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2015 Urban Water Management Plan
Final

17 August 2016

Prepared for

Las Virgenes Municipal Water District
4232 Las Virgenes Road
Calabasas, CA 91302

K/J Project No. 1644210*00

Table of Contents

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

List of Tables

Table of Contents (cont'd)

List of Figures

List of Appendices

Table of Contents (cont'd)

Acronym List

°F	Fahrenheit
Act	Urban Water Management Planning Act
AF	Acre Feet
AFY	Acre Feet per Year
ARDWP	Annual Reports to the Drinking Water Program
AWWA	American Water Works Association
cfs	Cubic Feet per Second
CMWD	Calleguas Municipal Water District
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DDW	Division of Drinking Water
DMM	Demand Management Measure
DWR	California Department of Water Resources
ETo	Evapotranspiration
GIS	Geographic Information System
GPCD	Gallons Per Capita Per Day
gpm	Gallons per Minute
HGL	Hydraulic Grade Line
IRP	Integrated Water Resources Plan
JPA	Joint Powers Authority
LADWP	Los Angeles Department of Water and Power
LRP	Local Resource Program
mg/l	Milligrams per Liter
mgd	Million Gallons per Day
MWDSC	Metropolitan Water District of Southern California
ppm	Parts per Million
RHNA	Regional Housing Needs Assessment
RWQCB	Regional Water Quality Control Board
SBX7-7	Senate Bill 7 of Special Extended Session 7
SDP	Seawater Desalination Program
SWP	State Water Project

SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TSD	Triunfo Sanitation District
TWRF	Tapia Water Reclamation Facility
UWMP	Urban Water Management Plan
VCWWD	Ventura County Waterworks District
WSCP	Water Shortage Contingency Plan

Section 1: Introduction

1.1 Overview

This document presents the 2015 Urban Water Management Plan (UWMP) for the Las Virgenes Municipal Water District (LVMWD). This chapter describes the general purpose of the Plan and discusses Plan adoption and implementation.

The State of California mandates that all "urban" water suppliers within the state prepare a UWMP. Detailed information on what must be included in these plans as well as who must complete them can be found in California Water Code (CWC) sections 10610 through 10657. According to the Urban Water Management Planning Act (Act) of 1983, an urban water supplier is defined as a supplier, either public or private, that provides water for municipal purposes either directly or indirectly to more than 3,000 customers or supplies more than 3,000 acre-feet (AF) annually.

1.2 Purpose

An UWMP is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a Section which "describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

"A plan is intended to function as a planning tool to guide broad-perspective decision making by the management of water suppliers." (*Sonoma County Water Coalition v. Sonoma County Water Agency* (2010) 189 Cal. App. 4th 33, 39.) It should not be viewed as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty and planning projections may change in response to a number of factors. "[L]ong-term water planning involves expectations and not certainties. Our Supreme Court has recognized the uncertainties inherent in long-term land use and water planning and observed that the generalized information required in the early stages of the planning process are replaced by firm assurances of water supplies at later stages." (Id., at 41.) From this perspective, it is appropriate to look at the UWMP as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?

- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?

- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these "framework" questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands.

The Act requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (LVMWD is going beyond the requirements of the Act by developing a plan which spans twenty-five years.)

- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry and multiple-dry years.

- Implements conservation and efficient use of urban water supplies.

Additionally, Senate Bill 7 of Special Extended Session 7 (SBX7-7) was signed into law in November 2009, which calls for progress towards a 20 percent reduction in per capita water use statewide by 2020. As a result, the legislation mandated each urban retail water supplier to develop and report a water use target in the retailer's 2010 UWMP. The legislation further requires that retailers report an interim 2015 water use target, their baseline daily per capita use and 2020 compliance daily per capita use, along with the basis for determining those estimates. Beginning in 2016, retail water suppliers are required to comply with the water conservation requirements in SBX7-7 in order to be eligible for State water grants or loans. Water suppliers have the ability to revisit the SBX7-7 baseline and targets that were determined in the 2010 UWMPs and update them in the 2015 Plan. In addition, if the 2010 census was not utilized for the SBX7-7 calculations in the 2010 UWMP, census data must be used to update the 2015 Plan.

Significant new requirements for quantified demand reductions have been added by the enactment of SBX7-7, which amended the Act. In addition, a number of changes to the Water Code have been enacted since 2010 which affect implementation of the 2015 Plan updates. These changes apply to:

- Demand Management Measures CWC Section 10631(f)(1) and (2) Assembly Bill 2067, 2014

- Submittal Date CWC Section 10621 (d) Assembly Bill 2067, 2014

- Electronic Submittal CWC Section 10644 (a)(2) Senate Bill 1420, 2014

- Standardized Forms CWC Section 10644(1)(2) Senate Bill 1420, 2014

- Water Loss CWC Section 10631 (e)(1)(J) and (e)(3)(A) and (B) Senate Bill 1420, 2014

- Estimating Future Water Savings CWC Section 10631 (e)(4) Senate Bill 1420, 2014
- Voluntary Reporting of Energy Intensity CWC Section 10631.2 (a) and (b) Senate Bill 1036, 2014
- Defining Water Features CWC Section 10632 (b) Assembly Bill 2409, 2014

A checklist to ensure compliance of this Plan with the Act requirements is provided in Appendix A.

It is the stated goal of LVMWD to deliver a reliable and high quality water supply to its customers, even during dry periods. Based on conservative water supply and demand assumptions over the next twenty five years in combination with conservation of non-essential demand during normal water years, the UWMP successfully achieves this goal.

1.3 Basis for Preparing the Plan

In accordance with the CWC, urban water suppliers with 3,000 or more service connections, or supplying 3,000 or more acre-feet (AF) of water per year, are required to prepare a UWMP every five years. The 2015 UWMP shall be updated and submitted to the California Department of Water Resources (DWR) by July 1, 2016. LVMWD has prepared this UWMP as it directly provides water for municipal purposes to over 3,000 customers and supplies more than 3,000 AF of water annually.

LVMWD prepared and adopted UWMPs for the years 2005 and 2010. This UWMP serves as an update to the 2010 UWMP and was prepared as an individual UWMP, covering only the LVMWD service area (more details on the LVMWD service area are provided in Chapter 2).

1.4 Overview of Document

This plan is organized as follows:

1) Introduction
2) Service Area
3) Water Use
4) Water Supply
5) Recycled Water
6) Water Quality
7) Reliability Planning
8) Demand Management Measures
9) Water Shortage Contingency Plan
10) References
11) Appendices

1.4.1 Methodology and Key Assumptions

A water supplier may report on a fiscal year or calendar year basis, but must clearly state in its UWMP the type of year that is used for reporting. The type of year should remain consistent throughout the Plan. DWR prefers that agencies report on a calendar year basis in order to ensure UWMP data is consistent with data submitted in other reports to the State. This UWMP provides data consistent with a calendar year, in acre-feet per year (AFY).

Public water systems (PWS) are systems that provide drinking water for human consumption and these systems are regulated by the State Water Resources Control Board (SWRCB), Division of Drinking Water. The SWRCB, Division of Drinking Water, requires reporting on the PWS. Reporters file electronic Annual Reports to the Drinking Water Program (ARDWP) to the SWRCB, which include annual reports of water usage and other information. The information provided in the UWMP should be consistent with the data reported in the ARDWP.

1.4.2 Standardized Tables

Revisions to the CWC directed DWR to develop standardized tables for the reporting and submittal of UWMP data. Water agencies are required to submit UWMP data electronically to DWR using the standardized tables. The standardized tables were prepared for this Plan and are included as Appendix B.

1.5 Coordination During Plan Preparation and Adoption

1.5.1 Agency Coordination

The UWMP Act requires that the water agency identify its coordination with appropriate nearby agencies. LVMWD's 2015 UWMP is intended to address those aspects of the UWMP Act which are under the control of the District, specifically water supply and water use. LVMWD is the sole water supplier and water management agency for the area. While preparing the 2015 UWMP, LVMWD coordinated its efforts with relevant agencies to ensure that the data and issues discussed in the plan are presented accurately. Among other coordination activities, LVMWD also informed the Metropolitan Water District of Southern California (MWDSC) of projected water use. Table 1-1 summarizes how the UWMP preparation was coordinated with relevant agencies in the area. All agencies listed in Table 1-1 were sent a notice of preparation, copies of which are included in Appendix C.

TABLE 1-1
COORDINATION AND NOTIFICATION FOR PLAN PREPARATION

	Participated in Developing UWMP	Received Copy of Draft	Commented on Draft	Attended Public Meetings	Contacted for Assistance	Was Sent Notice of Intent to Adopt	Not Involved
Metropolitan Water District of Southern California	✓	✓				✓	
Calleguas Municipal Water District	✓	✓				✓	
City of Calabasas	✓	✓	✓			✓	
City of Hidden Hills	✓	✓				✓	
City of Agoura Hills	✓	✓				✓	
City of Westlake Village	✓	✓				✓	
Triunfo Sanitation District	✓	✓				✓	
Los Angeles County	✓	✓				✓	

1.5.2 Public Outreach

LVMWD has actively encouraged community participation in its Urban Water Management Planning efforts. A notice of public hearing was published in the local newspaper on April 14, 2016, notifying interested parties that the draft 2015 UWMP was under preparation. City and County agencies were notified on March 1, 2016, more than 60 days prior to the public hearing. Copies of the public hearing notification, which include the time and place of the public hearing, are included in Appendix C.

The Draft 2015 UWMP was presented to the LVMWD Board of Directors on May 10, 2016 in a public hearing. The hearing provided an opportunity for LVMWD's customers, residents, and employees to learn and ask questions about the current and future water supply. The Final Draft 2015 UWMP was presented to the LVMWD Board of Directors and subsequently adopted by resolution of the Board on May 24, 2016. A copy of the resolution of the intent to adopt and the adoption resolution are included in Appendix D.

Table 1-2 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings and invitation letters are attached in Appendix C.

TABLE 1-2
PUBLIC PARTICIPATION TIMELINE

March 1, 2016	Notice of Preparation	City and County agencies notified of 2015 UWMP preparation
April 15, 2015	Release of Public Draft UWMP	Draft UWMP made available on LVMWD website
May 10, 2016	Public Hearing, Presentation of Draft UWMP	Review contents of Draft UWMP and take comments
May 24, 2016	Board Approval	UWMP considered for approval by the Board

1.5.3 Plan Availability

The adopted 2015 UWMP will be submitted to:

- The California Department of Water Resources
- The California State Library
- The County of Los Angeles Regional Planning Department
- The City of Agoura Hills
- The City of Calabasas
- The City of Hidden Hills
- The City of Westlake Village

In addition, the plan will be posted to the LVMWD website and will be made available during normal business hours at LVMWD, located at: 4232 Las Virgenes Road, Calabasas, CA 91302.

Section 2: Service Area

2.1 Las Virgenes Municipal Water District Service Area

The LVMWD service area comprises a 122-square mile area (74,640 acres) in western Los Angeles County, including the Los Angeles/Ventura County boundary to the northwest and the City of Los Angeles to the east. As shown in Figure 2-1, the service area includes the incorporated cities of Agoura Hills, Calabasas, Hidden Hills, and Westlake Village as well as unincorporated portions of Los Angeles County.

2.2 Land Use

A large portion of the service area is undeveloped land characterized by the Santa Monica Mountains that range in elevation from a few feet above mean sea level (msl) to elevations exceeding 2,500 ft-msl. As shown in Figure 2-2, these open space areas comprise about 35 to 40 percent of the total service area and are mostly held in public ownership, such as state and national parks that will not require water service. There are also many undeveloped private parcels, particularly in the southern half of the service area. While these parcels are difficult to develop due to the topography of the land, they are accounted for in long-range water planning as these parcels could potentially receive water from LVMWD in the future (Kennedy/Jenks 2014a). The remaining portion is primarily made up of mixed residential and commercial land uses, while only a small portion of the service area is designated as industrial and agricultural land use types. The development pattern in recent years within the service area has been predominately commercial/office along the freeway corridor with some modest residential development and growth in smaller tracts.

There are several unique aspects of LVMWD's geography which must be considered when discussing regional water infrastructure. LVMWD's water demands are primarily residential, as opposed to commercial, industrial, institutional, or agricultural, so LVMWD's customer base consists of many small users (i.e., single family residential homes) with associated landscape irrigation. Secondly, because of LVMWD's rural location within the Santa Monica Mountains, the distribution systems are large and must accommodate geographical challenges such as rapidly changing elevations. And while LVMWD benefits from a highly integrated recycled water system, effective potable distribution has been a continual challenge.

2.2.1 Development Projections

The 2014 Potable Water Master Plan contains development projections, taking into account land use and planning data, local agency Housing Element reports, and vacant housing information. That analysis was updated with most recent Housing Element reports for this UWMP. Based on the analysis, a total of 5,254 new dwelling units is anticipated by build-out. For purposes of this 2015 UWMP and in contrast to the 2014 Master Plan, build-out is projected to occur by 2040. Using applicable persons per household numbers, the related additional population from these new development projects is estimated to be 16,378. These projections are summarized in Table 2-1.

FIGURE 2-1: DISTRICT SERVICE AREA BOUNDARY

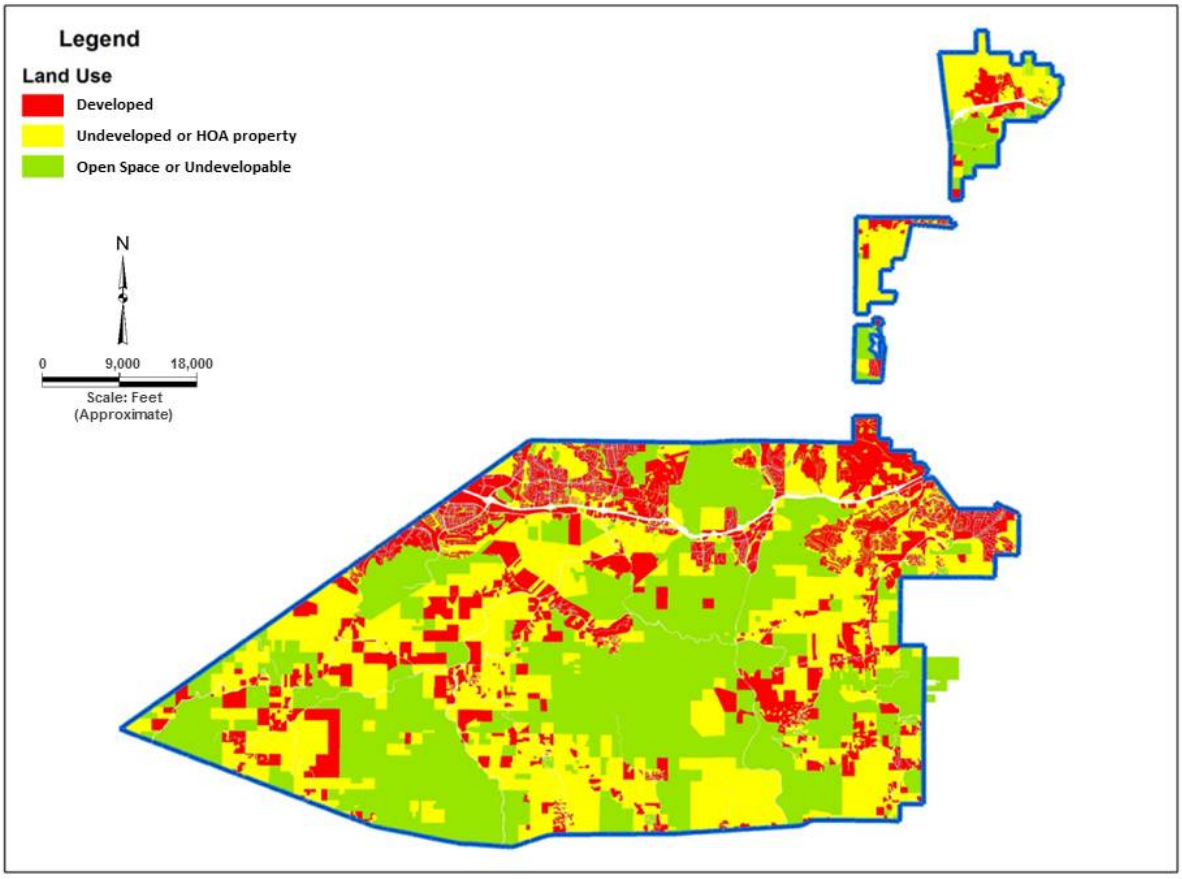
TABLE 2-1
HOUSING AND POPULATION PROJECTIONS

Agency/Growth Description	Projected New Dwelling Units	Applicable Persons per Household (PPH)[a]	Projected Additional Population
Agoura Hills[b]			
Agoura Village	293	3.345	980
N Agoura Rd	73	3.345	244
Calabasas[c]			
Paxton Calabasas	78	3.045	238
Village at Calabasas	80	3.045	244
Vacant Residential Sites	306	3.045	932
Underutilized Residential Sites	270	3.045	822
Second Units	12	3.045	37
Hidden Hills[d]			
Vacant Land	32	3.23	103
Affordable Housing	17	3.23	55
Second Units	2	3.23	6
Westlake Village[e]			
Westlake Village Business	401	3.01	1,207
Additional Potential Residential	8	3.01	24
Additional Units[f]			
Additional Population from Land Use Calculations (Unincorporated LA County)[b]	2,746	3.15	8,650
Additional Population from Vacant units[b]	936	3.03	2,836
Total Additional Population from New Development	**5,254**	**n/a**	**16,378**
Total Population at Buildout			**85,144[g]**

Notes:
Source: Adapted from Potable Water Master Plan Update 2014

(a) PPH from 2014 Master Plan
(b) Based on assessment from Potable Water Master Plan Update 2014 (Kennedy/Jenks Consultants 2014b), Table 2-2 and Appendix O.
(c) City of Calabasas Housing Element 2014-2021 Update, 2013; Table V-4
(d) City of Hidden Hills 2013-2021 Housing Element, 2014
(e) City of Westlake Village 2013-2021 Housing Element, 2014; Table 4
(f) Based on assessment from Potable Water Master Plan Update 2014 (Kennedy/Jenks Consultants 2014b), Table 2-2
(g) Total population at buildout (2040) taking into account current 2015 and additional population from new development. See also Table 2-2.

FIGURE 2-2: DEVELOPED, UNDEVELOPED AND DEDICATED OPEN SPACE LAND IN LVMWD SERVICE AREA



2.3 Population

The population for LVMWD in 2015 was required to be calculated using the DWR online population tool, which uses a Geographic Information System (GIS) interface. By adding shape files for the LVMWD service area boundaries, population is derived using U.S. Census Bureau census tract data from historical census years and combined with persons per connection data.

Based on 2015 population data and additional population from new development, which is assumed to occur by 2040, future population was calculated for all intervening years through the end of the planning period. Population projections are shown in Table 2-2. As can be seen, it is anticipated that LVMWD's service area population will grow to around 85,144 in the next 25 years.

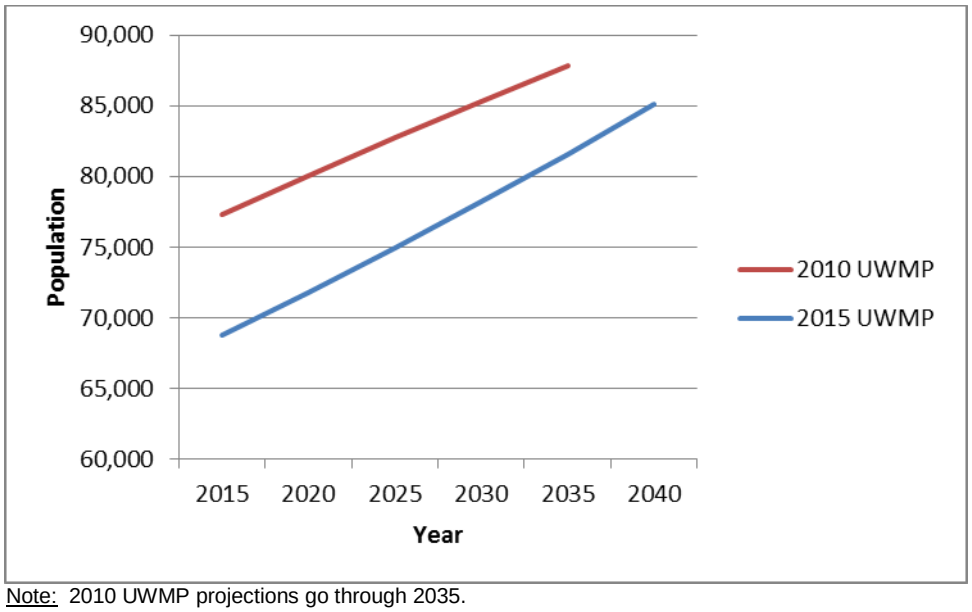
TABLE 2-2
CURRENT AND PROJECTED POPULATION

	2015	2020	2025	2030	2035	2040
Service Area Population	68,766[(a)]	71,768	74,901	78,170	81,582	85,144[(b)]

Notes:
(a) 2015 population value from DWR population tool.
(b) 2040 population reflects current plus additional population at build-out

Population projections in this UWMP are similar to build-out projections made in the 2014 Master Plan and the 2010 UWMP, albeit slightly lower and with a slightly steeper increasing trajectory. A comparison of population projections from the 2010 UWMP and this 2015 UWMP are shown in the figure.

FIGURE 2-3: COMPARISON OF POPULATION PROJECTIONS



Note: 2010 UWMP projections go through 2035.

2.4 Climate

The majority of LVMWD's service area climate is a semi-arid environment with mild winters, warm summers and moderate rainfall, consistent with coastal Southern California. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific. As a result, the climate is mild, tempered by cool sea breezes. The usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or dry hot Santa Ana winds. The standard monthly average evapotranspiration (ETo) rates, rainfall, and temperature are summarized in Table 2-3.

As can be seen, LVMWD's average monthly temperature ranges from about 52 to 78 degrees Fahrenheit (°F), with an annual average temperature of 65°F. The daily extreme low and high temperatures have been measured to be 38°F and 104°F, respectively. ETo averages a total of 68.5 inches per year, while the average annual rainfall is 16.86 inches. Records for the 2007-2016 timeframe show that the monthly precipitation has been as high as 8 inches and as low as 0.0 inches. Most of the rainfall typically occurs during the period of November through April.

TABLE 2-3
CLIMATE CHARACTERISTICS

Month	Standard Monthly Average ETo (inches)[(a)]	Monthly Average Rainfall (inches)[(b)]	Monthly Average Temperature(°F) [(b)]		
			Average	Minimum	Maximum
January	3.25	3.78	53.6	67.9	39.3
February	3.29	3.95	55.35	70	40.7
March	5.28	2.78	57.1	72.3	41.9
April	6.30	1.13	60.7	76.8	44.6
May	7.57	0.29	65.1	81.1	49.1
June	8.05	0.04	70.2	87.4	53
July	8.55	0.01	75.95	94.9	57
August	8.53	0.1	76.35	95.4	57.3
September	6.56	0.16	73.15	91.7	54.6
October	4.83	0.52	66.5	84	49
November	3.57	1.79	58.7	74.8	42.6
December	2.64	2.31	53.8	68.8	38.8
Annual	68.55	16.86	63.85	80.4	47.3

Notes:
(a) Source: California Irrigation Management Information System (CIMIS) Station 204 (CIMIS, 2016). Represents monthly average data from January 2007 to January 2016.
(b) Source: Western Regional Climate Center (WRCC), Woodland Hills Pierce College, California (Station 041484); Period of record: 7/1/1949-1/20/2015.

Section 3: Water Use

3.1 Overview

This chapter describes historic and current water usage and the methodology used to project future demands within LVMWD's service area. Water usage is divided into sectors such as residential, commercial/institutional, landscape, and other. To undertake this evaluation, existing land use data and anticipated new development information were compiled. This information was then compared to historical trends of water usage. In addition, weather and water conservation effects on historical water usage were factored into the evaluation.

The discussion on water demands in this chapter is related to potable demands, unless otherwise stated. The potable water distribution system draws solely from potable water sources. A detailed discussion on demands for recycled water is provided in Section 5.

3.2 Historical and Current Water Use

3.2.1 Water Deliveries

All authorized connections within the LVMWD service area are metered and meters are installed for all new accounts. The water use categories are characterized as follows:

- Single-Family Residential – A single-family dwelling unit, generally a single lot containing a single home.
- Multi-Family Residential – Multiple dwelling units contained within one building or a complex of several buildings.
- Commercial/Institutional/Industrial – This is a single water use category that captures water customers conducting business (i.e. providing a product or service), customers dedicated to public service, and manufacturers or processors of materials. Most of the City's water use in this sector reflects water use for retail businesses.
- Irrigation – Water connections supplying water solely for landscape irrigation, including landscapes in a residential, commercial, or institutional setting.
- Other – Water for fire protection and temporary uses, such as line flushing and construction. A portion of these uses are metered, whereby a portion may fall under unmetered, unbilled consumption depending on system operations and tracking methods.

Approximately 84 percent of LVMWD's potable water demand in 2015 came from the residential sector, of which approximately 77 percent was attributed to single-family and 7percent attributed to multi-family residential customers. The remainder of demands came from commercial, irrigation uses and a smaller portion from other uses. Historical (2010) and current (2015) water deliveries by customer class are shown in Table 3-1. As of 2015, LVMWD served approximately 19,900 connections.

TABLE 3-1
ACTUAL WATER DELIVERIES – 2010 AND 2015

		Volume of Deliveries[(a)] (AF)	
Water Use Sector	**Level of Treatment**	**2010**	**2015**
Single-family	Drinking Water	13,911	13,221
Multi-family	Drinking Water	1,291	1,309
Commercial	Drinking Water	2,182	2,006
Landscape	Drinking Water	559	545
Other[(b)]	Drinking Water	503	207
	Total Potable Water Demand	**18,446**	**17,288**

Notes:
(a) Source: LVMWD staff – potable water sales data
(b) "Other" Includes metered fire protection and temporary uses

Between the years 2010 and 2015, water use showed a slight increasing trend through 2013 and began to decrease after 2014 to below 2010 values in 2015. Declines are largely attributable to increased water conservation efforts in response to drought conditions and statewide water use reduction targets.

On May 5, 2015 the State Water Resources Control Board (State Water Board) adopted an Emergency Regulation for urban water conservation to address, in part, the mandatory 25 percent statewide reduction mandated by the Governor by Executive Order of April 1, 2015. As part of this Emergency Regulation, LVMWD was directed by the State Water Board to reduce water usage by 36 percent compared to 2013 water usage. In response to this water use reduction requirement, LVMWD enacted numerous water conservation measures, including irrigation restrictions, general potable water conservation requirements and stricter enforcement actions.

3.2.2 Historic Sales

LVMWD has not historically sold any water to other water agencies, nor does it anticipate any future sales to other agencies.

3.2.3 Historical Other Water Uses

Besides metered deliveries to customers, LVMWD has additional demands on its water supplies. Surplus potable water supplies from MWDSC are delivered to the Las Virgenes Reservoir, LVMWD's potable reservoir, for seasonal and emergency system storage. The reservoir provides seasonal balancing between supplies and demands. Further, when demand on the recycled water system is greater than available recycled water supplies, potable water purchased from MWDSC is used to supplement the recycled water system. This usually occurs in the April to October period.

A portion of water consumption within the LVMWD service area is made up of unbilled unmetered water use, such as for emergency fire suppression or water line flushing. As these unmetered volumes tend to be difficult to quantify, a default value of 1.25 percent of authorized metered consumption, as used in the AWWA water audit software, was used to estimate related volumes in 2010 and 2015.

LVMWD, like all water agencies, also has some system losses, which is the difference between the amount of water supplied and the amount of authorized consumption. As required by DWR, LVMWD performed a system water audit as part of this UWMP (see output provided in Appendix E). The reporting period was the 2015 calendar year, which showed that system losses for that timeframe made up approximately 1 percent of water supplied within LVMWD's potable water distribution system. Approximately 30 percent of system losses is from real losses (actual leaks) and the remaining 70 percent from apparent losses, such as meter reading errors. A summary of the 2015 audit report is provided in Table 3-2.

TABLE 3-2
12 MONTH WATER LOSS AUDIT REPORT SUMMARY

Reporting Period Start Date	Volume of Water Loss[(a)] (AF)
January 2015	189

Note:
(a) Sum of real and apparent losses.

All "other" LVMWD water uses, besides metered deliveries are summarized in Table 3-3.

TABLE 3-3
HISTORIC "OTHER" WATER USES (AF)

Use Type	2010	2015
Other[(a)]	2,171	2,108
System Losses[(b)]	208	189
Total[(c)]	**2,379**	**2,297**

Notes:
(a) Includes deliveries to the LVMWD potable reservoir, potable supplies used to augment the recycled water system, and authorized, but unbilled and unmetered uses.
(b) 2010 losses estimated based on 2015 audit report.
(c) Any water accounted for in Table 3-1 is not included in this table.

3.2.4 Total Historical Water Use

Table 3-4 below summarized information on all historic potable water uses for the years 2010 and 2015, from the previous tables.

TABLE 3-4
HISTORIC TOTAL POTABLE WATER USE (AF)

Use Type	2010	2015
Total Water Deliveries (from Table 3-1)	18,446	17,288
Other water uses and losses (from Table 3-3)	2,379	2,297
Total	**20,825**	**19,585**

Total water demands including potable and recycled water demands are shown in Table 3-5.

TABLE 3-5
HISTORIC TOTAL WATER USE (AF)

Use Type	2010	2015
Total Potable Water Use[(a)]	20,825	19,585
Total Recycled Water Use[(b)]	4,354	4,240
Total	**25,179**	**23,825**

Notes:
(a) From Table 3-4
(b) See Section 5 for details.

3.3 Existing and Targeted Per Capita Water Use

The Water Conservation Bill of 2009 (SBX7-7) is one of four policy bills enacted as part of the November 2009 Comprehensive Water Package (Special Session Policy Bills and Bond Summary). The Water Conservation Bill of 2009 provides the regulatory framework to support the statewide reduction in urban per capita water use described in the *20 by 2020 Water Conservation Plan*. Consistent with SBX7-7, each water supplier must determine and report its existing baseline water consumption and establish water use targets in gallons per capita per day (GPCD), and compare actual water use against the target; reporting began with the 2010 UWMP. The primary calculations required by SBX7-7 are summarized in Table 3-6.

TABLE 3-6
SBX7-7 CALCULATION

	2010 UWMP	2015 UWMP	2020 UWMP
Base Daily Water Use calculation (average GPCD used in past years)	First calculated and reported in 2010 plan: [318 GPCD (5-year); 307 GPCD (10-year)]	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation. (Described in this Section)	NA
Interim Water Use Target (target GPCD in 2015)	First calculated and reported in 2010 plan: [277 GPCD]	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation. (Described in this Section)	NA
Compliance Water Use Target (target GPCD in 2020)	First calculated and reported in 2010 plan: [246 GPCD]	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation., (Described in this Section)	NA
Actual 2015 Water Use (in GPCD)	NA	In 2015 Plan must compare actual 2015 GPCD against 2015 target. (Described in this Section)	NA
Actual 2020 Water Use (in GPCD)	NA	NA	In 2020 Plan must compare actual 2020 GPCD against 2020 target

In the 2015 UWMP water agencies must demonstrate compliance with the target established for 2015 and demonstrate that the agency is on track to achieve its 2020 target. Compliance is done through review of the SBX7-7 Verification Tables submitted with the 2015 Plan (included in Appendix B).

LVMWD first reported its Base Daily Water Use in its 2010 UWMP. However, at the time the 2010 UWMP was prepared full Census data was not available. LVMWD was therefore required to redo the Base Daily Water Use calculation in this UWMP.

The Base Daily Water Use calculation is based on gross water use by an agency in each year and can be based on a ten-year average ending no earlier than 2004 and no later than 2010 or a 15-year average if ten percent of 2008 demand was met by recycled water. Base Daily Water Use must account for all water sent to retail customers, excluding:

- Recycled water
- Water sent to another water agency
- Water that went into storage

It is at an agency's discretion whether or not to exclude agricultural water use from the Base Daily Water Use calculation. If agricultural water use is excluded from the Base Daily Water Use calculation it must also be excluded from the calculation of actual water use in later urban water management plans. LVMWD did not supply water to agriculture during the period 1995 to 2010 and so agricultural water does not factor into LVMWD's SBX7-7 calculations.

An urban retail water supplier must set a 2020 water use target (herein called the Compliance Water Use Target) and a 2015 interim target (herein called the Interim Water Use Target). There are four methods for calculating the Compliance Water Use Target:

1. Eighty percent of the urban water supplier's baseline per capita daily water use
2. Per capita daily water use estimated using the sum of the following:
    a. For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of DWR's 2016 report to the Legislature reviewing progress toward achieving the statewide 20 percent reduction target, this standard may be adjusted by the Legislature by statute.
    b. For landscape irrigated through dedicated or residential meters or connections, water use efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in section 490 et seq. of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992.
    c. For CII uses, a ten percent reduction in water use from the baseline CII water use by 2020.
3. Ninety-five percent of the applicable state hydrologic region target as stated in the state's April 30, 2009, draft 20 by 2020 Water Conservation Plan. LVMWD falls within the South Coast Hydrologic Region (95 percent of the region target is 142).
4. Reduce the 10 or 15-year Base Daily Per Capita Water Use a specific amount for different water sectors:
    a. Indoor residential water use to be reduced by 15 GPCD or an amount determined by use of DWR's "BMP Calculator".
    b. A 20 percent savings on all unmetered uses.
    c. A 10 percent savings on baseline CII use.
    d. A 21.6 percent savings on current landscape and water loss uses.

The Interim Water Use Target is set as a halfway point between the Base Daily Water Use GPCD and the 2020 Compliance Water Use Target GPCD.

Finally, the selected Compliance Water Use Target must be compared against what DWR calls the "Maximum Allowable GPCD". The Maximum Allowable GPCD is based on 95 percent of a 5-year average base gross water use ending no earlier than 2007 and no later than 2010. The Maximum Allowable GPCD use is used to determine whether a supplier's 2015 and 2020 per capita water use targets meet the minimum water use reduction of the SBX7-7 legislation. If an agency's Compliance Water Use Target is higher than the Maximum Allowable GPCD, the agency must instead use the Maximum Allowable GPCD as their target.

3.3.1 Base Daily Per Capita Water Use

Figure 2-1 illustrates the LVMWD service area population projection used to estimate the Base Daily Per Capita water use. Table 3-7 and Table 3-8 summarize the Base Daily Water Use calculation for LVMWD. As is shown in these tables, LVMWD is eligible to use a 10 to 15-year base period. Years 1999 to 2008 have been selected for calculation of a 10-year base period while years 2004 to 2008 have been selected for calculation of the 5-year base period

TABLE 3-7
BASELINE PERIOD RANGES

Baseline	Parameter	Value	Units
10 to 15 year baseline period	2008 total water deliveries	30,479	AFY
	2008 total volume of delivered recycled water	5,325	AFY
	2008 recycled water as a percent of total deliveries	17	Percent
	Number of years in baseline period[(a)]	10	Years
	Year beginning baseline period range	1999	-
	Year ending baseline period range[(b)]	2008	-
5 year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	-
	Year ending baseline period range[(c)]	2008	-

Notes:
(a) If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a contiguous 10-year period. If the amount of recycled water delivered in 2007 is 10 percent or greater, the first baseline period is a contiguous 10 to 15 year period.
(b) The ending year must be between December 31, 2004 and December 31, 2010.
(c) The ending year must be between December 31, 2007 and December 31, 2010

In order to calculate Base Daily Per Capita water use for past years, it was necessary to develop population estimates for past years. The population for LVMWD was calculated for 1990, 2000, 2010 and 2015 using the DWR online population tool. This was accomplished using a GIS interface. By adding shape files for the entity service area boundaries or public water system boundary in 1990, 2000, and 2010, population is derived using U.S. Census Bureau census tract data from census years. Then, along with District production and service connections, the DWR population tool derives a persons-per-connection number, which is used to determine population in the intervening years between 1990 and 2010.

As shown in the top portion of Table 3-8, LVMWD 10-year Baseline GPCD is estimated to be 311. As shown in the second tier of Table 3-8 LVMWD's 5-year Baseline GPCD is 322.

TABLE 3-8
GALLONS PER CAPITA PER DAY

Year		Service Area Population	Gross Water Use (gallons)	Daily Per Capita Water Use
10 to 15 Year Baseline GPCD				
1	1999	64,771	7,183,720,560	304
2	2000	65,641	7,175,248,423	299
3	2001	65,888	6,817,789,407	283
4	2002	66,135	7,705,082,843	319
5	2003	66,384	7,216,631,554	298
6	2004	66,633	7,752,005,448	319
7	*2005*	*66,883*	7,381,838,227	302
8	*2006*	*67,135*	7,603,417,198	310
9	*2007*	*67,387*	8,474,092,211	345
10	*2008*	*67,640*	8,196,466,795	332
10 to 15 Year Average Baseline GPCD				**311**
5 Year Baseline GPCD				
Year		**Service Area Population**	**Gross Water Use (gallons)**	**Daily Per Capita Water Use**
1	2004	66,633	7,752,005,448	319
2	2005	66,883	7,381,838,227	302
3	2006	67,135	7,603,417,198	310
4	2007	67,387	8,474,092,211	345
5	2008	67,640	8,196,466,795	332
5 Year Average Baseline GPCD				**322**
2015 Compliance Year GPCD				
2015		68,766	5,633,319,470	**224**

The re-calculation of historical service area population for this UWMP, using the DWR population tool and 2010 Census data, resulted in slightly lower historical population values and consequently a slightly higher 10-year average baseline. The 10-year average baseline was 307 GPCD in the 2010 UWMP, compared to 311 GPCD shown in Table 3-8.

3.3.2 Compliance Water Use Targets

In addition to calculating base gross water use, the "20 by 2020" legislation requires that a retail water supplier identify its demand reduction targets.

Option 1. 80% of baseline gpcd water use (i.e., a 20% reduction).

Option 2. The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (80% ETo existing landscapes, 70% of ETo for future landscapes); plus 10% reduction in baseline commercial, industrial institutional use by 2020.

Option 3. 95% of the applicable state hydrologic region target as set in the DWR "20x2020 Water Conservation Plan" (February, 2010) (20x2020 Plan).

Option 4. The provisional target method for determining water use targets developed by DWR pursuant to SBX7-7, which is not applicable here

The methodologies for calculating demand reduction targets were described above. LVMWD is choosing to meet SBX7-7 targets as an individual agency rather than as part of a regional alliance. LVMWD has selected Method 1, achieving 80% of baseline GPCD water use (i.e., a 20% reduction). The 10 year baseline GPCD for LVMWD is 311, which after a 20% reduction is 249 (311*0.80=249). The Interim Water Use Target is 280 GPCD. These calculations are summarized in Table 3-9.

The LVMWD 2015 GPCD was calculated by using the DWR population tool. Once population was derived from 1990 to 2010, 2015 could be extrapolated by using the data points from 1990 to 2010. With 2015 production and connection data, an entity can then calculate their 2015 consumption to determine if they met their 2015 interim target. As shown in Table 3-8, LVMWD had a 2015 GPCD of 224, which means the District has met the 2015 Interim Target.

TABLE 3-9
COMPONENTS OF TARGET DAILY PER CAPITA WATER USE

Period	Value		Unit	
10 to 15-year period selected for baseline GPCD	*First Year*	1999	*Last Year*	2008
5-year period selected for maximum allowable GPCD	*First Year*	2004	*Last Year*	2008
Highest 10-year Average	311		GPCD	
Highest 5-year Average	322		GPCD	
Compliance Water Use Target	249		GPCD	
Maximum Allowable Water Use Target (5% Reduction 5yr)	306		GPCD	
2020 Target	**249**		GPCD	
2015 Interim Target	**280**		GPCD	
Methodology Used	Option #1			

3.4 Projected Water Use

Starting around 2008, water demands dropped off in response to various factors including water conservation efforts and the economic downturn. The 2014 Water Master Plan projected that water demands would eventually recover to pre-2008 levels and then continue to climb. This projected climb was attributed in part to anticipated economic recovery and associated declines in unemployment rates, which were found to be closely correlated to water demands in the area (Kennedy/Jenks 2014a).

However, drought conditions and statewide conservation regulations have also impacted water demands in the recent years. For example, LVMWD was directed to reduce usage by 36 percent in order to meet statewide water use reduction goals; which LVMWD has responded to with additional conservation measures and related penalties. Additional details on these mandatory measures are presented in Chapters 7 and 8. As a result of these conditions, water demands have remained low, compared to 2008 and pre-2008 levels.

LVMWD water demand projections were based on historic water demand trends, an assumption of some easing of water use prohibitions and anticipated population growth from new development. Since these demands are based on historic demands, they naturally account for ongoing water savings resulting from LVMWD's long-standing water conservation regulations, such as water waste ordinances. Future water savings due to codes, standards, ordinances, or transportation and land use plans are not considered in these water use projections nor have other conservation activities been estimated. Continued implementation of aggressive water conservation actions, including for purposes of meeting GPCD targets, could be expected to reduce demands going forward.

From 2014 to the end of 2015, there was a strong reduction in LVMWD demands, largely resulting from drought-related statewide conservation mandates and ensuing conservation actions implemented by LVMWD. It is assumed water use will increase again by 2020 to around average yearly total water use over the past five-year period, which is approximately 21,600 AFY (see also Table 4-2). This translates into an approximately 10 percent increase over 2015 water use. This increase is based on the assumption that drought restrictions resulted in water demand reductions that were greater than usual and which will diminish slightly once water conditions normalize again.

3.4.1 Projected Water Use from New Development

In addition to the anticipated easing of drought restrictions, additional demands are projected to occur from potential future developments. As noted in Section 2, analyses of potential new developments estimated 5,254 new dwelling units by buildout, resulting in additional population of 16,378 by 2040. The associated population growth rate, approximately 1 percent annually, was used to calculate projected demands from the additional population through the end of the planning period. Additional projected demands from future developments are presented in Table 3-10.

3.4.2 Total Projected Water Use

Total projected demands, taking into account the anticipated easing of drought restrictions and estimated additional demands from new development, are shown in Table 3-10.

TABLE 3-10
TOTAL PROJECTED DEMANDS FOR POTABLE WATER (AFY)

Use Type	2020	2025	2030	2035	2040
Projected Baseline Demands[(a)]	21,600	21,600	21,600	21,600	21,600
Additional Demands from Future Development	943	1,927	2,954	4,026	5,144
Total	**22,543**	**23,527**	**24,554**	**25,626**	**26,744**

Notes:
(a) Assumes 10% rebound due to easing of drought restrictions. Based on average of water use over the past five-year period.

It is worth noting here that the demand projections assessed in this UWMP are significantly lower than those developed in the Potable Water Master Plan Update 2014. Demand projections in the Master Plan were based higher population estimates already starting in 2010 and accounted for both, an economic recovery factor of 25 percent and a drought rebound factor of 16 percent (Kennedy/Jenks 2014b). As noted under Section 3.4, Master Plan analyses assumed water demand recovery to pre-2008 levels, however overall demands have remained noticeably lower than pre-2008 levels, in part due to mandatory water use reductions.

In contrast, demand projections in this UWMP account for an approximately 10 percent rebound in demands by 2020, based on average historic water use, as described above.

3.4.3 Projected Demands by Water Use Type

The breakdown of total water use projections, is discussed in this section. Projected customer demands by water use sector are shown in Table 3-11, along with 2015 demands (from Table 3-1). The ratios of water use by sector were assumed to remain the same as the average ratios recorded since 2010.

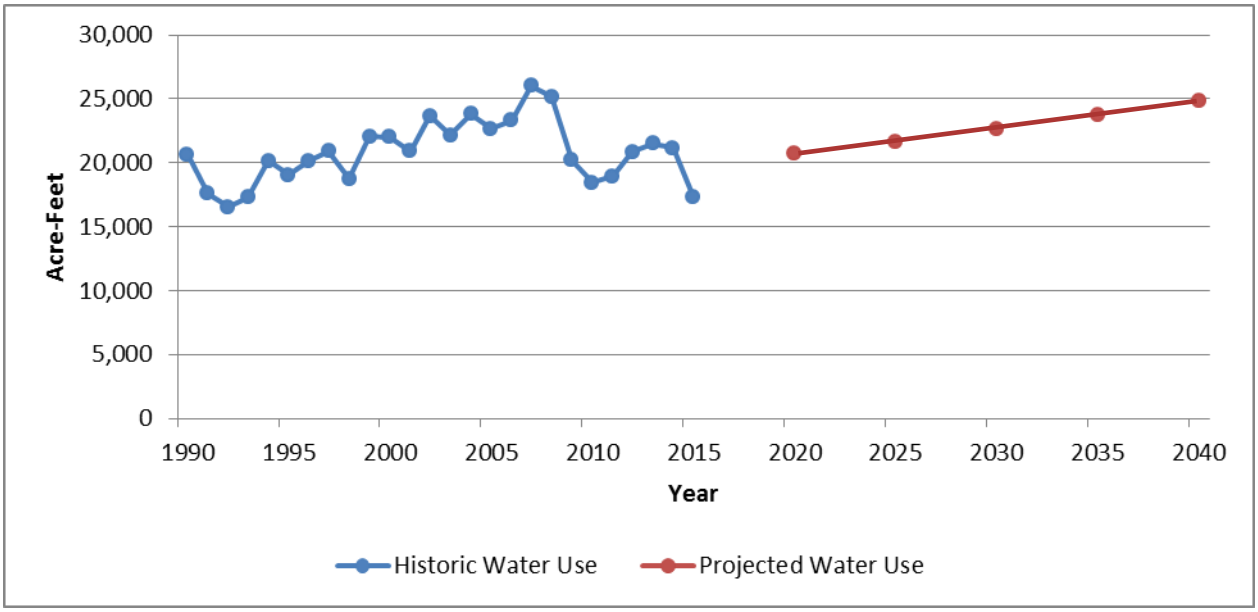
TABLE 3-11
PROJECTED DEMANDS BY WATER USE SECTOR (AFY)

Water Use Sector	2015	2020	2025	2030	2035	2040
Single-family	13,221	15,907	16,656	17,438	18,254	19,106
Multi-family	1,309	1,429	1,496	1,566	1,639	1,716
Commercial	2,006	2,338	2,448	2,563	2,683	2,808
Landscape	545	672	704	737	771	807
Other[(a)]	207	342	358	374	392	410
Total	**17,288**	**20,687**	**21,662**	**22,678**	**23,739**	**24,847**

Note:
(a) Other includes metered fire protection and temporary uses.

The projected customer demands (from Table 3-11) along with historical demands are shown in Figure 3-1.

FIGURE 3-1: HISTORIC AND PROJECTED CUSTOMER DEMANDS



Of the total demands, various portions will be attributed to other uses as described for historical and current water use. Other uses anticipated in the future, will include use of surplus supplies for the Las Virgenes Reservoir, potable water to supplement the recycled water system, other authorized uses such as unmetered, unbilled consumption, and system losses. LVMWD does not anticipate any future sales to other agencies. These uses, beyond those metered deliveries in Table 3-11 are shown in Table 3-12.

TABLE 3-12
FUTURE SALES AND "OTHER" WATER USES (AFY)

Water Use	2020	2025	2030	2035	2040
Sales to Other Agencies	0	0	0	0	0
Other[a]	1,630	1,630	1,630	1,630	1,630
System Losses[b]	225	235	246	256	267
Total[c]	**1,855**	**1,865**	**1,876**	**1,886**	**1,897**

Notes:
(a) Includes deliveries to the LVMWD potable reservoir, potable supplies used to augment the recycled water system, and unbilled, unmetered supplies, such as temporary uses.
(b) Calculated as 1% of deliveries, based on 2015 audit. Losses account for real and apparent losses.
(c) Any water accounted for in Table 3-12 is not included in this table.

Table 3-13 summarizes all projected potable water uses for the years 2020 to 2040, as described in the previous tables.

TABLE 3-13
TOTAL PROJECTED POTABLE WATER USE (AF)

Water Use	2020	2025	2030	2035	2040
Total Water Deliveries (from Table 3-11)	20,687	21,662	22,678	23,739	24,847
Additional water uses (from Table 3-12)	1,855	1,865	1,876	1,886	1,897
Total	**22,543**	**23,527**	**24,554**	**25,626**	**26,744**

Table 3-14 summarizes all projected water uses for the years 2020 to 2040, including potable and recycled water.

TABLE 3-14
TOTAL PROJECTED WATER USE (AF)

Water Use	2020	2025	2030	2035	2040
Total Potable Water Use[(a)]	22,543	23,527	24,554	25,626	26,744
Total Recycled Water Use[(b)]	4,255	4,269	4,284	4,299	4,314
Total	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**

Notes:
(a) From Table 3-13
(b) See Section 5 for details.

3.4.4 Water Use Projections for Lower Income Households

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single-family and multi-family residential housing for lower income households, as defined in Section 50079.5 of the Health and Safety Code, and as identified in the housing element of any city, county, or city and county in the service area of the supplier.

Regional Housing Needs Assessment (RHNA) data developed by SCAG for the 2014-2021 timeframe were used to estimate water use projections for lower income households for the LVMWD service area. These assessments are developed for all Southern California jurisdictions covered by SCAG, including the four cities located within the LVMWD service area.

The average allocations for very low income and low income households across the LVMWD service area Cities, were the following:

- Very Low Income Households 27%[1]
- Low Income Households 17%[1]

No further classification by water use category was available. Therefore, these percentages were applied to the total projected residential water demands to estimate future lower income

[1] Southern California Association of Governments 5th Cycle Regional Housing Needs Assessment Final Allocation Plan, 2012.

household water use, as shown in Table 3-15. These demands are accounted for in, and are not in addition to, total potable water demands described in Section 3.4.4.

TABLE 3-15
PROJECTIONS OF FUTURE LOW-INCOME HOUSEHOLD WATER USE (AF)

Water Use	2020	2025	2030	2035	2040
Estimated Very Low Income Household Water Use[(a)]	4,694	4,915	5,145	5,386	5,637
Estimated Low Income Household Water Use[(b)]	2,891	3,027	3,169	3,317	3,472
Total Lower Income Household Water Use	7,584	7,942	8,314	8,703	9,109

Source: Southern California Association of Governments 5th Cycle Regional Housing Needs Assessment
http://www.scag.ca.gov/Documents/5thCyclePFinalRHNAplan.pdf

Notes:
(a) Assumes 27% (rounded from 27.1%) Very Low Income Households
(b) Assumes 17% (rounded from 16.7%) Low Income Households

In addition, LVMWD will not deny or condition approval of water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

- LVMWD specifically finds that it does not have sufficient water supply;
- LVMWD is subject to a compliance order issued by the State Water Resources Control Board Division of Drinking Water that prohibits new water connections; or
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

3.4.5 GPCD Comparison with Projections

An overview of GPCD projections made in the 2010 and GPCD calculations made in this 2015 UWMPs is provided in the following table. As can be seen in the table, GPCD calculations made in the 2010 are very similar to those calculated for this UWMP, although demand and population projections were higher in the 2010 UWMP.

TABLE 3-16
GPCD COMPARISON WITH PROJECTIONS

Water Use	GPCD
2010 UWMP Projections/Calculations	
2015 Interim Target[(a)]	277
2020 Target[(a)]	246
2015 UWMP Projections/Calculations	
2015 Interim Target[(b)]	280
2020 Target[(b)]	249
Actual 2015 GPCD[(c)]	**224**
Projected 2020 GPCD[(d)]	**257**

Notes:
(a) LVMWD 2010 UWMP, Table 5.2
(b) Table 3-9
(c) Table 3-8 and 3-9
(d) Based on 2020 projected population of 71,768 and projected demands from Table 3-11 of 20,687 AFY

3.4.6 Plan to Meet 2020 GPCD Target

Based on population and water demand projections assessed in this UWMP, and as shown in Table 3-16, the projected 2020 GPCD would exceed the 2020 target by 8 GPCD. As discussed under Section 3.4, the projected 2020 GPCD assumes a 10 percent rebound in demands by 2020. In order to achieve the 2020 target GPCD of 249 at the projected 2020 population, 2020 water demands (pertaining to actual deliveries) would have to be reduced by 643 AFY, for a total of 20,017 AFY compared to the projected 20,687 AFY. This reduction in water demands is highly feasible with the recently adopted budget-based rate structure and continued implementation of water conservation measures, as described in Section 8 – Demand Management Measures.

A budget-based rate structure was adopted by LVMWD at the end of 2015 and went into effect on January 1, 2016. Water budgets provide a strong price signal to drive an efficiency ethic among customers and will enable LVMWD to effectively conserve water and reduce per capita consumption. In addition, LVMWD's current conservation activities, such as public outreach, water conservation rebate programs, and programs such as the "Stop the Waste" campaign will continue to increase awareness about water conservation and promote practices to bring down per capita water use. More details on LVWMD's demand management measures are provided in Section 8.

3.5 Other Factors Affecting Water Usage

In addition to the factors described above, future water use may be affected by other factors, such as climate or demand reducing behaviors. Historically, when the weather is hot and dry, water usage generally increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool, wet years, water usage generally decreases, reflecting less water usage for exterior landscaping.

Under current drought conditions, conservation efforts within the LVMWD service area have been increasingly implemented, resulting in noticeable water demand reductions. As described above, short-term drought responses are anticipated to ease once drought conditions end. However, passive water conservation will continue to contribute to demand reduction goals and ongoing water resource management efforts will continue to focus on maintaining high levels of water use efficiency. Additional details on ongoing and future water conservation actions are provided in Section 8, Demand Management Measures.

Section 4: Water Supply

4.1 Overview

This section describes the water resources available to LVMWD for the 25-year period covered by this Plan. Both currently available and planned supplies are summarized in Table 4-1 and discussed in more detail below.

Located in the Santa Monica Mountains, LVMWD has very limited natural water resources and currently relies on four sources: imported potable water from MWDSC and VCWWD, recycled water from the Tapia Water Reclamation Facility (TWRF), groundwater from the Thousand Oaks Area Basin (which is only used to supplement the TWRF effluent), and surface runoff into the Las Virgenes Reservoir.

LVMWD has developed these water resources to provide increased water reliability and efficient water use to help meet the water demand of the LVMWD service area into the future.

TABLE 4-1
SUMMARY OF CURRENT AND PLANNED WATER SUPPLIES (AFY)

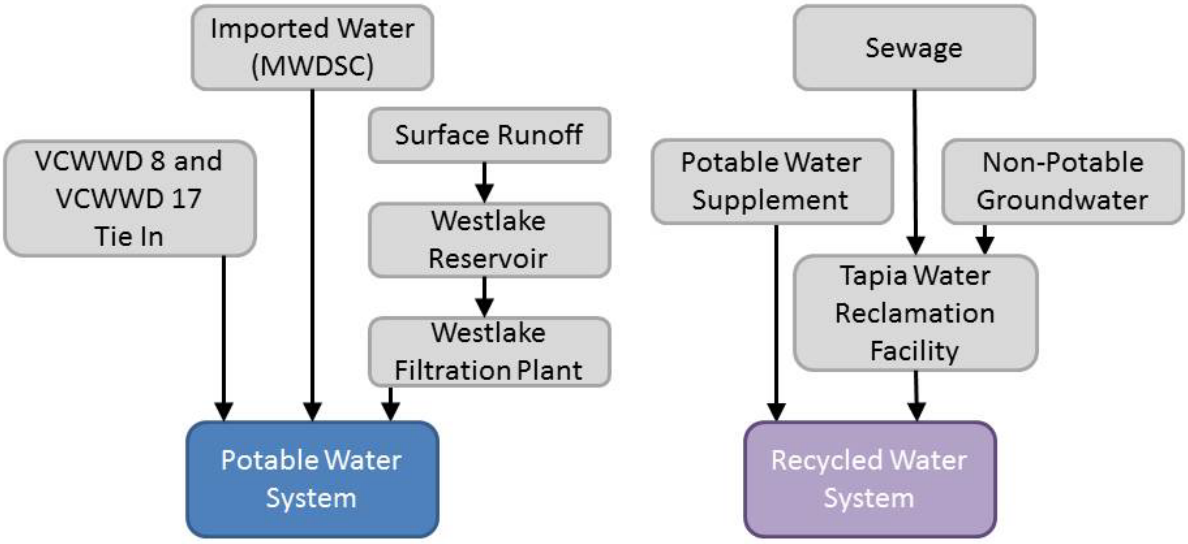
Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported[a]						
MWDSC	19,467	22,412	23,396	24,423	25,495	26,613
Box Canyon (VCWWD 8)[b]	16	19	19	19	19	19
Woolsey (VCWWD 17)[b]	101	112	112	112	112	112
Local Groundwater[c]	0	0	0	0	0	0
Recycled Water[d]	4,240	4,255	4,269	4,284	4,299	4,314
Total Existing Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
Planned Supplies						
Future supplies[e]	0	0	0	0	0	0
Total Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**

Notes:
(a) See Section 4.3.
(b) Projections based on historical average supplies. See Section 4.3.2.
(c) Groundwater is set to 0 to avoid double counting. All pumped groundwater is used to supplement the recycled water system and is therefore accounted for in recycled water supplies. See Section 4.4.
(d) Recycled water supplies are set equal to the lesser of recycled water supplies or demands. See Section 5 for discussion on recycled water supplies and demands.
(e) There are currently no planned/future supplies. See Section 4.7.

4.2 LVMWD Water Distribution System

LVMWD operates two water distribution systems, the potable water distribution system and the recycled water distribution system. Both systems are schematically presented in Figure 4-1.

FIGURE 4-1: LVMWD WATER DISTRIBUTION SYSTEM



LVMWD's potable water distribution system includes 25 storage tanks, 24 pump stations, and nearly 400 miles of pipelines. LVMWD maintains 22 main pressure zones due to the mountainous topography of its service area. For billing purposes, the pressure zones are categorized into five pumping zone levels based on hydraulic grade line (HGL).

LVMWD's recycled water distribution system consists of 62 miles of pipelines, 3 storage tanks, 3 open reservoirs, and 4 pump stations. More details on LVMWD's recycled water system, including related supplies and demands is presented in Section 5 of this UWMP.

4.2.1 Embedded Energy

While not required by the CWC, urban water suppliers are encouraged to provide estimates of energy use related to water operations, also known as embedded energy. As part of this 2015 UWMP, an assessment of energy intensity for the potable water management operations within LVMWD's control was conducted using the Total Utility Approach as described in Appendix O of the UWMP Guidebook. This assessment only evaluates energy use once water enters LVMWD's system and does not include energy used by LVWMD's wholesale agency, MWDSC. For this assessment, water entering the District's distribution system was compared to energy consumed over the one year timeframe of fiscal year 2013/2014. Energy consumption was calculated based on electricity and gas expenditures during the timeframe as reported in the LVMWD budget report and related per unit costs for each energy source. Results of the

assessment showed an energy intensity of 481 kWh/AF for the FY 2013/2014 period, as shown in Table 4-2. The completed Voluntary Energy Intensity Table of UWMP Guidelines Appendix O is provided with this UWMP in Appendix F.

TABLE 4-2
EMBEDDED ENERGY FOR FY 2013/2014 WATER OPERATIONS

Unit	Sum of All Water Management Processes
Volume of Water Entering Process (AF)	23,759[(a)]
Energy Consumed (kWh)	11,428,043[(b)]
Energy Intensity (kWh/AF)	**481**

Notes:

(a) Total volume of water purchased during FY 2013/2014, according to Las Virgenes Municipal Water District Adopted Budget – Fiscal Year 2015-16.
(b) Based on total "Energy" and "Gas" expenses for FY 2013/2014 (according to Las Virgenes Municipal Water District Adopted Budget – Fiscal Year 2015-16) and assuming electricity rates of $0.14/kWh and gas rates of $0.35/therm.

4.3 Imported Water Supplies

4.3.1 State Water Project Supplies

LVMWD's potable water is provided almost entirely through wholesale purchases from MWDSC. MWDSC imports water from northern California through the SWP and the Colorado River to meet the needs of 26 member agencies across six Southern California counties. LVMWD is one of MWDSC's member agencies. Currently, the configuration of MWDSC's distribution system allows LVMWD to receive solely SWP water originating from northern California through the Sacramento-San Joaquin Bay-Delta. The SWP water is treated at Jensen Filtration Plant in Granada Hills prior to delivery to LVMWD.

LVMWD's historical and current SWP deliveries from MWDSC are shown in Table 4-3.

TABLE 4-3
HISTORICAL IMPORTED WATER SUPPLIES FROM MWDSC (AFY)

Water Source	2011	2012	2013	2014	2015	Average
SWP (MWDSC)	20,065	20,695	23,595	23,987	19,467	21,562

Source: LVMWD Water Purchase Records

LVMWD receives the imported supplies on its eastern side and then distributes it to its customers through its potable water distribution system. LVMWD maintains three connections to the MWDSC system. LVMWD's total instantaneous imported water supply capacity is 33,000 gallons per minute (gpm), or 73 cubic feet per second (cfs), as shown in Table 4-4.

TABLE 4-4
CAPACITY OF IMPORTED WATER CONNECTIONS

Connection Name	MWD Pipeline Designation	Current Capacity (gpm / cfs)
LV1	West Valley Feeder No. 1	11,000 gpm (24 cfs)
LV2	Calabasas Feeder	20,000 gpm (45 cfs)
LV3	West Valley Feeder No. 2	2,000 gpm (4 cfs)
Total		**33,000 gpm (73 cfs)**

Note:
(1) Source: 2007 Integrated Systems Master Plan (Boyle 2007)

During planned and unplanned MWDSC outages, LVMWD also utilizes an interconnection to the Los Angeles Department of Water and Power (LADWP), which was enabled through an agreement with MWDSC and LADWP. LADWP provides supply at two distinct connections, one at Kittridge Street and one at Germain Street. Imported supplies from MWDSC presented in this UWMP include water supplied through the three connections to the MWDSC system and the LADWP connections.

4.3.1.1 Reliability of MWDSC Supplies

MWDSC has invested significantly in the development of a diverse resource mix to ensure continued reliability of its supplies. In addition, MWDSC has undertaken numerous planning initiatives, including a recent update to the Integrated Water Resources Plan (IRP), the Water Surplus and Drought Management Plan, the Water Supply Allocation Plan, and the Long-Term Conservation Plan. Additional details on these reports are found in Section 9. These efforts enable MWDSC to meet water supply needs of its member agencies under various water year types.

Based on the 2015 draft MWDSC UWMP, MWDSC anticipates having supplies sufficient to reliably meet water demands through 2040 during average, single dry-, and multiple dry-years. In fact, MWDSC projects surplus supplies under all water year types. It is therefore assumed that MWDSC can meet the full water demands of LVMWD. Hence, for purposes of projecting available imported MWDSC supplies for this 2015, these supplies have been set equal to total LVMWD demands less other imported water supplies and are shown in Table 4-5.

TABLE 4-5
PROJECTED IMPORTED WATER SUPPLIES FROM MWDSC (AFY)

Water Source	2020	2025	2030	2035	2040
SWP (MWDSC)[(a)]	22,412	23,396	24,423	25,495	26,613

Note:
(a) Projections are equivalent to total LVMWD water demand projections less “other imported water supplies.”

4.3.2 Other Imported Water Supplies

In addition to the imported water connections with MWDSC, LVMWD also receives a small amount of treated imported water from the City of Simi Valley/Ventura County Waterworks

District 8 and Ventura County Waterworks District 17. On average these supplies account for less than one percent of LVMWD's potable water deliveries. Interconnections with these agencies provide potable water to two small areas in the hills west of the San Fernando Valley, Woolsey Canyon and Box Canyon. These areas are geographically isolated, and currently not connected to the rest of the LVMWD distribution system. However, LVMWD may connect these customers to the main potable water distribution system in the future (Psomas 2005). A summary of historical purchases from these sources are shown in Table 4-6.

TABLE 4-6
HISTORICAL OTHER IMPORTED WATER SUPPLIES (AFY)

Water Source	2011	2012	2013	2014	2015	Average
VCWWD 8 (Woolsey)	100	115	120	125	101	112
VCWWD 17 (Box Canyon)	17	19	21	22	16	19

Source: LVMWD Water Purchases Records

As these supplies are originally imported via MWDSC, these supplies are considered to be reliable based on the MWDSC reliability discussion above.

4.3.3 Potable Water Reservoir

LVMWD owns and operates the Las Virgenes Reservoir, located just south of Westlake Village. This potable water reservoir has a total capacity of 9,600 AF and provides storage to balance differences between seasonal supply and demands. This reservoir is filled with imported water and is withdrawn and replenished as needed. In low demand season LVMWD puts water into the reservoir, while in high demand season LVMWD draws upon the reservoir to meet the increased demands.

In addition to serving as a seasonal storage facility, the reservoir also provides emergency storage capacity that can be used during imported water outages. Although LVMWD also has a connection to the LADWP system used during scheduled MWDSC outages, following a major earthquake, the Las Virgenes Reservoir would be the only source of supply that LVMWD could count on.

Water withdrawn from the reservoir is treated at the Westlake Filtration Plant. The plant is rated for 15 million gallons per day (mgd) and typically operates during periods of peak demand in the summer. The total volume of the reservoir typically fluctuates by several hundred to more than 1,000 AF each year. Since its creation, the reservoir has remained at a volume of approximately 7,300 AF, but occasionally drops below 4,000 AF during dry months, and reaches over 9,000 AF when recharge water is purchased from MWDSC.

While the reservoir's watershed area does not supply a significant source of water in most years, it is estimated that sufficient runoff is typically produced to offset evaporative losses. Based on an assumed watershed area of 550 acres, the watershed is estimated to receive about 770 AF annually, whereby average evaporation losses are estimated at about 700 AFY.

Due to the uncertainties of runoff volumes and minimal contribution to overall water supplies, this runoff is not accounted for in LVMWD supplies.

4.3.3.1 Potable Water Interconnection

Currently, LVMWD and Calleguas Municipal Water District (CMWD) are currently in the process of developing a joint interconnection between their potable water systems. The interconnection would enable delivery of potable water from one agency to the other if imported water supply was interrupted, and would enable LVMWD to receive water from CMWD to support winter refill of Las Virgenes Reservoir. This project is anticipated to enable the exchange of approximately 870 AFY and will enable LVMWD to fill the Las Virgenes Reservoir by an additional 1,300 AFY. This additional water would serve as an alternative to purchasing water from MWDSC during summer months.

Overall, this interconnection will increase reliability of the potable water system of both agencies.

4.4 Groundwater

Groundwater underlying the LVMWD service area provides a local source of water supplies. However, due to its poor quality, this source is solely used to augment supplies of the recycled water system. As all pumped groundwater is used to supplement the recycled water system, these supplies are not explicitly listed in total LVMWD supply tables, but rather accounted for under “recycled water”.

Currently, LVMWD operates two groundwater wells in the Thousand Oaks Area Groundwater Basin; Westlake Well 1 and Westlake Well 2, which are located along Lindero Canyon Road, South of Highway 101. The combined capacity of these two wells is approximately 1.15 mgd, or 800 gpm. Due to high levels of iron and manganese, groundwater pumped from these wells needs to be treated first. To avoid the need of a separate treatment facility, the pumped groundwater is discharged into the sewer collection system when additional recycled water is needed. After mixing and conveyance, this water is treated at the TWRF, at which point it is used to supplement the recycled water system.

FIGURE 4-2: GROUNDWATER BASIN

4.4.1 Groundwater Basin Description

The Thousand Oaks Area Groundwater Basin (Basin), shown on Figure 4-2, is a relatively small alluvial basin bounded by semi-permeable rocks of the Santa Monica Mountains. Triunfo Creek drains the valley into Malibu Creek. The Basin underlies a surface area of about 3,100 acres or five square miles.

Groundwater in the Basin is primarily found in Quaternary age alluvium, with some water found in sandstone beds and fractures. Recharge to the Basin occurs by percolation of rainfall and stream flow from Conejo Creek. The Basin is estimated to have a total storage capacity of 130,000 AF (DWR 2004).

According to California's Groundwater Bulletin 118, groundwater quality is magnesium-calcium-sodium sulfate in nature. Total dissolved solids (TDS) content usually ranges from 800 to 1,200 milligrams per liter (mg/l). TDS content averages about 1,400 mg/L, but can be as high as 2,300 mg/l in some areas. In addition to high TDS levels in the Basin, water quality is also impaired by high alkalinity and hardness (DWR 2004).

4.4.2 Historical Groundwater Levels

In the past and into the mid 1970's groundwater was being pumped by private and public users in larger quantities than currently. Once LVMWD improved the water supply systems in the service area and neighboring systems came on line, imported water began to dominate local supply. These actions caused groundwater pumping to decline and groundwater levels to rise.

4.4.3 Groundwater Management

The Thousand Oaks Area Basin is not adjudicated and DWR has not identified the Basin to be in an overdraft condition (DWR 2004). Therefore, there are no defined legal pumping rights for LVMWD. LVMWD has not adopted a groundwater management plan, and no regional groundwater management plan currently exists for the Basin. The Thousand Oaks Area Groundwater Basin has been rated a "very low" priority basin by DWR and as such is not subject to the Sustainable Groundwater Management Act.

4.4.4 Groundwater Pumping

As groundwater supplies are only used to supplement LVMWD's recycled water system during peak demand season, annual groundwater pumping varies significantly. The amount of groundwater pumped from the Basin through the Westlake Wells over the last five years is presented in Table 4-7.

TABLE 4-7
HISTORICAL GROUNDWATER PUMPING FROM THE THOUSAND OAKS AREA BASIN (AFY)

Water Source	2011	2012	2013	2014	2015	Average
Thousand Oaks Area Basin	190	182	267	298	258	239

Source: Pumping data from LVMWD

Given the existing conditions of the Basin, very low priority of the basin and overall low levels of pumping by LVMWD, groundwater supplies are anticipated to be reliably available throughout the planning period of this UWMP.

Projections of groundwater to be pumped from the Basin are presented in Table 4-8. These projections are based on the assumption that groundwater will be required to supplement wastewater flows for production of recycled water for two months out of each year and in consideration of average historical pumping shown above.

TABLE 4-8
PROJECTED GROUNDWATER PUMPING FROM THE THOUSAND OAKS AREA BASIN (AFY)

Water Source	2020	2025	2030	2035	2040
Thousand Oaks Area Basin[(a)]	239	239	239	239	239

Note:
(a) Projections are based on average historical pumping from table 4-5. Actual usage by year is anticipated to fluctuate based on actual needs during periods of peak recycled water demands.

As noted previously, to avoid double counting of supply capacities, groundwater supplies are stated as zero in total supply tables, as they are captured in total recycled water supply.

4.5 Recycled Water

Recycled water is discussed in Section 5.

4.6 Desalinated Water Opportunities

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[h]). LVMWD has evaluated opportunities for using desalinated water in future supply options. However, at this time, none of the opportunities is practical or economically feasible for LVMWD and LVMWD has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this Plan. Desalination options considered by LVMWD are described below.

4.6.1 Opportunities for Brackish Water and/or Groundwater Desalination

As discussed under Section 4.4, water from the groundwater basin underlying the LVMWD service area is currently delivered to the TWRF for treatment and subsequent use in the recycled water system. These groundwater supplies are characterized by elevated TDS concentrations, reaching as high as 2,800 mg/l in some areas in addition to high iron and manganese concentrations. A conversion of this groundwater use for potable supplies is not considered a feasible option at the moment. No other opportunities for desalination of local brackish groundwater currently exist.

4.6.2 Opportunities for Seawater Desalination

It is not considered practical nor economically feasible to implement a seawater desalination program at this time. While located near the Pacific Ocean, in comparison to many other water purveyors, the topography of LVMWD's service area would not be conducive to pumping desalinated water from the ocean.

LVMWD could provide financial assistance to other retailers and/or team with MWDSC to provide financial assistance in the construction of other retail water purveyor's seawater desalination facilities in exchange for SWP supplies. Should the need arise, LVMWD may consider this option.

4.6.3 MWDSC's Desalination Program

Although, LVMWD has not identified any specific opportunities for desalination of seawater or impaired groundwater at this time, other desalination projects developed by MWDSC within the region will indirectly benefit LVMWD. MWDSC serves as a regional facilitator for seawater desalination and provides assistance and incentives to promote the development of local seawater desalination projects.

MWDSC's Seawater Desalination Program (SDP) was created in 2001 as an incentive program to encourage the development of seawater desalination by local agencies. In 2014, seawater desalination projects were merged into the Local Resource Program (LRP) to promote local resources development in the region. Like the LRP, the SDP offers sliding-scale incentives to member and local agencies that proceed up to $250/acre-foot of produced supplies. The incentive is designed to accelerate the development of expensive local supply projects by member agencies by lowering their cost. Current SDP projects have the potential to produce between 91,000 to 142,000 AFY once completed (MWDSC 2016).

4.7 Transfers and Exchanges

There are currently no transfers or exchanges planned at this time.

4.8 Planned Water Supply Projects and Programs

4.8.1 Projects Planned by LVMWD

LVMWD updated its Integrated Water System Master Plan in 2014. Analysis of the potable water system resulted in recommended improvements to enhance system operations and reliability. Recommendations included piping, storage and pumping improvements, as shown in Table 4-9.

TABLE 4-9
POTABLE WATER SYSTEM RECOMMENDED CAPITAL IMPROVEMENTS

Improvements	Description
Improvements for Existing Demand Conditions	
Pipeline	A total of 19,611 linear feet in various pressure zones.
Storage	Jed Smith pressure zone, storage needed: 0.8 MG.
Pumping	Standby pumping needs in two pressure zones.
Improvements for Future Demand Conditions	
Pipeline	A total of 28,975 linear feet in various pressure zones.
Storage	A total of 5.5 MG in various pressure zones.
Pumping	Standby pumping needs in various pressure zones.

Source: Potable Water Master Plan Update 2014

With the implementation of these projects, LVMWD will improve its potable water infrastructure to meet the existing and projected demands. These projects are important to continue to provide reliable potable water services, however, these projects will not change the availability of existing supplies or result in new supplies. As a result, no planned supplies are shown in supply projection tables.

In efforts to enhance overall water supplies, LVMWD continues to look for opportunities to expand its recycled water system. Opportunities to do so were assessed in the Recycled Water Master Plan Update of 2014. The majority of potential growth in recycled water demand stems from extensions to the existing recycled water system and conversion of existing potable water demand to recycled use.

Additional potential options to expand the recycled water system outside of the LVMWD service area are described in the Recycled Water Master Plan Update (2014). Details on existing and projected recycled water use and supplies are discussed in in Section 5.

4.8.2 Projects Planned by MWDSC

Since LVMWD purchases most of its water from MWDSC, projects implemented by MWDSC to secure their water supplies have a direct impact on LVMWD.

As described in its 2015 UWMP, MWDSC plans to meet its supply reliability goal through:

- Surface water storage programs related to the SWP and Colorado River
- Colorado River Water Management Programs
- SWP Management Programs
- Central Valley/SWP Storage and Transfer Programs
- Water Conservation
- Development of Local Supplies
- Water Recycling Projects
- Seawater Desalination Programs
- Groundwater banking programs in Southern California Region

The projected supply capability of MWDSC's programs that are under development, under average year conditions, is summarized in Table 4-10. Details on the implementation approach and the achievements to-date for each of these programs are discussed in detail in Chapter 3 of the MWDSC 2015 UWMP.

TABLE 4-10
MWDSC'S PLANNED ADDITIONAL SUPPLY PROGRAMS (AFY)

Programs Under Development	2020	2025	2030	2035	2040
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	225,000	225,000	225,000
Colorado River Aqueduct	5,000	25,000	25,000	25,000	25,000
Total Capability of Proposed Programs	**63,000**	**100,00**	**343,000**	**385,000**	**425,000**

Source: MWDSC 2015 UWMP, Table 2-6

As shown in Table 4-10, the planned programs are estimated to provide up to 425,000 AFY in additional supplies by 2040.

4.9 Projected Water Supplies in Average, Single Dry and Multiple Dry Years

The following tables provide an overview of supplies anticipated to be available to LVMWD in average/normal, single-dry and multiple-dry years over the planning period of this UWMP.

TABLE 4-11
WATER SUPPLY ESTIMATES – AVERAGE/NORMAL YEAR (AFY)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported[(a)]						
MWDSC	19,467	22,412	23,396	24,423	25,495	26,613
Box Canyon (VCWWD 8)	16	19	19	19	19	19
Woolsey (VCWWD 17)	101	112	112	112	112	112
Local Groundwater[(b)]	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Existing Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**

Notes:
(a) See Section 4.3.
(b) Groundwater is set to 0 to avoid double counting. Groundwater is used within the recycled water system and is accounted for in recycled water supply.

Single dry year estimates were calculated based on the largest percent increase in water use between two years over the last 5 years, which was approximately 10 percent. Accordingly, supplies and demands are assumed to increase by 10 percent over the average water year. The timeframe chosen was considered appropriate for purposes of assessing dry year water resource conditions due to severe drought conditions during the recent 5-year period.

TABLE 4-12
WATER SUPPLY ESTIMATES – SINGLE-DRY YEAR (AFY)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported[(a)]						
MWDSC	19,467	24,653	25,736	26,865	28,044	29,275
Box Canyon (VCWWD 8)	16	21	21	21	21	21
Woolsey (VCWWD 17)	101	123	123	123	123	123
Local Groundwater[(b)]	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Existing Supplies	**23,825**	**29,052**	**30,149**	**31,294**	**32,487**	**33,733**

Notes:
(a) See Section 4.3.
(b) Groundwater is set to 0 to avoid double counting. Groundwater is used within the recycled water system and is accounted for in recycled water supply.

Multiple dry year estimates were calculated based on the largest percent increase between multiple years over the last 5 years, which occurred between 2011 and 2013 and amounted to approximately 14 percent. Accordingly, supplies and demands are assumed to increase by 14 percent over the average water year. The timeframe chosen was considered appropriate for purposes of assessing dry year water resource conditions due to severe drought conditions during the recent 5-year period. Table 4-13 presents water supply estimates for multiple dry year conditions, representing the 3rd year of the sequence.

TABLE 4-13
WATER SUPPLY ESTIMATES – MULTIPLE DRY YEAR (AFY)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported[(a)]						
MWDSC	19,467	25,550	26,671	27,842	29,064	30,339
Box Canyon (VCWWD 8)	16	22	22	22	22	22
Woolsey (VCWWD 17)	101	128	128	128	128	128
Local Groundwater[(b)]	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Existing Supplies	**23,825**	**29,954**	**31,090**	**32,276**	**33,512**	**34,803**

Notes:
(a) See Section 4.3.
(b) Groundwater is set to 0 to avoid double counting. Groundwater is used within the recycled water system and is accounted for in recycled water supply.

Section 5: Recycled Water

5.1 Overview

This section of the Plan describes the existing and future recycled water opportunities available to the District service area. The description includes descriptions of recycled water supply and demand for 2015 and projections out to 2040 in five year increments, as well as LVMWD's proposed actions to encourage recycled water use.

5.2 Recycled Water Coordination and Recycled Water System

Since TWRF began producing recycled water in 1972, LVMWD has aggressively pursued the development of a recycled water market. By requiring all non-residential landscaping located along the District's recycled water distribution main lines to be designed or converted to utilize recycled water for landscape irrigation, LVMWD now serves 638 of the approximately 900 dedicated irrigation accounts within their service area with recycled water. Further, for well over a decade, all water reaching the TWRF during the summer has been beneficially reused.

Recycled master planning efforts began in the 1980s, when ambitious concepts for a regional system were first developed. Master Plans for the existing recycled water system were prepared in 1985, 1988, 1999, 2007, and most recently updated in 2014.

The existing recycled water system is jointly owned and operated by LVMWD, Triunfo Sanitation District (TSD) and CMWD. This system currently serves customers ranging from Calabasas in the east to Thousand Oaks in the west. The system begins at the TWRF, which is owned by the Joint Powers Authority (JPA) of LVMWD and TSD, where up to 10 mgd of wastewater is treated to a high level, allowing it to be distributed for non-potable uses such as landscape irrigation and various commercial uses. The JPA also owns and operates a complex distribution system, consisting of pipelines, pump stations, tanks and reservoirs, and associated appurtenances to deliver the recycled water to areas of Los Angeles and Ventura Counties (Kennedy/Jenks Consultants/HDR 2014).

5.3 Wastewater Collection, Treatment, and Disposal

5.3.1 Tapia Water Reclamation Facility

TWRF was initially constructed in 1965 with an initial capacity of 0.5 mgd. The plant is located on Malibu Canyon Road at the southern edge of LVMWD's wastewater service area, as shown on Figure 5-1, and provides primary, secondary, and tertiary treatment for wastewater contributed by both LVMWD and TSD from their respective service areas.

Figure 5-1: LVMWD and TSD Service Areas

The current design treatment capacity of TWRF is 16 mgd, however due to permit limitations on nutrients, its current treatment capacity is approximately 12 mgd. The average daily flows to TWRF are fairly constant, but do show some seasonal variation. During storm events the daily flows into the TWRF can double due to inflow and infiltration into the sewer mains. In 2015, the plant processed nearly 8 mgd. A decrease in flows is attributed to increased water conservation efforts and the economic slow-down.

Table 5-1 presents an overview of influent and effluent flows at TWRF in 2015.

TABLE 5-1
2015 WASTEWATER FLOWS AT TWRF (AF)

TWRF Flows (AF)	2015
Influent	8,550[(a)]
Effluent	7,727

Source: TWRF Month End Reports provided by LVMWD
Note:
(a) Value includes supplemental groundwater in 2015 and retreat water. Actual sewage flows were 6,854.

Table 5-2 documents wastewater collection in 2015, as required by UWMP Guidelines. Methods of disposal are discussed in the subsequent subsection. Table 5-3 documents wastewater treatment and discharge in 2015.

Influent flows to TWRF are made up of TSD wastewater flows, LVMWD wastewater flows, and supplemental water primarily from LVMWD wells. In 2015, the ratio of LVMWD wastewater to TSD wastewater was approximately 60 to 40. Influent flows were supplemented in 2015 by 258 AFY of groundwater. A depiction of inputs to the recycled water system is provided in Section 4, Figure 4-1.

5.3.2 Effluent Disposal

The supply of recycled water is relatively constant because the generation of wastewater is essentially the same throughout the year. In contrast, recycled water demands typically vary on a seasonal basis. Summer peaks, for example, can be several times higher than typical spring and fall demands. Currently, recycled water demand exceeds supply during summer months and is lower than available supply during winter months, requiring a portion to be disposed of.

Excess treated water effluent from TWRF is discharged to two local waterways. The primary disposal method is discharge into Malibu Creek during the months of November to April. Excess effluent, beyond what can be discharged to Malibu Creek, is discharged to the Los Angeles River, via the Arroyo Calabasas, which requires pumping over the Calabasas grade.

TABLE 5-2
WASTEWATER COLLECTED WITHIN SERVICE AREA 2015 (AFY)

Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area in 2015	Name of Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
JPA (LVMWD, TSD)	Metered	4,116	JPA (LVMWD, TSD)	Tapia Water Reclamation Facility	Yes	No

TABLE 5-3
WASTEWATER TREATMENT AND DISCHARGE WITHIN SERVICE AREA IN 2015

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2015 Volumes (AFY)			
						Wastewater Treated	Discharged Treated Wastewater[a]	Recycled Within Service Area	Recycled Outside of Service Area
TWRF	Malibu Creek	Monte Nido Area	River/creek disposal	Yes	Tertiary	8,550	1,798	4,240	1,635
TWRF	Los Angeles River	Arroyo Calabasas Creek	River/creek disposal	Yes	Tertiary	0[b]	54	0[b]	0[b]
					Total	**8,550**	**1,852**	**4,240**	**1,635**

Notes:
(a) "Discharged Treated Wastewater" volume is the amount of effluent disposed of via creek disposal.
(b) Volumes of wastewater treated and recycled are captured in the first row, and set to 0 in the second row in order to avoid double-counting.

Discharges from the TWRF are regulated under an NPDES permit (Order No. R4-2005-0074) issued by the Los Angeles Regional Water Quality Control Board. Under the existing permit, LVMWD is generally prohibited from discharging to Malibu Creek from April 15 to November 15. However, when the creek flow drops below 2.5 cfs during this period, LVMWD is required to release recycled water from Tapia to provide water pools (habitat) for the endangered steelhead trout.

5.3.3 Recycled Water Supplement

During periods of peak demands, TWRF treated effluent is not be sufficient to meet recycled water demands. In such cases, LVMWD supplements its recycled water with two sources: storage within the system and supplemental water from Westlake groundwater wells and potable water. As a result of the poor groundwater quality, groundwater supplies are conveyed to the TWRF via the sewer system. The groundwater thereby enters the recycled water system with other water treated at TWRF. The amount of groundwater from the Westlake Wells is on average about 240 AFY (see Table 4-5).

Even with groundwater supplies to supplement recycled water, historical demands have significantly exceeded recycled water availability in the summer months. As a result, potable water supplement is needed to meet recycled water needs for those months. The amount of supplemental imported water has averaged approximately 590 AFY since 2010. Supplementing with potable water is possible at three locations in the recycled water system, listed as follows:

- Cordillera Tank (1,200 gpm capacity)
- Reservoir 2 (about 2,100 gpm capacity)
- Morrison Tank (about 1,300 gpm capacity)

Supplemental water sources and respective volumes in 2015 are shown in Table 5-4.

TABLE 5-4
SUPPLEMENTAL WATER ADDED IN 2015

Source of Supplemental Water	Volume (AF)
Groundwater	257
Potable Water	454
Total	711

These supplemental sources are important to the optimization of recycled water use in the LVMWD service area, as they allow recycled water system demands to be met during peak periods thereby encouraging continued demands by recycled water users during non-peak periods.

5.3.4 Wastewater Flow Projections

The 2014 Sanitation Master Plan Update projected the wastewater flow to reach approximately 12 MGD in year 2035. The projection was based on an average annual wastewater flow of 8 MGD in 2013 and an Economic Factor of 13 percent, Drought Recovery Factor of 9 percent and an Infiltration and Inflow Factor of 4 percent (Kennedy/Jenks Consultants 2014c). Due to persistent drought condition that reduced inflows, low groundwater tables that all but eliminated infiltration, a not fully recovered economy and a mandatory water conservation order from the State to reduce water usage by 36% within the LVMWD service area, the most recent wastewater flow has been reduced from the 8 MGD in 2013 to 6 MGD in 2015. Although the Economic Factor, Drought Recovery Fact and Infiltration and Inflow Factor identified in the 2014 Sanitation Master Plan still hold true when future conditions improve, the timing to apply these factors should be extended. For the purpose of projecting wastewater flow to the 2040 built-out year for this report, we are estimating the wastewater flow growth projection slope identified in the ES-1 on page Executive Summary-II of the 2014 Sanitation Master Plan Updated has been further flattened and with a lower starting point due to reduction of wastewater flow from 8 MGD in 2013 to 6 MGD in 2015. Therefore the 12 MGD projection would likely be reached in 2040 than in the year 2035 as identified in the 2014 Sanitation Master Plan Update. Projections in five-year increments are shown in Table 5-5.

TABLE 5-5
PROJECTED WASTEWATER FLOWS (AFY)

User Type	2015	2020	2025	2030	2035	2040
Wastewater Flows (Influent to TWRF)[(a)]	7,140	8,181	9,374	10,741	12,308	14,103
Total	**7,140**	**8,181**	**9,374**	**10,741**	**12,308**	**14,103**

Note:
(a) Wastewater flows from LVMWD and TSD combined. Does not include groundwater supplement.

Groundwater and potable water supplies will continue to be supplemented on an as-needed basis and can be expected to be used in volumes similar to historical averages (described in Section 5.3.3).

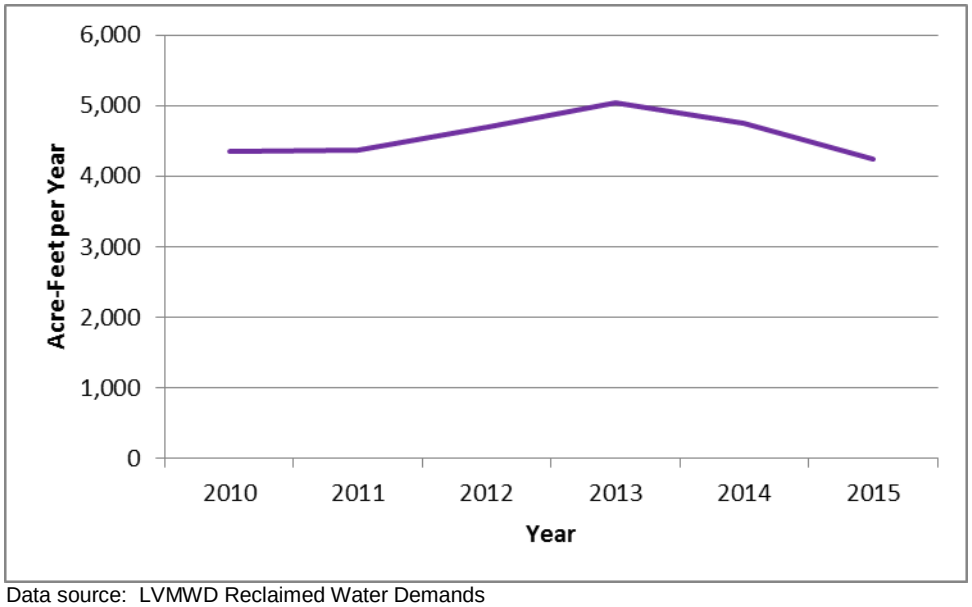
5.4 Recycled Water Beneficial Uses

LVMWD currently (2015) supplies about 20 percent of its total customer demands with recycled water. In summer and fall, all wastewater produced at TWRF is effectively recycled. While the Regional Water Quality Control Board (RWQCB) has permitted TWRF tertiary treated water for spray landscape irrigation, agriculture, and industrial uses, recycled water uses by LVMWD's customers are almost exclusively for landscape and golf course irrigation within LVMWD's service area.

Historical recycled water deliveries to LVMWD customers since 2010 are displayed in Figure 5-2. Recycled water demands peaked in 2013, then dropped to below 2010 levels by 2015. Unusually dry and warm conditions during winter months resulted in increased recycled water

use during normal periods of low demand. However, observed declines in demands can in part be attributed to extensive promotion of water conservation in the LVMWD service area.

FIGURE 5-2:
HISTORICAL LVMWD RECYCLED WATER DELIVERIES



Data source: LVMWD Reclaimed Water Demands

LVMWD recycled water use in 2015 by user type is shown in Table 5-6.

TABLE 5-6
2015 RECYCLED WATER USE (AFY)

User Type	2015
Landscape Irrigation	3,756
Golf Course Irrigation	483
Other[(a)]	1
Total	**4,240**

Note:
(a) Dual Plumbed Commercial

5.5 Potential Recycled Water Demands

Recycled water planning efforts have been successful in connecting virtually all schools, parks, and golf courses to the existing recycled water system. LVMWD's opportunities for expansion of the recycled water system are limited by the wastewater flow projections for its service area. However, opportunities for developing additional recycled water use are also limited. The LVMWD service area is nearly built out. The smaller sized developments that are expected to be built in the next few decades are anticipated to lack major recycled water customers, such as schools and parks. In order for demands to keep up with any potential increases in supply,

therefore, LVMWD will need to make a concerted effort to maximize the use of recycled water whenever new developments occur or large customers sign up for service. The conversion of estate-sized residential customers to recycled water user may also be needed, though it should be noted that this will need to be closely coordinated with DDW.

The 2014 Recycled Water Master Plan assessed potential future demands, with a focus on potential infill and recycled water distribution extensions. The majority of potential growth in recycled water use will come from extensions to the recycled water system to serve primarily existing customers and conversion of a portion of potable water uses to recycled water use.

5.5.1 Recycled Water Demands Projections

Up to 4,314 AFY in total recycled water demands are estimated to be possible in the LVMWD service area by 2040 based on existing demands and realization of potential projects that would serve the LVMWD service area (HDR 2014). It is anticipated by LVMWD, and assumed for purposes of recycled water use projections, that all new recycled water demands will be for landscape irrigation. Projected recycled water use for the LVMWD service area is shown in Table 5-7.

TABLE 5-7
PROJECTED RECYCLED WATER USE (AFY)

User Type	2020	2025	2030	2035	2040
Landscape Irrigation	3,771	3,785	3,800	3,815	3,830
Golf Course Irrigation	483	483	483	483	483
Other[(a)]	1	1	1	1	1
Total	**4,255**	**4,269**	**4,284**	**4,299**	**4,314**

Note:
(a) Dual Plumbed Commercial

5.6 Comparison of Projected and Actual Use

Table 5-8 presents actual 2015 recycled water use, and provides a comparison of the projections from the 2010 UWMP. As shown in the table, LVMWD supplied slightly less recycled water than projected for 2015 in the 2010 UWMP. Reduced demands are in part attributed to overall LVMWD water conservation actions, as described above.

TABLE 5-8
RECYCLED WATER USES - PROJECTION COMPARED WITH ACTUAL USE (AFY)

User Type	2010 Projection for 2015[(a)]	2015 Use
Landscape Irrigation	4,410	3,756
Golf Course Irrigation	467	483
Other[(b)]	1	1
Total	**4,878**	**4,240**

Notes:
(a) Total recycled water use projection from 2010 UWMP, Table 4.4. Breakdown based on average of actual 2010 and 2015 use.
(b) Dual Plumbed Commercial

5.7 Actions to Encourage and Optimize Recycled Water Use

The 2014 Recycled Water Master Plan evaluated infrastructure improvements needed to reach new customers and address capital facility replacement needs. These improvements would contribute to optimizing recycled water use. As noted above, opportunities for developing substantial new recycled water demands are fairly limited. The majority of potential new growth in recycled water use would occur through main extensions that would primarily serve existing customers and enable conversion of some potable water demands to recycled water use.

Optimizing recycled water use also depends on maximizing use during periods where recycled water supply exceeds demands. This is primarily important in months when excess treated water cannot be discharged to Malibu Creek due to permit restrictions. During these so-called shoulder months, one method implemented to increase use has been to encourage recycled water customers to use water above their normal requirements at no added cost.

The District and its JPA partner, TSD are currently undertaking an effort for seasonal storage of recycled water, which entails long-range plans to beneficially use all of the JPA's recycled water and to effectively discontinue discharges to Malibu Creek. In July of 2015, a Plan of Action was approved for the effort by the JPA Board of Directors.

As a drought response measure, the JPA has been making recycled water available at no cost to residential customers. After attending a brief training, customers may fill up their own sealable containers at the Rancho Las Virgenes Composting Facility. Up to 300 gallons of recycled water may be picked up on a single visit.

Expanding the use of recycled water for demands that do not peak seasonally, such as dual-plumbing systems and recirculation systems would allow more year-round usage of recycled water. LVMWD's customer base, lacking significant industrial or commercial office customers, preclude extensive use of recycled water for these types of demands.

Direct or indirect potable reuse of recycled water may be considered by LVMWD to further optimize recycled water use in the future as the process becomes more common in California.

Section 6: Water Quality

6.1 Overview

Water quality is an important factor in determining overall supply reliability. If adequate drinking water quality cannot be maintained, then the supply may no longer be available for use. Water quality is not a static feature of water, and the potential impacts and variables must be recognized. Water quality is dynamic in nature and can vary over the course of a year.

Water quality regulations can also change as the result of the discovery of new contaminants, changes in the understanding of the health effects of contaminants, and the introduction of new treatment technologies. All retail water purveyors are subject to drinking water standards set by the U.S. Environmental Protection Agency (EPA) and DDW.

LVMWD's regular water quality monitoring and understanding of current and potential regulations allows LVMWD to respond readily to any water quality issues that may impact supply reliability.

This section provides a general description of the water quality of LVMWD's water supplies. A discussion of potential water quality impacts on the reliability of these supplies is also provided.

6.2 Imported State Water Project Water

LVMWD meets the majority of its potable water demands with imported water from MWDSC. This imported water is transported from northern California via the SWP and supplied to MWDSC, a SWP contractor. The water is then supplied to LVMWD its three turnout connections to the MWDSC system or interconnections, as described in Section 3. A small portion, typically less than one percent, is purchased from Ventura County Waterworks Districts 8 and 17. These supplies also originate primarily from the SWP.

The source of SWP water is rain and snow from the Sierra Nevada, Cascade, and Coastal mountain ranges. This water travels to the Sacramento-San Joaquin Delta, which is a network of natural and artificial channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The Delta forms the eastern portion of the San Francisco estuary, receiving runoff from more than 40 percent of the state's land area. It is a low-lying region interlaced with hundreds of miles of waterways. From the Delta, the water is pumped into a series of canals and reservoirs, which provides water to urban and agricultural users throughout the San Francisco Bay Area and Central and Southern California.

During periods of intense rainfall or snowmelt, new constituents may be mobilized and enter the water while other constituents are diluted or eliminated. However, imported SWP water is generally of high quality with low levels of TDS, sulfate, hardness, iron and manganese, and consistently meets all federal and state water quality standards as reported in the annual Water Quality Report (LVMWD 2014). According to the 2014 report, TDS levels in the water served in the LVMWD service area ranged from 300 to 440 parts per million (ppm), which is well below the California secondary standard of 1,000 ppm. Nitrate concentrations are also generally low and were measured at up to 0.6 ppm in LVMWD's water supplies according to the 2014 report.

In contrast, the California drinking water standard for nitrate is 45 ppm. Prior to delivery to LVMWD, the imported water is treated at MWDSC's Jensen Treatment Facility in Granada Hills to ensure that all water quality standards are met.

The water quality reports of the Ventura County Waterworks Districts providing water to LVMWD also show that delivered water quality is high and well below the State drinking water standards (VCWWD 8 and 17, 2015).

6.3 Local Surface Water Quality

A portion of LVMWD's potable water is stored in the Westlake Reservoir, which is replenished with surplus imported water supplies. The reservoir also receives runoff from the watershed. Water withdrawn from the reservoir is treated at the Westlake Filtration Plan. Filtration at the plant is accomplished through 10 filtration units containing diatomaceous earth filtration media. The filtered water is then disinfected with chloramines. Reservoir supplies have historically been of very high quality. LVMWD does not currently experience and does not foresee issues with supplies from this reservoir.

6.4 Groundwater

Local groundwater is relatively high in sodium bicarbonate or calcium bicarbonate, iron, manganese and possibly calcium-magnesium sulfate. The TDS content typically ranges from 800 to 1,200 mg/l, although can reach concentrations as high as 2,800 mg/l in some areas. The elevated TDS concentrations make the water too poor in quality to be used as a potable source without substantial treatment. High iron and manganese concentrations also cause sidewalk stains when put directly into irrigation systems. To circumvent this issue, the groundwater is used only to augment the recycled water system.

6.5 Recycled Water

While recycled water is not a source of LVMWD's potable water supplies, its reliability and hence its quality, is important for continuing to offset non-potable water demands. Recycled water comprises nearly 20 percent of LVMWD's total water use on an annual basis. The recycled water is stored in an open reservoir, which can often times result in increased levels of particulate matter, which could potentially impact its usability. However, LVMWD has had success with using non-clogging sprinklers and valve controllers where problems with particulate matter have been experienced. No other water quality issues related to recycled water have been identified to pose problems in the LVMWD service area.

6.6 Water Quality Impacts on Reliability

The quality of water dictates the types and extent of management strategies a retail water purveyor will implement, including, but not limited to, the selection of raw water sources, treatment alternatives, blending options, and modifications to existing treatment facilities. Maintaining the quality of water supplies helps maintain continued reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. If water supplies become degraded they may require additional treatment to ensure that drinking water standards

are met. However, high levels of degradation may eventually require the water source to be taken off-line and could potentially decrease overall water supply reliability.

Further, utilizing high quality sources of water facilitates management activities, increases water supply alternatives and water supply reliability, and decreases the cost of treatment within the service area. Based on current conditions and knowledge, water quality is not anticipated to affect LVMWD's water reliability. LVMWD receives and expects to continue to receive high quality imported SWP water. However, as water quality issues are constantly evolving, LVMWD will take appropriate steps to continue providing safe, high quality water supplies, to the extent feasible. It is well recognized water quality treatment can have significant costs should the need for treatment arise.

Section 7: Water Reliability

7.1 Overview

The UWMP Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty years in five year increments. The Act also requires an assessment for a single-dry year and multiple-dry years. Water use projections are described in Chapter 3 and water supply is described in Chapter 4. This chapter summarizes LVMWD's water supply relative to demands over the 25-year planning period, through 2040.

7.2 Normal, Single-Dry, and Multiple-Dry Year Reliability

Water supply and demands comparison is presented in this section for three water year scenarios: normal (average), single dry, and multiple dry water years. These scenarios are defined as follows:

- Normal Year: The normal year is a year in the historical sequence that most closely represents median runoff levels and patterns.
- Single Dry Year: This is defined as the year with the minimum useable supply.
- Multiple Dry Years: This scenario represents the lowest average water supply available for a consecutive multiple year period (three years or more).

7.2.1 Normal/Average Water Year

Assumptions about supplies and demands are provided in Chapters 3 and 4. Table 7-1 demonstrates that LVMWD anticipates adequate supplies for years 2020 to 2040 under Normal conditions.

7.2.2 Single-Dry Year

LVMWD's water supplies and demands over the 25-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in the recent five years. Table 7-2 summarizes the existing and planned supplies available to meet demands during a single-dry year. Demand during dry years was assumed to increase by 10 percent over the average water year, based the highest increase between two years over the last five-year period.

7.2.3 Multiple-Dry Year

The water supplies and demands for the LVMWD service area over the 25-year planning period were also analyzed in the event that a three-year multiple-dry year event occurs. Water systems are typically more vulnerable to these dry conditions of longer duration because they deplete water storage reserves in local and state reservoirs and in groundwater basins.

Table 7-3 summarizes the existing and planned supplies available to meet demands during multiple-dry years. Demand during multiple-dry year conditions was assumed to increase by 14 percent over average water conditions, by the third year of dry conditions. This percent increase is based on the highest three-year period increase over the last five-year period.

7.2.4 Summary of Comparisons

As shown in the tables below, LVMWD anticipates having adequate supplies to meet demands during average, single-dry, and multiple-dry years throughout the 25-year planning period.

TABLE 7-1
COMPARISON OF SUPPLIES AND DEMANDS – AVERAGE/NORMAL YEAR (AF)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies[(a)]						
Imported						
MWDSC	19,467	22,412	23,396	24,423	25,495	26,613
Box Canyon (VCWWD 8)	16	19	19	19	19	19
Woolsey (VCWWD 17)	101	112	112	112	112	112
Local Groundwater	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
Estimated Demands						
Potable Water Demands[(b)]	19,585	**22,543**	**23,527**	**24,554**	**25,626**	**26,744**
Recycled Water Demands[(c)]	4,240	4,255	4,269	4,284	4,299	4,314
Total Demands	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
Difference (Supply - Demand)	**0**	**0**	**0**	**0**	**0**	**0**

Notes:
(a) See Section 4
(b) From Tables 3-4 and 3-13
(c) From Table 5-2

TABLE 7-2
COMPARISON OF SUPPLIES AND DEMANDS – SINGLE DRY YEAR (AF)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported						
MWDSC	19,467	24,653	25,736	26,865	28,044	29,275
Box Canyon (VCWWD 8)	16	21	21	21	21	21
Woolsey (VCWWD 17)	101	123	123	123	123	123
Local Groundwater	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Supplies	**23,825**	**29,052**	**30,149**	**31,294**	**32,487**	**33,733**
Estimated Demands						
Potable Water Demands	**19,585**	**24,797**	**25,880**	**27,009**	**28,188**	**29,419**
Recycled Water Demands	4,240	4,255	4,269	4,284	4,299	4,314
Total Demands	**23,825**	**29,052**	**30,149**	**31,294**	**32,487**	**33,733**
Difference (Supply - Demand)	**0**	**0**	**0**	**0**	**0**	**0**

TABLE 7-3
COMPARISON OF SUPPLIES AND DEMANDS – MULTIPLE DRY YEAR (AF)

Water Supply Source	2015	2020	2025	2030	2035	2040
Existing Supplies						
Imported						
MWDSC	19,467	25,550	26,671	27,842	29,064	30,339
Box Canyon (VCWWD 8)	16	22	22	22	22	22
Woolsey (VCWWD 17)	101	128	128	128	128	128
Local Groundwater	0	0	0	0	0	0
Recycled Water	4,240	4,255	4,269	4,284	4,299	4,314
Total Supplies	**23,825**	**29,954**	**31,090**	**32,276**	**33,512**	**34,803**
Estimated Demands						
Potable Water Demands	**19,585**	**25,699**	**26,821**	**27,991**	**29,213**	**30,489**
Recycled Water Demands	4,240	4,255	4,269	4,284	4,299	4,314
Total Demands	**23,825**	**29,954**	**31,090**	**32,276**	**33,512**	**34,803**
Difference (Supply - Demand)	**0**	**0**	**0**	**0**	**0**	**0**

7.3 Climate Change

Understanding the potential impacts of climate change is essential for optimizing water resources planning and preparing appropriate responses. A climate change vulnerability assessment was performed for the 2014 Greater Los Angeles County (GLAC) Integrated Regional Water Management Plan (IRWMP), which includes the LVMWD service area. Impacts to the region described in the GLAC IRWMP include average temperature increases by at least 3.5 degrees Fahrenheit by mid-century; a decrease in precipitation by 2 to 5 inches with the greatest reductions occurring in higher elevations; demand increases; and changes in the reliability of imported water supplies.

A summary of the highest priority vulnerability issues identified for the GLAC Region with a description of the applicability to the LVMWD service area is provided in Table 7-4 and discussed in the following.

Similar to the GLAC Region and other areas across the State, the LVMWD service area is vulnerable to numerous climate change impacts, including increased water demands, changes in the reliability of water supplies and potential water quality impacts with potential implications on treatment costs.

Water demand and water supply are the two primary factors that guide water resource planning. Demands in the LVMWD service area are expected to increase as a result of potential new developments. While water conservation efforts in the LVMWD service area have shown effectiveness to reduce demands, water use savings are expected to level off in the future as demands harden and water conservation fatigue sets in. Hence, it will be especially critical for LVMWD to ensure and improve water supply reliability to meet projected demands.

Due to the high dependence on imported supplies, LVMWD's vulnerability of water supplies to climate change impacts is highly dependent on MWDSC's supply reliability. MWDSC has undertaken significant efforts in water resource planning and in developing and promoting development of a diverse mix of water resources. These efforts have helped and continue to help improve overall water supply reliability in the face of climate change.

Diversifying the water supply portfolio is an important strategy for improving local supply reliability and increase climate change resiliency. LVMWD has been expanding local water resources primarily with its extensive recycled water system. While future LVMWD projects primarily consist of water infrastructure improvements that are not anticipated to produce new or additional supplies, LVMWD will continue to consider and pursue opportunities for enhanced water supply reliability and climate change resiliency as they become available.

The foregoing discussion also reflects vulnerabilities assessed for the LVMWD service area based on the Climate Change Vulnerability Assessment of the Climate Change Handbook for Regional Water Planning (USEPA and DWR, 2011). This assessment was completed for the LVMWD service area in relation to water demand, water supply and water quality vulnerabilities, as shown below in Table 7-5.

TABLE 7-4
SUMMARY OF GLAC REGION AND LVMWD CLIMATE CHANGE VULNERABILITIES

Vulnerability Issue	General Impact on GLAC Region	Applicability to LVMWD
Decreased ability to meet water conservation goals.	Demand hardening and increased costs can be anticipated to reduce water use efficiency options and additional savings.	In response to drought conditions and water use reduction targets, LVMWD has implemented water conservation measures that have produced measurable savings. As of January 1, 2016, water budgets are being implemented to encourage greater water use reductions. While these ongoing actions will produce initial water use reductions, there will be few, if any "low-hanging fruit" for obtaining significant additional savings in the future.
Reduced resiliency to drought.	The Region is highly vulnerable to persistent drought and climate change effects will increase the need for drought resiliency.	Similar to the Region as a whole, the need for drought resiliency will increase in the LVMWD service area, which includes expanding and diversifying water resources available to LVMWD.
Municipal water demand would increase.	Water demands are anticipated to increase from new developments in combination with hotter temperatures.	Water demand projections show an increase in potable water demands alone of over 7,000 AFY through 2040.
Decrease in imported water supply (from impacts to Bay-Delta system).	Climate change impacts including sea level rise, temperature changes and higher storm surges could impact the reliability of imported Delta supplies.	LVMWD depends highly on imported Delta supplies, via MWDSC. However, reliability assessments performed by MWDSC anticipate sufficient supplies through the planning period as a result of various local and imported water projects and planning strategies.
Decrease in coastal groundwater supply.	Reduced reliability of alternative supplies, including imported water could increase pressures on groundwater supplies.	Groundwater in the LVMWD service area is currently only used to supplement the recycled water system and overdraft conditions have not been identified. Changes in the reliability of alternative supplies, such as imported water, are not anticipated to have significant impacts on groundwater resources in the service area.
Increase in wildfire risk and erosion and sedimentation which may impact water quality, flood control, and habitat.	Increases in erosion from increased wildfires and flashier storm events would result in increased sediment loads entering local streams or other water bodies.	Wildfire risks are generally high in undeveloped open space areas, which make up approximately a third of the LVMWD service area. Water supplies stored in LVMWD potable and recycled water reservoirs could be vulnerable to increased wildfires and related erosion and sedimentation. Water quality impacts could have particular implications on treatment requirements and costs at the Westlake Filtration Plant, which treats potable water supplies from the Las Virgenes Reservoir.

Vulnerability Issue	General Impact on GLAC Region	Applicability to LVMWD
Damage to coastal infrastructure/ recreation/ tourism due to sea level rise and storm surge	Coastal infrastructure is vulnerable to sea level rise in combination to increased flooding.	LVMWD is not located directly along the coast, therefore related impacts are not considered high vulnerability issues to LVMWD.

TABLE 7-5
CLIMATE CHANGE VULNERABILITY INDICATOR QUESTIONS

Vulnerability Question[(a)]	Potential Vulnerability Issue[(a)]	Response/Justification
	Water Demand	
Are there major industries that require cooling/ process water in your planning region?	As average temperatures increase, cooling water needs may also increase.	There are no major industries in the LVMWD service area.
Does water use vary by more than 50% seasonally in parts of your region?	Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent.	Potable water use does not vary by more than 50% seasonally. Recycled water demands do show significant seasonal variations, which is one of the reasons for which supplemental water is used in the recycled water system. The supplemental supplies, from groundwater and potable imported water, help maintain consistent demand from recycled water customers, while meeting peak demands and minimizing discharge of unused recycled water supplies.
Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?	Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.	Agricultural water demands in the LVMWD service area are limited and impacts on crop water needs are not anticipated to have significant effect on overall water demands.
Do groundwater supplies in your region lack resiliency after drought events?	Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.	Groundwater in the LVMWD service area is currently only used to supplement the recycled water system, with production averaging 239 AFY since 2011. The groundwater basin from which groundwater is pumped, the Russell Valley Basin, has not been identified to be in overdraft. Due to overall low reliability on the groundwater basin, low levels of pumping and very low CASGEM priority conditions, groundwater supplies are not considered to lack resiliency after drought events.

Vulnerability Question[(a)]	Potential Vulnerability Issue[(a)]	Response/Justification
Are water use curtailment measures effective in your region?	Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.	Water use conservation measures implemented to achieve a 20% reduction by 2020 and particularly in response to drought targets in 2015, have proven to be largely effective in reducing water use across the LVMWD service area. As of March, 2016, water use was reduced by over 28 percent compared to 2013 baseline levels through expanded implementation of conservation efforts. District customers have been found to be very responsive to calls for water use reductions, including with efforts to change their landscapes, use of water saving appliances, and altering water use practices. Additional water conservation measures and possible curtailments will need to be implemented in order to meet drought targets and 2020 per capita water use targets. However it is important to note that with the implementation of additional water conservation measures, saturation of water-saving devices and fixtures, as well as onset of water conservation fatigue felt by customers, it can be expected that marginal water savings will decrease and savings will eventually level off. At that point, the vulnerability to drought may increase.
Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements.	Snowmelt is not a source of flow for local streams. However maintaining instream flow requirements exist in the service area. Minimum instream flows are recommended for Malibu Creek, which receives excess recycled water flows from the Tapia WRF. At the same time, discharges are prohibited between April 15 to November 15. Due to the consistency of wastewater flows in contrast with the seasonal variability of recycled water demands, discharges of excess treated water can be anticipated to be available to meet minimum flows as needed. With drier conditions potentially resulting from climate changes, additional discharges may be required in the future.

Vulnerability Question[(a)]	Potential Vulnerability Issue[(a)]	Response/Justification
	Water Supply	
Does a portion of the water supply in your region come from snowmelt?	Snowmelt is expected to decrease as the climate warms. Water systems supplied by snowmelt are therefore potentially vulnerable to climate change.	Imported SWP supplies originate in large part from snowmelt in northern California. Those supplies are the primary source of supplies in the LVMWD service area and may be impacted by changes in precipitation and temperature regimes.
Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Some imported or transferred water supplies are sources from climate-sensitive watersheds, such as water imported from the Delta and the Colorado River.	LVMWD relies on imported water originating from the Delta. LVMWD does not receive Colorado River water,
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.	LVMWD does not rely on coastal aquifers.
Would your region have difficulty in storing carryover supply surpluses from year to year?	Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.	Currently, LVMWD stores surplus imported water supplies in its Westlake Reservoir, which has a capacity of approximately 9,600 AF. Water stored in this reservoir adds some resiliency to LVMWD water supplies. However, LVMWD would also continue to rely on the resiliency of the MWDSC system to meet all its demands.
Has your region faced a drought in the past during which it failed to meet local water demands?	Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.	The region, and State as a whole, has recently experienced a historic drought, which required significant water use cutbacks. LVMWD customers did not experience shortages in their supplies. Water shortage contingency plan elements have been implemented to reduce demands and will continue to be implemented as needed in order to meet demands.
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.	Quagga muscles are a threat to the Westlake Reservoir and if introduced at the reservoir they could impact the operation of the reservoir.

Vulnerability Question[(a)]	Potential Vulnerability Issue[(a)]	Response/Justification
	Water Quality	
Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?	Some areas are expected to become more vulnerable to wildfires over time.	Wildfire risks are generally high in undeveloped open space areas, which make up approximately a third of the LVMWD service area. Water supplies stored in LVMWD potable and recycled water reservoirs could be vulnerable to increased wildfires and related erosion and sedimentation. Water quality impacts could have particular implications on treatment requirements and costs at the Westlake Filtration Plant, which treats potable water supplies from the Westlake Reservoir.
Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.	The LVMWD service area does not rely on local surface water as a supply source. Imported SWP water is generally of high quality, however higher temperatures could impact the quality of those supplies.
Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?	In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.	Most streams in the area region are naturally ephemeral or intermittent. With increasing temperatures instream flows could decrease, which has the potential to compromise assimilative capacities. Treated water discharges to Malibu Creek will continue to be maintained or limited, as required by existing permits.
Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	In the future, low flows are expected to decrease and to last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.	Existing beneficial uses of Malibu Creek, a representative stream of the LVMWD service area, include the following: - Warm Freshwater Habitat - Cold Freshwater Habitat - Wild Habitat - Rare, Threatened, or Endangered Species - Migration of Aquatic Organisms - Spawning, Reproduction, and/or Early Development - Wetland Habitat

Vulnerability Question[(a)]	Potential Vulnerability Issue[(a)]	Response/Justification
		These beneficial uses would likely be affected by lower flows in the future.
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.	The LVMWD service area depends on imported SWP water which is treated at the Jensen Filtration Plant prior to delivery to LVMWD. As a result, water entering the LVMWD distribution system has a consistent high quality. Impacts to water quality in the Westlake reservoir are a potential vulnerability which could result in additional treatment requirements and/or higher treatment costs.

Note:
(a) Vulnerability questions and potential vulnerability issues are taken from the Climate Change Vulnerability Assessment of the Climate Change Handbook for Regional Water Planning (USEPA and DWR, 2011)

Section 8: Demand Management Measures

8.1 Overview

The purpose of the Demand Management Measures (DMM) section of this UWMP is to describe the DMMs that LVMWD (a) has implemented over the past five years (since 2010) to meet its urban water use reduction targets and (b) plans to implement to meet its urban water use reduction targets. For the purposes of this UWMP the DMMs are categorized as "Foundational" and "Other". Foundational DMMs, listed below, are those DMMs that the UWMP Act and Water Code specifically mention:

a. Water waste prevention ordinances
b. Metering
c. Conservation pricing
d. Public education and outreach
e. Programs to assess and manage distribution system real loss
f. Water conservation program coordination and staffing support

Activities outside of the Foundational DMMs that encourage less water use within LVMWD fall in the "Other DMM" category.

LVMWD is committed to implementing water conservation and recycling programs to maximize sustainability in meeting future water needs for its customers. LVMWD is a signatory to the Memorandum of Understanding regarding Urban Water Conservation in California dated September 1991 (and amended thereafter). As a member of the CUWCC and signatory of its MOU, LVMWD realizes the importance of the DMMs to ensure a reliable future water supply. Water conservation reports for the recent reporting period are recorded in the CUWCC database.

Narrative descriptions of LVMWD's DMMs are provided below and include conservation measures already in place and those that are being considered to improve the efficiency of water use within LVMWD.

8.1.1 Foundational DMMs

8.1.1.1 Water Waste Prohibition

Section 3-4.202 of Article 2 of the Las Virgenes Municipal Water District Code, addresses penalties for wasteful water use. These penalties were adopted on August 11, 2015 and became effective on January 1, 2016. As described in that section, District customers are not allowed to wastefully or negligently use water, including knowingly allow leaks. Water waste penalties are summarized in Table 8-1.

Water use exceeding twice a customer's water budget is considered a waste of water and a violation subject to escalating administrative penalties, as described in Section 3-4.202 and summarized in the table below. Water budgets are described under 8.1.1.3.

TABLE 8-1
WATER WASTE PENALTIES

Penalties or Charges	Violation Level
The customer shall receive a written warning from LVMWD, with amount of exceedance and notice that further exceedances will result in monetary penalties.	First Violation
A penalty of $2.50 per billing unit or portion thereof will be imposed, for water use exceeding twice the customer's water budget.	Second Violation
A penalty of $5.00 per billing unit or portion thereof will be imposed, for water use exceeding twice the customer's water budget.	Third and Subsequent Violation

In addition, mandatory conservation measures and irrigation practices, as required under Section 3-4.404, are listed in Table 9-3.

In August 2015, LVMWD also adopted Resolution No. 2481, which updated the Water Shortage Contingency Plan and is described in more detail in Section 9 – Water Shortage Contingency Plan.

8.1.1.2 Metering

Currently, all connections within LVMWD's service area are metered and customers are billed according to the amount of water used. LVMWD will continue to install meters on all new connections, however additional water conservation savings are not foreseeable from this measure.

Installation of Automatic Meter Reading/Automated Metering Infrastructure (AMR/AMI) is planned for the future. The AMR/AMI system will assist customers in monitoring their water use, facilitate compliance with water budgets and enhance leak detection.

8.1.1.3 Conservation Pricing

In an effort to encourage water use reduction, LVMWD implemented a budget-based water billing structure with Resolution No. 2475, adopted on October 26, 2015. Each customer is provided with a personalized water budget, which is designed to meet their specific indoor and outdoor water needs.

For residential customers, budgets are based on the number of people in the household, irrigated area, evapotranspiration rate, with some adjustments. Irrigation customer budgets are based on irrigated areas and evapotranspiration rates. For commercial customers, individual budgets are based on each customer's historical usage. Customers are then charged based on their efficiency relative to their budget (by tier). A summary of the tiers, tier descriptions and related 2016 rates for residential, irrigation and commercial customer classes is provided in the Table 8-2.

TABLE 8-2
QUANTITY RATES AND TIER LEVEL

Tier Name	Tier Name/Description (Residential and Irrigation[(b)])	Tier Description (Commercial)	Customer Rates ($/HCF)[(a)]
Tier 1	Efficient Indoor (Indoor Water Budget)	33% of Budget	$2.36
Tier 2	Efficient Outdoor (Outdoor Water Budget)	67% of Budget	$3.18
Tier 3	Inefficient (101-150% of Budget)	101-150% of Budget	$3.96
Tier 4	Excessive (Over 150% of Budget)	Over 150% of Budget	$4.98

Notes:
(a) 2016 rates; rates are per hundred cubic feet (hcf)
(b) Irrigation only has three tiers. Irrigation Tiers 1, 2 and 3 correspond to Residential Tiers 2, 3, and 4.

In addition to the budget-based commodity charges, District water rates also include a "Readiness to Serve Charge", which is a fixed rate depending on the meter size, and per unit elevation charges to offset pumping costs. Elevations charges differ by zone, with customers at higher elevations paying higher costs per unit of water.

8.1.1.4 Public Education and Outreach

Public Information Program

LVMWD maintains an intensive outreach commitment to customers regarding water conservation benefits and practices. LVMWD engages in numerous public information programs, including ongoing public tours of district facilities preceded by a presentation on conservation, specialized tours provided to leadership from local cities, state and local elected officials and local environmental groups and their volunteers. LVMWD has a Speaker's Bureau that provides expert speakers to service clubs, homeowner associations, chambers of commerce and other organizations on a variety of topics, including water conservation, water efficient plant selections, environmental issues and more.

LVMWD utilizes multiple media outlets to encourage water conservation and educate its customers, including social media, its website, cable tv, "auto dial" telephone messages, news releases, newsletters, paid ads in local newspapers, and portions of the Water Quality Report dedicated to conservation messages. In the period 2013-2015, LVMWD's General Manager was featured on several television newscasts, a radio program and multiple cable television productions speaking on the topic of water conservation.

The LVMWD website provides a substantial amount of water conservation resources and information. The website includes detailed tips and guidance on conserving water, both indoors and outdoors, including videos on how to check for leaks, irrigate properly, and save water. In addition, the website is used to advertise initiatives to further reduce potable water use. For example, free recycled water is available to customers of LVMWD or Triunfo Sanitation District for irrigation purposes and is advertised on the LVMWD website. Participants can fill up their approved containers every Saturday after attending one training session. The LVMWD website also advertises that any resident of LVMWD or Triunfo Sanitation District can obtain free

compost from the Rancho Las Virgenes Community Composting Facility every Saturday. The soil amendment improves soil conditions and results in reduced watering needs. Additional content includes rebates, water-wise plants, daily watering index, sign-ups for water-wise gardening classes and facility tours and conservation advisories.

LVMWD also publishes a bi-monthly newsletter, "The Current Flow", which provides LVMWD customers with updates on conservation, rebates, environmental stewardship, easy to use water-saving ideas, landscaping tips and more. The newsletter is mailed to customers and is also available on the LVMWD website and in hard copy at LVMWD. Water conservation information is also included in the LVMWD annual water quality report. Social media outlets, including twitter and Facebook, are also used for public outreach.

At community events occurring throughout the District's service area, LVMWD promotes awareness of water conservation issues through an informational outreach booth, often accompanied by its mascot "Little Drop." Among the many of the events where LVMWD has encouraged water conservation are the following:

- Agoura Hills Conservation Summit and Expo, August 17, 2015
- Agoura Hills Concerts in the Park, July 5, 2015
- Agoura Hills Public Safety Day, 2013 and 2015
- Bay Laurel Carnival 2014
- Calabasas Pumpkin Festival, 2013, 2014 and 2015
- Calabasas Earth Day Celebrations 2013, 2014 and 2015
- Agoura Hills Reyes Adobe Days, 2013, 2014 and 2015
- Westlake Village Rotary Street Fair, 2013, 2014 and 2015
- Sumac Elementary's Fall Festival, 2014

Further efforts include the donation of water-topic books and other resources to local libraries, and presentations scheduled at local city council meetings, all of which are carried on public access television. LVMWD also conducts point of purchase advertising in conjunction with its rebate programs.

School Education Programs

In addition to reaching out to the general public, LVMWD implements a school education program that includes providing educational materials and instructional assistance.

LVMWD's primary outreach is conducted with Las Virgenes Unified School District, which has some 11,300 students enrolled in grades K-12. Additional outreach is made to private schools and home-schooled students. School programs include:

- $107,000 direct financial support for the LVUSD 4-5 Science Team

- Facility tours for all fourth grade students and high school science classes (includes bus transportation)
- Educational water conservation performances by “The Story Pirates”
- Annual water conservation student art contest that generates several thousand submissions
- Support for two high school teams participating in the Metropolitan Water District’s Solar Cup Challenge (2013, 2014, 2015)
- Mentoring outreach to local high schools
- Website section devoted to water conservation targeted to students

8.1.1.5 Program to Assess and Manage Distribution System Real Loss

A Water Activity Report, previously called Water Loss Report, was produced for the 2015 calendar year, based on the water system balance methodology established by the American Water Works Association (AWWA) Manual 36. The results showed that LVMWD’s unaccounted for water losses (real and apparent losses) are minimal, at approximately one percent for the audited period.

LVMWD regularly utilizes visual inspection of distribution routes and aerial surveys of 8 miles of pipeline traversing rugged terrain to detect leaks.

8.1.1.6 Water Conservation Program Coordination and Staffing Support

The Water Conservation and Reuse Supervisor is responsible for coordinating LVMWD’s water conservation program and providing residents with useful water conservation information. This position is held by Scott W. Harris.

8.1.2 Other DMMs

8.1.2.1 Water Survey Program

LVMWD offers water audits to residential customers. Audits include reviewing water usage history with the customer, identifying leaks inside and outside the home, and recommending improvements. Between 2010 and 2015, 576 water use efficiency surveys were conducted at single-family residential properties.

LVMWD also provides water efficiency surveys to large landscape customers. Between 2010 and 2015, LVMWD conducted large landscape efficiency surveys for over 107 acres, including locations such as schools, country clubs, and homeowners associations.

8.1.2.2 Stop the Waste

In an effort to identify water waste and increase water use efficiency, LVMWD established the “Stop the Waste” program in February 2014. With this program, anyone can report incidents such

as water leaks, broken sprinkler heads or irrigation violations to LVMWD by phone or email. Photos of the leaks or other water waste incidents can be included in the report sent to LVMWD. LVMWD will then contact the property owner to correct the problem. Information can be found on the LVMWD website: http://www.lvmwd.com/your-water/drought/stop-the-waste.

LVMWD also engages the community in reducing water waste by providing door tags that community members can use to alert neighbors of observed water waste.

8.1.2.3 Rebate Programs

LVMWD has been offering and promoting water conservation rebates in coordination with MWDSC as part of the SoCal WaterSmart rebates program, including the following:

- High Efficiency Toilet (HET)
- High Efficiency Clothes Washer (HECW)
- Weather-Based Irrigation Controller (WBIC)
- Rotating Sprinkler Heads
- Rain Barrel
- Soil Moisture Sensor System
- Premium High-Efficiency Toilets
- Ultra Low and Zero Water Urinals
- Plumbing Flow Control Valves
- Larch Rotary nozzles
- In-stem Flow Regulators
- Soil Moisture Sensor Systems
- Connectionless Food Steamers
- Air-cooled Ice machines
- Cooling Tower Conductivity Controllers
- Cooling Tower pH Controllers
- Dry Vacuum Pumps
- Laminar Flow Restrictors

Between 2012 and 2015, LVMWD also implemented the “Mow no Mow” turf removal rebate. Under the program LVMWD residential customers received $2 per square foot of turf removed, up to a total of $6,000. The program converted 1.4 million square feet of landscaping to California-friendly gardens and hardscaping.

Table 8-3 The following table provide a summary of conservation rebates provided between 2010 and 2015.

TABLE 8-3
CONSERVATION REBATES BETWEEN 2010 AND 2015

Rebate Type	Number of Rebates Provided
Residential Conservation Rebates	
HECW	1,554
HET	845
Rain Barrels	91
Rotating Nozzles	3,208
Soil Moisture Sensor	1
WBIC	3,71
WBIC Large Landscape	107
CII Conservation Rebates	
In-stem Flow Restrictor	1,360
HET	1
HET Premium	28
Rotating Nozzle	2,020
Zero Water Urinals	10
WBIC	135

Source: LVMWD Conservation Intervention Data (2010-2015) provided by LVMWD staff

8.1.3 Planned Actions to Meet Water Use Targets

Going forward, LVMWD will continue implementation of the Foundational DMMS described in above. However, the extent and details of implementation may be modified. It is important to note that severe drought conditions, statewide reduction mandates and wholesale agency use restrictions have led LVMWD to considerably intensify their water conservation program efforts, including significantly increased public outreach and education. As a result, economic factors including feasibility and cost-effectiveness will be taken into account to evaluate future implementation and possible modifications to LVMWD’s water conservation program. Overall, these programs will assist LVMWD in achieving its SBX7-7 2020 target as described in this UWMP.

Section 9: Water Shortage Contingency Plan

9.1 Overview

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, an earthquake which damages water delivery or storage facilities, a regional power outage, or a chemical spill that affects water quality. This section of the UWMP describes how LVMWD plans to respond to such emergencies so that water demands can be appropriately reduced and emergency water needs are met promptly and equitably.

LVMWD updated its Water Shortage Contingency Plan (WSCP) in August 2015. The implementation of budget-based water rates on January 1, 2016 triggered the most recent update of the WSCP. As the State recognizes, water budgets can achieve results equivalent to outdoor irrigation restrictions. In lieu of watering restrictions, the LVMWD Board of Directors may institute a drought factor to limit outdoor water use and/or reduce the indoor water allowance.

9.2 Stages of Action

The 2016 WSCP establishes four stages of escalating response to a water shortage caused by droughts and/or emergencies. Each stage may be triggered by a declaration from federal or state authorities, MWDSC, or LVMWD to address events that result in a water shortage. The stages and applicable water supply conditions are summarized in Table 4-1.

TABLE 9-1
STAGES OF LVMWD WATER SHORTAGE CONTINGENCY PLAN

Stage	Percent Supply Reduction	Triggers
1 Water Shortage Alert	0 to 10%	• Federal, state or local disaster declaration that may impact water supplies • State or MWDSC declaration due to drought or system maintenance • LVMWD Board of Directors determination • Unplanned LVMWD water system maintenance
2 Water Shortage Warning	10 to 20%	• Federal, state or local disaster declaration that may impact water supplies • State or MWDSC declaration due to drought or system maintenance • LVMWD Board of Directors determination • Unplanned LVMWD water system maintenance requiring more time to repair

Stage	Percent Supply Reduction	Triggers
3 Water Shortage Emergency	20 to 50%	• Federal, state or local disaster declaration that may impact water supplies • State or MWDSC determination due to drought or significant system failure - State outdoor irrigation restriction; and/or - MWDSC Water Supply Allocation Plan (5-50% of baseline allocation) • LVMWD Board of Directors determination • Unplanned LVMWD water system failure or emergency (Westlake Filtration Plant, Dam and/or Backbone System)
4 Critical Water Shortage Emergency	50% or higher	• Federal, state or local disaster declaration that may impact water supplies • Sacramento to Delta/SWP failure • State or MWDSC determination due to drought or significant system failure • LVMWD Board of Directors determination • Natural or human-caused catastrophe disrupting delivery of water to, or within the service area • Severe LVMWD water system failure (Westlake Filtration Plant, Dam and Backbone System)

9.2.1 Procedures for Water Shortage Level Determination

The LVMWD General Manager will recommend activation of one or more elements of the WSCP whenever water supplies of the District have a reasonable prospect for being inadequate to meet the needs of customers. The recommendation shall be presented to the board in the form of a written report, which includes the reasons for the recommendation. The board shall consider the report at a duly noticed public hearing. In case of emergencies, a special meeting may be called by a majority of the Board on less than twenty-four hour notice and without an agenda to deal with the disruption of service.

If an emergency arises which would ordinarily be brought to the attention of the Board but insufficient time exists, the General Manager has administrative authority to take action as he deems appropriate and reasonable.

LVMWD uses various public notification forms like media outlets, direct mail, automated voice recording, website, social media, group presentations and public meetings. The form and extent of notification depends on the severity and duration of the emergency condition.

9.3 Prohibitions on End Uses and Consumption Reduction Methods

LVMWD permanently implements general water conservation measures and irrigation practices aimed at increasing everyday water use efficiency. Those measures are outlined in 3-4.404 of the LVMWD Code and are presented in Table 9-2.

TABLE 9-2
PERMANENT WATER CONSERVATION MEASURES

General Water Conservation Measures
• Potable water shall not be used to clean or sweep hard surfaces, such as sidewalks, walkways, driveways, or parking areas and only as necessary to protect public health and safety.
• Hotels, motels and other places for commercial transient occupancy shall offer guests who stay more than one night the opportunity to retain towels and linens during their stay.
• Car washing is permitted only with the use of a nozzle having an automatic shut-off.
• Fountains and other decorative water features shall recirculate water.
• Drinking water shall be served only upon request in eating or drinking establishments, including but not limited to restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased.
Irrigation Practices
• Irrigation shall occur after 5:00 p.m. and before 10:00 a.m. No irrigation is permitted during and within 48 hours after measurable rainfall.
• Irrigation shall not run off to streets, gutters or adjacent properties.
• The District shall assist in the promotion of water efficient irrigation practices by monitoring compliance with landscaping plans approved by cities and the county under the Water Conservation in Landscaping Act. The District shall notify the city or county with jurisdiction by law if it is determined that a landscaping plan has been breached.
• Limit the number of watering days, if and as determined by the Board, except that watering is permitted at any time with a hand-held hose equipped with an automatic shut-off, a faucet filled bucket of five gallons or less, or a drip irrigation system.

According to each water shortage stage enacted, the LVMWD WSCP outlines actions required by customers and by LVMWD. These actions are presented in Table 9-3.

TABLE 9-3
CUSTOMER AND DISTRICT WATER SHORTAGE ACTIONS

Stage	District Actions	Customer Actions
Stage 1	• Initiate public information campaign • Increase awareness of conservation measures • Commence enforcement of conservation measures • Promote methods to reduce water use • Conduct focused outreach to large water users • Coordinate public outreach with the cities and County	• Voluntary water conservation • Adhere to conservation measures • Consider conversion to more efficient irrigation methods • Consider turf removal and conversion to California-friendly landscaping • Patronize local carwashes that recycle their water
Stage 2	• Expand public information campaign • Step up enforcement of conservation measures • Continue previous actions	• Re-double voluntary conservation • Continue previous actions
Stage 3	• Intensify public information campaign • Expand enforcement of conservation measures • Implement State and MWDSC required reduction using a drought factor for water budgets • Send direct notices to all customers • Provide regular media, city council and County briefings • Activate emergency connections with mutual aid agencies • Continue previous actions	• Continue previous actions • Ensure appropriate programming of irrigation controller
Stage 4	• Implement crisis communication plan • Activate Emergency Operations Center • Implement State and MWDSC required reduction using a drought factor for outdoor water budgets and reduction in indoor water budget if necessary • Coordinate actions with regulatory agencies • Coordinate actions with public safety agencies to address enforcement and fire protection issues • Install flow restrictors on meters as necessary • Terminate potable water supplement to the recycled water system • Recall all temporary meters and activate water fill stations • Continue previous actions	• Continue previous actions • Terminate outdoor water use for irrigation, pools and fountains • Water may only be used outdoors for public health and safety purposes • Be on alert for Boil Water Orders if they become necessary

Multiple communication channels will be used by LVMWD staff to communicate water shortage conditions and necessary actions to the LVMWD Board of Directors, customers, residential homeowners associations, business chambers, inter-governmental bodies,

essential facilities (schools, hospitals, fire), and other stakeholders. Among the communication methods to be used are the following:

- Public water conservation forums hosted at LVMWD headquarters and off- site locations.
- Attendance and agenda presentation at local city council meetings.
- Attendance and agenda presentations at home-owners association and business chamber meetings.
- Direct mailings and bill inserts to customers and account holders.
- Press releases.
- LVMWD publications, e.g., the *Current Flow*.
- Updated posting of issues and information on LVMWD website.
- Advertisements in local publications and cable channels.
- Cards, table tents, door hangers and other leave-behind reminders.

9.4 Penalties, Charges, Other Enforcement of Prohibitions

Section 3-4.406 of the LVMWD Code outlines enforcement actions for violations of water conservation measures. These actions are summarized in Table 8-1. LVMWD customers are encouraged to report water conservation violations through use of the LVMWD hotline.

TABLE 9-4
ENFORCEMENT ACTIONS

Violation Level	Penalties or Charges
First Violation	The customer shall be notified in writing. The notice shall include a warning that further violations could result in stricter penalties.
Second Violation	A second violation within a twelve-month period is punishable by a fine of up to $100.
Third Violation	A third violation within a twelve-month period is punishable by a fine of up to $200.
Fourth Violation	A fourth violation within a twelve-month period is punishable by a fine of up to $500.
Fifth Violation	A fifth violation within a twelve-month period may result in the installation of flow restrictors or termination of service.

9.5 Determining Water Shortage Reductions

The water shortage condition may be determined at the local, regional or state level. An issue with LVMWD's transmission main or treatment system may require water use reduction in a particular area or community. The Metropolitan Water District, as wholesaler at the regional level, may require a reduction in to their member agencies to manage their allocation from the state. Lastly, as in the current drought condition, the State may impose a reduction mandate to each water purveyor to achieve a statewide goal.

LVMWD's water system currently has water meters on all connections. These meters record the amount of water consumed at each location. LVMWD will use these meters in concert with the budgeted water allocations for each customer to monitor actual reductions in water use district-wide.

9.6 Revenue and Expenditure Impacts

Currently, only about 21 percent of LVMWD's fixed costs are covered by fixed revenues. In contrast, water sales make up the largest portion of the total operating revenue. As a result, water conservation efforts can significantly impact revenues. Current drought conditions have presented a reminder of the large fluctuations in water sales volumes that can occur within the LVMWD service area and statewide, and emphasize the importance of measures to improve revenue stability.

According to the LVMWD Fiscal Year 2015-16 Adopted Budget, reductions in potable water use due to statewide mandates are anticipated to result in an operating shortfall for the Potable Water Enterprise. While operating expenses are reduced with lower sales, fixed costs cannot be fully recovered for potable water with significant reductions in sales, thereby resulting in a net operating loss. This shortfall will be made up by drawing from LVMWD's Rate Stabilization Fund that was established for this purpose (LVMWD 2015).

In the case of future water use reductions resulting from the implementation of the LVMWD WSCP, LVMWD would likely experience similar impacts to operating revenue and would draw as necessary and as possible from the Rate Stabilization Fund. In addition, one of the objectives of the budget-based rate structure implemented on January 1, 2016 is to improve revenue stability for LVMWD. Therefore, while revenue would inevitably fluctuate with water use reductions, LVMWD has established appropriate means to manage these impacts.

9.7 Resolution or Ordinance

LVMWD adopted the WSCP with Resolution No. 2481 on January 12, 2016. This Resolution amended Section 3-4.407 of the LVMWD Code and repealed Resolution No. 2478. A copy of the WSCP is included in Appendix G.

9.8 Catastrophic Supply Interruption

9.8.1 MWDSC Catastrophic Supply Strategies

A catastrophic event, such as an earthquake damaging the aqueducts that transport imported water supplies could result in an unplanned interruption in MWDSC supplies, which LVMWD depends on. In recognition of the possibility of such unplanned events, MWDSC has invested in emergency storage facilities located within and outside of the region to facilitate continued supplies. In the event of a SWP outage, water stored in surface reservoirs and groundwater basins under MWDSC's emergency storage program would be made available to meet demands by MWDSC member agencies, which includes LVMWD. Under circumstances of a 6-month disruption of imported supplies, storage supplies could serve 75 percent of firm retail demands (MWDSC 2016).

In the case of extreme water shortages within the MWDSC service area, MWDSC will implement the WSAP. The WSAP provides methodologies for allocating supply to each of MWDSC's retail and wholesale customers on an equitable needs-basis, and establishes surcharges for excess water use. The WSAP was originally adopted by the MWDSC Board in 2008 and was revised in 2014.

These efforts increase the reliability of supplies on a region-wide basis, including the LVMWD service area, even under unexpected circumstances, such as catastrophic supply interruption.

9.8.2 LVMWD Catastrophic Supply Strategies

Stage 4 actions of the LVMWD WSCP would be triggered, among other conditions, by a natural or human-caused catastrophe disrupting delivery of water to, or within the service area. Disruptions could include failures of the LVMWD water system, such as at the Westlake Filtration Plant, dam and/or backbone system, as well as at State or MWDSC facilities. All LVMWD and customer actions described above for Stage 4 would be implemented, as necessary to address catastrophic water supply interruption.

The Westlake Reservoir provides emergency storage capacity that can be used during imported water outages. In addition, the planned potable water interconnection with CMWD, described in Section 4, would provide additional system reliability, enabling LVMWD to receive potable water from CMWD as available under conditions of supply interruptions.

A large part of the potable water distribution system relies on local sub-systems that include individual pump stations and storage tanks. The storage tanks include a minimum of 5 hours of maximum day demand emergency storage. LVMWD owns three mobile generators that can be utilized at the sub-system pump stations. The main pumping stations of LV-2, Cornell and Westlake Pump Station include emergency power facilities proving the means to operate them during electrical power outages.

9.9 Minimum Supply Next Three Years

The minimum water supply available during the next three years would occur during a three-year multiple-dry year event between the years 2016 and 2018. Since 2015 was the driest year on record, it is assumed the minimum supply for 2016, 2017, and 2018 will be a repeat of what happened in 2015. Table 9-5 presents the minimum supply assumed to be available over the next three years.

TABLE 9-5
WATER SUPPLY ESTIMATES – NEXT THREE YEARS (AFY)

Water Supply Source	2016	2017	2018
Imported			
MWDSC	19,467	19,467	19,467
Box Canyon (VCWWD 8)	16	16	16
Woolsey (VCWWD 17)	101	101	101
Local Groundwater	0	0	0
Recycled Water	4,240	4,240	4,240
Total Supplies[(a)]	**23,825**	**23,825**	**23,825**

Note:
(a) See Section 4 for details on water supply sources. Note, as described in Section 4, LVMWD has no new planned supplies.

References

Boyle Engineering Corporation (Boyle). 2007. Recycled Water System Master Plan Update 2007. Prepared for Las Virgenes Municipal Water District. October 2007.

California Department of Water Resources. (DWR). 2015. 2015 State Water Project Delivery Capability Report. July 2015.

California Department of Water Resources (DWR). 2014. Final California Water Plan 2013 Update. October 2014.

California Department of Water Resources (DWR). 2014. Final CASGEM Basin Prioritization Results. June 2014.

California Department of Water Resources (DWR). 2004. California's Groundwater Bulletin 118 – Thousand Oaks Area Groundwater Basin. Updated February 2004. Accessed on March 25, at: http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/4-19.pdf

California Irrigation Management Information System (CIMIS). 2016. Station 204, monthly average data from January 2007 to January 2016.

City of Calabasas. 2013. 2030 General Plan, 2014-2021 Housing Element. September, 2013.

City of Hidden Hills. 2014. City of Hidden Hills 2013-2021 Housing Element. January 2014.

City of Simi Valley/Ventura County Waterworks District No. 8 (VCWWD 8). 2015. 2014 Water Quality Report. June 2015. Accessed on March 9, 2016, at: http://www.ci.simi-valley.ca.us/index.aspx?page=117

City of Westlake Village. 2014. Draft 2013-2021 Housing Element. January 2014.

HDR. 2014. Recycled Water Master Plan Update 2014. Prepared for Joint Powers Authority of LVMWD, TSD, and CMWD. June 2014.

Kennedy/Jenks Consultants. 2014a. Integrated Master Plan Update 2014. Prepared for the Joint Powers Authority of LVMWD and TSD with assistance from HDR. June 2014.

Kennedy/Jenks Consultants. 2014b. Potable Water Master Plan Update 2014. Prepared for LVMWD. June 2014.

Kennedy/Jenks Consultants. 2014c. Sanitation Master Plan Update 2014. Prepared for the Joint Powers Authority of LVMWD and TSD. June 2014.

Las Virgenes Municipal Water District (LVMWD). 2015. Adopted Budget – Fiscal Year 2015-16. June 2015.

Metropolitan Water District of Southern California (MWDSC). 2016. Draft 2015 Urban Water Management Plan. February 2016.

Psomas Engineering (Psomas). 2005. Las Virgenes Municipal Water District 2005 Urban Water Management Plan. Adopted 8 November 2005.

Southern California Association of Governments (SCAG). 2012. 5th Cycle Regional Housing Needs Assessment Final Allocation Plan, 1/1/2014-10/1/2021. Accessed on March 9, 2016 at: http://www.scag.ca.gov/Documents/5thCyclePFinalRHNAplan.pdf

Ventura County Waterworks District No. 17. Annual Water Quality Report – Reporting Year 2014. http://pwaportal.ventura.org/WSD/Residents/Water%20Services/Water%20Quality/docs/Ventura%20County%20Waterworks%20District%20No.17%20-%20Bell%20Canyon.pdf

Western Regional Climate Center (WRCC). 2016. Woodland Hills Pierce College, California, Station 041484. Period of record: 7/1/1949-1/20/2015. Accessed on March 25, 2016 at: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1484

Appendix A: DWR Checklist

Appendix B: DWR Standardized Tables and SBX-7 Verification Tables

Appendix C: Coordination and Outreach Materials

- Notices of Plan Update Sent to Nearby Agencies
- Notices of Public Hearing on Draft UWMP Sent to Land Use Jurisdictions
- Notices of Public Hearing on Draft UWMP Published in Newspapers
- Comments Received

Appendix D: UWMP Adoption Resolution

Appendix E: AWWA Water Loss Audit Report

Appendix F: Embedded Energy Calculations

Appendix G: Resolution No. 4281; LVMWD Water Shortage Contingency Plan; LVMWD Code