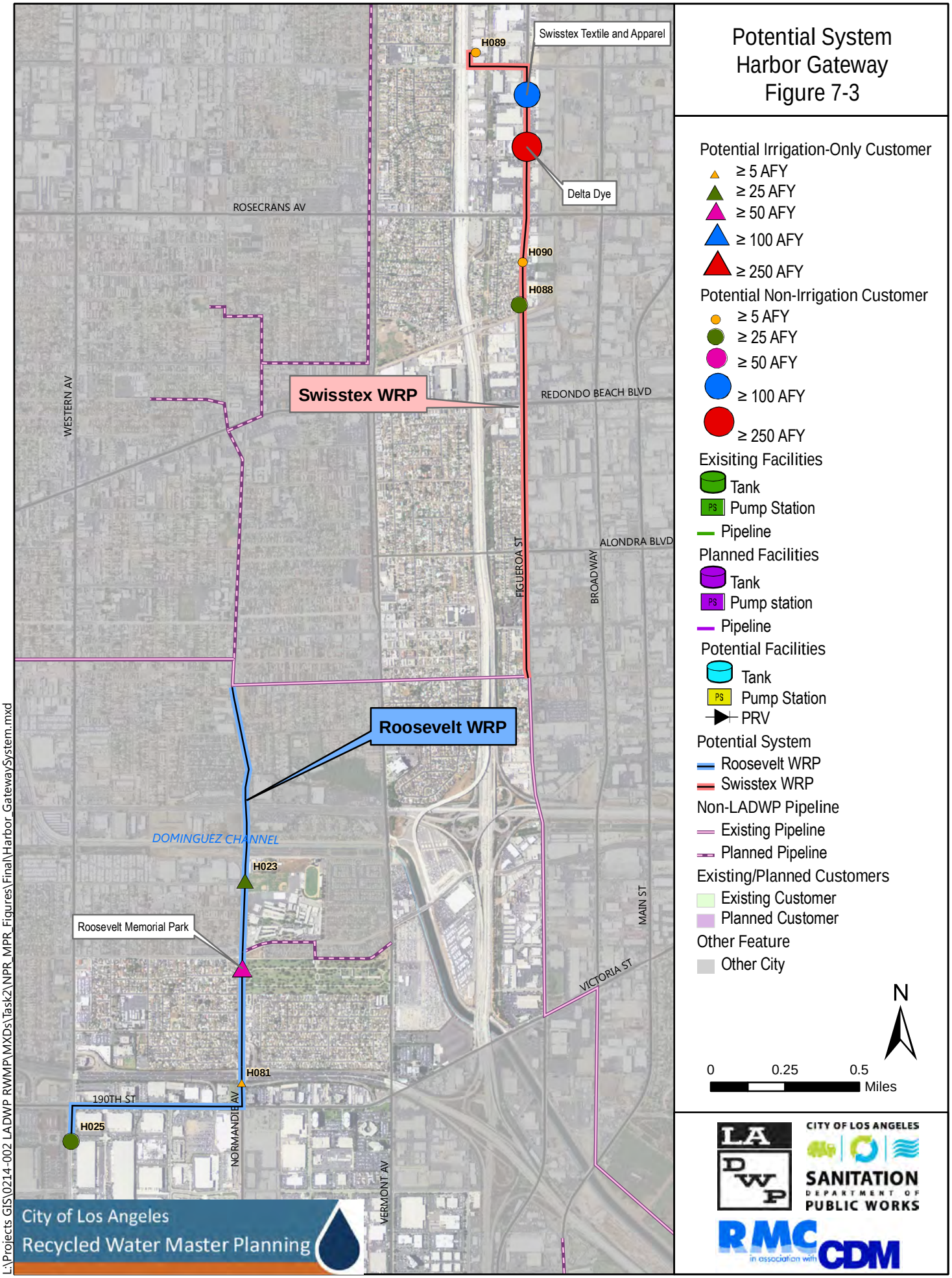
Table 7-7: Harbor – Gateway System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Roosevelt	123	0.11	0.22	$2.70	$0.10	$1,470
Swisstex	523	0.47	0.61	$3.52	$0.39	$1,120
Total	**645**	**0.58**	**0.83**	**$6.21**	**$0.48**	**$1,180**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

Each WRP in this system can be implemented independently so the primary consideration for each WRP is the anchor customer's commitment to use recycled water. Also, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.



Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

Customers

Table 7-8: Harbor – Gateway System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Roosevelt WRP		**123**	**0.11**	**0.22**		
Roosevelt Memorial Park	Irrigation	60	0.05	0.12	B	--
Non-Anchor Customers (3)		63	0.06	0.10		
Swisstex WRP		**523**	**0.47**	**0.61**		
Delta Dye	Industrial	270	0.24	0.31	B	B,B
Swisstex Textile and Apparel	Industrial	180	0.16	0.21	B	C,B
Non-Anchor Customers (3)		73	0.06	0.08		
Total[4]		**645**	**0.58**	**0.83**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system depends on the WBMWD Title 22 system for supply and pressure and the availability of conveyance capacity and sufficient pressure must be confirmed with WBMWD. Each WRP requires a connection with the existing WBMWD Title 22 Distribution System. The Roosevelt WRP connection is at W 168th Street and S Figueroa Street. The Swisstex WRP connection is at W 168th Street and South Normandie Avenue. No new major facilities are included in this system since it is dependent on the WBMWD Title 22 system.

Costs

Table 7-9: Harbor – Gateway System – Summary of Potential Costs

Item \ WRP	Roosevelt	Swisstex	Total
Annual Yield (AFY)	123	523	645
Capital Cost ($M)			
Storage Tanks	--	--	--
Pump Stations	--	--	--
PRVs	--	--	--
Pipelines	$1.60	$2.08	$3.68
Subtotal	*$1.60*	*$2.08*	*$3.68*
Construction Cont.	$0.48	$0.62	$1.10
Subtotal	*$2.07*	*$2.70*	*$4.78*
Implementation	$0.62	$0.81	$1.43
Total	**$2.70**	**$3.52**	**$6.21**
Annual O&M Cost ($M/yr)			
Facility O&M	$0.01	$0.01	$0.01
RW Purchase Cost	$0.09	$0.38	$0.47
Total	**$0.10**	**$0.39**	**$0.48**
50-Year Present Value Analysis			
Present Value ($M)	$9.00	$29.28	$38.21
Total Yield (AF)	6,127	26,131	32,257
PV Unit Cost ($/AF)	**$1,470**	**$1,120**	**$1,180**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.4 Metro – LAGWRP System

The potential Metro – LAGWRP System maximizes the use of existing recycled water from LAGWRP through cost effective expansion opportunities. LADWP's allotment from LAGWRP is 9 mgd. The system's planned peak day demand is estimated to use all of LADWP's allotment. Supplementing the system with potable water to meet peak day demands would allow for increased recycled water use throughout most of the year while still meeting peak day demands and staying within LADWP's LAGWRP allotment. Also, the USC WRP is defined as part of the LAGWRP System and the CBMWD System so that it can be compared when selecting the WRP to implement for this system.

Table 7-10: Metro – LAGWRP System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Atlas Carpets	310	0.28	0.36	$0.84	$0.02	$130
Laterals	565	0.50	1.00	$6.35	$0.07	$350
Medical Center	264	0.24	0.47	$3.96	$0.03	$400
USC	2,345	2.09	3.09	$30.99	$0.20	$350
Potential Total	**3,485**	**3.11**	**4.92**	**$42.14**	**$0.32**	**$330**
Existing System	2,430	2.17	4.77	--	--	--
Planned System	2,370	2.12	4.56	--	--	--
System Total	**8,285**	**7.40**	**14.25**	**--**	**--**	**--**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The primary consideration for this system is the availability of supply during the peak season. The available peak season supply needs to be confirmed based on actual peak day demands observed once the planned potential WRPs are implemented. Also, using potable water to supplement during peak periods should be considered.

The Atlas Carpet WRP and each lateral associated with the Laterals WRP can be implemented independently and will be dependent on confirmation of customer's ability to use recycled water and a review of on-site conversion requirements. The Medical Center WRP builds off the Atlas Carpets WRP so it is dependent on its implementation.

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Potential System
Metro LAGWRP
Figure 7-4

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- PS Pump Station
- Pipeline

Planned Facilities
- Tank
- PS Pump station
- Pipeline

Potential Facilities
- Tank
- PS Pump Station
- PRV

Potential System
- Laterals WRP
- Atlas Carpets WRP
- Medical Center WRP
- USC WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.5 1 Miles

LA DWP

CITY OF LOS ANGELES SANITATION DEPARTMENT OF PUBLIC WORKS

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City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-11: Metro – LAGWRP System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Atlas Carpets WRP		**310**	**0.28**	**0.36**		
Atlas Carpet Mills	Industrial	310	0.28	0.36	A	A,A
Laterals WRP		**565**	**0.50**	**1.00**		
Lakeside Golf Course	Irrigation	200	0.18	0.39	--	--
Non-Anchor Customers (28)		365	0.32	0.61		
Medical Center WRP		**264**	**0.24**	**0.47**		
Lincoln Park and Lake	Irrigation	115	0.10	0.23	A[4]	--
LAC + USC Medical Center	Mixed-Use	50	0.04	0.08	B	--
Non-Anchor Customers (6)		99	0.10	0.16		
USC WRP		**2,345**	**2.09**	**3.09**		
Matchmaster	Industrial	800	0.71	0.93	A	A,A
USC Main Campus	Mixed-Use	530	0.47	0.80	A	A,B
LA County Central Plant	Industrial	230	0.21	0.27	A	A,A
Boyle Heights Development	Mixed-Use	150	0.13	0.23	--	New[5]
Expo Park	Irrigation	140	0.12	0.27	B	--
Dye House, the	Industrial	140	0.12	0.16	A	A,A
Washington Garment	Industrial	120	0.11	0.14	C	--
Trigen-LA Bunker Hill	Industrial	100	0.09	0.12	B	A,A
Twin Towers Correctional Facility	Industrial	95	0.08	0.11	B	A,A
Farmers Field	Mixed Use	40	0.05	0.06	--	--
Total[6]		**3,485**	**3.11**	**4.92**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. This customer received an "A" for conversion of park irrigation demands but the ability to use recycled water for supplemental lake supply could not be resolved.
5. New development customers do not require conversions so they all receive "A" ratings.
6. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system uses surplus capacity in the LAGWRP system (LAGWRP, LAGWRP Pump Station, tanks and pipelines) so no new major facilities are included in this system.

Costs

Table 7-12: Metro – LAGWRP System – Summary of Potential Costs

Item \ WRP	Atlas Carpets	Laterals	Medical Center	USC	Total
Annual Yield (AFY)	310	565	264	2,345	3,485
Capital Cost ($M)					
Storage Tanks	--	--	--	--	--
Pump Stations	--	--	--	--	--
PRVs	--	--	--	--	--
Pipelines	$0.50	$3.76	$2.34	$18.34	$24.94
Subtotal	*$0.50*	*$3.76*	*$2.34*	*$18.34*	*$24.94*
Construction Cont.	$0.15	$1.13	$0.70	$5.50	$7.48
Subtotal	*$0.65*	*$4.89*	*$3.04*	*$23.84*	*$32.42*
Implementation	$0.19	$1.47	$0.91	$7.15	$9.73
Total	**$0.84**	**$6.35**	**$3.96**	**$30.99**	**$42.14**
Annual O&M Cost ($M/Yr)					
Facility O&M	$0.02	$0.07	$0.03	$0.20	$0.32
RW Purchase Cost	--	--	--	--	--
Total	**$0.02**	**$0.07**	**$0.03**	**$0.20**	**$0.32**
50-Year Present Value Analysis					
Present Value ($M)	$1.97	$9.63	$5.33	$40.94	$57.92
Total Yield (AF)	15,500	28,256	13,224	117,250	174,231
PV Unit Cost ($/AF)	**$130**	**$340**	**$400**	**$350**	**$330**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.5 Metro – CBMWD System

The potential Metro – CBMWD System provides a large recycled water supply to customers south of the terminus of the LAGWRP System since existing supplies may be limited from LAGWRP. The area generally covers Downtown and south and west of Downtown. In particular, the two largest potential anchor customers for the USC WRP, USC and Matchmaster, have identified recycled water demands in excess of 1,300 AFY.

The system's recycled water source is up to 4 mgd from SJCWRP from a connection to CBMWD's planned recycled water system expansion near the City of Vernon, referred to as the Southeast Water Reliability Project (SWRP) Phase II. Therefore, the system is dependent on implementation of SWRP Phase II as well as a guaranteed annual minimum purchase from LADWP. Also, the USC WRP is defined as part of the LAGWRP System and the CBMWD System so that it can be compared when selecting the WRP to implement for this system.

Table 7-13: Metro – CBMWD System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Downtown	884	0.79	1.18	$24.32	$0.65	$1,500
Echo Park	282	0.25	0.51	$7.23	$0.19	$1,380
LAGWRP Conn.	60	0.05	0.07	$3.01	$0.04	$1,860
USC	2,605	2.33	3.50	$32.24	$1.34	$930
Total	**3,831**	**3.42**	**5.27**	**$66.80**	**$2.22**	**$1,110**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The primary considerations for this system are its dependence on CBMWD to construct SWRP Phase II and the associated need for LADWP to commit to a minimum recycled water purchase to support the CBMWD project's implementation. The USC WRP is the first WRP for the Metro – CBMWD System and includes the connection to the CBMWD recycled water system. The Downtown WRP builds off the USC WRP and the remaining two potential WRPs independently build off the Downtown WRP.

The customer base for the USC and Downtown WRPs have large industrial components that historically can be more challenging to connect and have a more uncertain long-term viability. The customer conversion evaluation effort eliminated several industrial customers from consideration but the two largest customers in the USC WRP, i.e. Matchmaster and USC, have expressed support of the use of recycled water. All three anchor customers in the Downtown WRP, i.e. LA County Central Plant, Trigen-LA Bunker Hill, and Twin Towers Correctional Facility, had "A" conversion ratings. The planned "Clean Tech Corridor"[5] is located adjacent to the Downtown WRP so potential service is noted but non-potable service needs (demand, water quality, and pressure) are not known at this point.

[5] For additional information, refer to http://mayor.lacity.org/Issues/CleanTech/index.htm

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Potential System
Metro CBMWD
Figure 7-5

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Downtown WRP
- Echo Park WRP
- LAGWRP Connection WRP
- USC WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.5 1 Miles

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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The use of recycled water as a supplemental lake supply needs to be evaluated for Echo Park & Lake and MacArthur Park & Lake prior to implementation of the Echo Park WRP.

Customers

Table 7-14: Metro – CBMWD System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Downtown WRP		**884**	**0.79**	**1.18**		
LA County Central Plant	Industrial	230	0.21	0.27	A	A,A
Trigen-LA Bunker Hill	Industrial	100	0.09	0.12	B	A,A
Twin Towers Correctional Facility	Industrial	95	0.08	0.11	B	A,A
Non-Anchor Customers (36)		459	0.41	0.68		
Echo Park WRP		**282**	**0.25**	**0.51**		
MacArthur Park and Lake	Irrigation	85	0.08	0.17	A[4]	--
Echo Park and Lake	Irrigation	50	0.04	0.10	A[4]	--
Non-Anchor Customers (13)		147	0.13	0.25		
LAGWRP Connection WRP		**60**	**0.05**	**0.07**		
Non-Anchor Customers (2)		60	0.05	0.07		
USC WRP		**2,605**	**2.33**	**3.50**		
Matchmaster	Industrial	800	0.71	0.93	A	A,A
USC Main Campus	Mixed-Use	530	0.47	0.80	A	A,B
Boyle Heights Development	Mixed-Use	150	0.13	0.23	--	New[5]
Expo Park	Irrigation	140	0.12	0.27	B	--
Dye House, the	Industrial	140	0.12	0.16	A	A,A
Washington Garment	Industrial	120	0.11	0.14	C	--
E&C Fashion Inc.	Industrial	90	0.08	0.10	B	A,A
Seoul Texprint	Industrial	64	0.06	0.07	--	--
Non-Anchor Customers (30)		571	0.53	0.80		
Total[6]		**3,831**	**3.42**	**5.27**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. These customers received an "A" for conversion of park irrigation demands but the ability to use recycled water for supplemental lake supply could not be resolved.
5. New development customers do not require conversions so they all receive "A" ratings.
6. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system requires a connection to a non-LADWP recycled water system and one set of major facilities to create a new pressure zone. Each facility is described:

- **CBMWD Connection:** The connection with the planned CBMWD recycled water system is at the corner of E Washington Blvd and Downey Rd. Also, there are seven potential non-potable customers, including E&C Fashion, located east of Downey Rd along E Olympic Blvd that could be served directly off the planned CBMWD system.
- **Alameda PRV, Tank, and Pump Station:** The Downtown WRP requires a PRV, storage tank, and pump station combination to create an adequate new pressure zone from the USC WRP. The new pressure zone includes the Echo Park and LAGWRP Connection WRPs as well. A 20" PRV is required to break the pressure provided from the CBMWD Connection. The 0.8 MG tank with a ground elevation of 300 ft and overflow elevation of 330 ft serves as a wet well to the pump station. The pump station has two duty pumps (plus one standby) each with a capacity of 950 gpm at 250 ft head. All the facilities should be co-located. The facilities are assumed to be located anywhere along the Alameda St alignment between the connection with the USC WRP at E Washington St and Temple St. A specific site was not identified to accommodate all three facilities

Costs

Table 7-15: Metro – CBMWD System – Summary of Potential Costs

Item \ WRP	Downtown	Echo Park	LAGWRP Connection	USC	Total
Annual Yield (AFY)	884	282	60	2,605	3,831
Capital Cost ($M)					
Storage Tanks	$3.20	--	--	--	$3.20
Pump Stations	$0.97	$0.45	$0.07	--	$1.50
PRVs	$0.30	--	--	--	$0.30
Pipelines	$9.92	$3.83	$1.71	$19.08	$34.53
Subtotal	*$14.39*	*$4.28*	*$1.78*	*$19.08*	*$39.53*
Construction Cont.	$4.32	$1.28	$0.53	$5.72	$11.86
Subtotal	*$18.71*	*$5.56*	*$2.32*	*$24.80*	*$51.38*
Implementation	$5.61	$1.67	$0.69	$7.44	$15.42
Total	**$24.32**	**$7.23**	**$3.01**	**$32.24**	**$66.80**
Annual O&M Cost ($M/Yr)					
Facility O&M	$0.21	$0.05	$0.01	$0.04	$0.30
RW Purchase Cost	$0.44	$0.14	$0.03	$1.30	$1.92
Total	**$0.65**	**$0.19**	**$0.04**	**$1.34**	**$2.22**
50-Year Present Value Analysis					
Present Value ($M)	$66.12	$19.51	$5.59	$120.90	$212.44
Total Yield (AF)	44,222	14,086	3,000	130,243	191,552
PV Unit Cost ($/AF)	**$1,500**	**$1,380**	**$1,860**	**$930**	**$1,110**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.6 Valley – DCTWRP AWPF System

The potential Valley – DCTWRP AWPF System defines small potential expansions from the existing / planned system to maximize the use of DCTWRP effluent. The system's supply will be AWPF water from DCTWRP once the Valley GWR Project is implemented. No supply will be available for potential NPR customers if the 30,000 AFY GWR Project is implemented and approximately 14 mgd of effluent would be available if only the 15,000 AFY GWR Project (Phase 1) is implemented. Therefore, the potential system was limited to customers in proximity to the existing / planned system.

Table 7-16: Valley – DCTWRP AWPF System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Laterals	438	0.39	0.68	$6.98	$0.05	$420
Vulcan	296	0.27	0.47	$8.47	$0.08	$870
Potential Total	**734**	**0.66**	**1.15**	**$15.47**	**$0.13**	**$600**
Existing System	2,298	2.05	2.83			
Planned System	671	0.60	1.26			
System Total	**3,703**	**3.31**	**5.24**			

Note: Existing and planned demands currently served from DCTWRP were divided between this system and the Valley – DCTWRP T22 System. Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The primary consideration for this system is the availability of DCTWRP AWPF supply and the potential impact from the use of this supply on the Valley GWR Project yield.

The potential WRPs (and individual laterals within the Laterals WRP) can be implemented independently and will be dependent on confirmation of customer's willingness to use recycled water and a review of on-site conversion requirements. The Vulcan WRP can be supplied with recycled water from the DCTWRP AWPF System, DCTWRP T22 System, or Burbank System depending on the supply that is conveyed to the Hansen Tank.

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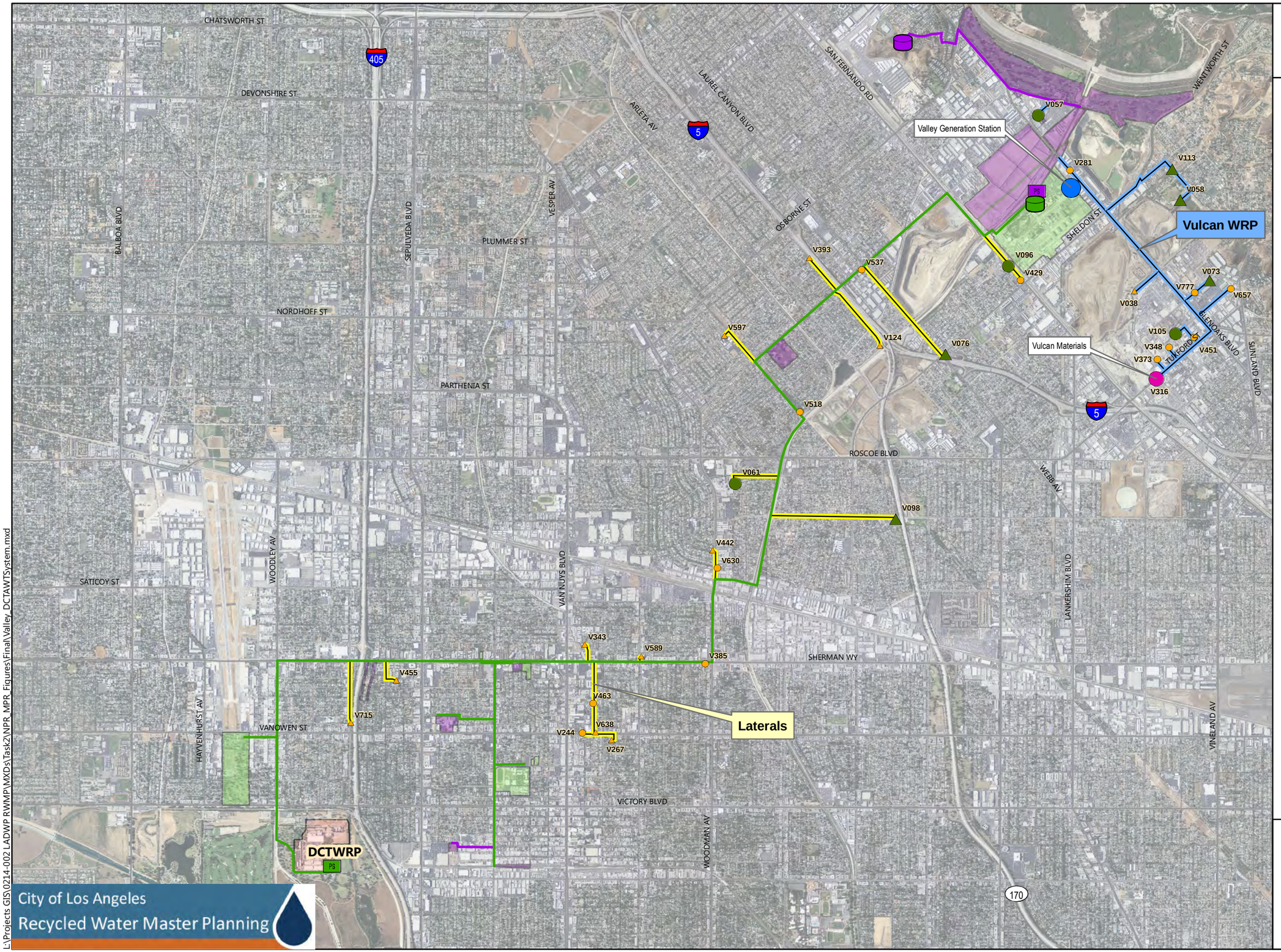
Potential System
Valley DCTWRP AWPF
Figure 7-6



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facility
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Laterals
- Vulcan WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

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City of Los Angeles
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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-17: Valley – DCTWRP AWPF System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Laterals WRP		**438**	**0.39**	**0.68**		
Valley Generating Station	Industrial	150	0.13	0.17	--	--
Non-Anchor Customers (21)		288	0.26	0.51		
Vulcan WRP		**296**	**0.27**	**0.47**		
Vulcan Materials	Industrial	51	0.05	0.06	A	A,B
Non-Anchor Customers (12)		245	0.22	0.41		
Total[4]		**734**	**0.66**	**1.15**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system uses surplus capacity in the DCTWRP AWPF System (DCTWRP, Balboa Pump Station, Hansen Tank, Garber Tank, and pipelines) so no new major facilities are included in this system. The system may require larger capacity in the initial phase of the planned AWPF to accommodate non-potable customer demands. The Vulcan WRP may require an expansion of the Hansen Pump Station to include the WRP's peak day demands but the firm capacity of this planned pump station has not been finalized.

Costs

Table 7-18: Valley – DCTWRP AWPF System – Summary of Potential Costs

WRP / Item	Laterals	Vulcan	Total
Annual Yield (AFY)	438	296	734
Capital Cost ($M)			
Storage Tanks	--	--	--
Pump Stations	--	$0.40	$0.40
PRVs	--	--	--
Pipelines	$4.13	$4.62	$8.76
Subtotal	*$4.13*	*$5.01*	*$9.14*
Construction Cont.	$1.24	$1.50	$2.74
Subtotal	*$5.37*	*$6.51*	*$11.89*
Implementation	$1.61	$1.95	$3.57
Total	**$6.98**	**$8.47**	**$15.45**
Annual O&M Cost ($M/Yr)			
Facility O&M	$0.05	$0.08	$0.13
RW Purchase Cost	--	--	--
Total	**$0.05**	**$0.08**	**$0.13**
50-Year Present Value Analysis			
Present Value ($M)	$9.19	$12.88	$22.07
Total Yield (AF)	21,921	14,792	36,713
PV Unit Cost ($/AF)	**$420**	**$870**	**$600**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.7 Valley – DCTWRP T22 System

The potential Valley – DCTWRP T22 System includes potential WRPs with the consideration that no potential WRPs may be implemented if the 30,000 AFY GWR Project is implemented since no surplus flow is projected if the project is implemented. If only the 15,000 AFY GWR Project (Phase 1) is implemented, approximately 14 mgd of effluent would be available from DCTWRP to implement the WRPs. Considering the supply situation, three WRPs (Pierce College, Hansen Connection, and Vulcan) were defined as part of more than one system and can be compared when selecting the WRPs to implement for each system.

Table 7-19: Valley – DCTWRP T22 System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Braemar	707	0.63	1.36	$21.32	$0.18	$920
Knollwood	1,074	0.96	2.09	$35.12	$0.45	$1,170
Laterals	195	0.17	0.37	$4.51	$0.03	$660
Pierce College	261	0.23	0.40	$7.79	$0.04	$790
Reseda	88	0.08	0.17	$9.80	$0.02	$2,480
VA Hospital	1,177	1.05	1.87	$32.44	$0.20	$750
Potential Total	**3,502**	**3.13**	**6.26**	**$110.95**	**$0.92**	**$950**
Existing System	1.690	1.51	3.32			
Planned System	688	0.61	1.35			
System Total	**5,880**	**5.25**	**10.93**			

Note: Note: Existing and planned demands currently served from DCTWRP were divided between this system and the Valley – DCTWRP T22 System. In addition to this system, the Pierce College WRP is considered in the Las Virgenes System. Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The primary consideration for this system is the availability of supply from DCTWRP and the potential impact from the use of this supply on the Valley GWR Project yield.

The Braemar WRP is required to implement the Pierce College WRP and the VA Hospital WRP is required to implement the Knollwood, Hansen Connection, and Vulcan WRPs. The Braemar and VA Hospital WRPs can be implemented independently. The Braemar WRP is required to implement the DCTWRP T22 Laterals WRP and serve existing / planned customers in the Sepulveda Basin area (adjacent to DCTWRP) because the El Caballero Tank, which is part of the Braemar WRP, is necessary to manage the system's peak hour pumping requirements to avoid an extremely large DCTWRP T22 Pump Station. Any alternative system approach without a tank is described in Section 7.7.1.

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Potential System
Valley DCTWRP T22
Figure 7-7

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- PS Pump Station
- Pipeline

Planned Facilities
- Tank
- PS Pump station
- Pipeline

Potential Facilities
- Tank
- PS Pump Station
- PRV

Potential System
- Laterals
- Braemar WRP
- Hansen Connection WRP
- Knollwood WRP
- Pierce College WRP
- Reseda WRP
- VA Hospital WRP
- Vulcan WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

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Knollwood WRP
Knollwood Golf Course
Knollwood Tank
Eden Memorial Park
San Fernando Mission Cemetery
Brand Park
Catholic Archdiocese of Los Angeles
Vulcan WRP
Haskell Facilities
Veteran's Administration Hospital
VA Hospital WRP
CSU Northridge
Cesar Chavez Recreation Complex
Bradley Landfill
Vulcan Materials
Caltrans (5 at Tuxford St)
Valley Sod Farms
Anheuser Busch
Caltrans (170 at Burton St)
Hansen Connection WRP
Pierce College WRP
Pierce College
Reseda WRP
DCTWRP AWPF System (for reference)
DCTWRP
DCTWRP T22 PS
Laterals
Hjelte Sports Center
El Caballero Country Club
El Caballero Tank
Braemar Country Club
Braemar WRP

SANTA SUSANA PASS RD
RINALDI ST
CHATSWORTH ST
DEVONSHIRE ST
MARILLA ST
PLUMMER ST
NORDHOFF ST
NORDHOFF WY
PARTHENIA ST
ROSCOE BLVD
SATICOY ST
SHERMAN WY
OXNARD ST
VENTURA BLVD
VICTORY BLVD
BURBANK BLVD
MAGNOLIA BLVD
MOORPARK ST
VANOWEN ST
SAN FERNANDO RD
MACLAY AV
TRUMAN ST
GLENOAKS BLVD
FOOTHILL BLVD
OSBORNE ST
SHELDON ST
TUXFORD ST
SUNLAND BLVD
WEBB AV
ARLETA AV
BALBOA BLVD
ZELZAH AV
DE SOTO AV
CANOGA AV
WINNETKA AV
RESEDA BLVD
WOODLEY AV
HAYVENHURST AV
SEPULVEDA BLVD
VAN NUYS BLVD
WHITE OAK AV
TAMPA AV
WOODMAN AV
LAUREL CANYON BLVD
VINELAND AV
LANKERSHIM BLVD
BEVERLY GLEN BLVD
MULHOLLAND DR
LOS ANGELES R

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LA DWP
RMC in association with CDM

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and customers <50 AFY have IDs shown

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Customers

Table 7-20: Valley – DCTWRP T22 System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Braemar WRP		**707**	**0.63**	**1.36**		
Braemar Country Club	Irrigation	300	0.27	0.59	A	A,A
El Caballero Country Club	Irrigation	290	0.26	0.57	A	B,B
Non-Anchor Customers (11)		117	0.10	0.20		
Knollwood WRP		**1,074**	**0.96**	**2.09**		
Knollwood Golf Course	Irrigation	280	0.25	0.55	A	A,A
Eden Memorial Park	Irrigation	225	0.20	0.44	B	B,A
San Fernando Mission Cem.	Irrigation	200	0.18	0.39	B	A,A
Brand Park	Irrigation	50	0.04	0.10	A	--
Catholic Archdiocese of LA	Irrigation	50	0.04	0.10	--	--
Non-Anchor Customers (19)		269	0.24	0.51		
Laterals WRP		**195**	**0.17**	**0.37**		
Hjelte Sports Center	Irrigation	90	0.08	0.18	A	--
Non-Anchor Customers (5)		105	0.09	0.20		
Pierce College WRP		**261**	**0.23**	**0.40**		
Pierce College	Mixed-Use	190	0.17	0.29	A	A,A
Non-Anchor Customers (5)		71	0.06	0.11		
Reseda WRP		**88**	**0.08**	**0.17**		
Non-Anchor Customers (4)		88	0.08	0.17		
VA Hospital WRP		**1,177**	**1.05**	**1.87**		
CSU Northridge	Mixed-Use	340	0.30	0.52	A	A,B
Veterans Admin. Hospital	Mixed-Use	320	0.29	0.49	A	A,A
Valley Sod Farms	Irrigation	140	0.12	0.27	A	A,A
Anheuser Busch	Industrial	130	0.12	0.15	B	--
Non-Anchor Customers (19)		247	0.22	0.44		
Total[4]		**3,502**	**3.13**	**6.26**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

The DCTWRP T22 System requires a new pump station at DCTWRP to continue to supply DCTWRP tertiary product to Sepulveda Basin customers once the Balboa Pump Station is dedicated to the DCTWRP AWPF System. The new DCTWRP T22 Pump Station could be reduced in size with the addition of a tank in the distribution system. The El Caballero Tank, which is associated with the Braemar WRP, could serve this role. Finally, the Knollwood WRP requires a new pressure zone so a set of major facilities is included with the WRP to provide the pressure lift and a floating tank at the top of WRP.

The facilities associated with implementation of all potential WRPs are described as follows:

- **DCTWRP T22 Pump Station:** The pump station has two pumps (plus one standby) each with a capacity of 4,400 gpm at 340 ft head.
- **El Caballero Tank:** The tank size is 2.5 MG with a ground elevation of 940 ft and overflow elevation of 970 ft. The El Caballero Country Club was selected as a potential location since it is the only customer near the western portion of the system that is located at the desired elevation and may have a location on the course for the tank. However, an exact site for the tank was not evaluated.
- **Haskell PRV, Tank, and Pump Station:** The Knollwood WRP requires a PRV, storage tank, and pump station combination to create a new pressure zone from the VA Hospital WRP to provide adequate customer service pressures. A 20" PRV is required to break the pressure provided from the DCTWRP T22 Pump Station and the 1.0 MG tank with a ground elevation of 900 ft and overflow elevation of 930 ft serves as a wet well to the pump station. The pump station has **t**wo pumps (plus one standby) each with a capacity of 850 gpm at 250 ft head. All the facilities should be co-located. The facilities are assumed to be located somewhere near VA Hospital but a specific site was not identified to accommodate all three facilities.
- **Knollwood Tank:** The tank is 1.25 MG with a ground elevation of 1,155 ft and overflow elevation of 1,185 ft and provides floating head to the pressure zone created by the Haskell facilities. The tank is assumed to be located somewhere near Knollwood Golf Course but a specific site was not identified.

Costs

Table 7-21: Valley – DCTWRP T22 System – Summary of Potential Costs

Item \ WRP	Braemar	Knollwood	Laterals	Pierce College	Reseda Park	VA Hospital	Total
Annual Yield (AFY)	707	1,074	195	261	88	1,177	3,502
Capital Cost ($M)							
Storage Tanks	$5.00	$6.75	--	--	--	--	$11.75
Pump Stations	$0.97	$2.85	$0.27	$0.36	$0.12	$1.61	$6.17
PRVs	--	$0.35	--	--	--	--	$0.35
Pipelines	$6.65	$10.83	$2.40	$4.26	$5.68	$17.59	$47.38
Subtotal	*$12.62*	*$20.78*	*$2.67*	*$4.61*	*$5.80*	*$19.20*	*$65.65*
Construction Cont.	$3.79	$6.23	$0.80	$1.38	$1.74	$5.76	$19.70
Subtotal	*$16.40*	*$27.01*	*$3.47*	*$6.00*	*$7.54*	*$24.96*	*$85.35*
Implementation	$4.92	$8.10	$1.04	$1.80	$2.26	$7.49	$25.60
Total	**$21.32**	**$35.12**	**$4.51**	**$7.79**	**$9.80**	**$32.44**	**$110.95**
Annual O&M Cost ($M/Yr)							
Facility O&M	$0.18	$0.45	$0.03	$0.04	$0.02	$0.20	$0.92
RW Cost	$0.00	--	--	--	$0.00	--	$0.00
Total	**$0.18**	**$0.45**	**$0.03**	**$0.04**	**$0.02**	**$0.20**	**$0.92**
50-Year Present Value Analysis							
Present Value ($M)	$32.54	$62.68	$6.41	$10.31	$10.84	$44.09	$167.17
Total Yield (AF)	35,370	53,701	9,735	13,034	4,377	58,864	175,083
PV Unit Cost ($/AF)	**$920**	**$1,170**	**$660**	**$790**	**$2,480**	**$750**	**$950**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.7.1 Limited DCTWRP T22 System

The 15,000 AFY GWR Project (Phase 1) includes AWPF treatment capacity for existing and planned DCTWRP customers. The Limited DCTWTP T22 System would serve existing and planned customers in the Sepulveda Basin area with DCTWRP tertiary effluent instead of AWPF water. Also, producing 2.13 mgd of AWPF product requires 2.70 mgd of tertiary water and the 0.57 mgd (634 AFY) of DCTWRP tertiary effluent that was AWPF concentrate would now be available for additional NPR or treatment by the AWPF to increase the Valley GWR Project yield. The Reseda WRP requires 88 AFY so 546 AFY of tertiary water would be available for GWR, which would result in 430 AFY of AWPF product water.

Table 7-22: Limited Valley – DCTWRP T22 System – Summary of Customers

Sepulveda Basin Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)
Existing Customers (5)[1]	Irrigation	1,690	1.51	3.32
Planned Customers (7)[2]	Irrigation	695	0.62	0.44
Reseda WRP (4)	Irrigation	88	0.08	0.17
Total		**2,473**	**2.21**	**3.93**

1. Existing customers are Anthony C. Beilenson Park, Balboa Municipal Golf Course, Balboa Sports Complex, Encino Municipal Golf Course, and Woodley Lakes Municipal Golf Course.
2. Planned customers are California Air National Guard, Birmingham High School, High Tech High School, Mulholland Middle School, Sepulveda Basin Sports Complex, Valley Alternative High School, and Woodley Park/Cricket Fields.

Limited DCTWRP T22 System Costs

The DCTWRP T22 System that is limited to serving existing and planned Sepulveda Basin customers and the Reseda Park WRP would be operated without a tank in the system. The DCTWRP T22 Pump Station associated with this scenario has two pumps (plus one standby) each with a capacity of 5,100 gpm at 280 ft head.

Table 7-23: Limited Valley – DCTWRP T22 System – Summary of Potential Costs

Item	Cost
Capital Cost ($M)	
Treatment	--
Storage Tanks	--
Pump Stations	$5.36
Pipelines	$4.90
Subtotal	*$10.26*
Construction Cont.	$3.08
Subtotal	*$13.34*
Implementation	$4.00
Total	**$17.34**
Annual O&M Cost ($M/Yr)	
Facility O&M	$0.40
50-Year Present Value Analysis	
Present Value ($M)	$43.73

Note: See **Appendix J** for detailed cost estimates.

Limited DCTWRP T22 System Avoided Costs

Implementation of this system avoids the need for 2.13 mgd (average annual demand of existing and planned Sepulveda Basin customers) of AWPF production capacity; however, the AWPF design capacity would not be reduced because the facility will be constructed in 5 mgd increments. Implementation of this system avoids the O&M costs to produce 2.13 mgd of AWPF water. The AWPF O&M cost estimate for average annual AWPF production of 32.1 mgd is $17.0 M, which is approximately equivalent to $530,000 per mgd of average annual production. Therefore, the proposed system would avoid approximately $1.1 M in annual O&M.

Table 7-24: Limited Valley – DCTWRP T22 System – Summary of Avoided AWPF Costs

Item	Cost
Capital Cost ($M)	
Treatment	--
Total	**$**--
Annual O&M Cost ($M/Yr)	
Facility O&M	$1.11
50-Year Present Value Analysis	
Present Value ($M)	$55.27

Note: See **Appendix J** for detailed cost estimates.

Limited DCTWRP T22 System Net Present Value

The present value of the avoided AWPF cost is greater than the present value of the potential NPR system costs and would result in a net benefit to LADWP of $11.5 M (50-year present value).

Table 7-25: Limited Valley – DCTWRP T22 System – Net Present Value

Item	Present Value ($M)
Summary of Potential NPR Costs	$43.73
Summary of Avoided AWPF Costs	($55.27)
Net Present Value	**($11.54)**

Note: See **Appendix J** for detailed cost estimates.

7.7.2 DCTWRP T22 System with Hansen Tank Connection

The addition of the Hansen Connection WRP to the DCTWRP T22 System would convey DCTWRP tertiary product to Hansen Tank to serve customers upstream of Hansen Tank – VGS, planned Hansen Dam Golf Course WRP customers, and potential Vulcan WRP customers (if implemented) instead of using AWPF product water as proposed in the Valley – AWPF System. The system was defined to compare the costs of a new system with the avoided costs associated with AWPF production and the benefit of increased supply due to avoidance of AWPF concentrate. The system is also defined as part of the Valley – Burbank System so that they can be compared when selecting the potential WRPs to implement for each system.

Table 7-26: Valley – DCTWRP T22 System with Hansen Tank Connection – Summary

Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
816	0.73	0.25	$43.23	$0.19	$1,340

Implementation Considerations

Implementation of the Hansen Connection WRP has several significant impacts on other WRPs in the DCTWRP T22 System that must be considered when they are implemented, including:

- Reduced head needed from the DCTWRP T22 Pump Station for Hansen Tank
- Moving Haskell facilities (PRV, tank, and pump station) south to a lower elevation to account for lower head from DCTWRP T22 Pump Station and increasing head production from the Haskell Pump Station

The Vulcan WRP can be supplied with recycled water from the DCTWRP AWPF System, DCTWRP T22 System, or Burbank System depending on the supply that is conveyed to the Hansen Tank. The only potential difference in the Vulcan WRP between the different systems is that the Hansen Connection WRP, which is associated with the DCTWRP T22 System and Burbank System, can serve Vulcan Materials directly.

Facilities

The Hansen Connection WRP incorporates the Hansen Tank into the DCTWRP T22 System. The head elevation from the initial analysis for the DCTWRP T22 Pump Station would cause the Hansen Tank to overflow, so a lower head elevation was applied. As a result, the Haskell PRV, Tank, and Pump Station need to be move south to a lower elevation to start the new pressure zone for the Knollwood WRP.

Each facility is further described as follows:

- **DCTWRP T22 Pump Station:** The pump station has two pumps (plus one standby) each with a capacity of 2,300 gpm at 280 ft head.
- **Haskell PRV, Tank, and Pump Station:** Compared with the initial analysis, the tank ground elevation would be reduced to 800 ft (and overflow elevation of 830 ft) and the

pump station would instead have two pumps (plus one standby) each with a capacity of 1,000 gpm at 350 ft head.

- **Knollwood Tank:** The tank has the same characteristics as the initial analysis: 1.25 MG with a ground elevation of 1,155 ft and overflow elevation of 1,185 ft.

Customers

Table 7-27: Valley – DCTWRP T22 System with Hansen Tank Connection – Summary of Potential Customers

Potential Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating Initial[2]	Conversion Rating Compre-hensive
Cesar Chavez Rec. Complex	Irrigation	90	0.08	0.18	A	--
Caltrans (170 at Burton St)	Irrigation	50	0.04	0.10	A	--
Non-Anchor Customers (22)		676	0.60	1.12		
Total		**816**	**0.73**	**0.25**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.

Costs

Table 7-28: Valley – DCTWRP T22 System with Hansen Tank Connection – Summary of Potential Costs

Item \ WRP	Hansen Connection
Annual Yield (AFY)	816
Capital Cost ($M)	
Storage Tanks	--
Pump Stations	$1.76
PRVs	--
Pipelines	$23.82
Subtotal	*$25.58*
Construction Cont.	$7.67
Subtotal	*$33.25*
Implementation	$9.98
Total	**$43.23**
Annual O&M Cost ($M/Yr)	
Facility O&M	$0.19
RW Cost	--
Total	**$0.19**
50-Year Present Value Analysis	
Present Value ($M)	$54.72
Total Yield (AF)	40,818
PV Unit Cost ($/AF)	**$1,340**

Note: See **Appendix J** for detailed cost estimates.

7.8 Valley – Burbank System

The potential Valley – Burbank System includes potential WRPs to maximize the use of Burbank's recycled water system capacity that is available to LADWP. Burbank can supply up to 3.8 mgd of peak day flow from the Studio District Extension, which is the primary connection point with LADWP. There are also three other smaller connections included in the Laterals WRP.

Table 7-29: Valley – Burbank System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Cesar Chavez	767	0.69	1.29	$20.11	$0.27	$930
Laterals	233	0.21	0.43	$2.80	$0.01	$270
North Hollywood	137	0.12	0.26	$7.74	$0.01	$1,210
Valley College	670	0.60	1.24	$23.00	$0.20	$1,010
Total	**1,808**	**1.61**	**3.23**	**$53.66**	**$0.48**	**$910**

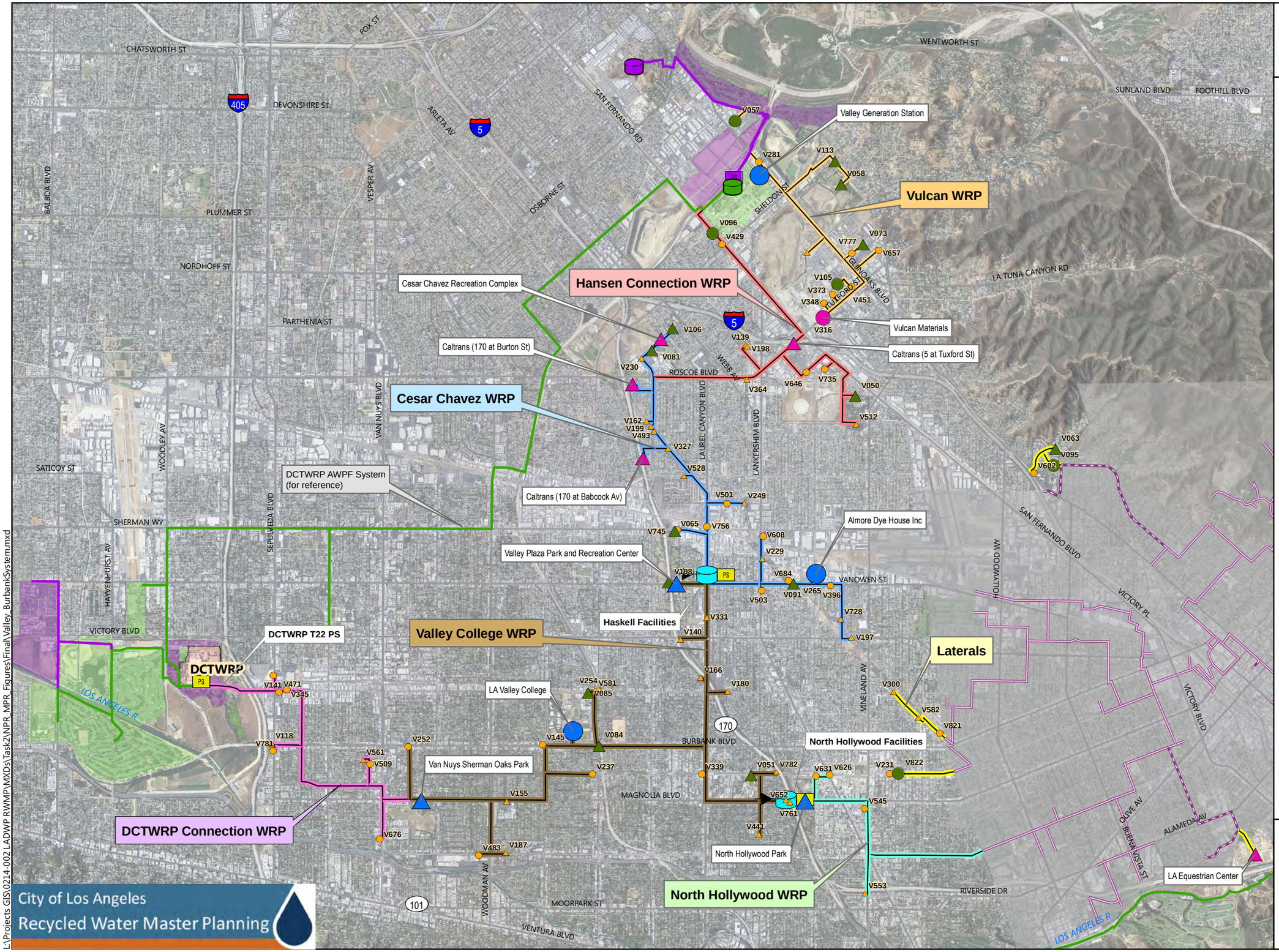
Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The City has already committed funds for the Burbank Recycled Water system to be built out to the City border with Burbank in the southeastern portion of the San Fernando Valley. The largest connection is from the Studio District Extension. The Burbank Laterals WRP includes three other smaller connections with Burbank's recycled water system: Equestrian Center, Valhalla, and Northern.

The North Hollywood WRP is the first WRP for this system followed by the Valley College WRP. The Cesar Chavez and DCTWRP Connection WRPs independently build off the Valley College WRP. The Hansen Connection WRP builds off the Cesar Chavez WRP. A new pressure zone is necessary beyond the North Hollywood WRP so only this WRP and the Burbank Laterals WRP can be implemented without a large capital investment.

Potential System
Valley Burbank
Figure 7-8



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Laterals
- Cesar Chavez WRP
- DCTWRP Connection WRP
- Hansen Connection WRP
- North Hollywood WRP
- Valley College WRP
- Vulcan WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

0 0.5 1 Miles

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City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-30: Valley – Burbank System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Cesar Chavez WRP		**767**	**0.69**	**1.29**		
Almore Dye House Inc	Industrial	230	0.21	0.27	C	--
Cesar Chavez Rec. Complex	Irrigation	90	0.08	0.18	A	--
Caltrans (170 at Babcock Av)	Irrigation	60	0.05	0.12	A	A,A
Caltrans (170 at Burton St)	Irrigation	50	0.04	0.10	A	--
Non-Anchor Customers (31)		337	0.30	0.62		
Laterals WRP		**233**	**0.21**	**0.43**		
LA Equestrian Center	Industrial	70	0.06	0.14	--	--
Non-Anchor Customers (8)		163	0.15	0.29		
North Hollywood WRP		**137**	**0.12**	**0.26**		
North Hollywood Park	Irrigation	100	0.09	0.20	A	A,B
Non-Anchor Customers (5)		37	0.03	0.06		
Valley College WRP		**670**	**0.60**	**1.24**		
Valley Plaza Park	Irrigation	130	0.12	0.26	A	A,B
Van Nuys Sherman Oaks Park	Irrigation	105	0.09	0.21	A	A,A
LA Valley College	Mixed-Use	100	0.09	0.15	A	A,B
Non-Anchor Customers (16)		335	0.30	0.62		
Total		**1,808**	**1.61**	**3.23**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

The potential WRPs supplied from the Studio District connection (which is all potential WRPs except for the Laterals WRP) has three pressure zones. One zone is created from pressure provided by the Burbank Connection and the other two zones are provided by sets of major facilities at North Hollywood Park and Valley Plaza Park.

Each facility is further described below:

- **Burbank Connection:** This WRP requires a connection with Burbank's Studio District Extension terminus at Verdugo Ave and Clybourn Ave. An agreement exists between LADWP and Burbank, in which Burbank has upsized pipelines in a portion of the Studio District System to 16" to increase the flow available to LADWP throughout the year. The agreement calls for a minimum of 2,100 gpm of flow during the day and 800 gpm of flow during the night with an associated minimum service pressure of 90 psi.

- **North Hollywood PRV, Tank, and Pump Station:** The Valley College WRP requires a PRV, storage tank, and pump station combination to create a new pressure zone from the North Hollywood WRP to provide adequate customer service pressures. A 16" PRV is required to break the pressure provided from the Burbank Connection and a 1.0 MG tank with a ground elevation of 625 ft and overflow elevation of 655 ft serves as a wet well to the pump station. The pump station has two pumps (plus one standby) each with 280 ft head at 750 gpm. It is preferable that the facilities be located together. The facilities are assumed to be located near North Hollywood Park but a specific site was not identified to accommodate all three facilities.
- **Valley Plaza PRV, Tank, and Pump Station:** The Cesar Chavez WRP requires a PRV, storage tank, and pump station combination to create a new pressure zone from the Valley College WRP to provide adequate customer service pressures. A 12" PRV is required to regulate the pressure provided from the Burbank Connection and a 0.5 MG tank with a ground elevation of 700 ft and overflow elevation of 730 ft serves as a wet well to the pump station. The pump station has **t**wo pumps (plus one standby) each with 260 ft head at 280 gpm. All the facilities should be co-located. The facilities are assumed to be located near Valley Plaza Park but a specific site was not identified to accommodate all three facilities.

Costs

Table 7-31: Valley – Burbank System – Summary of Potential Costs

Item \ WRP	Cesar Chavez	Laterals	North Hollywood	Valley College	Total
Annual Yield (AFY)	767	233	137	670	1,808
Capital Cost ($M)					
Storage Tanks	$3.50	$0.00	$0.00	$1.50	$5.00
Pump Stations	$1.39	$0.00	$0.00	$0.63	$2.02
PRVs	$0.30	$0.00	$0.00	$0.35	$0.65
Pipelines	$6.71	$1.66	$4.58	$11.13	$24.09
Subtotal	*$11.90*	*$1.66*	*$4.58*	*$13.61*	*$31.75*
Construction Cont.	$3.57	$0.50	$1.37	$4.08	$9.53
Subtotal	*$15.47*	*$2.15*	*$5.95*	*$17.69*	*$41.28*
Implementation	$4.64	$0.65	$1.79	$5.31	$12.38
Total	**$20.11**	**$2.80**	**$7.74**	**$23.00**	**$53.66**
Annual O&M Cost ($M/yr)					
Facility O&M	$0.27	$0.01	$0.01	$0.20	$0.48
RW Cost	$0.00	$0.00	$0.00	$0.00	$0.00
Total	**$0.27**	**$0.01**	**$0.01**	**$0.20**	**$0.48**
50-Year Present Value Analysis					
Present Value ($M)	$35.75	$3.14	$8.28	$33.92	$81.97
Total Yield (AF)	38,374	11,643	6,868	33,495	90,380
PV Unit Cost ($/AF)	**$930**	**$270**	**$1,210**	**$1,010**	**$910**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.8.1 Burbank System with Hansen Tank Connection

The addition of the DCT Connection and Hansen Connection WRPs to the Hansen System would convey DCTWRP tertiary product to Hansen Tank to serve customers upstream of Hansen Tank – VGS, planned Hansen Dam Golf Course WRP customers, and potential Vulcan WRP customers (if implemented) instead of using AWPF product water as proposed in the Valley – AWPF System. The system was defined to compare the costs of a new system with the avoided costs associated with AWPF production and the benefit of increased supply due to avoidance of AWPF concentrate. The system is also defined as part of the Valley – DCTWRP T22 System so that they can be compared when selecting the potential WRPs to implement for each system.

Table 7-32: Valley – Burbank System with Hansen Tank Connection – Summary

Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
1,836	1.64	3.27	$88.10	$0.48	$1,300

Implementation Considerations

Implementation of the Hansen Connection WRP has several significant impacts on other WRPs in the Burbank System that must be considered when they are implemented, including:

- Upsizing pipelines in the DCTWRP Connection, Valley College, and Cesar Chavez WRPs
- Increased head production from the North Hollywood Pump Station
- Removal of Valley Plaza facilities

The Vulcan WRP could be supplied with recycled water from the DCTWRP AWPF System, DCTWRP T22 System, or Burbank System. The only potential difference in the Vulcan WRP between the different systems is that the Hansen Connection WRP, which is associated with the

Facilities

The Hansen Connection and DCTWRP Connection WRPs incorporate the Hansen Tank into the Burbank System. The demand associated with the additions exceeds the available Burbank supply so DCTWRP tertiary product from the DCTWRP T22 Pump Station is the primary supply. The DCTWRP T22 Pump Station would directly supply the Hansen Tank and, as a result, the Valley Plaza facilities are not necessary and the discharge head from the pump station in North Hollywood would be increased to match the DCTWRP T22 Pump Station to be able to fill the Hansen Tank. The Burbank Connection would still operate as described but the use of Burbank recycled water and DCTWRP tertiary product would be optimized.

Each facility is further described below:

- **DCTWRP T22 Pump Station:** The pump station has two pumps (plus one standby) each with a capacity of 5,500 gpm at 270 ft head.

- **North Hollywood PRV, Tank, and Pump Station:** Compared with initial analysis, the pump station head will be increased from 280 ft to 340 ft.

Customers

Table 7-33: Valley – Burbank System with Hansen Tank Connection – Summary of Potential Customers

Potential Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating Initial	Conversion Rating Compre-hensive
Cesar Chavez, N. Hollywood, and Valley College WRPs Anchor Customers		865	0.77	1.49	N/A	N/A
Non-Anchor Customers (55)		971	0.87	1.78		
Total		**1,836**	**1.64**	**3.27**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.

Costs

Table 7-34: Valley – Burbank System with Hansen Tank Connection – Summary of Potential Costs

WRP / Item	Hansen Connection
Annual Yield (AFY)	1,836
Capital Cost ($M)	
Storage Tanks	--
Pump Stations	$5.98
PRVs	--
Pipelines	$46.16
Subtotal	*$52.13*
Construction Cont.	$15.64
Subtotal	*$67.77*
Implementation	$20.33
Total	**$88.10**
Annual O&M Cost ($M/Yr)	
Facility O&M	
RW Cost	--
Total	**$0.48**
50-Year Present Value Analysis	
Present Value ($M)	$119.2
Total Yield (AF)	91,811
PV Unit Cost ($/AF)	**$1,300**

Note: See **Appendix J** for detailed cost estimates.

7.9 Valley – Las Virgenes System

The potential Valley – Las Virgenes System includes potential WRPs to provide an alternative recycled water supply from DCTWRP for potential customers in the western San Fernando Valley. The system and potential WRPs are compared with serving similar customers from DCTWRP but the supply limitations and distance from DCTWRP lower the likelihood that many western San Fernando Valley customers will receive DCTWRP supplies. The Pierce College WRP is defined as part of this system and the Valley – DCTWRP T22 System so that they can be compared when selecting the potential WRPs to implement for each system.

Table 7-35: Valley – Las Virgenes System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Pierce College	666	0.59	1.04	$10.97	$0.36	$1,030
Woodland Hills	288	0.26	0.56	$12.68	$0.16	$1,590
Total	**954**	**0.85**	**1.60**	**$23.66**	**$0.51**	**$1,200**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

Las Virgenes Municipal Water District determined that some upgrades to their recycled water system would allow for service to customers associated with the Woodland Hills WRP. Furthermore, LVMWD has additional supplies available during off-peak periods but use of these flows would require some type of seasonal storage, making service to the Pierce College WRP customers not as cost effective. The cost of this storage has not yet been determined.

The Woodland Hills Country Club is the anchor customer for the Woodland Hills WRP. As such, any potential questions related to water quality must be addressed before this WRP can be implemented. The Pierce College WRP requires the Woodland Hills WRP to be constructed first. Also, service to its anchor customer, Pierce College, could also be provided as part of the DCTWRP T22 System.

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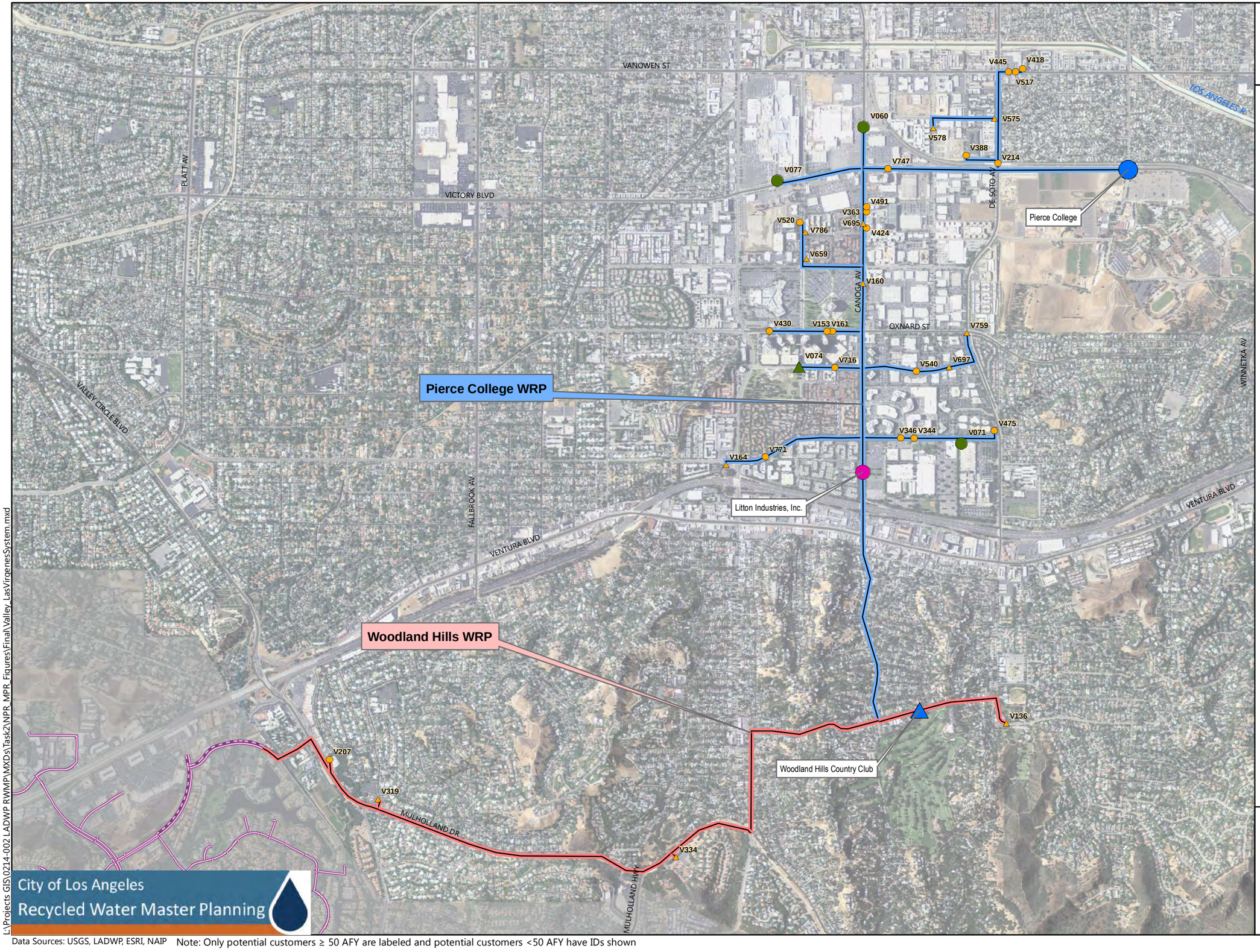
Potential System
Valley Las Virgenes
Figure 7-9



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facility
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Pierce College WRP
- Woodland Hills WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.25 0.5 Miles

City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-36: Valley – Las Virgenes System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Pierce College WRP		**666**	**0.59**	**1.04**		
Pierce College	Mixed-Use	190	0.17	0.29	A	A,A
Litton Industries, Inc.	Mixed-Use	75	0.07	0.11	A	--
Non-Anchor Customers (32)		399	0.36	0.63		
Woodland Hills WRP		**288**	**0.26**	**0.56**		
Woodland Hills Country Club	Irrigation	230	0.21	0.45	A	B,B
Non-Anchor Customers (4)		54	0.05	0.10		
Total[4]		**954**	**0.85**	**1.60**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

The system will rely on the pressure provided by LVMWD at the City border and does not need any additional pressure increases since customers are either at (approximately 950 ft) or below the service connection elevation.

The LVMWD Connection between LADWP and the LVMWD recycled water system is located at the City's border along El Canon Ave by the Motion Picture and Television Hospital. Receipt of up to 0.5 mgd requires approximately $3.5 million in upgrades to LVMWD recycled water system, including a new pipeline to get to the City's border and a pipeline to parallel a portion of their existing system.

Table 7-37: Valley – Las Virgenes System – Summary of Potential Costs

Item \ WRP	Pierce College	Woodland Hills	Total
Annual Yield (AFY)	666	288	954
Capital Cost ($M)			
Storage Tanks	--	--	--
Pump Stations	--	--	--
PRVs	--	--	--
Pipelines	$6.49	$7.50	$14.00
Subtotal	*$6.49*	*$7.50*	*$14.00*
Construction Cont.	$1.95	$2.25	$4.20
Subtotal	*$8.44*	*$9.76*	*$18.20*
Implementation	$2.53	$2.93	$5.46
Total	**$10.97**	**$12.68**	**$23.66**
Annual O&M Cost ($M/Yr)			
Facility O&M	$0.02	$0.01	$0.04
RW Purchase Cost	$0.33	$0.14	$0.48
Total	**$0.36**	**$0.16**	**$0.51**
50-Year Present Value Analysis			
Present Value ($M)	$34.39	$22.83	$57.27
Total Yield (AF)	33,317	14,394	47,711
PV Unit Cost ($/AF)	**$1,030**	**$1,590**	**$1,200**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates. The pipeline estimate for Woodland Hills WRP includes pipeline costs for the LVMWD recycled water system to provide the supply to LADWP.

7.10 Westside – Westside System

The potential Westside – Westside System includes potential WRPs to build off the existing system. The system expands the existing Westside System using recycled water produced by WBMWD at their ELWRF in El Segundo.

Table 7-38: Westside – Westside System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Laterals	390	0.35	0.61	$5.23	$0.30	$1,280
Penmar	177	0.16	0.35	$10.63	$0.14	$2,240
Potential Total	**568**	**0.51**	**0.96**	**$15.87**	**$0.44**	**$1,580**
Existing System	880	0.79	1.72	--	--	--
Planned System	610	0.54	0.91	--	--	--
System Total	**2,058**	**1.84**	**3.59**	**--**	**--**	**--**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

The system's primary issue is water age and LADWP is actively addressing this issue. One part of the solution to water age issues is the addition of customers to increase flow through the pipes and, in particular, to add customers at the end of the system. Therefore, LADWP should consider prioritizing the customers at the northern end of this WRP. Also, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.

The Penmar WRP and each lateral associated with the Laterals WRP can be implemented independently and will be dependent on confirmation of customer's ability to use recycled water and a review of their on-site conversion requirements.

The primary implementation consideration for the Penmar WRP is that the Penmar Water Quality Improvement Project (Penmar WQIP) is currently being implemented by the City's Bureau of Sanitation to serve non-potable water to the WRP's two anchor customers: Penmar Golf Course and Penmar Recreation Center. The project proposes to reuse dry weather stormwater for irrigation at these sites. Therefore, these customers' recycled water demand estimates will need to be reduced based on the amount of non-potable demand that is met by the Penmar WQIP. Then, the cost effectiveness of the WRP must then be revisited with the new recycled water demand estimate.

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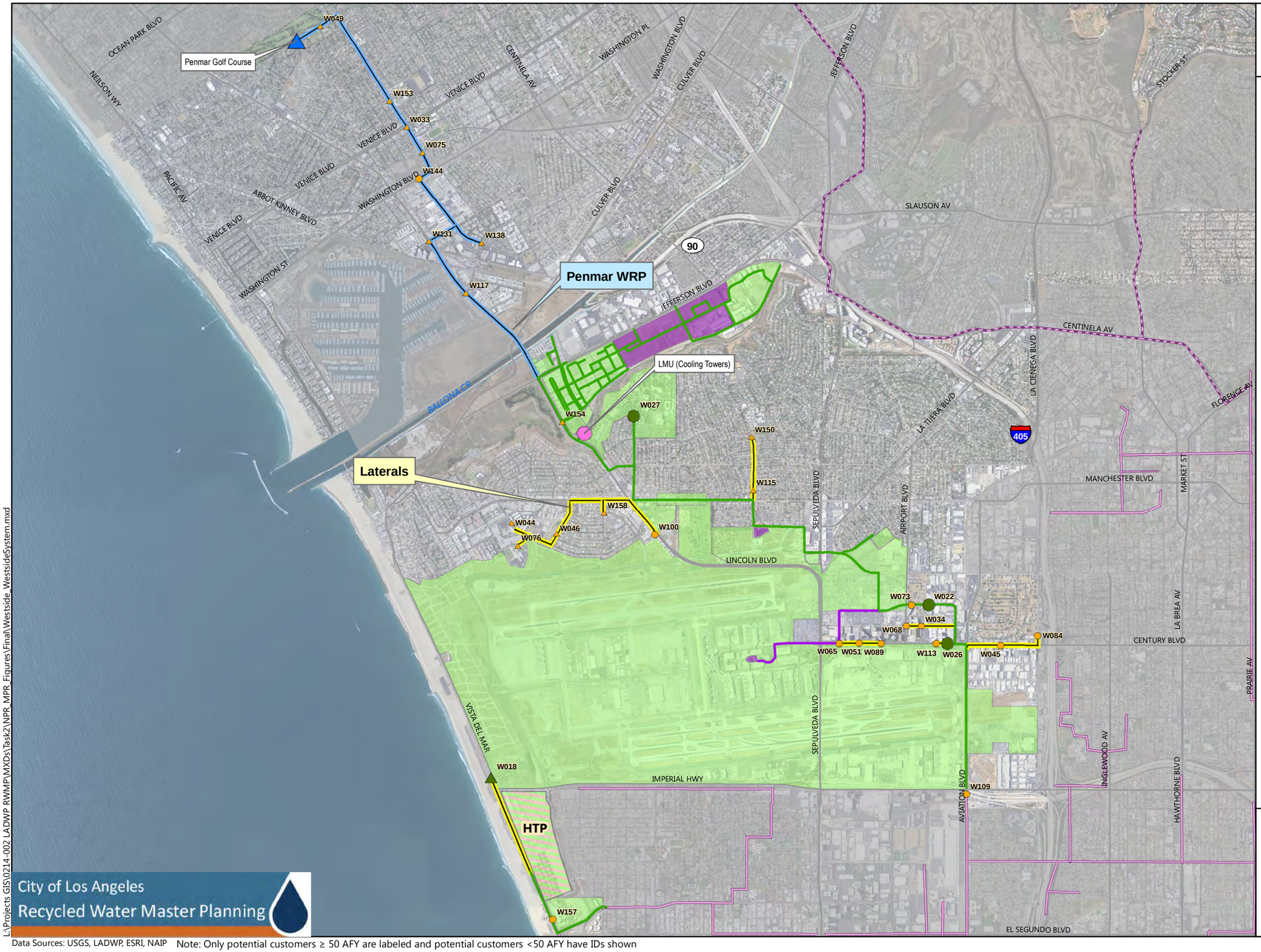
Potential System Westside Westside
Figure 7-10



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Existing Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Laterals
- Penmar WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-39: Westside – Westside System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Laterals WRP		**390**	**0.35**	**0.61**		
LMU (Cooling Towers)	Industrial	50	0.04	0.06	B	--
Non-Anchor Customers (23)		340	0.31	0.56		
Penmar WRP		**177**	**0.16**	**0.35**		
Penmar Golf Course	Irrigation	100	0.09	0.20	A	--
Non-Anchor Customers (8)		77	0.07	0.15		
Total[4]		**568**	**0.51**	**0.96**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

The system will rely on the pressure provided by WBMWD for the existing Westside System (at the LAX Connection) and does not need any additional pressure increases since customers are either at the elevation (approximately 950 ft) or below the elevation of the connection point.

Table 7-40: Westside – Westside System – Summary of Potential Costs

WRP / Item	Laterals	Penmar	Total
Annual Yield (AFY)	390	177	568
Capital Cost ($M)			
Storage Tanks	--	--	--
Pump Stations	--	--	--
PRVs	--	--	--
Pipelines	$3.10	$6.29	$9.39
Subtotal	*$3.10*	*$6.29*	*$9.39*
Construction Cont.	$0.93	$1.89	$2.82
Subtotal	*$4.02*	*$8.18*	*$12.20*
Implementation	$1.21	$2.45	$3.66
Total	**$5.23**	**$10.63**	**$15.87**
Annual O&M Cost ($M/Yr)			
Facility O&M	$0.01	$0.01	$0.03
RW Purchase Cost	$0.29	$0.13	$0.41
Total	**$0.30**	**$0.14**	**$0.44**
50-Year Present Value Analysis			
Present Value ($M)	$24.89	$19.90	$44.72
Total Yield (AF)	19,506	8,871	28,378
PV Unit Cost ($/AF)	**$1,280**	**$2,240**	**$1,580**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.11 Westside – Westwood System

The potential Westside – Westwood System includes potential WRPs to serve the set of large customers in the northern half of the Westside Service Area, which is far from existing recycled water infrastructure. The system uses recycled water produced by WBMWD at their ELWRF in El Segundo and connects to WBMWD's recycled water system at its terminus in Inglewood. The Inglewood extension was originally sized to accommodate a large LADWP recycled water system in the future.

Table 7-41: Westside – Westwood System – Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Kenneth Hahn	349	0.31	0.64	$14.67	$0.43	$2,430
UCLA	2,836	2.53	4.80	$61.28	$2.55	$1,610
Total	**3,185**	**2.84**	**5.44**	**$75.95**	**$2.98**	**$1,700**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

Since this system starts within the WBMWD service area, implementation of this WRP will require coordination with WBMWD (as the regional wholesaler) and their retailers serving customers in the area (Cal Am and Culver City). WBMWD has identified potential non-potable customers in their service area that could be added to the project. This provides an opportunity for cost-sharing of capital facilities but implementation is dependent on moving ahead with an agreement with WBMWD, Cal Am, and Culver City.

Also, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.

Each WRP can be implemented independently but each WRP has unique issues. The UCLA WRP has one of the largest potential non-potable demands in this report but all of the anchor customers are located at least 7 miles from the supply (at the WBMWD Inglewood connection) so significant capital investment must be undertaken prior to connecting any large customers. Within the Kenneth Hahn WRP there are plans to convert the existing oil operations to open space with public access. The park conversion may result in a large demand that could anchor this WRP and provide the opportunity to upgrade the aging irrigation system.

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Potential System
Westside Westwood
Figure 7-11

Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Existing Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Kenneth Hahn WRP
- UCLA WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.5 1 Miles

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

Veterans Tank
UCLA
Los Angeles Country Club
Trigen-LA Energy
Breitburn Energy
Veterans Administration
Riviera Country Club
Brentwood Country Club
Hillcrest Country Club
Cheviot Hills Rec Center
Rancho Park Golf Course
Palms Facilities
UCLA WRP
Kenneth Hahn WRP
Kenneth Hahn State Recreation Area
Jim Gilliam Recreation Center
Plains Exploration & Production Company (PXP)
Kenneth Hahn Facilities

W021 W096 W087 W121 W119 W048 W149 W055 W152 W036 W030 W124 W032 W059 W103 W066 W133 W094 W078 W114 W106 W091 W123 W107 W063 W047 W061 W120 W090 W132 W029 W050

SUNSET BLVD SAN VICENTE BLVD SEPULVEDA BLVD WILSHIRE BLVD SANTA MONICA BLVD BEVERLY DR BURTON WY 3RD ST ROBERTSON BLVD BEVERLY GLEN BLVD BEVERWIL DR PICO BLVD FAIRFAX AV OLYMPIC BLVD WESTWOOD BLVD BLUNDY DR GATEWAY BLVD NATIONAL BLVD VENICE BLVD WASHINGTON BLVD LA BREA AV SLAUSON AV 7TH ST LINCOLN BLVD OCEAN AV OCEAN PARK BLVD NEILSON WY PACIFIC AV ABBOT KINNEY BLVD CENTINELA AV WASHINGTON PL CULVER BLVD JEFFERSON BLVD LA CIENEGA BLVD STOCKER ST BALLONA CR

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City of Los Angeles
Recycled Water Master Planning

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Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

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Customers

Table 7-42: Westside – Westwood System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Compre-hensive[3]
Kenneth Hahn WRP		**349**	**0.31**	**0.64**		
Kenneth Hahn Rec Area	Irrigation	160	0.14	0.31	B	--
Jim Gilliam Rec Center	Irrigation	75	0.07	0.15	A	--
Plains Exploration & Production Company (PXP)	Industrial	50	0.04	0.06	--	--
Non-Anchor Customers (4)		63	0.06	0.12		
UCLA WRP		**2,836**	**2.53**	**4.80**		
UCLA	Mixed-Use	540	0.48	0.82	B	--
Veterans Administration	Mixed-Use	430	0.38	0.65	A	--
Rancho Park Golf Course	Irrigation	400	0.36	0.79	A	--
Brentwood Country Club	Irrigation	230	0.21	0.45	A	--
Riviera Country Club	Irrigation	180	0.16	0.35	A	--
Trigen-LA Energy	Industrial	170	0.15	0.20	B	--
Hillcrest Country Club	Irrigation	170	0.15	0.33	A	--
Breitburn Energy	Industrial	165	0.15	0.19	A	--
Los Angeles Country Club	Irrigation	140	0.12	0.27	A	--
Cheviot Hills Rec Center	Irrigation	70	0.06	0.14	A	--
Non-Anchor Customers (30)		341	0.30	0.60		
Total[4]		**3,185**	**2.84**	**5.44**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

The system will rely on the hydraulic pressure provided by WBMWD at the recycled water system's terminus in Inglewood and includes two additional independent pressure zones. Each WRP uses the initial pressure from the WBMWD connection and has a set of major facilities to increase pressure to meet customer service needs. The UCLA WRP includes a tank at the top of the system to provide floating head.

Each facility is further described:

- **WBMWD Connection:** The system connects to the WBMWD Title 22 system at its terminus in Inglewood. This portion of WBMWD's system was originally designed to provide several thousand acre-feet per year to LADWP in the future.
- **Kenneth Hahn PRV, Tank, and Pump Station:** The Kenneth Hahn WRP requires a PRV, storage tank, and pump station combination to create a new pressure zone to

provide adequate customer service pressures. A 12" PRV is required to break the pressure provided from the WBMWD Inglewood Connection and a 1.0 MG tank with a ground elevation of 270 ft and overflow elevation of 300 ft serves as a wet well to the pump station. The pump station has two pumps (plus one standby) each with 200 ft head at 550 gpm. All the facilities should be co-located. The facilities are assumed to be located along in Kenneth Hahn Park but a specific site was not identified to accommodate all three facilities.

- **Palms PRV, Tank, and Pump Station:** The UCLA WRP requires a PRV, storage tank, and pump station combination to create a new pressure zone to provide adequate customer service pressures. A 24" PRV is required to break the pressure provided from the WBMWD Inglewood Connection and a 0.4 MG tank with a ground elevation of 165 ft and overflow elevation of 195 ft serves as a wet well to the pump station. The pump station has two pumps (plus one standby) each with 340 ft head at 1,600 gpm. All the facilities should be co-located. The facilities are assumed to be located along the Overland Ave alignment between the City boundary at Venice Blvd and Pico Blvd but a specific site was not identified to accommodate all three facilities.
- **Veterans Tank:** The tank volume is 4.0 MG with a ground elevation of 490 ft and overflow elevation of 520 ft and provides floating head to the pressure zone created by the Palms facilities. The tank is assumed to be located somewhere near Knollwood Golf Course but a specific site was not identified.

Table 7-43: Westside – Westwood System – Summary of Potential Costs

Item \ WRP	Kenneth Hahn	UCLA	Total
Annual Yield (AFY)	349	2,836	3,185
Capital Cost ($M)			
Storage Tanks	$3.00	$9.60	$12.60
Pump Stations	$0.99	$2.22	$3.21
PRVs	$0.30	$0.35	$0.65
Pipelines	$4.39	$24.09	$28.49
Subtotal	*$8.68*	*$36.26*	*$44.95*
Construction Cont.	$2.60	$10.88	$13.49
Subtotal	*$11.28*	*$47.14*	*$58.44*
Implementation	$3.38	$14.14	$17.53
Total	**$14.67**	**$61.28**	**$75.97**
Annual O&M Cost ($M/Yr)			
Facility O&M	$0.18	$0.49	$0.67
RW Purchase Cost	$0.25	$2.07	$2.32
Total	**$0.43**	**$2.55**	**$2.99**
50-Year Present Value Analysis			
Present Value ($M)	$42.40	$228.24	$271.49
Total Yield (AF)	17,429	141,817	159,246
PV Unit Cost ($/AF)	**$2,430**	**$1,610**	**$1,700**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

7.12 Summary of Potential Systems

The estimated yield and cost for each potential system is summarized in **Table 7-44** and each potential WRP is summarized in **Table 7-45**.

Table 7-44: Summary of Potential Systems

	Demand Estimates (AFY)				Cost for Potential Systems	
Service Area / System	Existing Systems	Planned Systems	Potential Systems	Total	Capital Cost ($M)	PV Unit Cost
Harbor Service Area						
TIWRP System	3,000	210	2,132	5,342	$36.8	$1,740/AF
WBMWD System	--	9,300	1,199	10,499	$4.9	$1,160/AF
Gateway System	--	--	645	645	$6.2	$1,180/AF
Harbor Subtotal[1,2]	**3,000**	**9,510**	**2,881**	**15,391**	**$44.8**	
Metro Service Area						
LAGWRP System	2,430	2,370	3,485	8,285	$42.1	$330/AF
CBMWD System	--	--	3,831	3,831	$66.8	$1,110/AF
Metro Subtotal[1,3]	**2,430**	**2,370**	**5,011**	**9,811**	**$77.9**	
Valley Service Area[4]						
DCTWRP AWPF System	2,300	670	734	3,704	$15.5	$600/AF
DCTWRP T22 System	1,690	690	3,502	5,882	$111.0	$950/AF
Burbank System	--	--	1,808	1,808	$53.7	$910/AF
Las Virgenes System	--	--	954	954	$23.7	$1,200/AF
Valley Subtotal[1,5]	**3,990**	**1,360**	**6,808**	**12,118**	**$192.6**	
Westside Service Area						
Westside System	880	610	568	2,058	$15.9	$1,580/AF
Westwood System	--	--	3,185	3,185	$76.0	$1,700/AF
Westside Subtotal	**880**	**610**	**3,753**	**5,243**	**$91.8**	
Ultimate Total[1,2,3,4,5]	**10,300**	**13,850**	**18,453**	**42,603**	**$408.8**	
Planning Total[6,7,8]	**8,000[6]**	**11,350[7]**	**9,650[8]**	**29,000**	**$195.3**	**$990/AF**

1. Total and subtotal demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding.
2. Subtotal excludes 1,095 AFY of potential demand and $3.1 M of capital cost for the Harbor East and Warren E&P WRPs in WBMWD System because they are also included in the TIWRP System.
3. Subtotal excludes 2,305 AFY of potential demand and $31.0 M of capital cost for the USC WRP in the LAG System because it is also included in the CBMWD System.
4. Does not include the following alternative systems: Limited DCTWRP T22 System; DCT T22 System with Hansen Tank Connection; and Burbank System with Hansen Tank Connection.
5. Subtotal excludes 190 AFY of potential demand and $10.3 M of capital cost for the Pierce College WRP in the Las Virgenes System because it is also included in the DCTWRP T22 System.
6. Recent recycled water sales totaled 8,000 AFY but the ultimate demand estimate for existing customers is 10,300 AFY based on expected sales once all existing customer maximize available supplies.
7. Assumes all planned customers may not reach their ultimate demand or ultimately connect as customers.
8. As discussed in Section 1.7.2, this NPR Master Planning Report was developed to develop a suite of potential NPR projects to achieve at least 9,650 AFY.

Table 7-45: Summary of Potential WRPs

WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Harbor-TIWRP System						
Laterals	109	0.10	0.14	$0.62	$0.15	$1,420
Harbor East	799	0.71	0.93	$11.84	$1.08	$1,620
Peck Park	194	0.17	0.35	$5.93	$0.33	$2,380
POLA	268	0.24	0.42	$8.49	$0.37	$1,990
Ponte Vista	281	0.25	0.50	$7.03	$0.43	$2,070
SA Recycling	105	0.09	0.12	$1.85	$0.15	$1,710
Warren E&P	375	0.33	0.44	$1.01	$0.50	$1,370
Potential Total	**2,132**	**1.90**	**2.90**	**$36.77**	**$3.00**	**$1,740**
Existing System	3,000	2.68	2.68			
Planned System	210	0.19	0.37			
System Total	**5,342**	**4.77**	**5.95**			
Harbor-WBMWD System						
Laterals	104	0.09	0.19	$1.79	$0.09	$1,460
Harbor East	720	0.64	0.84	$2.80	$0.58	$1,150
Warren E&P	375	0.33	0.44	$0.27	$0.30	$1,080
Potential Total	**1,199**	**1.07**	**1.46**	**$4.86**	**$0.97**	**$1,160**
Existing System	--	--	--			
Planned System	9,300	8.3	12.0			
System Total	**10,499**	**9.37**	**13.46**			
Harbor-Gateway System						
Roosevelt	123	0.11	0.22	$2.70	$0.10	$1,470
Swisstex	523	0.47	0.61	$3.52	$0.39	$1,120
Potential Total	**645**	**0.58**	**0.83**	**$6.21**	**$0.48**	**$1,180**
Metro-LAGWRP System						
Laterals	565	0.50	1.00	$6.35	$0.07	$340
Atlas Carpets	310	0.28	0.36	$0.84	$0.02	$130
Medical Center	264	0.24	0.47	$3.96	$0.03	$400
USC	2,345	2.09	3.09	$30.99	$0.20	$350
Potential Total	**3,485**	**3.11**	**4.92**	**$42.14**	**$0.32**	**$330**
Existing System	2,430	2.17	4.77			
Planned System	2,370	2.12	4.56			
System Total	**8,285**	**7.40**	**14.25**			
Metro-CBMWD System						
Downtown	884	0.79	1.18	$24.32	$0.65	$1,500
Echo Park	282	0.25	0.51	$7.23	$0.19	$1,380
LAGWRP Conn.	60	0.05	0.07	$3.01	$0.04	$1,860
USC	2,605	2.33	3.50	$32.24	$1.34	$930
Potential Total	**3,831**	**3.42**	**5.27**	**$66.80**	**$2.22**	**$1,110**

Valley-DCTWRP AWPF System						
Laterals	438	0.39	0.68	$6.99	$0.05	$420
Vulcan	296	0.27	0.47	$8.47	$0.08	$870
Potential Total	**734**	**0.66**	**1.15**	**$15.45**	**$0.13**	**$600**
Existing System	2,298	2.05	2.83			
Planned System	671	0.60	1.26			
System Total	**3,703**	**3.31**	**5.24**			
Valley-DCTWRP T22 System						
Laterals	195	0.17	0.37	$4.51	$0.03	$660
Braemar	707	0.63	1.36	$21.32	$0.18	$920
Knollwood	1,074	0.96	2.09	$35.12	$0.45	$1,170
Pierce College	261	0.23	0.40	$7.80	$0.04	$790
Reseda WRP	88	0.08	0.17	$9.80	$0.02	$2,480
VA Hospital	1,177	1.05	1.87	$32.44	$0.20	$750
Potential Total	**3,502**	**3.13**	**6.26**	**$110.95**	**$0.92**	**$950**
Existing System	1,690	1.51	3.32			
Planned System	688	0.61	1.35			
System Total	**5,880**	**5.25**	**10.93**			
Valley-Burbank System						
Cesar Chavez	767	0.69	1.29	$20.11	$0.27	$930
Laterals	233	0.21	0.43	$2.80	$0.01	$270
N. Hollywood	137	0.12	0.26	$7.74	$0.01	$1,210
Valley College	670	0.60	1.24	$23.00	$0.20	$1,010
Potential Total	**1,808**	**1.61**	**3.23**	**$53.66**	**$0.48**	**$910**
Valley-Las Virgenes System						
Pierce College	666	0.59	1.04	$10.98	$0.36	$1,030
Woodland Hills	288	0.26	0.56	$12.68	$0.16	$1,590
Potential Total	**954**	**0.85**	**1.60**	**$23.66**	**$0.52**	**$1,200**
Westside-Westside System						
Laterals	390	0.35	0.61	$5.23	$0.30	$1,280
Penmar	177	0.16	0.35	$10.63	$0.14	$2,240
Potential Total	**568**	**0.51**	**0.96**	**$15.87**	**$0.44**	**$1,580**
Existing System	880	0.79	1.72			
Planned System	610	0.54	0.91			
System Total	**2,058**	**1.84**	**3.59**			
Westside-Westwood System						
Kenneth Hahn	349	0.31	0.64	$14.67	$0.43	$2,430
UCLA	2,836	2.53	4.80	$61.28	$2.55	$1,610
Potential Total	**3,185**	**2.84**	**5.44**	**$75.97**	**$2.99**	**$1,700**
Potential Total	**18,453**	**16.48**	**N/A**	**$408.8**	**$11.35**	
Planned Total	**9,650**	**10.81**	**N/A**	**$195.3**	**$4.5**	**$990/AF**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding.

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8. Implementation Plan

As discussed in Section 1.7.2, this NPR Master Planning Report was developed to provide a suite of potential NPR projects to achieve at least 9,650 AFY. When combined with the 19,350 AFY of existing and planned NPR demands and 30,000 AFY from the GWR project, these projects will achieve the City's goal of 59,000 AFY. Implementation of the existing, planned, and potential NPR portion of LADWP's Recycled Water Program is discussed in this section.

8.1 LADWP NPR Program

A representative subset of potential WRPs to achieve 9,650 AFY was combined with existing and planned WRPs to form a sample LADWP Non-Potable Recycled Water Program to achieve 29,000 AFY by 2035. A summary of the three components in the example 29,000 AFY NPR program is presented in **Table 8-1**.

Table 8-1: Summary of 29,000 AFY Program Costs

	Existing Projects	Planned Projects	Potential Projects	Total
Annual Yield (AFY)	8,000	11,350	9,650	29,000
Capital Cost ($M)	--[a]	$300.2 [a]	$195.3	$495.5
Annual O&M ($M)	$7.3	$10.6	$4.5	$22.4
50-Year Lifecycle Analysis				
			Present Value ($M)	$1,475.0
			50-Year Program Yield (AF)	1,297,830
			PV Unit Cost ($/AF)	**$1,140**

Note:

a. Capital expenditures for work done prior to July 2011 are not included in this assessment.

The representative subset of potential WRPs was chosen only for purposes of estimating the total possible cost of the NPR System and does not represent the final projects that LADWP may implement in future years. The specific potential NPR projects eventually chosen for implementation will be dependent on a number of factors, including cost-effectiveness, constructability, availability of recycled water, and customer viability. These factors will all be evaluated and considered further during the planning, selection and implementation of the potential NPR projects.

8.2 Financial Analyses

This section presents financial analyses of the NPR program costs presented in Section 8.1. There are many different ways that the NPR program could be financed, which impacts the total cost of the program. In this section two potential methods are presented, "pay-as-you-go" (no financing) and financing using borrowed funds, with the resulting cumulative cost over a 50-year period. For both evaluations, the projected cumulative cost is compared with projected Tier 1 Metropolitan Water District of Southern California (MWD) imported water cumulative costs.

8.2.1 Pay-As-You-Go Analysis

Historically, LADWP has funded its recycled water projects entirely through its Water Rates Ordinance Water Procurement Adjustment Surcharge (Surcharge) without borrowing money. This is called the "pay-as-you-go" method that provides funding during each of the project's planning, design, and construction phases, and also for ongoing O&M costs.

To evaluate and compare future recycled projects for the RWMP documents, a standard economic method called the present value (PV) approach was used. This approach first estimates future capital and O&M costs for the lifecycle of each project, accounting for inflation. Then all future year O&M and capital costs are brought back to PV terms using a discount rate. The discount rate accounts for the time value of money, which captures the economic principle that a dollar today is worth more than a dollar tomorrow because of the opportunity cost or investment potential. Typically the discount rate is set equal to the interest rate if capital costs are financed using borrowed funds. However, for the pay-as-you-go analysis presented in the RWMP documents, the discount rate was set at 3% (equal to projected inflation) as historically LADWP has not financed recycled water program capital costs using borrowed funds and unused monies from the Surcharge cannot be carried over to subsequent years.

To determine the cost-effectiveness of the recycled water projects under pay-as-you-go financing, a PV unit cost in dollars per acre-foot ($/AF) for the NPR program was estimated by taking the sum of the PV costs divided by the sum of water yield over the 50-year life of the program. This PV unit cost was then compared to the PV unit cost of MWD Tier 1 water purchases.

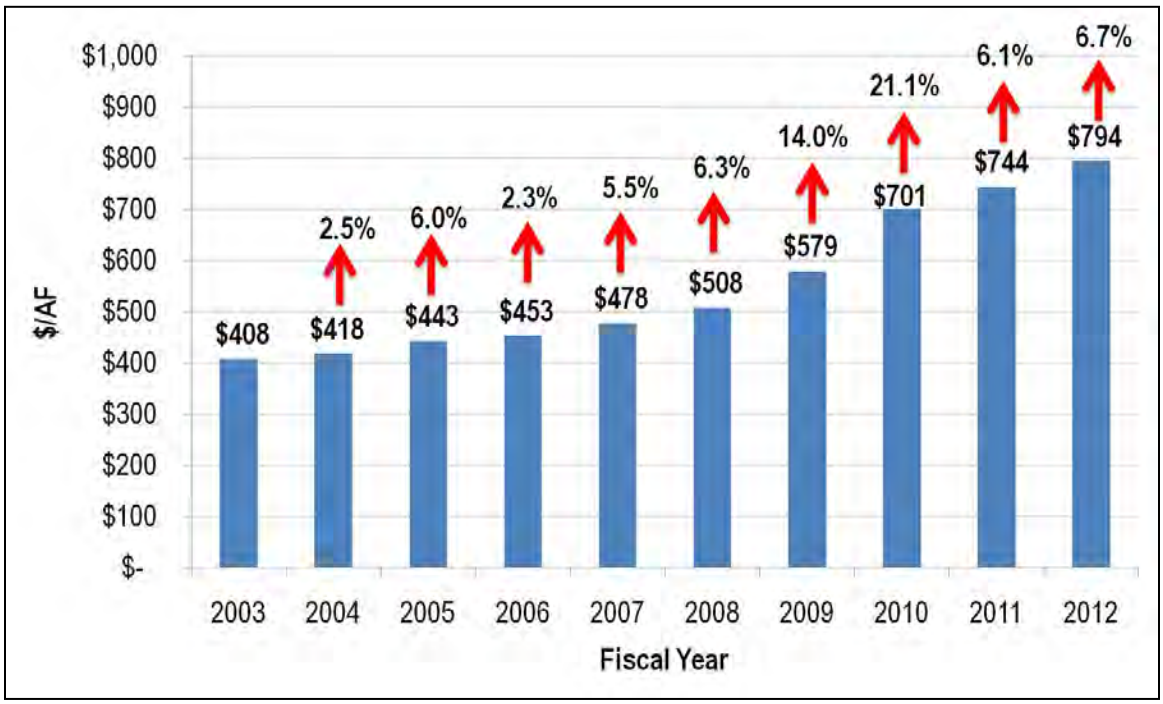
The PV unit cost for the NPR program is estimated to be $1,140/AF, which includes potential capital and O&M costs (summarized in Section 8.1) over the 50-year life of the recycled water projects. The PV unit cost for MWD water purchases over the same 50-year period is estimated to be $1,366/AF, which is about 20% greater than the estimated PV for the NPR program.

Present Value of Forecasted MWD Tier 1 Water Rates

LADWP purchases imported water from MWD under both Tier 1 and Tier 2 treated water rates. MWD sells a limited amount of Tier 1 imported water to each of its contractors (such as LADWP) and, once this allotment is met, the contractor must purchase more expensive Tier 2 supplies. Based on LADWP's UWMP, LADWP plans to stay within their Tier 1 allotment throughout the project period (through 2035). As a result, the cost of providing 29,000 AFY through the NPR program is being compared to the cost of MWD Tier 1 imported water. For the purpose of this comparison, the PV of water purchase costs for MWD Tier 1 imported water were estimated based on MWD Tier 1 rate projections.

As shown in **Figure 8-1**, MWD rates have increased significantly over the last 10 years. The figure shows those increases from FY 2003 through FY 2012. The increases may seem smooth, but looking at it on an annual basis you can see they are highly volatile, ranging from a low of 2.3% to a high of over 21%. This makes estimating rates into the future very difficult.

Figure 8-1: Historical and Approved MWD Tier 1 Imported Water Rates

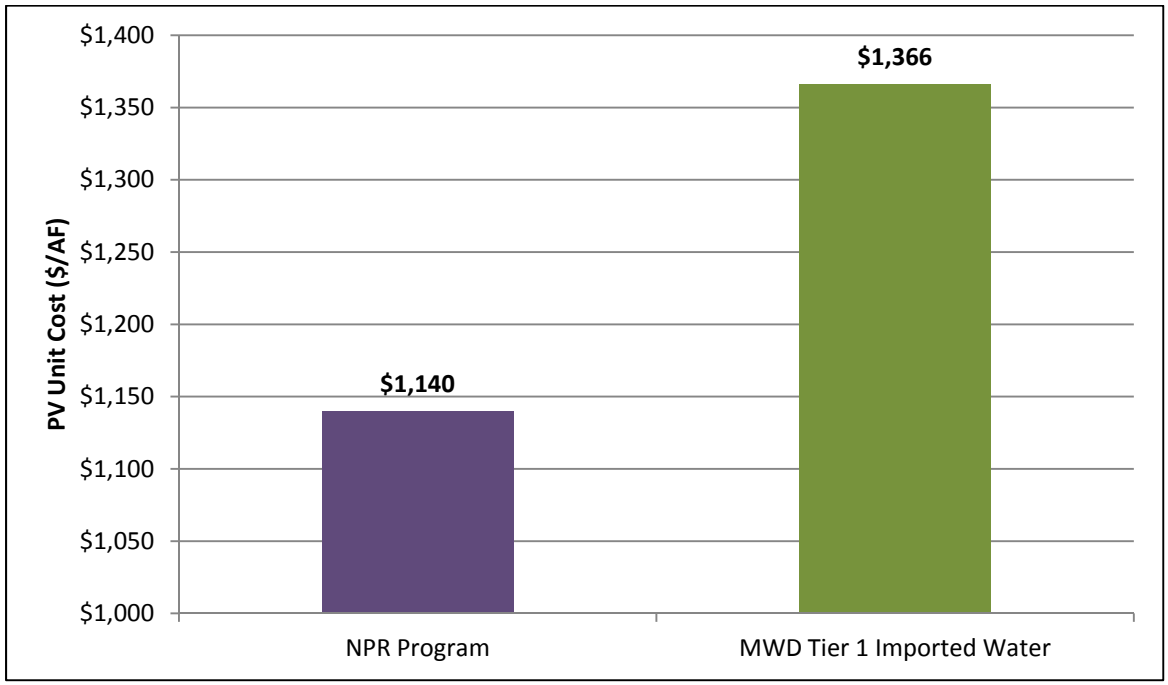


In July 2010, MWD issued a draft water rate forecast through 2018. The forecasted annual rate increase averaged 5% for Tier 1 water. For years after 2018 it was assumed that MWD's Tier 1 water rates would continue to increase at an average of 5% per year. This assumption was discussed with MWD's water resources group and they concurred that it was a good "planning" estimate, as there are a lot of unknowns such as how much a Delta solution would cost, when it would be implemented, and how costs for this solution would be allocated.

Based on current MWD rate projections through 2018 (averages 5% per year), historical rate increases (through 2012), and an assumed 5% annual growth from 2019 on, the future MWD Tier 1 rates were forecasted. This is conservative in comparison with 2004 to 2012 historical increases from MWD that averaged just under 8% per year (as shown in Figure 8-1).

Using this forecast, the PV of future MWD Tier 1 imported water rates were estimated to compare to the PV for the NPR program. The PV of the future MWD Tier 1 imported water is $1,366/AF. **Figure 8-2** shows the PV unit costs for the imported water rate projections along with the present value unit costs for the NPR program. As shown in the figure, the NPR program costs less than purchasing Tier 1 water from MWD.

Figure 8-2: PV Unit Cost for NPR Program Compared with Projected MWD Tier 1 Imported Water



8.2.2 Alternative Financial Analysis (Long-Term Financing)

An alternative funding approach is to borrow money through long-term financing to fund capital expenditures. Borrowing to fund these costs reduces the near-term impact on customer's water rates, but the costs will have to be repaid with interest, but over a long-term period.

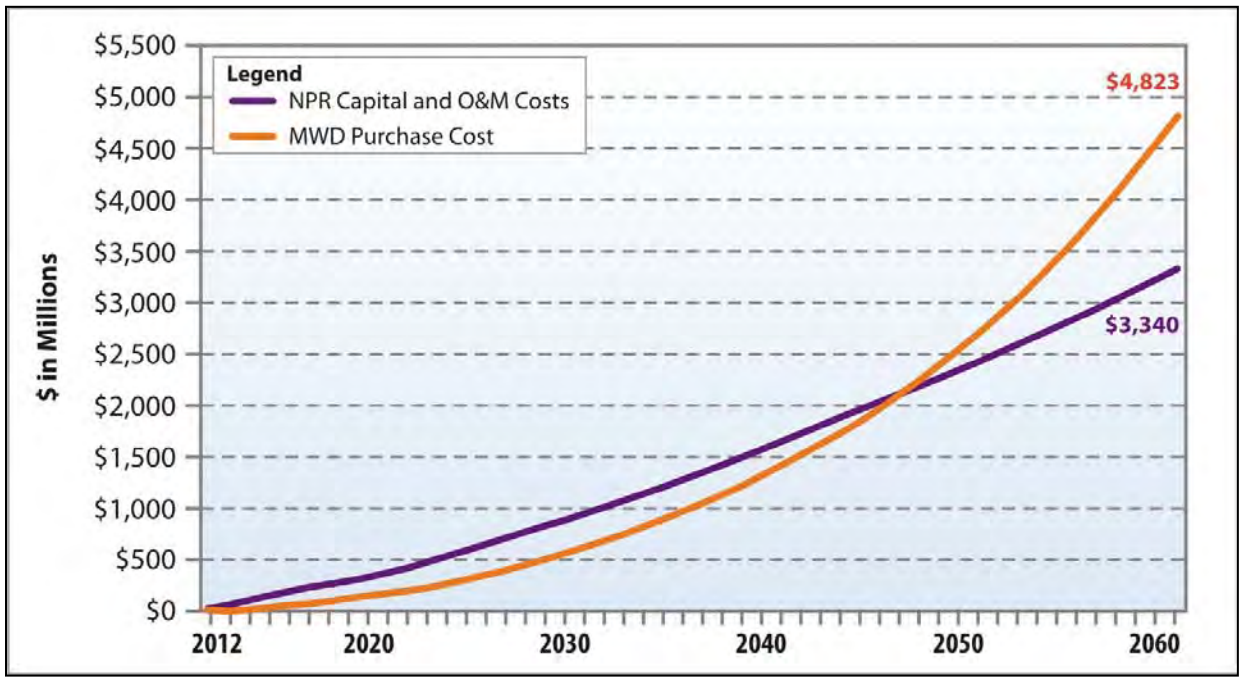
To determine the annual expenditures of the recycled water projects using this alternative funding approach, the following assumptions were made:

1. Sixty percent of capital expenditures are financed over 30 years at 5% interest, resulting in an annual amortized payment
2. The remaining forty percent of capital expenditures plus O&M costs are paid using the "pay as you go" method in each future year
3. All costs include the effects of inflation

The above costs are projected for each year and added together to arrive at a total annual project cost. **Figure 8-3** shows the cumulative annual expenditures over a 50-year period compared to the cumulative costs of purchasing equivalent amounts of Tier 1 MWD water. The same assumption regarding the future cost of MWD water used for the "pay-as-you-go" method described in Section 8.2.1 was used for this comparison.

The cumulative cost for the NPR program is $3.34 billion. Comparatively, the cumulative cost of purchasing MWD water is $4.82 billion. The payback year for the NPR program is 2047. A similar cumulative cost analysis for the pay-as-you-go model yields a 50-year NPR program cost of $3.01 billion (payback year of 2043).

Figure 8-3: Cumulative NPR Program Costs Compared with Projected MWD Water Purchases



8.2.3 Conclusion

In conclusion, cumulative MWD water purchases over a 50-year period are expected to be greater than LADWP's NPR program costs under either financing model. MWD water purchases will be 60% greater under the pay-as-you-go analysis and 44% under the alternative financial analysis. **Over the long term, the NPR program will cost less than the cost of purchasing MWD imported water**.

In addition, there are important operational and reliability benefits that are gained by having an increased amount of local water supplies. Recycled water is not subject to drought or imported water short or long term emergency outages that can significantly reduce MWD's imported water availability to Los Angeles.

8.3 Next Steps

Implementation of the GWR project and NPR program will be done concurrently as funding is available. Water recycling projects (WRPs) selected for implementation will consist of cost effective projects with a higher ease of implementation, lower capital costs, and anchor customers with high conversion ratings. Ultimately, LADWP will implement enough WRPs to result in non-potable reuse of at least 29,000 AFY by 2035, including 9,650 AFY of potential NPR projects developed in this report.

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