DRAFT Technical Memorandum No. 3

ULARA Salt and Nutrient Management Plan

Subject: **Goals and Objectives**

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Acronyms and Abbreviations

AF	Acre-feet
AFY	Acre-feet per year
Basin Plan	Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties
BWP	Burbank Water and Power
BWRP	Burbank Water Reclamation Plant
CVWD	Crescenta Valley Water District
GLAC	Greater Los Angeles County
GWP	Glendale Water and Power
GWR	Groundwater Replenishment
HSG	Hansen Spreading Grounds
IRWM	Integrated Regional Water Management
IW	Imported Water
LACDPW	Los Angeles County Department of Public Works
LADWP	Department of Water and Power
LAGWRP	Los Angeles-Glendale Water Reclamation Plant
LARWQCB	Los Angeles Regional Water Quality Control Board
LID	Low Impact Development
PSG	Pacoima Spreading Grounds
PWP	City of Pasadena Department of Water and Power
RW	Recycled Water
S/Ns	Salts/Nutrients
SFB	San Fernando Groundwater Basin
SNMP	Salt and Nutrient Management Plan
SW	Stormwater
SWP	State Water Project
TM	Technical Memorandum
TSG	Tujunga Spreading Grounds
ULARA	Upper Los Angeles River Area
WRP	Water Reclamation Plant

1 Purpose of TM

This Technical Memorandum (TM) describes the goals and objectives for the Upper Los Angeles River Area (ULARA) Salt and Nutrient Management Plan (SNMP), with the specific purpose of estimating the amount of groundwater recharge that may occur in the future in the ULARA groundwater basins. The TM identifies target volumes for recycled water and stormwater recharge, non-potable irrigation, imported water irrigation, groundwater irrigation, stormwater irrigation, and water conservation looking ahead to 2025, the planning horizon for the SNMP. These estimates are based on information provided through previous planning efforts in the ULARA region, including the 2013 Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Plan Update and other water-supply planning documents, as well as information reported by the Parties to the ULARA Judgment who are involved with the development of the ULARA SNMP.

The projected volumes for the various groundwater recharge mechanisms described herein will be used in the mixing model that is being developed as part of the ULARA SNMP.

2 Relationship to ULARA SNMP Draft Outline

A Draft Outline of the SNMP for ULARA (Draft Outline) was developed by the ULARA Watermaster and reviewed by the Los Angeles Regional Water Quality Control Board (LARWQCB) in January 2013. Revisions were subsequently made in response to comments from the LARWQCB. The revised Draft Outline designated two topics to be covered under "Groundwater Management Goals and Objectives". These two topics are incorporated into the organizational structure of this TM and are cross-referenced as described in **Table 1**.

Table 1: Draft Outline SNMP Topics Cross-Referenced in This TM

Draft Outline Topic	Section Number in this TM	Section Title in this TM
XXI. Groundwater Management Goals & Objectives:		
Recycled Water Use/Recharge Goals and Objectives	3.4 and 3.5	Recycled Water Direct Use Recycled Water Recharged
Stormwater Use/Recharge Goals and Objectives	3.6 and 3.7	Stormwater Direct Use Stormwater Recharged

3 Assumptions and Methodology

This TM uses existing documents as the basis for recharge and irrigation projections to 2025. The 2013 GLAC IRWM Plan contains water supply targets for each of the five sub-regions within the GLAC IRWM Region. One of the sub-regions, the Upper Los Angeles River (ULAR) IRWM sub-region, has geographic boundaries similar to those in the ULARA SNMP area. Because of this similarity, and since the GLAC IRWM water supply targets include the irrigation and recharge categories that are relevant for the ULARA SNMP, they are a useful starting point for developing several of the recharge/irrigation projections necessary for the mixing model work.

Several categories of supplies were identified in the GLAC IRWM Plan. These supply categories included: groundwater, imported water for direct use, imported water for recharge, recycled water for direct non-

potable use, recycled water for recharge, stormwater for direct use, stormwater for recharge, and water conservation. Supply targets were estimated for each category of supply based on specific assumptions listed in the IRWMP documents.

It is important to note that not all projections in this TM are based on information in the GLAC IRWM supply targets. For those projections that are based on the GLAC IRWM, differences between the adjudicated boundary of the ULARA and the ULAR sub-region boundary are accommodated using the following two adjustments as part of the methodology for recharge and irrigation numbers:

Adjustment 1 to account for difference between GLAC IRWM area and ULARA SNMP area:

Figure 1 identifies the overlaps between the ULARA SNMP region, the GLAC IRWM ULAR sub-region, and the Los Angeles River Watershed.[1] Due to the boundary differences, modifications to the GLAC IRWM water supply targets were necessary. The ULARA SNMP area is completely contained within the ULAR IRWM sub-region, and the geographic boundaries are identical except for the eastern portion of the sub-region. As shown in **Figure 1**, the ULARA SNMP area covers approximately 90 percent of the ULAR IWRM sub-region. Further, it was determined, using a geographic information system (GIS), that the ULARA SNMP area includes approximately 85 percent of the population of the IRWM sub-region. Therefore, some of the GLAC IRWM water supply target values are adjusted by 90 percent or 85 percent, respectively, depending on whether the values are correlated more closely to area or population. Again, not all of the projections herein are based on GLAC IRWM water supply numbers. Specific assumptions for each type of supply are described below.

Adjustment 2 to allocate to sub-areas within the ULARA SNMP area:

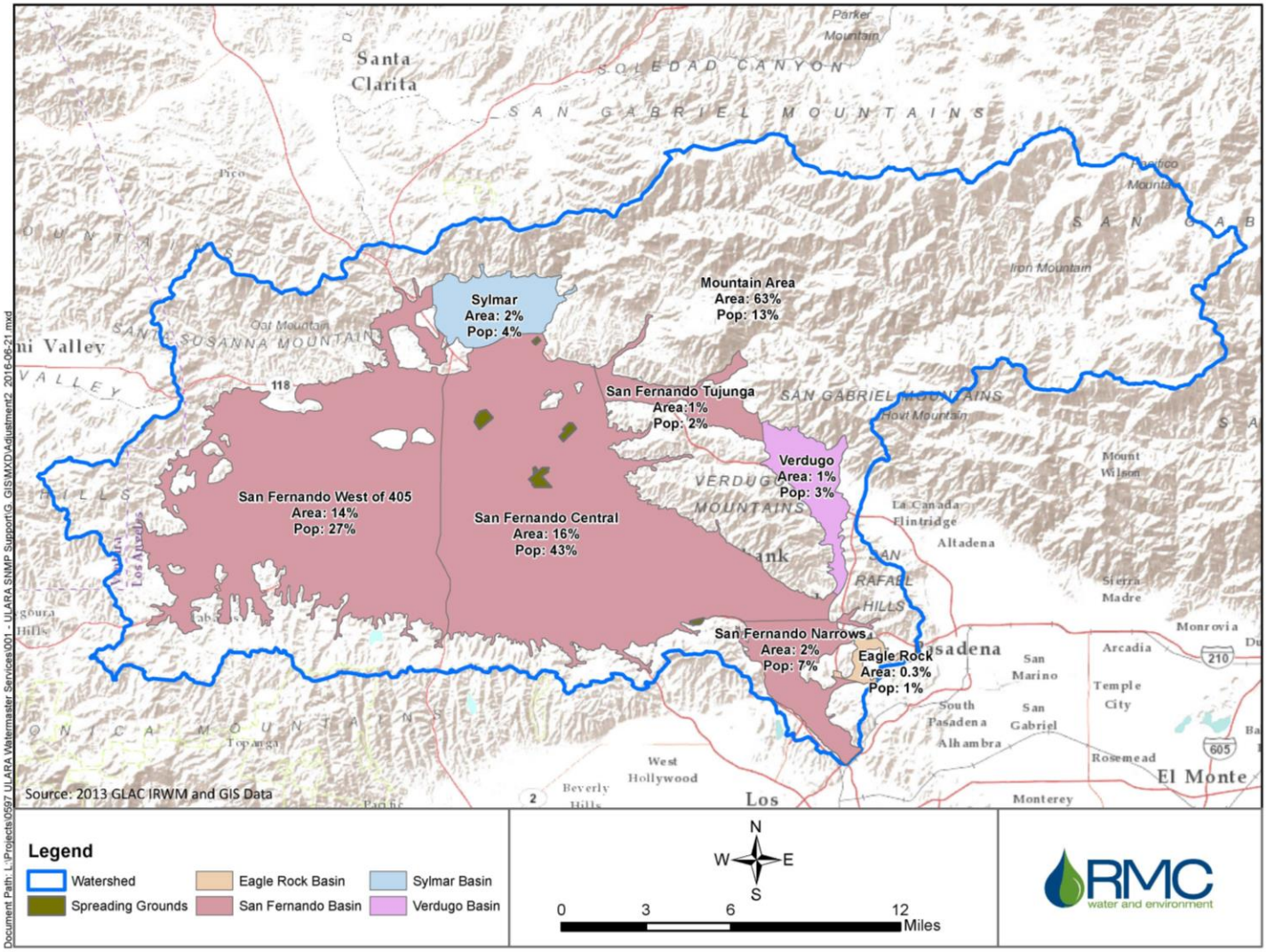
Projections for each type of supply were further adjusted to allocate volumes to each of the sub-areas in ULARA. The approximate boundaries and names of the sub-areas were generally mentioned in the Regional Water Quality Control Board in the Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), and represent different management areas for groundwater quality in ULARA. The sub-areas are shown in **Figure 2** and include: the San Fernando basin sub-areas – West of the 405, Central, Tujunga, and Narrows; the Sylmar sub-area; the Verdugo sub-area; the Eagle Rock sub-area; and the Mountain sub-area.[2]

These two adjustments apply to many of the supply projections listed herein that were derived from the GLAC IRWMP. Additional details on the methodologies for apportioning each specific type of water supply (for recharge or irrigation) to the ULARA sub-areas are provided in the sections that follow. The main purpose for each methodology is to estimate the amount of water that is percolated into the ULARA sub-areas either directly through artificial recharge (e.g., spreading operations) or indirectly through irrigation return flows. The methodologies and projections used in each case are summarized in **Table 2**.

[1] The boundary of the Los Angeles River Watershed is included for context.
[2] Remaining portions of ULARA (i.e., not designated as a sub-area) are referred to as "Other" in Figure 2.

Figure 1: Difference Between ULAR IRWM Sub-Region Boundary and ULARA SNMP Area

Figure 2: ULARA Sub-Areas by Area and Population Distribution



3.1 Groundwater Delivered

"Groundwater Delivered" is groundwater that is pumped from the San Fernando, Sylmar, Verdugo, and Eagle Rock basins and delivered to end uses in each of the ULARA sub-areas. Outdoor end uses result in water percolating back into the groundwater basins, whereas indoor end uses are typically sewered and ultimately flow to wastewater treatment plants.

To estimate the amount of groundwater that is ultimately re-introduced back into each of the ULARA sub-areas, the following methodology was used. First, GLAC IRWM water supply targets for "Groundwater Pumped" were modified using Adjustment 1 (**Figure 1**). It was assumed that groundwater supplies, obtained from production wells, have end uses that are distributed roughly by area; thus, a 90 percent adjustment was used. Then, to allocate these supplies to each ULARA sub-area, a document provided by the ULARA Watermaster was used. The document is an Excel spreadsheet entitled "Delivered Water by Sub-Area" that tracks water deliveries within ULARA on a year-to-year basis according to data derived from Annual Watermaster reports. It is important to note that not all of the groundwater that is pumped from the ULARA groundwater basins is delivered to users in the ULARA basins. The delivery infrastructure for LADWP is constructed such that a portion of the groundwater pumped from the ULARA sub-basins is delivered for use in the Metro Los Angeles area, outside of the San Fernando Valley. Therefore, for the Water Years 2001-02 through 2011-12, average percentages of groundwater pumped that was delivered to each sub-area were calculated. Then these percentages were applied to the adjusted GLAC IRWM supply targets for 2015, 2020, and 2025 to provide acre-feet per year (AFY) estimates of Groundwater Delivered by Sub-Area to account for groundwater that is pumped from the ULARA groundwater basins, but delivered to customers outside of ULARA.

Finally, these percentage values by sub-area were adjusted to account for outdoor irrigation versus indoor uses. An outdoor water factor of 45 percent was used. This value is based on typical outdoor potable water use reported by the ULARA parties. The actual estimates of outdoor water use reported by the parties were:

- Los Angeles Department of Water and Power (LADWP) – 39% outdoor use
- Burbank Water and Power (BWP) – Normally estimated to be 50% outdoor use, but recently 35% to 40% may be more accurate with outdoor watering restrictions imposed due to the ongoing drought
- Glendale Water and Power (GWP) – 47% outdoor use overall for the City. Outdoor use in Verdugo Basin is higher than in the San Fernando Basin, and outdoor use in the portion of the City that overlies the Verdugo Basin may be closer to 55%.
- Crescenta Valley Water District (CVWD) – estimated to be 50% outdoor use
- City of San Fernando – estimated to be 40% outdoor use, consistent with estimates by the Metropolitan Water District of Southern California (MWD).

The calculation for each ULARA sub-area may be performed using the following formula:

Groundwater Delivered = [GLAC IRWM supply target] * [90% Adjustment 1] * [sub-area percentage] * [45% outdoor use factor]

This methodology assumes that the distribution of future groundwater use inside ULARA will be reflective of historical groundwater distribution as tracked by the Watermaster. See **Table 2** for projected values.

3.2 Imported Water Delivered

"Imported Water Delivered" is water obtained supplies outside the region and delivered to end uses inside ULARA via the Los Angeles Aqueduct (LAA) and MWD. These combined supplies were derived from values reported in the Annual Watermaster reports.

To estimate the portion of imported water that is ultimately delivered into each of the ULARA sub-areas, the following methodology was used. First, GLAC IRWM water supply targets for "Imported Water" were modified using Adjustment 1 (Figure 1). It was assumed that imported supplies have end uses that are distributed roughly by area; thus, a 90 percent adjustment was used. Then, to allocate these supplies by ULARA sub-area, the Annual Watermaster report data was used. To determine these values, the Watermaster tallied the volume of imported water delivered to each groundwater basin as listed in the Annual ULARA Watermaster reports. Then, to divide the deliveries into the separate sub-areas of the San Fernando Basin, it was necessary to use LADWP-provided percentages of the overall delivered water that was delivered to the subareas. This was accomplished by LADWP via a GIS exercise, using actual point-of-delivery information. For the Water Years 2001-02 through 2011-12, average percentages of imported water delivered for each sub-area were calculated and then applied to the adjusted GLAC IRWM supply targets for 2015, 2020, and 2025 to yield AFY estimates of Imported Water Delivered by sub-area.

Finally, these percentage values by sub-area were adjusted to account for outdoor irrigation versus indoor uses. An outdoor water factor of 45 percent was used, based on typical outdoor potable water use reported by the LADWP, BWP, GWP, and CVWD.

The calculation for each ULARA sub-area may be determined using the following formula:

> ***Imported Water Delivered = [GLAC IRWM supply target] * [90% Adjustment 1] * [sub-area percentage] * [45% outdoor use factor]***

This methodology assumes that the distribution of future imported water use inside ULARA will be reflective of historical imported water use as tracked by the Watermaster. See **Table 2** for projected values.

3.3 Imported Water Recharged

"Imported Water Recharged" is water obtained from supplies outside the region via the LAA and MWD, and delivered to engineered recharge sites inside ULARA. Water supplies that are directly recharged constitute an "outdoor use" that does not require an adjustment factor.

To estimate the amount of imported water that is directly recharged into each of the ULARA sub-areas, a document provided by LADWP was used. This document, entitled "Recharge Table 1", records and projects recharge volumes for the years 2013 to 2050 at each spreading facility. The only spreading facility that is projected to recharge imported water into the future is Pacoima Spreading Grounds. Pacoima Spreading Grounds recharged approximately 7,525 AFY in 2015, and is estimated to recharge an average of 7,425 AFY in 2020 and 2025. This is water that BWP purchases and spreads. The Pacoima Spreading Grounds are located in the San Fernando – Central ULARA sub-area, so that is the only sub-area assumed to receive imported water for recharge. See **Table 2** for projected values.

3.4 Recycled Water Direct Use

"Recycled Water Direct Use" is treated effluent produced from local water reclamation plants (WRP) such as the Donald C. Tillman WRP, the Los Angeles-Glendale WRP, the Burbank WRP, and the Tapia Water Reclamation Facility. The effluent, treated to Title 22 disinfected tertiary recycled water standards, is then delivered to end uses in each of the ULARA sub-areas. Recycled water is typically reserved for non-potable end uses and its percentage of outdoor use is higher than for potable water.

To estimate the amount of recycled water that is ultimately re-introduced back into each of the ULARA sub-areas, the following methodology was used. First, GLAC IRWM water supply targets for "Recycled – Direct Use" were modified using Adjustment 1 (Figure 1). It was assumed that recycled water supplies, obtained from treatment facilities, have end uses that are distributed roughly by area; so a 90 percent adjustment was used. Then, to allocate these supplies by ULARA sub-area, documents provided by the ULARA Watermaster were used. These documents are the Annual Watermaster reports for Water Years 2008-09 through 2011-12 (this date range is shorter than the full baseline period due to the fact that specific records for recycled water deliveries are not available from all ULARA Parties for that baseline period). For these years, average percentages of recycled water delivered for each sub-area were calculated and then applied to the adjusted GLAC IRWM supply targets for 2015, 2020, and 2025 to yield AFY estimates by sub-area. The percentages are shown in **Figure 3**. A specific number of 255 AFY for the Verdugo Basin was supplied by the ULARA Watermaster, based on annual reporting submitted by GWP.

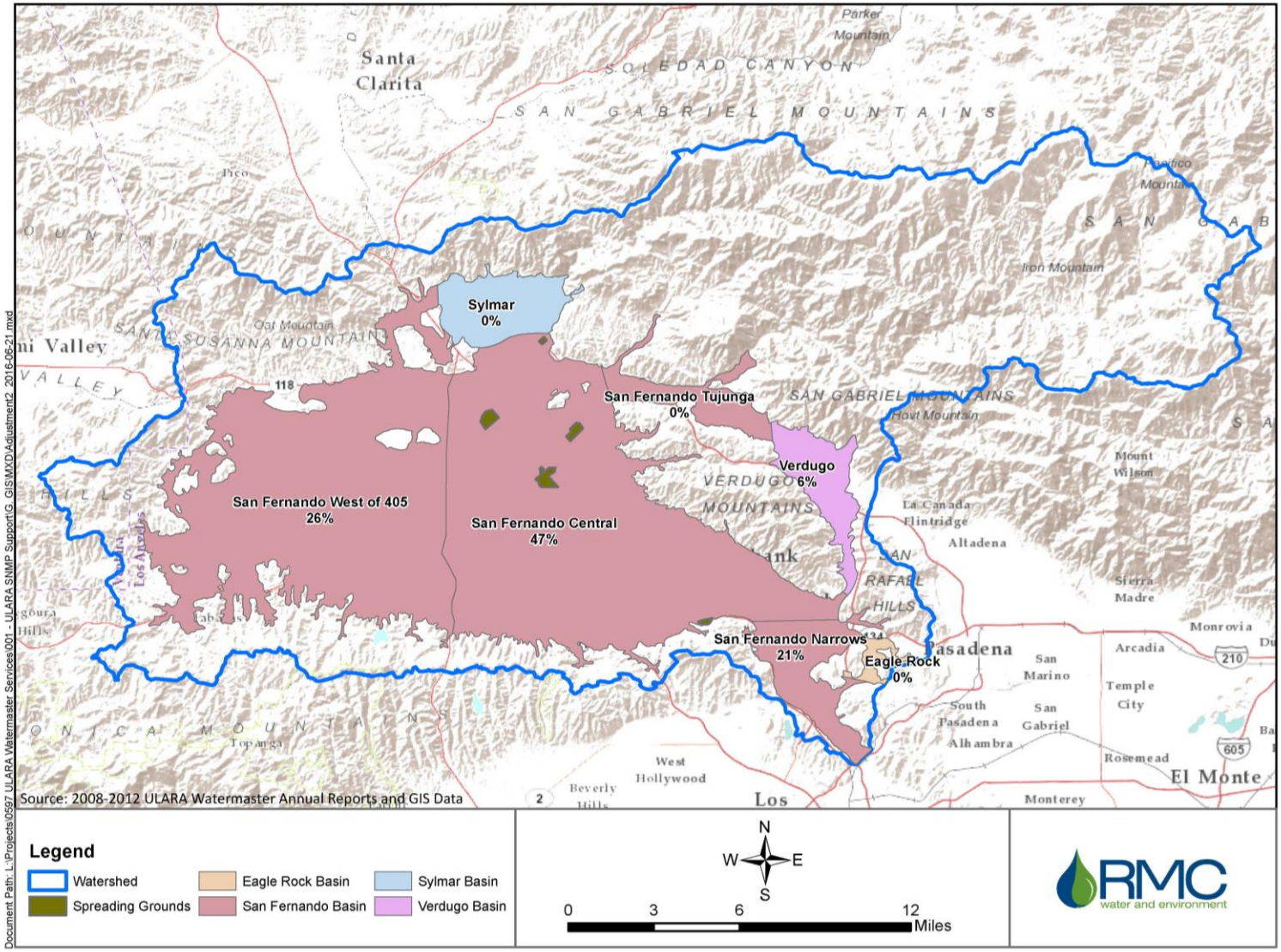
Finally, these percentage values by sub-area were adjusted to account for outdoor irrigation versus other indoor industrial uses (such as cooling towers at power generation facilities). An outdoor water factor of 75 percent was used, based on typical outdoor recycled water use reported in planning documents for LADWP and BWP. The value for Verdugo Basin was not adjusted for outdoor use as the value constitutes water delivered to the Verdugo Basin.

The calculation for each ULARA sub-area may be performed using the following formula:

> ***Recycled Water Direct Use = [GLAC IRWM supply target] * [90% Adjustment 1] * [sub-area percentage] * [75% outdoor use factor]***

This methodology assumes that the distribution of future groundwater use inside ULARA will be reflective of historical recycled water use as tracked by the Watermaster. See **Table 2** for projected values.

Figure 3: ULARA Historical Recycled Water Use by Sub-Area (2008-2012)



3.5 Recycled Water Recharged

"Recycled Water Recharged" represents treated effluent produced by local WRPs that is then delivered to engineered recharge sites in ULARA. Water supplies that are directly recharged constitute an "outdoor use" that does not require an adjustment factor.

To estimate the amount of recycled water that is directly recharged into each of the ULARA sub-areas, LADWP's "Recharge Table 1" was used. The only spreading facilities that are projected to recharge recycled water in the future are the Hansen and Pacoima spreading grounds, which are shown to recharge approximately 30,000 AFY combined in 2025 under the "high loading" scenario. Under the "low loading" scenario, recharge to Hansen and Pacoima will be phased from 5,000 AFY in 2017 to 30,000 AFY in 2030. The Hansen and Pacoima spreading grounds are located in the San Fernando – Central ULARA sub-area, so this sub-area is the only sub-area assumed to receive recycled water for recharge. See **Table 2** for projected values.[3]

3.6 Stormwater Direct Use

"Stormwater Direct Use" is precipitation that falls onto properties in the ULARA GWBs and is then used for irrigation purposes on-site. The most common example of Stormwater Direct Use is rain barrels.

To estimate the amount of stormwater that is re-introduced directly back into each of the ULARA sub-areas, the following methodology was used. First, GLAC IRWM water supply targets for "Stormwater – Direct Use" were modified using Adjustment 1 (Figure 1). It was assumed that stormwater direct supplies, which would be captured on-site for use on-site, have end uses that are distributed roughly by population; thus, an 85 percent adjustment was used. Then, to allocate these supplies by ULARA sub-area, Adjustment 2 was used (Figure 2). The percentages of population for each sub-area were applied to the adjusted GLAC IRWM supply targets for 2015, 2020, and 2025 to yield AFY estimates of Stormwater Direct Use by sub-area.

The calculation for each ULARA sub-area may be performed using the following formula:

> ***Stormwater Direct Use = [GLAC IRWM supply target] * [85% Adjustment 1] * [sub-area percentage Adjustment 2]***

It should be noted that the Mountain sub-area was not included in calculations pertaining to Stormwater Direct Use because precipitation falling in these areas does not percolate to the ULARA basins. See **Table 2** for projected values.

3.7 Stormwater Recharged

"Stormwater Recharged" is precipitation that is collected and delivered to centralized and decentralized recharge sites in ULARA. Water supplies that are directly recharged constitute an "outdoor use" that does not require an adjustment factor. Centralized recharge sites are large, engineered facilities, whereas decentralized recharge sites are smaller, parcel- or neighborhood-scale projects (e.g., low-impact development projects).

To estimate the amount of stormwater that is directly recharged into each of the ULARA sub-areas, several steps were used. First, GLAC IRWM water supply targets for "Stormwater – Recharged" were modified

[3] There are two different scenarios used to characterize the recharge project at the Hansen and Pacoima Spreading Grounds, based on different upstream treatment technologies and effluent water qualities (i.e., "high loading" and "low loading" scenarios). These scenarios are described in detail in TM 4 – Management Plan.

using Adjustment 1 (Figure 1). It was assumed that stormwater recharge supplies, which would be captured and conveyed for use throughout ULARA, have end uses that are distributed roughly by area; so a 90 percent adjustment was used. Second, LADWP's "Recharge Table 1" was used to account for that portion of the adjusted GLAC IRWM stormwater values that will be recharged in large, centralized facilities. The spreading facilities that are planned for stormwater recharge in the future are the Hansen, Pacoima, Tujunga, and Lopez spreading grounds, which are all located in the San Fernando – Central ULARA sub-area. Values from "Recharge Table 1" for those centralized facilities are assigned to the Central sub-area; and they were deducted from the adjusted GLAC IRWM stormwater recharge value.

Finally, the remaining amount from the adjusted GLAC IRWM stormwater recharge value was allocated to sub-areas using Adjustment 2 (Figure 2). The percentages of area for each sub-area were applied to the adjusted GLAC IRWM supply targets (minus centralized recharge AFY) for 2015, 2020, and 2025 to yield AFY estimates of Stormwater Recharged by sub-area.

The calculation for each ULARA sub-area may be performed using the following formula:

> ***Stormwater Recharged = [(GLAC IRWM supply target * 90% Adjustment 1) – (Centralized recharge reported by LADWP)] * [sub-area percentage Adjustment 2]***

It should be noted that stormwater from the Mountain sub-area was included in the recharge amounts derived from "Recharge Table 1". See **Table 2** for projected values.

3.8 Conservation

"Conservation" is a series of programmatic measures to reduce demands for water within ULARA. An example of a conservation measure is a program to provide rebates for installing efficient irrigation or removing turf. Conservation measures typically result in lower demands for all types of water supplies and can mean reduced percolation to the groundwater basins if outdoor conservation measures are implemented.

To estimate the amount of conservation in the ULARA sub-areas, the following methodology was used. First, GLAC IRWM water supply targets for "Conservation" were modified using Adjustment 1 (Figure 1). It was assumed that conservation measures, which passively or actively reduce demands, have end uses that are distributed roughly by population; so an 85 percent adjustment was used.[4] Then, to allocate these supplies by ULARA sub-area, Adjustment 2 was used (Figure 2). The percentages of population for each sub-area were applied to the adjusted GLAC IRWM supply targets for 2015, 2020, and 2025 to yield AFY estimates of Conservation by sub-area.

The calculation for each ULARA sub-area may be performed using the following formula:

> ***Conservation = [GLAC IRWM supply target] * [85% Adjustment 1] * [sub-area percentage Adjustment 2]***

It should be noted that the Mountain sub-area was not included in calculations pertaining to Conservation because demand reductions in those areas do not impact the ULARA basins. See **Table 2** for projected values.

4 Delivered Water Projections Summary Table

The projections for all types of water supplies that could impact the salt and nutrient balance in the ULARA basins are summarized in **Table 2**. The assumptions and methodologies are also summarized in the table.

[4] Population is used because conservation occurs where people are located, from a regional perspective. So on a regional basis, the population distribution is considered to more accurately reflect the distribution of water conserved.

Table 2: Summary Table of Delivered Water Projections

Supply Source	Basis/Methodology	Sub-Areas	2015 AFY	2020 AFY	2025 AFY
Groundwater Delivered	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Groundwater Pumped", scaled to ULARA SNMP area (90%) and allocated to sub-areas according to historical ULARA distribution of groundwater delivered. Final adjustment of 45% applied for outdoor water use.	San Fernando - West 405	4,417	4,108	4,686
		San Fernando - Central	13,054	26,980	30,773
		San Fernando - Tujunga	137	283	322
		San Fernando - Narrows	2,673	5,525	6,302
		Sylmar	201	415	473
		Verdugo	3,226	6,667	7,605[5]
		Eagle Rock	-	-	-
Imported Water Delivered	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Imported Water - Direct Use", scaled to ULARA SNMP area (90%) and allocated to sub-areas according to historical ULARA distribution of imported water delivered. Adjustment of 45% applied for outdoor water use.	San Fernando - West 405	53,065	45,739	43,897
		San Fernando - Central	59,259	51,079	49,022
		San Fernando - Tujunga	3,662	3,156	3,029
		San Fernando - Narrows	8,842	7,621	7,315
		Sylmar	5,633	4,855	4,660
		Verdugo	3,755	3,237	3,106
		Eagle Rock	2,020	1,741	1,671
Imported Water Recharged	Based on LADWP projections for imported water recharge at Pacoima Spreading Grounds by BWP.	San Fernando - West 405			
		San Fernando - Central	7,525	7,425	7,425
		San Fernando - Tujunga			
		San Fernando - Narrows			
		Sylmar			
		Verdugo			
		Eagle Rock			
Recycled Water Direct Use	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Recycled Water - Recharge", scaled to ULARA	San Fernando - West 405	3,110	3,687	3,937
		San Fernando - Central	5,621	6,665	7,116
		San Fernando - Tujunga	-	-	-

[5] The 2025 estimated delivered groundwater volume for Verdugo Basin exceeds the adjudicated safe yield of 7,150 AFY due to groundwater imports by Glendale from the San Fernando Basin to Verdugo Basin.

	SNMP area (90%) and allocated to sub-areas according to historical ULARA distribution of recycled water delivered. Adjustment of 75% applied for outdoor water use.	San Fernando - Narrows	2,512	2,978	3,180
		Sylmar	-	-	-
		Verdugo	255	255	255
		Eagle Rock	-	-	-
Recycled Water Recharged	Based on LADWP projections for recycled water recharge at Hansen and Pacoima Spreading Grounds.	San Fernando - West 405			
		San Fernando – Central ("high")[6]			30,000
		San Fernando – Central ("low")[4]		19,000	28,000
		San Fernando - Tujunga			
		San Fernando - Narrows			
		Sylmar			
		Verdugo			
		Eagle Rock			
Stormwater Direct Use	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Stormwater – Direct Use", scaled to ULARA SNMP population (85%) and allocated to sub-areas according to population distribution for all sub-areas.	San Fernando - West 405	266	799	1,331
		San Fernando - Central	424	1,272	2,120
		San Fernando - Tujunga	20	59	99
		San Fernando - Narrows	69	207	345
		Sylmar	39	118	197
		Verdugo	30	89	148
		Eagle Rock	10	30	49
Stormwater Recharged	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Stormwater - Recharged", scaled to ULARA SNMP area (90%) and separating out LADWP projections for centralized recharge of stormwater. After centralized AFY amounts deducted, remainder is assumed to be de-centralized stormwater recharge allocated	San Fernando - West 405	3,764	1,557	1,470
		San Fernando – Central (centralized)	21,004	28,104	30,104
		San Fernando – Central (decentralized)	3,375	1,396	1,318
		San Fernando - Tujunga	260	107	101
		San Fernando - Narrows	441	183	172

[6] There are two different scenarios used to characterize the recharge project at the Hansen and Pacoima Spreading Grounds, based on different upstream treatment technologies and effluent water qualities (i.e., "high loading" and "low loading" scenarios). These scenarios are described in detail in TM 4 – Management Plan.

	to sub-areas according to population distribution for all sub-areas. Centralized and de-centralized are shown at right separately.	Sylmar	415	172	162
		Verdugo	337	140	132
		Eagle Rock	61	25	24
Conservation	Based on GLAC IRWM Plan 2015, 2020, and 2025 supply targets for "Conservation", scaled to ULARA SNMP population (85%) and allocated to sub-areas according to population distribution for all sub-areas.	San Fernando - West 405	2,112	4,078	5,905
		San Fernando - Central	3,364	6,495	9,404
		San Fernando - Tujunga	156	302	437
		San Fernando - Narrows	548	1,057	1,531
		Sylmar	313	604	875
		Verdugo	235	453	656
		Eagle Rock	78	151	219

5 References

Burbank Water and Power, 2010. City of Burbank Water and Power Urban Water Management Plan.

California Regional Water Quality Control Board, Los Angeles Region, 1994. Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

Glendale Water and Power, 2010. City of Glendale Water and Power Urban Water Management Plan.

Greater Los Angeles County Integrated Regional Water Management Plan, Appendix L - Upper Los Angeles River Subregional Plan, October 2013.

Greater Los Angeles County Integrated Regional Water Management Plan, Section 3 – Objectives and Priorities, October 2013.

Greater Los Angeles County Integrated Regional Water Management Plan, Water Supply Objective & Targets Technical Memorandum, February 2013.

LADWP, 2010. LADWP Urban Water Management Plan.

LADWP, 2015. LADWP Recycled Water Portfolio FY 2014-15.

LADWP, 2015. Recharge Table 1 (Scenario 1), Model Input Projected Recharge Scenario, Water Years 2013-2050 (DRAFT), Hadi Johnny.

LVMWD, 2010. Final 2010 Urban Water Management Plan. Prepared by Carollo. June 2011.

Pasadena Water and Power, 2010. City of Pasadena Water and Power Urban Water Management Plan.

ULARA Annual Groundwater Pumping and Spreading Plans (since 1999), http://ularawatermaster.com/

ULARA Watermaster, ULARA Salt and Nutrient Management Plan, Technical Memorandum No. 4 – Management Measures, July 2016.

ULARA Watermaster, Delivered Water by Sub-Area (Excel spreadsheet), 2001-2012.

ULARA Watermaster Annual Reports (since 1968), http://ularawatermaster.com/