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DRAFT

2020 Urban Water Management Plan

Palmdale Water District

PALMDALE WATER DISTRICT

A CENTURY OF SERVICE

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PUBLIC REVIEW DRAFT
Palmdale Water District
2020 Urban Water Management Plan

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Prepared for

Palmdale Water District
2029 East Avenue Q
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List of Acronyms

Act	Urban Water Management Planning Act
AF	Acre-feet
AF	Acre-feet-per-year
AIP	Agreement in Principle
AMI	Advanced Metering Infrastructure
AVEK	Antelope Valley East-Kern Water Agency
AVSWCA	Antelope Valley State Water Contractors Association
AWPF	Advanced Water Purification Facility
AWWA	American Water Works Association
BMPs	Best Management Practices
CalOES	California Office of Emergency Services
CCR	Consumer Confidence Report
CDFW	California Department of Fish & Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CIMIS	California Irrigation Management Information Systems
City	City of Palmdale, California
COA	Coordinated Operations Agreement
Corps	American Army Corps of Engineers
CWC	California Water Code
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DAC	Disadvantaged Communities
DCP	Delta Conveyance Project
DCR	Delivery Capability Report

DDW	Division of Drinking Water
Delta	San Joaquin-Sacramento Bay Delta
District	Palmdale Water District
DMMs	Demand Management Measures
DRA	Drought Risk Assessment
DSOD	California Division of Safety of Dams
DWR	Department of Water Resources
EIR	Environmental Impact Report
ESA	Federal Endangered Species Act
ETo	evapotranspiration
FWS	United States National Fish & Wildlife Service
GAMA	Groundwater Ambient Monitoring and Assessment Program
GIS	Geographic Information Systems
GPCD	gallons per capita per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HET	High-efficiency Toilet
IRWM	Integrated Regional Water Management Plan
ITP	Incidental Take Permit
LACSD	Los Angeles County Sanitation District
LCID	Littlerock Creek Irrigation District
MCL	Maximum Contaminant Level
MGD	million gallons per day
NMFS	National Marines Fisheries Service
Plan	Urban Water Management Plan
PBP	Priority Basin Project
PRWA	Palmdale Recycled Water Authority
PWA	Palmdale Water Authority; Public Water Agencies
PWD	Palmdale Water District
Reclamation	United States Bureau of Reclamation
RWMG	Regional Water Management Group
SCAG	Southern California Association of Governments
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta Mendota Water Authority
SNMP	Salt & Nutrient Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
SWRP	Strategic Water Resources Plan
TDS	Total Dissolved Solids
UIF	Unimpaired Flow
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency

UWMP	Urban Water Management Plan
WIIN	Water Infrastructure Improvements for the Nation Act
WMT	water management tools
WRP	Water Reclamation Plant
WSCP	Water Shortage Contingency Plan
WSMP	Water System Master Plan
WTP	Water Treatment Plant

Executive Summary

This document presents the 2020 Urban Water Management Plan (UWMP, Plan) for the Palmdale Water District (PWD) service area. This section describes the general purpose of the Plan, discusses Plan implementation and provides general information about the PWD and its service area characteristics.

The State of California mandates that all urban water suppliers within the state prepare an 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 Sections 10610 through 10657.

An UWMP is a planning tool that generally guides the actions of urban water suppliers. 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." (Wat. Code, § 10631, subd. [d]). The identification of such opportunities and the inclusion of those opportunities in a plan's general water service reliability analysis neither commits an urban water supplier to pursue a particular water exchange/transfer opportunity, nor precludes it from exploring exchange/transfer opportunities never identified in its plan. Before an urban water supplier is able to implement any potential future sources of water supply identified in a plan, detailed project plans are prepared and approved, financial and operational plans are developed and all required environmental analysis is completed.

"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 must address uncertainty. Planning projections may change in response to a number of factors that are associated with uncertainty such as climate change, population growth and water demand.

The California 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 such as:

- What are the potential sources of supply and what amounts are estimated to be available from them?
- What is the projected demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How do the projected supply and demand figures compare and relate to each other?

Using these “framework” questions and resulting answers, the implementing agency or agencies will pursue feasible and cost-effective options and opportunities to develop supplies and meet demands.

As further detailed in this Plan, PWD will continue to explore enhancing and managing supplies from existing sources such as imported water as well as other options. These may include groundwater extraction, water exchanges and transfers, water conservation, water recycling, brackish water desalination, and water banking/conjunctive use. Additional specific planning efforts may be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, potential environmental impacts, and how each option would affect customers.

The UWMP Act requires preparation of a plan that, among other things:

- Accomplishes water supply planning over a 20-year period in five year increments (PWD is going beyond the requirements of the Act by developing a plan which spans twenty-five years to 2045).
- Identifies and quantifies existing and projected water supplies and water supply opportunities, 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.

State legislation, 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. The legislation requires that retailers develop and report the 2020 water use target, their baseline daily per capita use and 2020 compliance daily per capita use, along with the basis for determining those estimates. This UWMP reports on PWD’s progress in meeting the SBX7-7 targets.

Water Use

This UWMP describes historic and current water usage and the methodology used to project future demands within the PWD service area. Water usage is divided into sectors including residential, commercial, industrial, irrigation, and institutional. To undertake this evaluation, existing land use data and new housing construction information were compiled PWD. Based on average water consumption, ultimate potable water demands were projected to be approximately 24,250 AFY. Projected demands are provided in Table ES- 1.

Table ES- 1 Projected Potable Water Demands 2020 to 2045 AFY

Water Use	2025	2030	2035	2040	2045
Total Water Deliveries (see Section 2)	16,520	17,010	18,080	19,280	20,550
Sales to Other Water Agencies (see Section 2)	1,300	1,300	1,300	1,300	1,300
Distribution System Water Losses (see Section 2)	1,900	2,000	2,100	2,200	2,400
Total	**19,720**	**20,310**	**21,480**	**22,780**	**24,250**

Notes: Demands to not include non-potable water supplies.

Actions to Manage Demand

PWD has a uniquely low water use for a high desert area. However, PWD recognizes that conserving water is an integral component of a responsible water management strategy. PWD has a variety of programs to manage water demand including water waste prohibitions, public education, and outreach, metering, monitoring and repairing system leaks, and rebate programs. These programs are part of PWD's water conservation program. PWD plans to expand this program over the next five years and is dedicated to water conservation as a vital part of the water supply portfolio.

Compliance with Water Use Targets

From 1996 to 2004 average potable water use was approximately 231 gallons per capita per day (GPCD). The SBX7-7 reduction interim target for year 2015 was 208 GPCD and the Compliance Target for year 2020 was 185 GPCD. PWD had a GPCD of 165 in 2020, which means PWD has exceeded the reductions required by the 2015 Interim Target and 2020 Compliance Target. PWD plans to maintain an efficient GPCD by continuing implementation of demand management measures and water shortage contingency planning.

Water Service Reliability

Water Supply

PWD's water supplies include imported water, local and regional supplies, groundwater, and recycled water. As a State Water Contractor of the State Water Project (SWP), PWD purchases imported water from the Department of Water Resources (DWR). Each year, PWD receives an annual allotment, which is based on available SWP supplies, with a total maximum contract amount of 21,300 AFY. Since 2010, PWD has received between 13 and 78 percent of their annual allotment. PWD also has a long-term lease agreement with Butte County for up to 10,000 AFY of their SWP Table A Amount (2019 DCR). The amount available varies on the final annual allotment from DWR to its State Water Contractors.

PWD's local water sources include groundwater, surface water, and recycled water. Groundwater is pumped from the Antelope Valley Groundwater Basin and has accounted for 35 percent of PWD's supplies since 2016. In late 2015, PWD and other parties agreed to a stipulated judgment for the adjudication of the Antelope Valley Groundwater Basin. Per the judgment, PWD will begin receiving a groundwater production right of 2,770 AFY starting in 2023. PWD is also temporarily entitled to a share of a federal groundwater right, of up to 1,450 AFY until 2025.

PWD jointly owns and operates the Littlerock Dam Reservoir, which constitutes PWD's local surface water supply source and is located in the hills southwest of the PWD service area. PWD projects being able to take approximately 4,000 AFY from Littlerock Dam Reservoir in normal, single-dry, and multiple-dry years.

PWD is actively working with the Sanitation Districts of Los Angeles County (LACSD) to develop recycled water supplies for its service area customers and future groundwater recharge projects. Recycled water will help PWD meet its future water demands. A summary of current and future supplies is provided in Table ES- 2, Table ES- 3, and Table ES- 4 below; these supplies are anticipated to be available in a normal year, a single-dry year, and during multiple-dry years.

Table ES- 2 Normal Year Water Supplies 2025 to 2045 (AFY)

	2025	2030	2035	2040	2045
Water Supply Source					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	12,030	11,720	11,400	11,080	11,080
Butte Transfer Agreement[a]	5,650	5,500	5,350	5,200	5,200
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**36,725**	**35,315**	**35,345**	**35,375**	**35,375**

Notes: Values are rounded.
(a) For details see Section 4.3.1.

Table ES- 3 Single-Dry Year Water Supplies 2025 to 2045 (AFY)

	2025	2030	2035	2040	2045
Water Supply Source					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	1,490	1,705	1,915	2,130	2,130
Butte Transfer Agreement[a]	700	800	900	1,000	1,000
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**21,235**	**20,600**	**21,410**	**22,225**	**22,225**

Note: Values are rounded.
(a) For details see Section 4.3.1.

Table ES- 4 Multiple-Dry Year Water Supplies 2025 to 2045 (AFY)

	2025	2030	2035	2040	2045
Water Supply Source					
Groundwater (from Table 4-3)	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits (from Table 4-4)	5,000	5,000	5,000	5,000	5,000
Groundwater Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water (from Table 4-6)	4,000	4,000	4,000	4,000	4,000
Imported SWP Water (from Table 4-9)	6,180	5,645	5,110	4,470	4,470
Butte Transfer Agreement[(a)]	2,900	2,650	2,400	2,100	2,100
Recycled Water (from Table 5-4)	500	1,000	1,500	2,000	2,000
Total Supplies	**28,125**	**26,390**	**26,105**	**25,665**	**25,665**

Note: Values are rounded.
(a) For details see Section 4.3.1.

Water Quality

Based on current conditions and knowledge, water quality is not anticipated to affect water supply reliability. However, water quality issues are constantly evolving. It is understood that water quality treatment can have significant costs.PWD is committed to and will continue to work proactively to address water quality concerns in a timely manner to ensure safe drinking water is available to their customers.

Fundamental Findings of the UWMP

It is the stated goal of PWD to deliver a reliable and high-quality water supply to its customers, even during dry periods. Based on water supply and demand assumptions over the next twenty-five years, the UWMP successfully achieves this goal. PWD anticipates having adequate supplies to meet demands during normal years. However, PWD anticipates that during single-dry year conditions, demands will exceed supplies starting in 2030 and during multiple-dry year conditions, demands will exceed supplies starting in 2045. Additionally, in a consecutive five-year drought, PWD anticipates demand exceeding supplies in 2021 and 2023. Therefore, additional supplies are assumed to be needed to meet demand under those conditions. PWD has identified numerous short-and long-term transfer and exchange opportunities that would provide additional supplies to help overcome supply shortages. The Water Shortage Contingency Plan identifies numerous opportunities to reduce customer demand during water shortages.Therefore, it is anticipated that existing supplies in combination with identified future and potential water supply opportunities will enable PWD to meet all future water demands under all hydrologic conditions through the end of the planning period.

Section 1: Introduction/Lay Description

1.1 Overview

This document presents the 2020 Urban Water Management Plan (UWMP, Plan) for the Palmdale Water District (PWD) service area. This section describes the general purpose of the Plan, discusses Plan implementation and provides general information about PWD and its service area characteristics.

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1.2 Purpose

An UWMP is a planning tool that generally guides the actions of urban water suppliers. 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." (Wat. Code, § 10631, subd.[d]). The identification of such opportunities and the inclusion of those opportunities in a plan's general water service reliability analysis neither commits an urban water supplier to pursue a particular water exchange/transfer opportunity, nor precludes it from exploring exchange/transfer opportunities never identified in its plan. Before an urban water supplier is able to implement any potential future sources of water supply identified in a plan, detailed project plans are prepared and approved, financial and operational plans are developed and all required environmental analysis is completed.

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

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The District's 2020 UWMP revises the 2015 UWMP and incorporates changes enacted by legislation since that time. The Act has been modified over the years in response to the state's water shortages, droughts, and other factors. The main changes since 2015 to note include:

1. UWMP Submittal Date: 2020 UWMP updates must be adopted and submitted to DWR by July 1, 2021.

2. Reporting on Compliance with SBx7-7 Targets: The 2020 UWMP will be required to document compliance with the 20% reduction described in the *20 by 2020 Water Conservation Plan*, and a comparison of actual water use against the target.

3. Reporting compliance with Water Loss Standard: The State Water Resources Control Board (SWRCB) was to adopt a water loss standard no later than July 1, 2020. Currently it appears as if the formal rulemaking and standards will not be adopted until sometime in the future. Retail water suppliers such as the PWD will have to show progress on meeting a water loss standard in the 2020 UWMP. Water loss standards go into effect June 30, 2022.

4. 5-year Drought Risk Assessment: In past UWMPs suppliers were to conduct a drought risk assessment assuming a period of drought lasting 3 consecutive years. This requirement has changed, and suppliers must now conduct an assessment for a drought lasting 5 years.

5. Sustainable Groundwater Management Act (AB 1739, SB1168, and SB1319): Requires UWMPs to show consistency with Groundwater Sustainability Plan (GSP) supply protections, if applicable.

6. Seismic Risk Assessment (SB 664): Requires an urban water supplier to include within its plan a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities. This bill allows an urban water supplier to comply with this requirement by submitting a copy of the most recent adopted local hazard mitigation plan or multi-hazard mitigation plan if that plan specifically addressed seismic risk to the water supplier's infrastructure.

7. Water Shortage Contingency Plan (WSCP) Updates: State requirements call for an update to the existing WSCP and that it be formally adopted as a stand-alone plan. The WSCP must be updated in parallel to the UWMP.

8. Annual Water Supply and Demand Assessments will be required, starting June 2022, and the process to do the assessment must be described in the 2020 UWMP.

Items optional in the past, but now required, include: calculating the energy intensity of water, incorporation of land use changes in demand forecasting, and calculating water savings from codes and standards.

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

It is the stated goal of PWD 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 demands during normal and dry water years, the 2020 UWMP successfully achieves this goal.

1.3 Basis for Preparing a Plan

In accordance with the California Water Commission (CWC), urban water suppliers with 3,000 or more service connections, or supplying 3,000 or more acre-feet of water per year, are required to prepare a UWMP every five years. PWD qualifies as an urban water supplier and its 2020 UWMP shall be updated and submitted to DWR by July 1, 2021.

1.3.1 Relationship to Other Planning Efforts

Several other planning efforts related to the UWMP have been completed by PWD including:

- **Antelope Valley Integrated Regional Water Management Plan (2019):** Several leaders and agencies in the Antelope Valley Region, including Palmdale Water District, joined together to form a Regional Water Management Group (RWMG) to create the Integrated Regional Water Management (IRWM) Plan. In 2007, the RWMG and other stakeholders began to develop the IRWM plan consistent with the State sponsored Integrated Regional Water Management Program that makes grant funds available to support sound regional water management. The IRWM Plan defined a course of action to meet expected water demands within the Antelope Valley Region through 2035. The IRWM Plan was then updated in 2012 and revisited in 2017. Most recently, the IRWM Plan was updated in 2019 to extend the planning horizon through 2040.

- **Water System Master Plan (2016):** The Water System Master Plan (WSMP) was created to provide guidelines for the planning of PWD's potable water system through the year 2030 and under 2040 build-out conditions. The WSMP evaluated the potable water system under existing and future conditions.

- **Palmdale Recycled Water Authority (PRWA) Recycled Water Master Plan (2015):** The PRWA manages recycled water that is generated and used within the Palmdale area. The Recycled Water Master Plan updated and consolidated previous master planning documents as well as prepared a cost of service study to identify how development of a recycled water system can be economically financed. In addition, the Recycled Water Master Plan identified potential funding sources for planning and construction to help offset local costs.

- **Strategic Water Resources Plan: Final Report (2010):** The Strategic Water Resources Plan (SWRP) developed a water supply strategy through the year 2035 to meet the demands of current and future customers. The SWRP includes a recommended water resource strategy to meet supply needs through 2035, an implementation plan and schedule of the activities to take place, and a financing plan for how funding will be provided to make the necessary improvements.

1.3.2 Relationship to Water Shortage Contingency Plan

The CWC requires preparation of a separate Water Shortage Contingency Plan (WSCP) as outlined in *Making Water Conservation a California Way of Life* (DWR and SWRCB, 2018):

> "The legislation…Requires each urban water supplier to prepare, adopt, and periodically review a WSCP as part of its UWMP to describe the method, procedures, response actions, enforcement, and communications during six levels of water supply shortage conditions (CWC §10620(d)(2) and §10632)"

Concurrent with the 2020 UWMP update, PWD will also update its WSCP consistent with the CWC. The 2020 WSCP utilizes and expands on the WSCP contained within the 2015 UWMP per the new requirements set forth by the CWC. The WSCP will be adopted separately from the UWMP but will be submitted to DWR as an appendix to the UWMP (Appendix J).

1.4 Implementation of the Plan

This subsection provides the cooperative framework within which the Plan will be implemented including agency coordination, public outreach, and resources maximization.

1.4.1 Public Water Systems

Public water systems (PWS) provide drinking water for human consumption and are regulated by the State Water Resources Control Board Division of Drinking Water (SWRCB DDW). PWSs are required to electronically file Annual Reports to the Drinking Water Program with the SWRCB DDW, which include water usage and other information.

Table 1-1 provides the name and number of the PWS (drinking water only) that is covered by this UWMP.

Table 1-1 Retail Public Water System

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 (AF)
CA1910102	Palmdale Water District	26,869	23,315

Notes: Modified from DWR Table 1-1
Source: District Public Water System Statistics, Production data

1.4.2 Fiscal or Calendar Year

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 plan provides data consistent with a calendar year, in acre-feet per year (AFY).

1.5 Cooperative Preparation of the Plan

The UWMP Act requires that the water agency identify its coordination with appropriate nearby agencies. PWD's 2020 UWMP is intended to address those aspects of the UWMP Act which are under the control of PWD, specifically water supply and water use. While preparing the 2020 UWMP, PWD coordinated its efforts with relevant agencies to ensure data and issues are presented accurately.

PWD has encouraged community participation in water planning. Interested groups were informed about the development of the Plan along with the schedule of public activities.

Notices of public meetings were published in the local press and on PWD's website. Copies of the draft UWMP were sent to the City of Palmdale, the City of Lancaster, and Los Angeles County for review and comment, in addition to other local water agencies as noted in Table 1-2. Water resource specialists with expertise in water resource management were retained to assist PWD in preparing the details of its Plan.

Table 1-3 presents a timeline for public participation during the development of the Plan.

Table 1-2 Agency Coordination Summary

	Participated in UWMP Development	**Received Copy Draft**	**ofCommented on Draft**	**Attended Public Meetings**	**Contacted for Assistance**	**Sent Notice of Intent Adopt**
City of Palmdale	X	X				X
City of Lancaster	X	X				X
Los Angeles County Department of Regional Planning	X	X				X
Littlerock Creek Irrigation District	X	X				X
Los Angeles County Sanitation District	X	X				X
Antelope Valley-East Kern Water Agency	X	X				X
Quartz Hill Water District	X	X				X
Rosamond Community Services District	X	X				X
Los Angeles County Farm Bureau	X	X				X
Los Angeles World Airports	X	X				X
Los Angeles County Waterworks District No. 40	X	X				X

1.5.1 Plan Adoption

PWD began preparation of this UWMP in September 2020. The final version of the UWMP was adopted by the PWD Board on June 14, 2021 and submitted to DWR, the California State Library, the City of Palmdale, the City of Lancaster, and to Los Angeles County within thirty days of Board approval. This Plan includes all information necessary to meet the requirements of Water Conservation Act of 2009 (Wat. Code, §§ 10608.12-10608.64) and the Urban Water Management Planning Act (Wat. Code, §§ 10610-10656). Plan Adoption materials are provided in Appendix C.

1.5.2 Public Outreach

PWD has encouraged community participation in water planning. Interested groups as identified in Table 1-2 were informed about the development of the Plan along with the schedule of public activities. Notices of public meetings were published in the local press and at PWD's website. Copies of the draft UWMP were sent to the County of Los Angeles and City of Palmdale for review and comment as noted in Table 1-2. Table 1-3 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials is provided in Appendix D.

Table 1-3 Public Participation Timeline

Date	Event	Details
Sep. 3, 2020	Kick-off Meeting	Describe UWMP requirements and process
May 14, 2021	Public Draft UWMP	Public Draft released to solicit input
June 14, 2021	Public Hearing	Review contents of Public Draft UWMP and take comments
June 14, 2021	Board Approval	UWMP and WSCP considered for approval by the Board

1.5.3 Resources Maximization

Several documents have been developed to enable PWD to maximize the use of available resources, including PWD's 2010 UWMP (RMC 2011), PWD's Recycled Water Facilities Plan (RMC 2010), the Palmdale Recycled Water Authority Recycled Water Facilities Master Plan (Carollo 2015), the Antelope Valley Integrated Regional Water Management Plan (2019), DWR's 2019 State Water Project Delivery Capability Report (DWR 2019), PWD's 2016 Water System Master Plan (MWH 2016), Consumer Confidence Reports, the Antelope Valley Salt and Nutrient Management Plan. Section 4 of this Plan describes in detail the water resources available to PWD for the twenty-five-year period covered by the Plan. A complete reference list is provided in Section 9 of this Plan.

1.6 Water Management within PWD's Service Area

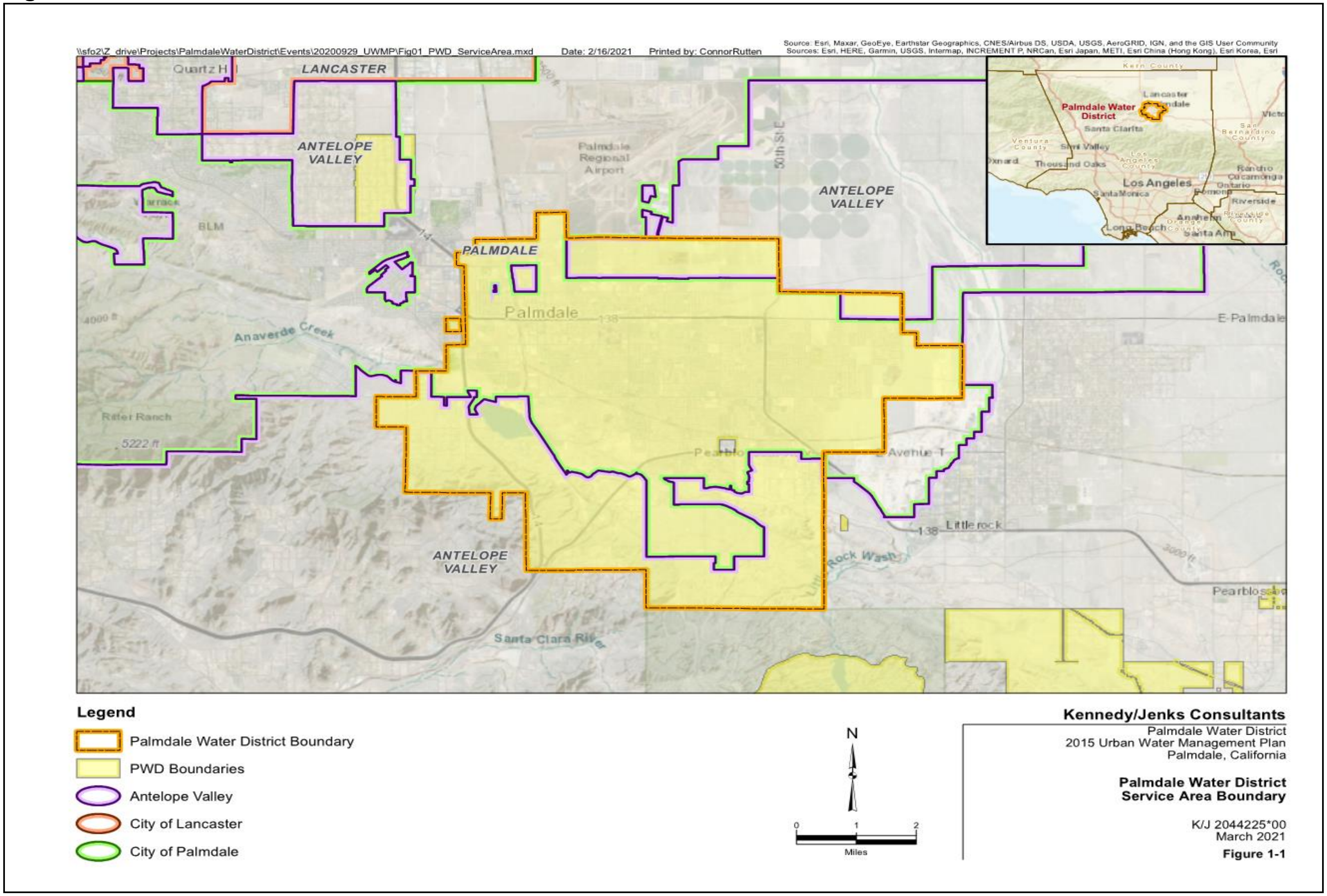
1.6.1 System Description

PWD is located within the Antelope Valley in Los Angeles County, approximately 60 miles north of the City of Los Angeles and includes the central and southern portions of the City of Palmdale and adjacent unincorporated areas of Los Angeles County, as shown in Figure 1-1. The City of Palmdale's nearest neighbor, Lancaster, is approximately 10 miles to the north.

The Antelope Valley Freeway (State Highway 14) runs north-south and Pearblossom Highway (State Highway 138) meanders in an east-west direction through the Palmdale Water District. PWD was established in 1918 as the Palmdale Irrigation District. The primary function of the PWD is to provide retail water service within its service area. Under the provisions of the CWC relating to the establishment of irrigation districts, PWD has the power to carry out any act to provide sufficient water for present and future beneficial uses, including construction and operation of facilities to store, regulate, divert and distribute water for use within its boundaries.

Until the 1950s, the area within Palmdale Irrigation District's boundaries was primarily agricultural. However, with the activation of Air Force Plant 42 and the increased use of Edwards Air Force Base, agricultural water use diminished. As populations grew within the Antelope Valley, the shift to domestic water began. In 1963, the Palmdale Irrigation District entered into an agreement to purchase water from the newly planned State Water Project (SWP). This agreement guarantees PWD will have sufficient imported source water to supply projected population growth well into its future.

Figure 1-1 PWD Service Area



To contain the anticipated increased water supply, bonds were sold to rebuild and expand Palmdale Lake (formerly known as Harold Reservoir) to an increased capacity of over 4,100 AF. This bond financing also allowed the construction of a new treatment facility adjacent to the Lake allowing Palmdale Irrigation District to serve a broader area of Palmdale. In 1973 the Palmdale Irrigation District name was changed to the more appropriate PWD. Founded as an irrigation district supplying water mainly to farms for agricultural use, PWD's boundaries had expanded with Palmdale's rapid population growth and PWD shifted to providing predominantly municipal and industrial water supply. PWD now acts as a retailer of water supplies for municipal, residential, irrigation, commercial, industrial, and institutional users.

PWD has continued to improve and add to its water distribution and storage facilities. PWD's primary service area now covers approximately 29,440 acres (46 square miles). The distribution system encompasses approximately 400 miles of pipeline, multiple well sites, booster pumping stations, and water storage tanks maintaining a total storage capacity of over 50 million gallons.

1.7 Population, Demographics, and Socioeconomics

1.7.1 Population

PWD currently serves 26,869 active connections, the majority of which (96 percent) are residential. Commercial connections account for approximately 2.5 percent, industrial connections account for about 0.5 percent, and landscape irrigation connections account for about 1 percent. Table 1-4 shows the historical service connections in 2015. As stated above, the categories have changed in 2020 and are reflected in Table 1-5.

Table 1-4 Historical Service Connections (2015)

Customer Class	2015
Single Family Residential	24,910
Multi-Family Residential	541
Commercial/Institutional	612
Industrial	78
Landscape Irrigation	225
Other (Fire Protection/ Non-potable)	0
Total	**26,366**

Source: District Public Water System Statistics.

Table 1-5 Existing Service Connections (2020)

Customer Class	2020
Single Family Residential	25,240
Multi-Family Residential	543
Commercial/Industrial	670
Irrigation	244
Fire Service	151
Construction	21
Total	**26,869**

Source: Communication with PWD, April 2021.

PWD has experienced steady population growth over the past 40 years, increasing by approximately 50 percent since 1995 (PWD 2005 UWMP). Table 1-6 shows PWD's population from 2015 – 2020.

Table 1-6 Historical Population Estimates (2015 - 2020)

Year	2015[a]	2016	2017	2018	2019	2020[a]
Population Served[b]	118,227	119,794	121,361	122,928	124,495	126,062

Note:
(a) DWR online population tool. See Appendix D for the population tool printout for 2020.
(b) Population for 2016 through 2019 were interpolated from the 2015 and 2020 values.

Table 1-7 shows the current and projected service area population in five-year increments to Year 2045. Population projections presented here are based on the PWD Water Master Plan Draft Report (MWH 2016). Projections were determined by using Southern California Association of Governments (SCAG) growth percentages for the City of Palmdale and applying them to the population recorded in the 2010 census within the PWD boundary. The current population (2020) shown below was calculated with the DWR population tool.

Table 1-7 Population - Current and Projected

Year	2020	2025	2030	2035	2040	2045
Population Served[a]	126,062[b]	128,998	132,003	138,554	145,962	153,766

Notes: Modified from DWR Table 3-1
(a) Source of 2025-2045 projections: PWD Draft Water Master Plan, September 2014, Table 2-5, "Adjusted SCAG Population Projections".
(b) 2020 population number is based on the DWR population tool (printout provided in Appendix F).

1.7.2 Demographics and Socioeconomics

Water service is provided to residential, commercial, industrial, and institutional customers, and for environmental and other uses, such as fire protection and landscaping. The total demand trend on water supplies is expected to continue to rise within the Antelope Valley area (along with most of California) because of population growth, planned development, economic activity, environmental and water quality needs, and regulatory requirements. Table 1-8 provides a breakdown of demographic and socioeconomic indicators for the City of Palmdale using the most recent US Census Bureau available.

Table 1-8 Demographics for the City of Palmdale, CA [a]

Demographic Category	Value
Age and Sex	
Persons under 5 years, percent	7.80%
Persons under 18 years, percent	30.00%
Persons 65 years and over, percent	9.30%
Female persons, percent	51.10%
Race and Hispanic Origin	
White alone, percent	46.10%
White alone, not Hispanic or Latino, percent	20.00%
Black or African American alone, percent	13.20%
American Indian and Alaska Native alone, percent	1.60%
Asian alone, percent	4.70%
Native Hawaiian and Other Pacific Islander alone, percent	0.40%
Two or More Races, percent	5.00%
Hispanic or Latino, percent	60.40%
Housing	
Owner-occupied housing unit rate, 2015-2019	65.30%
Median value of owner-occupied housing units, 2015-2019	$280,000
Median gross rent, 2015-2019	$1,319
Families & Living Arrangements	
Households, 2015-2019	43,404
Persons per household, 2015-2019	3.60
Economy	
In civilian labor force, total, percent of population age 16 years+, 2015-2019	59.60%
Persons in poverty, percent	15.60%

Note:
(a) Data taken from US Census Bureau (census.gov)

1.8 Land Uses in the Service Area

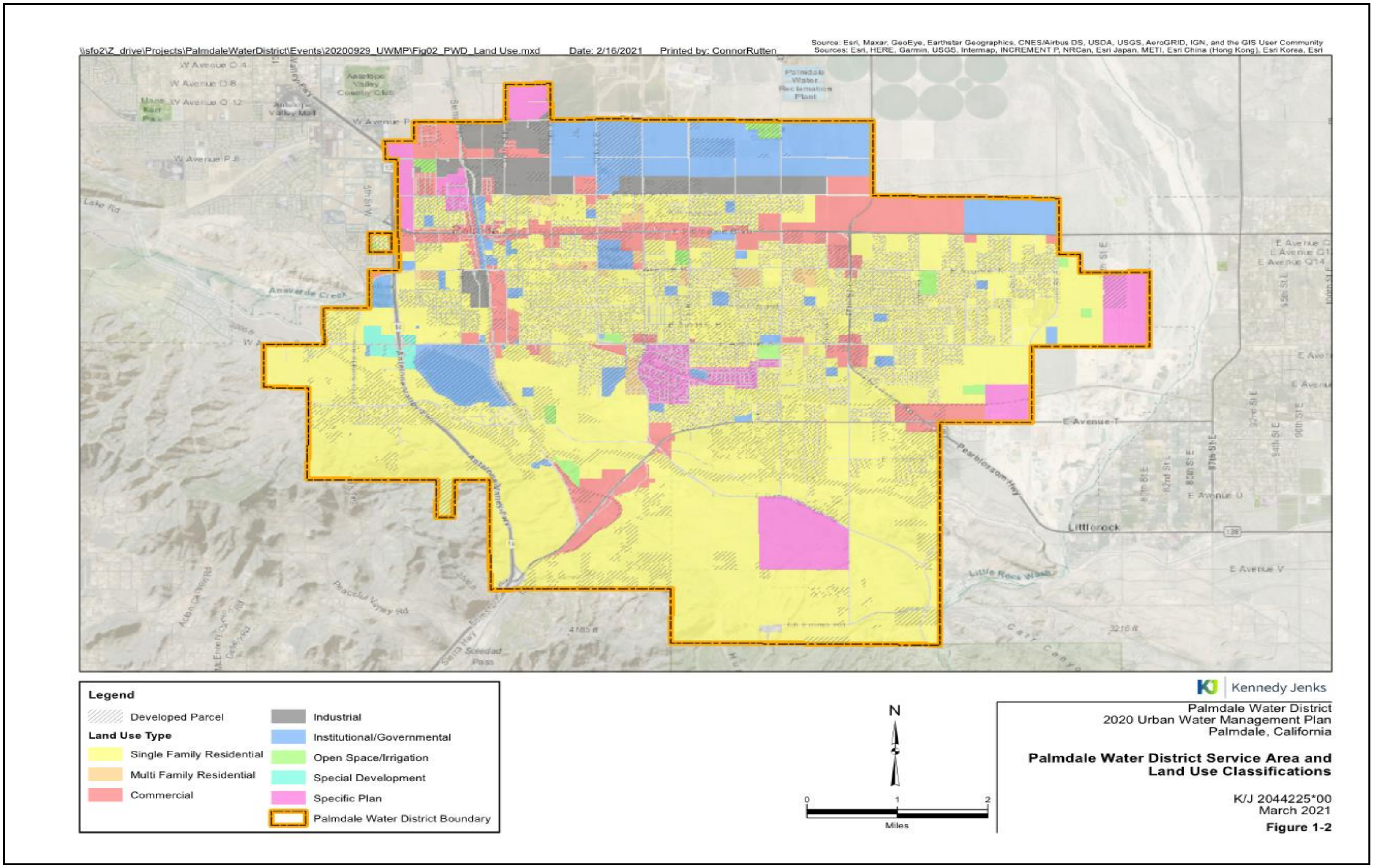
The breakdown of land uses in the service area were calculated using Los Angeles (LA) County parcel data as well as the most recent land use data taken from general and specific plans (provided by PWD). Existing land uses were determined from only developed parcels (not classified as “vacant” by LA County parcel data). Table 1-9 provides a breakdown of these land uses.

Figure 1-2 shows the identified land use categories in the PWD service area and also identifies which areas are developed/undeveloped.

Table 1-9 Existing Land Uses in Service Area

Land Use Type	Acreage
Single Family Residential	13,716
Recreational	71
Multi-Family Residential	285
Miscellaneous	741
Irrigated Farm	134
Institutional	154
Industrial	322
Government	1,177
Commercial	528
Total	**17,128**

Figure 1-2 Land Use Map



1.9 Climate

The climate in PWD's service area is characterized by wide temperature fluctuations, hot summers, cold winters, strong winds, low humidity and scant rainfall. Temperatures in the summer months vary between 54 degrees Fahrenheit (°F) and 95 °F. In the winter months, the average temperature extremes vary from 28 to 63 °F, respectively. Most of the precipitation occurs during the winter and spring months. Over the last five years monthly precipitation has averaged less than 1 inch. Table 1-10 shows the average, monthly evapotranspiration (ETo), rainfall, and temperature data for PWD.

Table 1-10 Climate Data
Monthly Average Climate Data Summary

Month	Monthly ETo	Average Total Rainfall (inches)	Average Temperature (F)	
			Max	Min
January	1.69	1.10	60.70	29.70
February	2.44	0.90	63.69	31.83
March	4.70	0.95	67.62	35.94
April	5.99	0.20	74.16	41.27
May	7.98	0.15	79.54	47.24
June	9.33	0.006	90.64	54.88
July	9.66	0.08	95.23	60.97
August	8.93	0.02	95.73	60.20
September	6.18	0.11	91.65	53.50
October	4.62	0.19	80.39	42.67
November	2.95	0.42	67.84	33.01
December	2.08	1.06	58.56	28.64

Source: California Irrigation Management System (CIMIS) data provided from Station No. 197, Los Angeles Region, January 2010 – December 2020 http://www.cimis.water.ca.gov/cimis/welcome.jsp.

1.10 Potential Effects of Climate Change

A topic of growing interest and research for water planners and managers is climate change and the potential impacts it could have on California's future water supplies. DWR's California Water Plan considers how climate change may affect water availability, water use, water quality, and the ecosystem. The California Water Plan Update 2018 builds upon previous updates and provides recommended actions, funding scenarios, and an investment strategy to meet the challenges and goals laid out in the prior 2013 Plan.[1]

[1] California Water Plan Update 2018

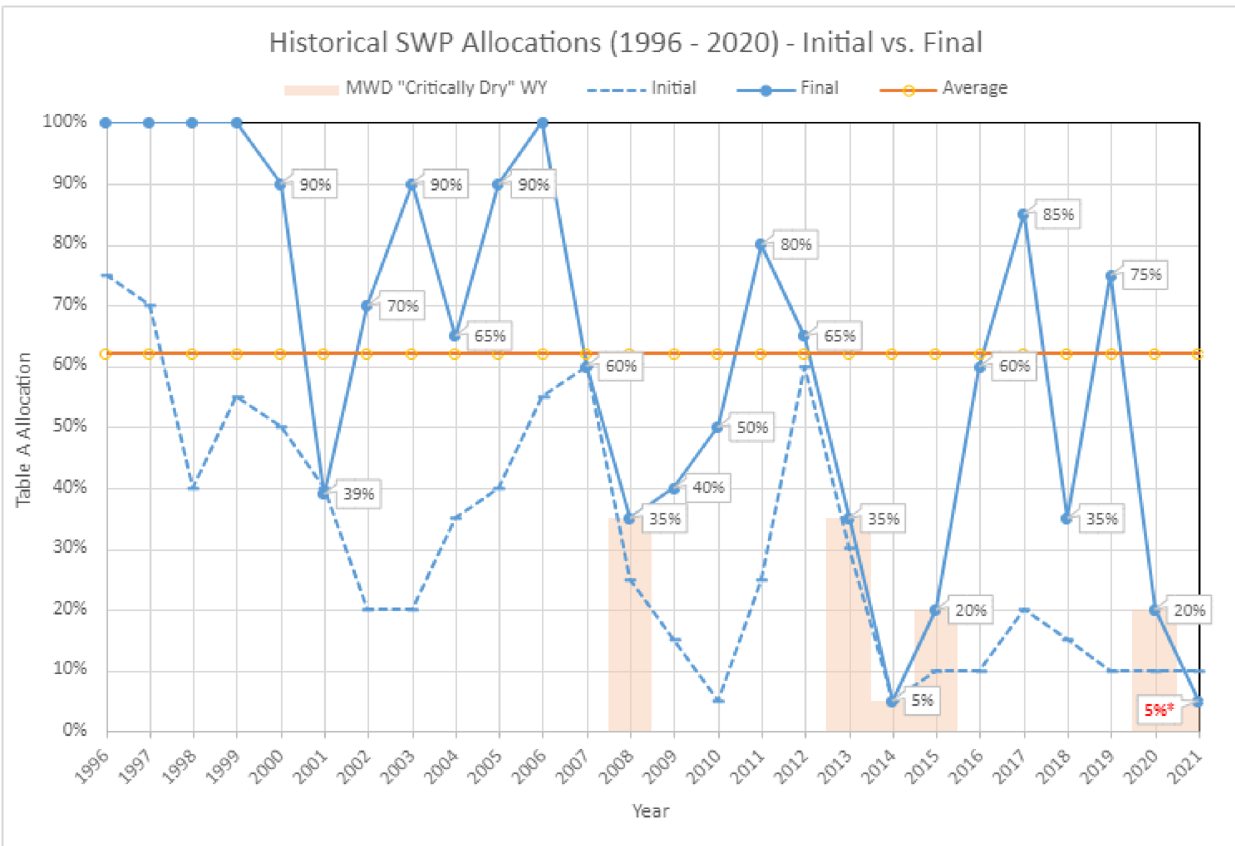
Chapter 3 of the California Water Plan, “Actions for Sustainability”, Volume 1, Chapter 5 of the California Water Plan, “Managing an Uncertain Future,” evaluated three different scenarios of future water demand based on alternative but plausible assumptions on population growth, land use changes, water conservation and future climate change. Future updates will test different response packages, or combinations of resource management strategies, for each future scenario. These response packages help decision-makers, water managers, and planners develop integrated water management (IRWM) plans that provide for resource sustainability and investments in actions with more sustainable outcomes. The 2018 Update provides recommended actions in order to support each of the identified goals of the plan. The goals are:

- Improve Integrated Watershed Management
- Strengthen Resiliency and Operational Flexibility of Existing and Future Infrastructure
- Restore Critical Ecosystem Functions
- Empower California’s Under-Represented or Vulnerable Communities
- Improve Inter-Agency Alignment and Address Persistent Regulatory Challenges
- Support Real-Time Decision-Making, Adaptive Management, and Long-Term Planning.

California faces the prospect of additional water management challenges due to a variety of issues including population growth, regulatory restrictions and climate change. Climate change is of particular interest because of the range of possibilities and their potential impacts on essential operations. The most likely scenarios involve increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months, and accelerated sea level rise. The other much-discussed climate change scenario is an increase in precipitation variability. Changes in precipitation patterns combined with the effects of sea level rise will especially compound water supply reliability impacts on State Water Project and Central Valley Project supplies that are conveyed through the fragile levee system of the Sacramento-San Joaquin Delta. The primary factor identified to impact Delta exports is the “flow seasonal pattern shifts.” Along with increasing temperatures, there will also be changes in the timing and type of precipitation and the timing and volumes of surface runoff. More precipitation will fall in the form of rain rather than snow, thereby resulting in a shift to more runoff during winter and early spring seasons. Earlier snowmelt and more rain versus snow will also result in an increasing inability to capture that runoff for later use, and most of the extra flows in the winter and early spring in the Delta watershed will be released as flood water and become Delta outflow. Overall, water supply from snowpack is projected to decline by two-thirds by 2050 in the State. Additionally, climate change poses the threat of more frequent water quality degradation, such as salinity impacts from sea level rise, which may also heavily impact delivery capability. Overall, by mid-century, Delta exports are projected to be reduced significantly, with possible reductions by up to 50% more than during historical droughts, and carryover storage may decline to one-fifth of levels found during historical droughts (Wang et al. 2018).

Already over past years, SWP supplies have become increasingly unreliable with substantial curtailments occurring during dry years. As a result of increasing hydrologic variability compounded with regulatory restrictions, the SWP is no longer capable of delivering full contractor entitlements on a routine basis. The last time 100 percent SWP allocations could be fulfilled was in 2006, after which time SWP allocations have shown a downward trend. During the height of the recent drought, SWP allocation was as low as 5 percent (in 2014). Since then, deliveries have fluctuated, with lows of 20 percent in 2015 and 2020 and a high of 85 percent in 2017 (Figure 1-3). The initial SWP allocation for 2021 is 10 percent of contractor requested Table A amounts. While some of the reductions since 2005 were also a result of more stringent Delta regulations and operational changes, long-term projections indicate continued curtailments in the future in large part due to climate change, for reasons described above.

Figure 1-3 Historical SWP Allocations



Source: https://californiawaterblog.com/2020/05/24/an-introduction-to-state-water-project-deliveries/

Projections for future deliveries are outlined in DWR's State Water Project Delivery Capability Report (DCR) 2019 (DWR 2020), which also considers impacts on SWP deliveries due to climate change, among other factors. In general, the DCR describes factors affecting the operation of the SWP, its long-term capability to provide water for beneficial use, and an estimate of its current delivery capability. In addition, the DCR Technical Addendum provides information on climate change hydrology and sea-level rise in its analysis of SWP delivery capability under future conditions, specifically under a 2040 high-emissions and 1.5 foot sea level rise scenario. Under current conditions, the long-term average of SWP Table A water deliveries is estimated to be 58 percent, with deliveries ranging between 7 percent for a single dry year and up to 97 percent for a single wet year. Under future conditions, the minimum, average, and maximum percent of maximum SWP Table A amounts are estimated to be 9 percent, 52 percent and 94 percent respectively. Average delivery estimates are down from previous DCR estimates.

In addition to imported water supplies, climate change will also have increasing impacts on groundwater resources which also serve as an important source of water supplies for the District. While groundwater is often considered a drought-resistant water resource, warmer temperatures, changing precipitation patters and more extreme drought conditions can indeed impact groundwater supplies. These conditions can lead to reduced groundwater recharge and increased dependence on groundwater supplies when other supplies, such as imported SWP supplies, are less available under drought conditions. However, local impacts are still uncertain given that average precipitation in the Antelope Valley may either increase or decrease in the future. This has implications on the sustainability of local groundwater operations.

Climate change impacts also have implications for water demands. Warmer temperatures and changes in precipitation patterns, as well as more frequent and extreme drought conditions, are anticipated to result in increasing water needs to support aquatic habitat and irrigation demands including for outdoor landscaping and irrigated agriculture, among other uses. Warmer temperatures increase plant evapotranspiration and reduces soil moisture, which contributes to increased water demands. Outdoor water use is a large component of water demands in the Antelope Valley, and generally a large component of urban water demands. On the other hand, drought conditions that impact water supply reliability may also lead to required demand reductions to avoid shortages, thereby counteracting demand increases. Climate change impacts on water demand have been considered in this UWMP primarily based on demand trends during historical dry weather conditions. Potential climate change effects on the Region include an increase in average temperature by 5 to 6 degrees by 2050, extreme heat days above threshold by 2050 with 34 additional extreme heat days by 2100, 524 to 413 more hectares burned by 2050 due to wildfires, a slight 1.6 inch increased in annual precipitation by 2050, and a reduction in local snowpack from 0.7 inches to zero. These climate change impacts are expected to impact future water demands. Additional details on demands are provided in Section 2 of this Plan.

With a broad range of uncertainty that the State and Antelope Valley face in its water supplies and demands, optimizing water resource management includes identifying combinations of resource management strategies, for future scenarios of local and imported water supply and demand conditions. This UWMP includes projections of water demands over the planning period as well as existing and future water supply options to continue to reliably serve the Antelope Valley.

1.11 Climate Change Vulnerability Analysis

Identification of watershed characteristics that could potentially be vulnerable to future climate change is the first step in assessing the climate change vulnerabilities in the Region. In the context of this analysis, vulnerability is defined as the degree to which a system is exposed to, susceptible to, and able to cope with and adapt to, the adverse effects of climate change, consistent with the definition in the recently issued Climate Change Handbook for Regional Water Planning (USEPA and DWR, 2011).

Water-related resources that are considered important in the Region and potentially sensitive to future climate change include water demands, water supplies, water quality, flooding, and ecosystem and habitat. A qualitative assessment of each of these resources with respect to anticipated climate change impacts has been prepared in the 2019 Integrated Regional Water Management Plan for the Antelope Valley Region. The assessment identified high priority vulnerability issues for the Region including:

- Limited ability to meet summer demand decrease in seasonal reliability
- Increases in flash flooding due to more frequent and intense storms
- Lack of groundwater storage to buffer drought
- Decrease in imported water supply
- Invasive species can reduce supply available
- Decreased water quality due to increased constituent concentrations

The assessment follows the climate change vulnerability checklist assessment as defined in the Climate Change Handbook for Regional Water Planning and highlights those water-related resources that are important to the Region and are sensitive to climate change.[2]

[2] Antelope Valley Integrated Regional Water Management Plan, 2019 update, Appendix H

Section 2: Water Use

2.1 Overview

This section describes historical and current water usage and the methodology used to project future demands within PWD's service area. Water usage was divided into categories such as residential, industrial, commercial, irrigation, and other. Starting in January 2020, PWD no longer has a customer class of 'other' and has added the sub-class 'institutional.' To undertake this evaluation, existing land use data and population projections were evaluated. This information was then compared to historical trends for new water service connections and customer water usage information. In addition, weather and water conservation effects on historical water usage were considered in the evaluation. Several factors can affect demand projections, including:

- Land use revisions
- New regulations
- Consumer choice
- Economic conditions
- Climate change
- Transportation needs
- Environmental factors
- Conservation programs
- Building and plumbing codes

The foregoing factors affect the amount of water needed, as well as the timing of when it is needed and available. During an economic recession, there is a major downturn in development and a subsequent slowing of the projected demand for water. The projections in this UWMP do not attempt to forecast recessions or droughts, but to develop measures to help mitigated against droughts. Likewise, no speculation is made about future building and plumbing codes or other regulatory changes. However, the projections do include water conservation consistent with new legislative requirements calling for a 20 percent reduction in per capita demand by 2020 (SBX7-7).

An analysis was performed that combined growth projections with water use data to forecast total water demand in future years. Water uses were broken out into specific categories and assumptions made about each to project future use more accurately. Three separate data sets were collected and included in the assessment; historical water use by land-use type, current population and projected population.

2.2 Historical Water Use

PWD only serves potable water supplies within its service area. A discussion on recycled water availability and use is found in Section 5.

2.2.1 Historical Water Deliveries

Predicting future water use requires accurate historical water use patterns and water usage records. PWD has meters on all residential, commercial and landscape service connections in the service area and requires meters on all new connections. PWD provides potable water service to customers within its service area and serves supplemental water to several customers outside its primary service area in accordance with agreements made with the Antelope Valley-East Kern Water Agency (AVEK).

PWD’s 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/Industrial– This category captures water customers conducting business (i.e. providing a product or service), such as construction, as well as water users dedicated to public service such as fire service. Most of PWD’s water use in this category reflects water use for retail businesses. Water users under the Industrial category are typically manufacturers or processors of materials. PWD serves one industrial customer.
- Institutional – Water users under this category are typically Governmental customers.
- Irrigation– Water connections supplying water solely for landscape irrigation, including landscapes in a residential, commercial, or institutional setting.

Approximately 80 percent of PWD’s demand comes from the residential demand category based on average demand data from 2017 – 2020. Historical (2015) and current (2020) water deliveries by demand category are shown in Table 2-2.

2.2.2 System Losses

In 2020, PWD removed the “Other” demand category from their rate structure. In addition to the traditional demand sources, there is another component that impacts PWD’s water resources known as system water losses. This component is typically defined as the difference between water production and water sales. These water losses can come from authorized, but unmetered sources, such as main flushing, or unauthorized sources such as leakage, illegal connections, and inaccurate flow meters.

New legislation requires the analysis for the 2020 UWMP to report on distribution system water losses for each of the five years preceding the plan update. The method suppliers use to estimate water loss is based on American Water Works Association’s (AWWA) M36 Manual. Water loss estimates are available for calendar years 2015 – 2019. Water loss volumes are summarized in Table 2-1. On average over the last five years, system water losses have accounted for approximately 10 percent of total production. PWD anticipates losses to decline as we continue to replace old mainlines.

Table 2-1 Water Loss Audit Report Summary

Reporting Year[(a)]	Volume of Non-Revenue Water[(b)] (AF)	Water Loss as % of Water Supplied[(c)]
2015	1,671	10.0%
2016	1,559	11.4%
2017	1,896	10.5%
2018	2,288	12.1%
2019	1,495	8.1%

Notes: Modified from DWR Table 4-4
(a) Calendar Year
(b) Sum of real and apparent losses based on AWWA water audit software output (Line 58).
(c) Calculated from PWD water use records based on total water purchased and total authorized consumption.

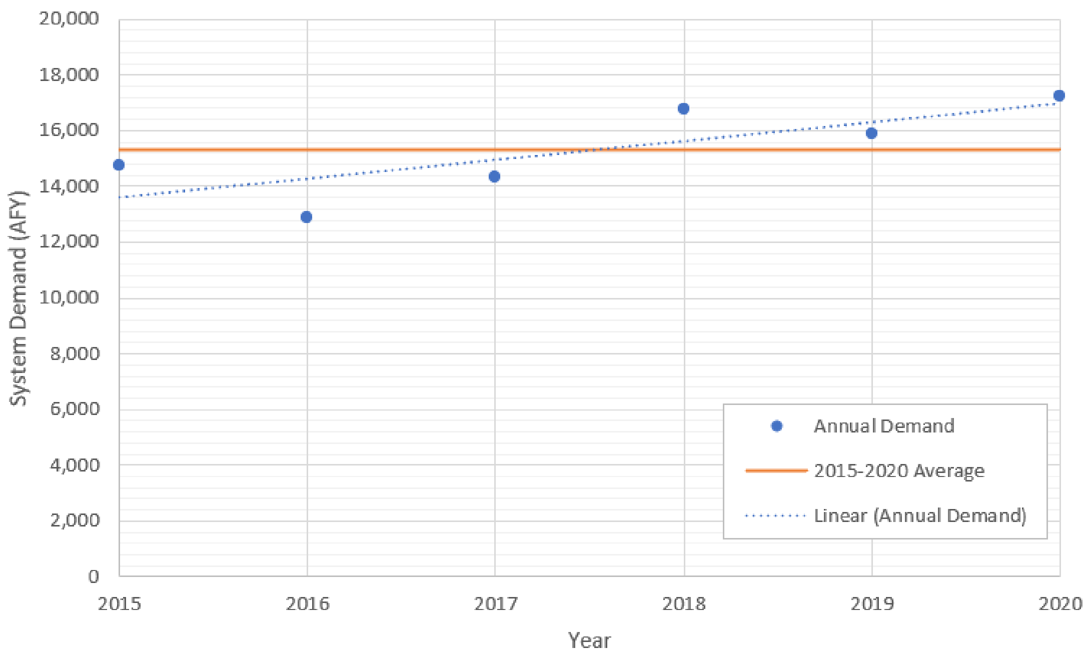
In 2020, PWD removed the “Other” demand category from their rate structure. Demand data provided by PWD for 2020 included both “fire service” as well as “construction” demand categories. With guidance from PWD, demands under “fire service” were included in the “industrial” demand category, and demands under “construction” were included in the “other” demand category for the purposes of comparing 2015 to 2020 demands.

Table 2-2 Historical Water Deliveries (2015 and 2020)

Demand Category	2015	2020[(a)]
Single family	10,251	11,757
Multi-family	1,276	1,555
Commercial[(b)]	863	1,190
Industrial	1,548	1,637
Landscape Irrigation	744	1,040
Other[(c)]	41	34
Sales to Other Agencies	432	1,301
Groundwater Recharge/Storage/Banking	0	0
Long Term System Storage	0	0
Saline Water Intrusion Barrier	0	0
Agricultural Irrigation	0	0
Non-Revenue Water [(d)]	1,841	1,997
Total	**16,996**	**20,511**

Note: Modified from DWR Table 4-1
(a) Data provided by PWD Staff Public Water System Statistics. 2020 total production was 20,511 AF as shown in Table 1-1.
(b) Includes Institutional and Governmental demands.
(c) Other uses include water for street sweeping, construction and other various limited use meters at PWD and school facilities.
(d) Based on average non-revenue water from past 5 years of water audit reports (see Table 2-1).

Figure 2-1 Historic Demands 2015 - 2020



As Figure 2-1 shows, 2020 had the highest system demand that the PWD system has experienced in the past six years. The demand projections discussed in Section 2.3 use the 2017-2020 average demand values rather than the 2020 historical demand values in order to avoid over-estimating projected demand. 2015 and 2016 demands were not included based on correspondence with PWD since demand during these years was uncharacteristically low due to severe drought conditions. Water loss and sales are not included in Figure 2-1.

2.2.3 Historical Sales and Deliveries to Other Water Agencies

PWD currently has arrangements with AVEK and Littlerock Creek Irrigation District (LCID) to provide treatment and delivery of raw water received from those agencies. Specifically, AVEK and LCID provide raw water to PWD, which is then treated and passed on to AVEK and LCID customers. These deliveries are described in Table 2-3.

As no additional PWD supplies are provided to AVEK or LCID with these treatment and delivery arrangements, those deliveries have no effect on PWD demands or supplies. Therefore, these deliveries are not accounted for in total PWD demands or supplies. No other arrangements for delivery or sales to other agencies currently exist with PWD.

Table 2-3 Historical Water Deliveries to Other Systems (AF)

Agency	2015	2016	2017	2018	2019	2020
LCID	1	2	2	3	10	1
AVEK	431	639	1,159	1,314	1,164	1,300
Total	**432**	**641**	**1,161**	**1,317**	**1,174**	**1,301**

Notes:
Data provided by PWD staff. As described above, these deliveries do not constitute sales to other agencies and due to the pass-through nature of these supplies are not being accounted for in total district demands. Values are rounded to the nearest whole number.

2.3 Projected Water Use

2.3.1 Water Delivery Projections Based on Land Use

PWD's projected water deliveries were estimated considering various factors, including historical and current demands, SCAG population projection data, and land use data. Figure 1-2 shows the land use classifications of both the developed and undeveloped areas within the PWD service area.

A relationship was first developed between the projected population and the projected land uses of the undeveloped areas within the PWD service area, using the estimated 2020 population within the PWD service area and the total developed residential acreage within the PWD service area. The estimated 2020 population within the PWD service area is 126,062 based on the DWR online population tool (see Table 1-6). Based on existing land use data, there are approximately 14,001 acres of developed residential acreage within the PWD service area, which equates to approximately 9 persons per acre of residential land. Therefore, for every 9 persons that SCAG estimates will be added to the PWD service area, 1 acre of residential land will develop. Approximately 98% of the existing developed residential acreage is single-family residential and 2% is multi-family residential.

Using the average historical water deliveries by usage category from 2017 and 2020 (see Table 2-2) combined with the existing developed land use data (see Table 1-8) unit demand factors with units of AFY per acre (AFY/Ac) for each usage category were developed. Table 2-4 shows the unit demand factors developed for the demand projections analysis.

Table 2-4 Unit Demand Factors

Usage Type	AFY/Ac
Single Family Residential	0.82
Multi-Family Residential	4.97
Commercial [(b)]	0.60
Industrial	4.06
Irrigation	7.24

Notes:
Based on 2017-2020 consumption and land use Classifications.
(a) Includes Institutional/Governmental Usage

Lastly, the land use data of the remaining undeveloped parcels within the PWD service area was analyzed to develop a ratio of undeveloped residential acreage to undeveloped commercial, industrial, and landscape acreages. Data from Specific Plans (Foothill Ranch, Palmdale Trade and Commerce, Palmdale Transit Village) was also analyzed to determine what portion of the area of these specific plans would fall into each defined land use category. Based on the Avenue S Corridor Area Plan, which included areas designated as “special development” at the intersection of Highway 14 and East Avenue S, these areas have not yet been slated for a specific type of development, and therefore were excluded from the acreage totals shown below in Table 2-5. The remaining undeveloped parcel acreages by land use are shown in Table 2-5, as well as the area ratios.

Table 2-5 Acreage of Remaining Undeveloped Within PWD Service Area By Land Use

Usage Type	Acreage	Ratio to Residential Acreage
Single Family	10,608	-
Multi Family	72	-
Commercial [(a)]	3,610	0.34
Industrial	336	0.03
Landscape Irrigation	346	0.03

Note:
a. Includes Institutional/Governmental Usage

Based on the land use classifications of the remaining undeveloped parcels within the PWD service area, for every 1 acre of residential area developed, approximately 0.34 acres of commercial, 0.03 acres of industrial, and 0.03 acres of landscape irrigation area will develop. Since no specific timelines are available for when the various commercial, industrial, or landscape irrigation projects will be completed, this method assumes that acreages associated with each land use type will increase in parallel with one another from the year 2020 up to “Buildout” (when all of the area inside of the PWD service area is assumed to be developed) at the ratios/rates identified above.

Given the projected population from Table 1-6, the calculated # persons per residential acre, the unit demands from Table 2-4, and the area ratios for the remaining undeveloped parcels within the PWD service area from Table 2-5, water delivery projections were developed through the year 2045, and are presented in Table 2-6. A linear growth rate for development was assumed between 2025 and 2045.

Table 2-6 Projected Potable Water Deliveries (AF)

Demand Category	2025	2030	2035	2040	2045
Single family	11,460	11,730	12,310	12,970	13,660
Multi-family	1,450	1,480	1,560	1,640	1,730
Commercial [(a)]	1,170	1,240	1,390	1,550	1,730
Industrial	1,350	1,390	1,480	1,590	1,700
Landscape	1,050	1,130	1,300	1,490	1,690
Other [(c)]	40	40	40	40	40
Sales to Other Agencies	1,300	1,300	1,300	1,300	1,300
Groundwater Recharge/Storage/Banking	0	0	0	0	0
Long Term System Storage	0	0	0	0	0
Saline Water Intrusion Barrier	0	0	0	0	0
Agricultural Irrigation	0	0	0	0	0
Non-Revenue Water [(b)]	1,900	2,000	2,100	2,200	2,400
Total	**19,720**	**20,310**	**21,480**	**22,780**	**24,250**

Notes: Modified from DWR Table 4-2

a. Includes Institutional/Governmental demands
b. Based on average non-revenue water from past 5 years of water audit reports (see Table 2-1).
c. Other uses include water for street sweeping, construction and other various limited use meters at PWD and school facilities.
d. Values are rounded.

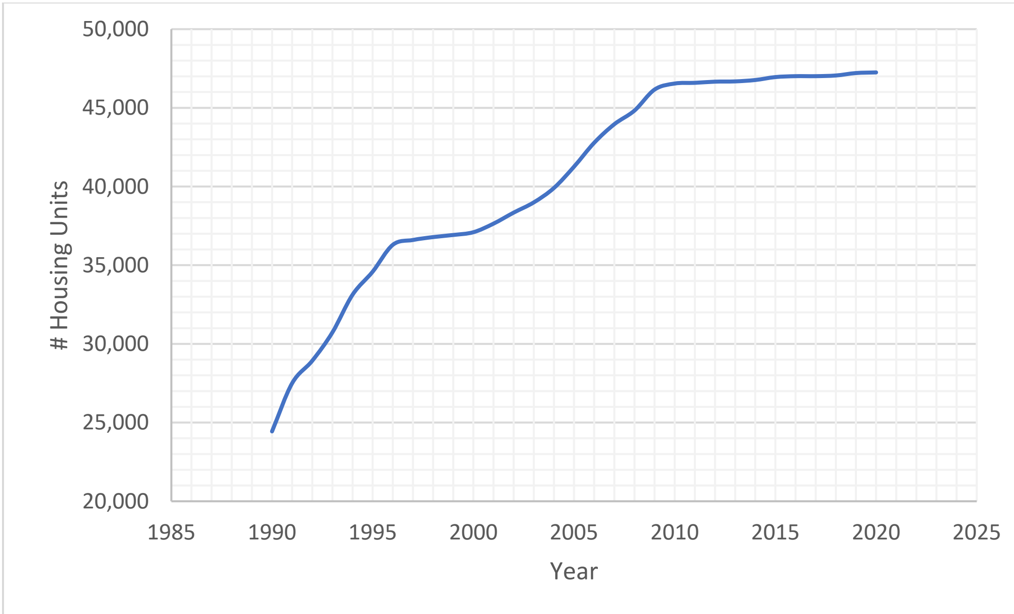
2.3.2 Effects of Codes, Standards, and Other Ordinances

Recent legislation provides that "if available and applicable" to PWD, demand projections must display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area. If such information is reported, the assessment will provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

Water savings resulting from implementation of codes, standards and other ordinances were not specifically estimated for water use projections in this UWMP. However, their potential impact was considered, and overall, it is expected that the water savings potential from codes and standards would be limited based on the following two main factors. 1) The majority of the City of Palmdale's housing stock is generally older, with approximately 52 percent of housing units built prior to 1990[3]. Figure 2-2 below shows how the number of housing units has grown from 1990 – 2020, showing a relatively steep increase from 1990 – 2008 before plateauing as a result of the recession and slowed growth.

[3] State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011-2020. Sacramento, California, May 2020. Available at: https://www.dof.ca.gov/Forecasting/Demographics/Estimates/

Figure 2-2 City of Palmdale # of Housing Units From 1990 - 2020



While water fixtures and appliances have become significantly more efficient since then due to standards and codes, these older housing units are also more likely to have already become more water efficient as a result of PWD rebate programs, natural replacement of old or malfunctioning fixtures or appliances, retrofit upon resale, or remodels. 2) There is minimal projected growth. New development would have to meet the newest water efficiency standards, thereby presenting a potential for water savings compared to the existing housing stock. However, the impact of the potential water savings from the new housing stock in PWD's service area would overall be limited due to the minor growth anticipated in the service area.

2.3.3 Effects of Climate Change on Water Use

Climate change projections have shown that California's water resources will likely be impacted by changes to temperature and precipitation. For the Antelope Valley Region, climate change is expected to increase average temperature by at least 5 degrees (Antelope Valley IRWMP, 2019) and precipitation is expected to remain relatively unchanged, with more precipitation coming in the form of intense storms. Temperature increases with more precipitation falling as rain rather than snow can lead to reduced snowpack storage and reduced imported water deliveries, resulting in more frequent drought periods.

In response to past drought conditions, PWD has implemented intensive conservation efforts and statewide conservation mandates in 2015 and has since maintained fairly steady demands with continued conservation efforts. The City plans to continue implementing effective demand management measures which are anticipated to impede major increases or rebounds in future per capita demands. Water conservation is the new normal for PWD customers, who continue to express interest in water conservation efforts and District programs. Projected water demands based on the current population and existing land uses are therefore estimated to stay within the recent 5-year range.

Projections are based on historic demands, thereby accounting for past dry periods, ongoing conservation efforts in addition to water savings resulting from the City's long-standing water conservation regulations, such as the City's Water Conservation Ordinance (Ord. 1516-NS) which lays out permanent mandatory water conservation measures.

As such, the baseline water use calculated from the recent 5-year period is considered to reasonably reflect regular water conservation practices and water savings related to codes and standards implemented to date.

2.4 Characteristic Five-Year Water Use

A new requirement for the 2020 UWMP cycle is the preparation of a five-year Drought Risk Assessment (DRA), in which water suppliers compare available water supplies with projected water use for a 5-year drought period. The first step in preparing the DRA is estimating expected gross water use for the next five years (2021 to 2025) without drought conditions, i.e. without accounting for short-term demand reduction actions or other drought effects.

Table 2-7 presents estimated normal and dry year water use over the next five years, based on factors anticipated to impact water use over the planning period, as described above. As noted above, baseline water demands take into account ongoing water conservation programs and permanent water conservation measures in accordance with PWD ordinances. Increases in demands above 2020 levels and through 2025 are a result of anticipated growth in PWD's service area. No additional water use demands are anticipated during dry periods. System losses are assumed to be equal to 11 percent of total production based on historical water loss audit data.

Table 2-7 Projected Five-Year Water Use (2021 - 2025)

Use Type	2021	2022	2023	2024	2025
Single family	11,250	11,300	11,360	11,410	11,460
Multi-family	1,420	1,430	1,440	1,440	1,450
Commercial	1,120	1,130	1,1140	1,160	1,170
Industrial	1,310	1,320	1,330	1,340	1,350
Landscape	990	1,000	1,020	1,030	1,050
Other	40	40	40	40	40
System Losses (Non-Revenue Water)	1,880	1,885	1,890	1,895	1,900
Sales to Other PWS	1,300	1,300	1,300	1,300	1,300
Total	**19,310**	**19,405**	**19,520**	**19,615**	**19,720**

2.5 Lower Income Projected Water Demands

The UWMP Act 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 identified in the housing element of any city, county, or city and county general plan in the service area of the supplier.

Based on a GIS analysis using census data, households with an income less than 80 of the state's median household income, made up approximately 50 percent of the PWD service area population in 2010. For purposes of estimating water use projections for PWD's lower income households, the proportion of lower income households within PWD's service area is assumed to be 50 percent through 2045. Related demands are presented in Table 2-8 and are accounted for in total water demands described in Section 2.4.

Table 2-8 Projections of Future Low-Income Household Water Use (AF)

Water Use	2025	2030	2035	2040	2045
Estimated Lower Income Water Use[(a)]	6,500	6,600	6,900	7,300	7,700

Notes: Values are rounded.
(a) Calculated as 50 percent of the single-family and multi-family residential demands presented in Table 2-6.

In addition, PWD 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:

- PWD specifically finds that it does not have sufficient water supply;
- PWD is subject to a compliance order issued by the SWRCB DDW that prohibits new water connections; or
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

Section 3: SBx7-7 Baseline and Targets

3.1 Existing and Targeted Per Capita Water Use

The Water Conservation Act 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 Act of 2009 provides the regulatory framework to support the goal of achieving a statewide reduction in urban per capita water use described in the 20x2020 Water Conservation Plan (DWR, 2010). 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. This section identifies the water use targets in 2015 and 2020 to demonstrate a 20% reduction in per capita water use by 2020. PWD calculated its baseline and target per capita water demands, in accordance with Method No. 1 described in "*Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*" (DWR Methodologies, 2011) The primary calculations required by SBX7-7 are summarized in Table 3-1.

Table 3-1 SBX7-7 Calculations

	2010 UWMP	2015 UWMP	2020 UWMP
Base Daily Water Use calculation (average GPCD used in past years)	First calculated and reported in 2010 plan	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation	Must use calculation from the 2015 plan
Interim Water Use Target (target GPCD in 2015)	First calculated and reported in 2010 plan	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation	May be revised in 2020 Plan under special circumstances
Compliance Water Use Target (target GPCD in 2020)	First calculated and reported in 2010 plan	May be revised in 2015 Plan, must be revised if 2010 Census data not used in original calculation	May be revised in 2020 Plan under special circumstances
Actual 2015 Water Use (in GPCD)	NA	In 2015 Plan must compare actual 2015 GPCD against 2015 target	Reported in the 2015 UWMP
Actual 2020 Water Use (in GPCD)	NA	NA	In 2020 Plan must compare actual 2020 GPCD against 2020 target

In the 2020 UWMP water agencies must demonstrate that the agency has met the 2020 Compliance Target by December 31, 2020. Compliance is done through review of the SBX7-7 Verification Tables and SBX7-7 Compliance Tables submitted with the 2020 Plan (included as Appendix F).

DWR requires that if an Agency prepared a 2015 UWMP it must use the baseline and target identified in its 2015 UWMP to determine compliance for 2020. Therefore, the methodology provided below is consistent with what was reported in PWD's 2015 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. PWD did not supply water to agriculture during the period 1995 to 2010 and so agricultural water does not factor into the baseline 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 2010 DWR "20x2020 Water Conservation Plan" (February, 2010) (20x2020 Plan). PWD falls within the South Lahontan Hydrologic Region (95 percent target for this region is 162).

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 is used to determine whether a supplier's 2015 and 2020 per capita water use targets meet the minimum water use reduction requirements of SBX7-7. 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 its target. As shown below, the Maximum Allowable GPCD does not apply to the PWD. PWD chose to use Methodology No. 1 and calculated a 2020 GPCD target of 185.

3.1.1 Base Daily Per Capita Water Use

Figure 1-1 illustrates PWD's service area used to estimate the Base Daily Per Capita Water Use. Tables Table 3-2 and Table 3-3 summarize the Base Daily Water Use calculation for PWD. As is shown in these tables, the PWD is not eligible to use a 15-year base period. Years 1995 to 2004 have been selected for calculation of the 10-year base period while years 2003 to 2007 have been selected for calculation of the 5-year base period.

Table 3-2 Baseline Period Ranges

Baseline	Parameter	Value	Units
10 to 15 year baseline period	2008 total water deliveries	25,339	AFY
	2008 total volume of delivered recycled water	0	AFY
	2008 recycled water as a percent of total deliveries	0	Percent
	Number of years in baseline period[(a)]	10	Years
	Year beginning baseline period range	1995	-
	Year ending baseline period range[(b)]	2004	-
5 year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	-
	Year ending baseline period range[(c)]	2007	-

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 the PWD service area was calculated for 1990, 2000, 2010, 2015, and 2020 using the DWR online population tool (printout provided in Appendix F).

This was accomplished using a Geographic Information System (GIS) interface to derive population. By adding shape files for the entity service area boundaries or public water system boundary in 1990, 2000, 2010, 2015 and 2020 population is derived using U.S. Census Bureau census tract data from census years. Then, along with PWD production and service connections, the DWR population tool derives a person's-per-connection number, which is used to determine population in the intervening years between 1990 and 2010 and estimates population in 2020.

As shown in the top portion of Table 3-3 PWD's 10-year Baseline GPCD was calculated as 231. As shown in the second tier of Table 3-3 PWD's 5-year Baseline GPCD is 229.

Table 3-3 Baseline Daily Per Capita Use

Year		Service Area Population	Gross Water Use (AFY)	Daily Per Capita Water Use (GPCD)
		10 to 15 Year Baseline GPCD		
1	1995	79,578	22,233	249
2	1996	88,785	23,514	236
3	1997	89,675	23,152	230
4	1998	90,540	20,626	203
5	1999	91,375	23,398	229
6	2000	92,172	25,901	251
7	2001	98,516	25,220	229
8	2002	99,649	25,670	230
9	2003	100,788	24,909	221
10	2004	104,237	26,684	229
10 to 15 Year Average Baseline GPCD				**231**
		5 Year Baseline GPCD		
1	2003	100,788	24,909	221
2	2004	104,237	26,684	229
3	2005	104,120	26,128	224
4	2006	105,754	27,934	236
5	2007	107,396	28,152	234
5 Year Average Baseline GPCD				**229**
		2015 Compliance Year		
	2015	7	17,015	**128**
		2020 Compliance Year		
	2020	62	23,245	**165**

3.1.2 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. The methodologies for calculating demand reduction targets were described above. PWD chose to use Method 1, as shown in Appendix F.

As shown in Table 3-3 PWD had a 2020 GPCD of 165, which means PWD has met its 2020 Compliance Target of 185 as identified in Table 3-4.

Table 3-4 Components of Target Daily Per Capita Use

Period	Value		Unit
10-year period selected for baseline GPCD	*First Year*	*1995*	*Last Year 2004*
5-year period selected for maximum allowable GPCD	*First Year*	*2003*	*Last Year 2007*
Highest 10-year Average	231		GPCD
Highest 5-year Average	229		GPCD
Compliance Water Use Target (20% Reduction on 10yr)	185		GPCD
Max Allowable Water Use Target (5% Reduction 5yr)	218		GPCD
2015 Interim Target	**208**		GPCD
2020 Target	**185**		GPCD
Methodology Used	Option #1		

PWD plans to maintain progress on meeting the 20x2020 water use targets through the continuation of existing methods of conservation that have been proven successful to date, and other methods discussed in Section 8 Demand Management Measures.

Section 4: Water Supply

4.1 Overview

This section describes the water resources available to PWD for the 25-year period covered by this UWMP. PWD currently receives water from three sources: groundwater, surface water from Littlerock Dam Reservoir, and imported water from the SWP. Groundwater is obtained from the Antelope Valley Groundwater Basin. This water is treated with chlorine disinfection and pumped directly into the District's potable distribution system. PWD's imported water is provided by the SWP and is conveyed through the East Branch of the California Aqueduct to Lake Palmdale, which acts as a forebay for the PWD's 35 million gallon per day (MGD) water treatment plant. Lake Palmdale can store approximately 4,129 AF of SWP and Littlerock Dam Reservoir water.

PWD has developed recycled water supplies to offset potable water demand and to diversify its water supply. Additionally, PWD is developing new sources of supply via groundwater banking and anticipated new supplies from transfer and exchange opportunities. PWD does not currently, nor does it have plans to use stormwater.

PWD supplies are summarized in Table 4-1 and discussed in more detail below. Both currently available and planned supplies are discussed.

This section also assesses supplies available to PWD in an average year, a single dry year, and during multiple dry years.

- An average year (also called a normal year) is the average supply over a range of years and represents the median water supply available.
- The single-dry year is the year that represents the lowest water supply available.
- The multiple-dry year period is the lowest average water supply available for five consecutive dry years.

The term "dry" is used throughout this section and in subsequent sections concerning water resources and reliability as a measure of supply availability. As used in this Plan, dry years are those years when supplies are the lowest and demands are the highest, which occurs primarily when precipitation is lower than the long-term average precipitation. The impact of low precipitation in a given year on a particular source of supply may differ based on how low the precipitation is, or whether the year follows a high-precipitation year or another low-precipitation year. For the SWP, a low-precipitation year may or may not affect supplies, depending on how much water is in SWP storage at the beginning of the year. Also, dry conditions can differ geographically. For example, a dry year can be local to the Antelope Valley area (thereby affecting local groundwater replenishment and production, and yield from Littlerock Dam Reservoir), local to northern California (thereby affecting SWP water deliveries), or statewide (thereby affecting both local groundwater and the SWP). When the term "dry" is used in this Plan, statewide drought conditions are assumed, affecting both local groundwater and SWP supplies at the same time.

Table 4-1 Summary of Current and Projected Supplies

	Detail	2020 Actual Volume (AF)	Level of Treatment	2025 Reasonably Available Volume (AF)	2030 Reasonably Available Volume (AF)	2035 Reasonably Available Volume (AF)	2040 Reasonably Available Volume (AF)	2045 Reasonably Available Volume (AF)
Existing Supplies								
Groundwater[a]	Antelope Valley Groundwater Basin	7,600	Drinking Water	4,220	2,770	2,770	2,770	2,770
Groundwater[a]	Return Flow Credit	4,090	Drinking Water	5,000	5,000	5,000	5,000	5,000
Groundwater	Groundwater or Surface Water Augmentation	0	Drinking Water	5,325	5,325	5,325	5,325	5,325
Surface Water[b]	Littlerock Reservoir	4,540	Raw Water	4,000	4,000	4,000	4,000	4,000
Imported Water[c]	SWP Table A	5,695	Raw Water	12,030	11,720	11,400	11,080	11,080
Imported Water	Butte Transfer Agreement[d]	1,320	Raw Water	5,650	5,500	5,350	5,200	5,200
Recycled Water[f]	LACSD[e]	70	Recycled Water	500	1,000	1,500	2,000	2,000
	Total Supplies	**23,315**	**-**	**36,725**	**35,315**	**35,345**	**35,375**	**35,375**

Notes: Modified from DWR Table 6-9
Values are rounded.
(a) See Section 4.2.1.3 for details.
(b) Projections based on estimated 50 percent of average historical yield (50 percent of 8,000 AFY). See Section 4.2.2.2.
(c) Supplies are linearly adjusted between “existing” and “future conditions” found in 2019 DCR technical addendum.
(d) For details see Section 4.2.3.
(e) Direct Reuse.
(f) See Section 5 for details.

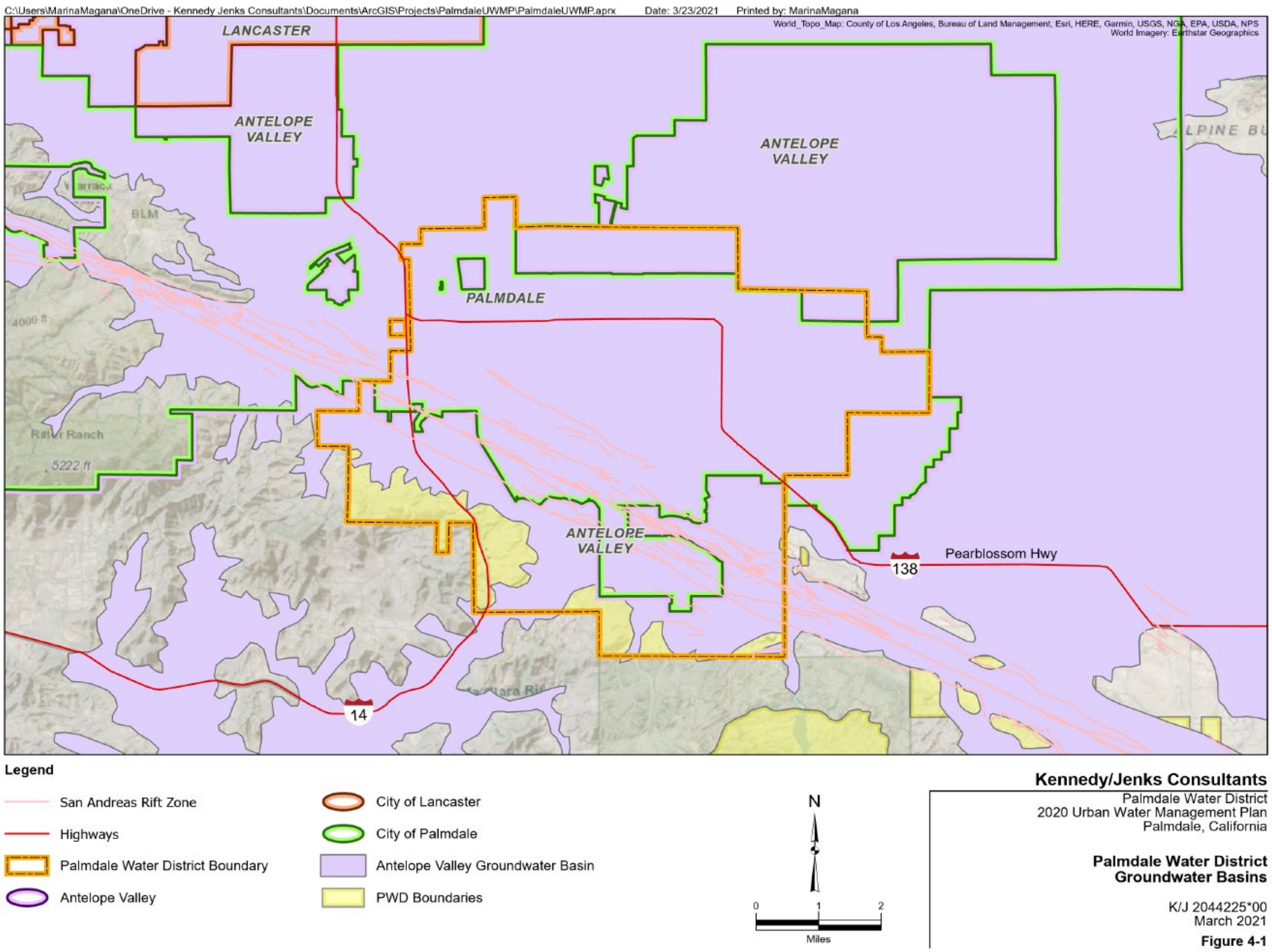
4.2 Local Water Supplies

4.2.1 Groundwater

Groundwater pumping currently makes up a significant proportion of PWD’s water supply portfolio, accounting for about 35 percent of supplies over the last five years. PWD’s groundwater supply is the Antelope Valley Groundwater Basin (DWR Basin No. 6-44, Bulletin 118), (Figure 4-1) where there are 22 active wells currently drawing from the aquifer. This water is treated with chlorine disinfection and pumped directly into PWD’s potable distribution system.

Since 2015, PWD has produced on average 6,380 AF of groundwater per year. The availability of groundwater supply for PWD does not vary throughout the course of a year.

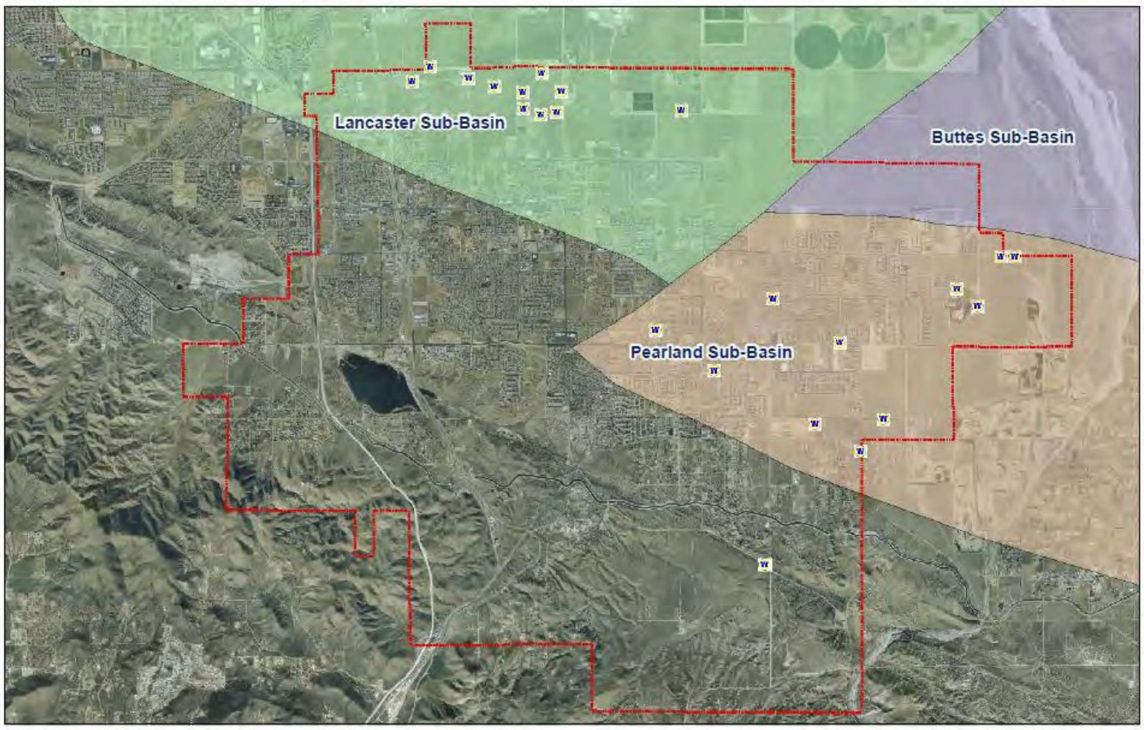
Figure 4-1 Groundwater Basins



4.2.1.1 Groundwater Subbasins

The U.S. Geological Survey has identified a series of subbasins in the Antelope Valley Groundwater Basin. PWD service area overlies the Lancaster, Buttes, and Pearland groundwater subbasins as shown in Figure 4-2. The boundaries between the three subbasins are determined by discontinuity or by steepening of the groundwater surface as measured in wells, rather than by surface evidence of faults. Movement of groundwater from the Pearland and Buttes subbasins to the Lancaster subbasin is slowed across these boundaries. The total amount of water transferred between these three subbasins is unknown (RMC 2011).

Figure 4-2 Groundwater Subbasins



Note: The red outline on this map is the PWD service area. This map does not include the San Andreas Rift Zone.

4.2.1.1.1 Lancaster Subbasin

The Lancaster subbasin is located in the center of the Antelope Valley Groundwater Basin with its southernmost portions lying within the PWD service area. It is bounded by bedrock to the south and by the Buttes and Pearland subbasins to the east. Alluvium in this subbasin reaches a thickness of about 1,100 feet in the northern portion of the service area. Two aquifer zones occur in this subbasin. The principal (upper) aquifer is confined and is several hundred feet thick within the PWD service area. PWD has 12 wells in the Lancaster subbasin. Currently, PWD operates 10 wells in the Lancaster subbasin, with a pumping capability of approximately 12,500 gallons per minute (gpm).

4.2.1.1.2 Buttes Subbasin

The Buttes subbasin is located southeast of the Lancaster subbasin. A small portion underlies the PWD service area. PWD does not currently have any wells or pump water from this subbasin. The aquifer zone consists of approximately 150 feet of saturated alluvial deposits.

4.2.1.1.3 Pearland Subbasin

The Pearland subbasin is also located southeast of the Lancaster Subbasin. This subbasin is bounded on the south by bedrock, on the north by a fault separating it from Buttes subbasin and on the West by the basin boundary. The northern most portion of the subbasin lies within the PWD service area. A single aquifer zone occurs within the Pearland subbasin and consists of approximately 250 feet of saturated alluvial deposits. PWD has 11 wells in the Pearland subbasin. Currently, PWD operates 10 wells in the Pearland subbasin, with a pumping capability of 3,500 gpm.

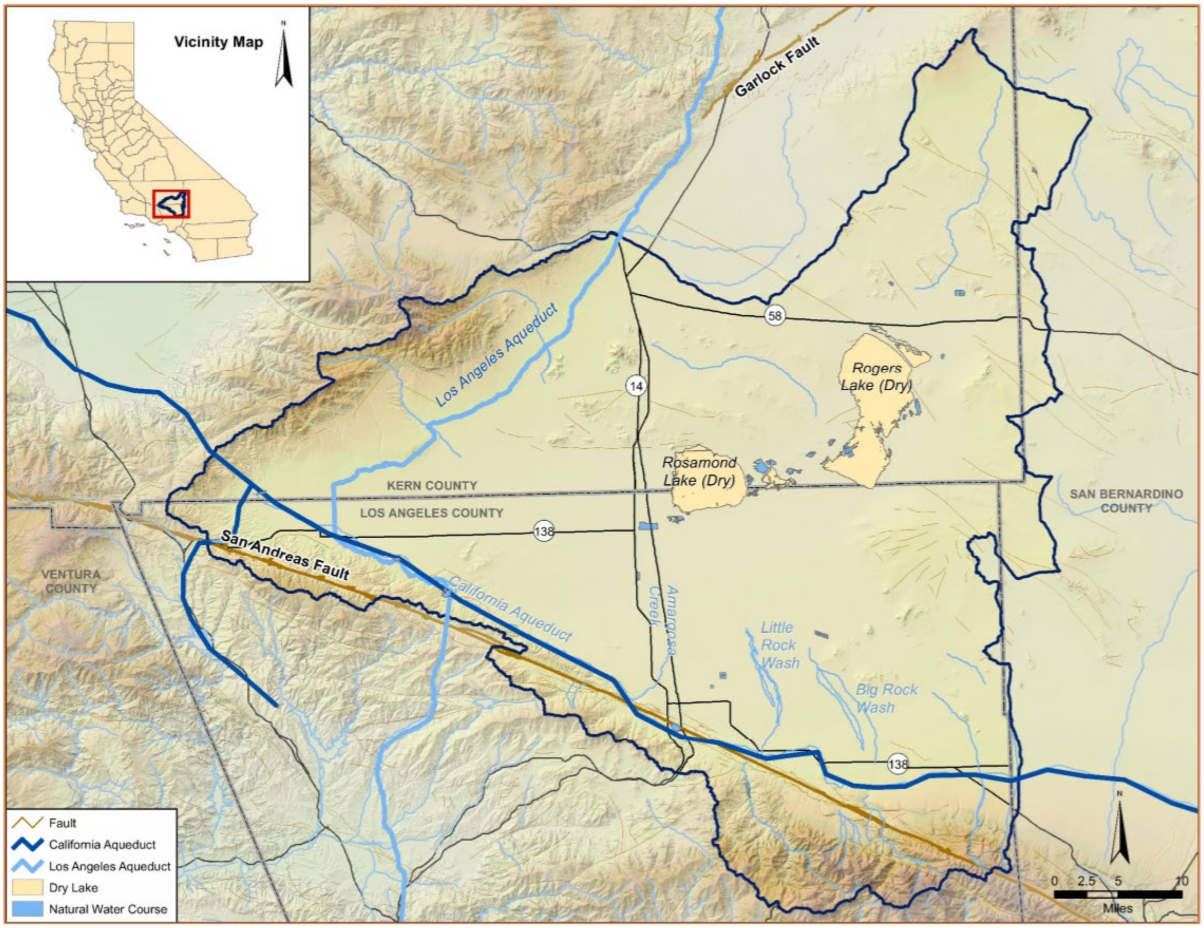
4.2.1.1.4 San Andreas Rift Zone

The San Andreas rift zone, widely known as the San Andreas Fault, has two general groundwater-bearing areas. These areas generally lie east and west of the intersection of Pearblossom Highway and Barrel Springs Road. The area to the east is a narrow valley, with poor groundwater production potential. The area to the west is a broader valley with more extensive groundwater-bearing deposits. PWD has 4 wells in the San Andreas rift zone, 2 in the western area and 2 in the eastern area.

Currently, PWD operates 3 of these wells, pumping approximately 150 AF each year.

The depth to water along the San Andreas rift zone is generally about 25 feet below the ground surface, with a seasonal groundwater level fluctuation of 15 feet. Over the long term, groundwater levels in sediments within the fault zone have remained relatively stable, suggesting that the groundwater-bearing sediments have not been overdrawn. The rift zone is shown on Figure 4-3 as the “San Andreas Fault”.

Figure 4-3 Antelope Valley Hydrologic Features



Source: 2019 Antelope Valley Integrated Regional Water Management Plan

4.2.1.2 Historical Groundwater Pumping

Total groundwater pumped from the Antelope Valley Groundwater Basin 2016-2020 by PWD is shown in Figure 4-2. PWD's groundwater supplies accounted for 13 to 39 percent of PWD's potable water supplies between 2016 and 2020. The projected groundwater pumping volumes are discussed in Section 4.2.1.3. As described in that section, pumping in the Antelope Valley Groundwater Basin will decrease in the future due to the adjudication process.

Table 4-2 Historical Pumping By PWD From the Antelope Valley Groundwater Basin (AF)

Basin Name	2016	2017	2018	2019	2020	Average
Antelope Valley	8,470	5,350	6,060	4,430	7,600	6,380

Note: Modified from DWR Table 6-1.
Values are rounded.
Source: PWD Groundwater pumping spreadsheet; 2016-2020.

4.2.1.3 Adjudication and Projected Groundwater Pumping

PWD is one of the entities involved in the adjudication of groundwater rights for the Antelope Valley Groundwater Basin that began in 2004. As part of an adjudication process, the court determines all the water rights in the basin, and orders either the reduction of groundwater extractions to levels that will stabilize or reverse groundwater level declines, or the purchase of imported water to replace over extraction of groundwater, or both. The adjudication allows groundwater banking between entities and allows PWD to take any additional groundwater banked.

In late 2015, PWD as well as the majority of parties involved agreed to a stipulated judgment for the adjudication of the Antelope Valley Groundwater Basin[1]. Per the judgment, PWD is receiving a groundwater production right of 2,770 AFY. The judgment is being appealed, but the PWD believes that it is unlikely that its groundwater production right will change significantly as a result of the appeal. Prior to the judgment, PWD had an unquantified right to pump water for beneficial use and assumed projected pumping volumes of up to 12,000 AF based on pumping capacity.

The judgment allows pumpers seven years, until 2023, to ramp down pumping and come into compliance with the judgement. PWD opted out of the seven year ramp down period and has been in full compliance with the judgement, pumping within its final adjudicated right since 2016.

In addition to its groundwater production right, PWD is entitled to a share of the unused federal reserved right. The judgment gives the federal government a right to pump 7,600 AFY, but it does not currently pump that much. The amount that the federal government does not pump is allocated among certain public water suppliers. Currently, the average amount of PWD's share of unused Federal Reserved Water Right Production is 1,450 AFY. Although the federal government has the right to increase its pumping at any time, PWD believes that it will be able to pump this amount at least until 2025. Groundwater pumping projects are shown in Table 4-3.

PWD is also entitled to a pumping allocation for return flow credit of imported water used. The return flow credit is equal to 39.1 percent of all of the SWP water utilized by PWD either for direct use via the Leslie O. Carter Water Treatment Plant (WTP) or pumped following for recharge at existing or future banking projects. Return flows credits are available to PWD following delivery to the Littlerock Reservoir or after banked imported water has been pumped. Based on the analyses conducted in planning reports return flow credits are projected to range between approximately 4,900 AFY and 6,000 AFY through 2040. For purposes of supply projections in this UWMP, 5,000 AFY in return flow credits are assumed to be available through 2045, for all water year types. These projections are shown in Table 4-4.

Finally, under the judgment (provided in Appendix G), PWD is able to purchase or lease groundwater rights from other parties. It is expected that additional rights will be available to the PWD throughout the period covered by this plan, if needed.

Table 4-3 Projected Pumping of Adjudicated Right From the Antelope Valley Groundwater Basin (AF)

Basin Name	2025 [(a)(b)]	2030	2035	2040	2045
Antelope Valley					
Normal Year	4,220	2,770	2,770	2,770	2,770
Single Dry Year	4,220	2,770	2,770	2,770	2,770
Multiple Dry Year	4,220	2,770	2,770	2,770	2,770

Source: Adjudication Court Order Judgment, 2015
Notes: Modified from DWR Tables 6-9, 7-2, 7-3, 7-4.
Values are rounded.
(a) PWD has been in compliance with the lowered groundwater right by 2025 as stipulated by the adjudication judgment.
(b) Values include both the PWD's production right and its share of the unused federal reserved right. Federal reserve right only projected out to 2025.

Table 4-4 Projected Groundwater Return Flow Credits (AF)

Water Source	2025	2030	2035	2040	2045
Return Flow Credit[(a)]	5,000	5,000	5,000	5,000	5,000

Note: Modified from DWR Table 6-9
(a) Assumes same availability for all water year types.

4.2.1.4 Groundwater Management Plan

PWD has not adopted a groundwater management plan, and no regional groundwater management plan currently exists for the basin. The adjudication, however, includes a court-ordered physical solution, which is a plan for managing groundwater. This court order is included as Appendix G.

In 2014 the Sustainable Groundwater Management Act (SGMA) was passed. SGMA requires the formation of local groundwater sustainability agencies (GSAs) that must assess conditions in their local groundwater basins and adopt locally based management plans. For those basins DWR has identified as medium to high priority (the Antelope Valley Groundwater Basin is a low-priority basin), SGMA requires GSAs to implement plans and achieve long-term groundwater sustainability. However, because the superior court issued a final judgment in the adjudication, the Antelope Valley Basin is exempt from the requirements of SGMA.

4.2.1.5 Groundwater Reliability

The most recent version of DWR's Bulletin 118, California's Groundwater (2019), does not characterize the groundwater basin as overdrafted, however it was deemed a 'low-priority' basin by DWR. It is noted that the prior versions of Bulletin 118 (1980 and 2003) identified the Antelope Valley groundwater basin as overdrafted and 'high-priority', respectively. The court in the ongoing adjudication referred to above made a finding that the basin is overdrafted, and PWD agrees with that finding. The adjudication judgment and physical solution will eliminate, over time, the long-term overdraft, either by reduction of pumping or the purchase of replacement water. Additional detail is provided in Section 4.2.1.3.

4.2.2 Local Surface Water

Littlerock Dam Reservoir was built in 1922. This reservoir constitutes PWD's local surface water supply source and is located in the hills southwest of the PWD service area. Recent renovations to Littlerock Dam Reservoir have increased its storage capacity to 3,500 AF.

The principal tributary streams that supply water to the PWD service area are Littlerock and Big Rock Creeks, which flow north from the San Gabriel Mountains along PWD's southern boundary. Numerous intermittent streams also flow into the service area, however run-off is meager. The Littlerock Dam Reservoir intercepts flows from Littlerock and Santiago Canyons. Runoff from the 65 square mile watershed in the Angeles National Forest to the reservoir is seasonal and varies widely from year to year. Although Littlerock Creek flows mainly during winter and spring months, this is buffered somewhat by Littlerock Dam Reservoir, allowing this water to be available throughout the year. The water is transferred from Littlerock Dam Reservoir through an eight and a half mile long open ditch to Lake Palmdale.

4.2.2.1 Local Surface Water Entitlements

PWD and Littlerock Creek Irrigation District (LCID) jointly hold long-standing water rights to divert 5,500 AFY from Littlerock Creek flows. Per an agreement between the two districts, the first 13 cubic feet per second (cfs) of creek flows is available to LCID (with modifications as described below). Any flow above 13 cfs is shared between the two districts with 75 percent going to the PWD and 25 percent to LCID. Each district is entitled to 50 percent of the reservoir's storage capacity. PWD anticipates taking approximately 4,000 AF per year from Littlerock Dam Reservoir.

In 1992, during renegotiations of the PWDs' Littlerock Creek Dam and Reservoir Rehabilitation, Operation and Maintenance agreement, a plan to rehabilitate the existing dam was implemented. The plan involved reinforcing the original multiple-arch construction with roller-compacted concrete buttress, raising the dam by 12 feet to increase capacity, providing recreational facilities around the reservoir, and replacing the historic wooden trestle between the creek and the reservoir with an underground siphon. The entire project was completed by the end of 1995. This revised agreement gave PWD the authority to manage the reservoir.

LCID granted ownership of its water rights to PWD for the fifty-year term of the agreement in-lieu of contributing financial resources for the rehabilitation work. Most recently, PWD completed a sediment removal project to remove more than 1.16 million cubic yards of sediments that had built up behind the dam since 1992, and which were reducing storage capacity by 500 AF. LCID is currently entitled to purchase from PWD, in any one calendar year, 1,000 AF of water or 25 percent of the yield from Littlerock Dam Reservoir, whichever is less.

4.2.2.2 Historical and Projected Local Surface Water Production

PWD's historical and current production from Littlerock Dam Reservoir is shown in Table 4-5. Historically PWD's local surface water production accounts for approximately 1 to 10 percent of its water supplies. The projected local surface water production from Littlerock Dam Reservoir is shown in Table 4-6. For surface water from Littlerock Reservoir, PWD used the driest year on record of 1951. Thus, PWD expects to use 4,000 AF of its diversion rights under normal, single-dry, and multiple-dry year conditions. This amount is calculated as 50 percent of the average available yield from Littlerock Reservoir (50 percent of 8,000 AF) and is considered to be available for supply in all years.

Table 4-5 Historical Surface Water Supplies (AF)

Water Source	2016	2017	2018	2019	2020	Average
Littlerock Reservoir	-	970	3,140	3,130	4,540	2,950

Source: PWD Public Water System Statistics. Note: Values are rounded.

Table 4-6 Projected Surface Water Supplies (AF)

Water Source	2025	2030	2035	2040	2045
Littlerock Reservoir					
Normal Year	4,000	4,000	4,000	4,000	4,000
Single Dry Year	4,000	4,000	4,000	4,000	4,000
Multiple Dry Year	4,000	4,000	4,000	4,000	4,000

Source: Personal Communication, PWD, April 2021.
Note: Modified from DWR Table 6-9, 7-2, 7-3, 7-4

4.2.3 Imported Water

PWD is one of 29 water agencies (commonly referred to as "contractors") that have a SWP Water Supply Contract with DWR. Each SWP contractor's Water Supply Contract contains a "Table A," which lists the maximum amount of contract water supply, or "Table A water," an agency may request each year throughout the life of the contract. The Table A Amounts in each contractor's SWP Water Supply Contract ramped up over time, based on projections at the time the contracts were signed, of future increases in population and water demand, until they reached a maximum Table A Amount.

The total planned annual delivery capability of the SWP and the sum of all Contractors' maximum Table A amounts was originally 4.23 million AF. The initial SWP storage facilities were designed to meet Contractors' water demands in the early years of the SWP, with the construction of additional storage facilities planned as demands increased. However, essentially no additional SWP storage facilities have been constructed since the early 1970s. SWP conveyance facilities were generally designed and have been constructed to deliver maximum Table A Amounts to all contractors. After the permanent retirement of some Table A Amount by two agricultural contractors in 1996, the maximum Table A amounts of all SWP contractors now totals about 4.13

million AF. Currently, PWD's annual Table A Amount is 21,300 AF. Over the last decade, PWD has received between 13 percent and 78 percent of its 21,300 AF contractual amount.

4.2.3.1 Historical Imported Water Deliveries

PWD's recent SWP deliveries are shown in Table 4-7. Since 2011, imported water has accounted for approximately 13 to 66 percent of the PWD's water supply.

Table 4-7 Historical Imported Water Supplies (AF)

Water Source	2016	2017	2018	2019	2020	Average
Imported SWP	10,516	13,858	10,210	12,066	7,016	10,733

Source: DWR Annual Finalization Report – Water File.

4.2.3.2 Projected Imported Water Supplies

Projected imported water supplies for the planning period are provided in Table 4-8 and Table 4-9. The development of these projections is complex and details of the considerations in developing imported water supply projections are provided in Sections 4.2.3.3 through 4.2.3.13.

Table 4-8 PWD Imported Water Supply Reliability Average, Single-Dry Year, and Multiple-Dry Year Conditions

Imported SWP Supplies	2025	2030	2035	2040	2045
PWD Table A Allocation	21,300	21,300	21,300	21,300	21,300
Average Water Year[a]					
% of Table A Amount Available [e]	56.5%	55%	53.55%	52%	52%
Anticipated Deliverables (AF)[b]	12,030	11,720	11,400	11,080	11,080
Single-Dry Year [b]					
% of Table A Amount Available	7%	8%	9%	10%	10%
Anticipated Deliveries (AF)[d]	1,490	1,705	1,915	2,130	2,130
Multiple-Dry Year [c]					
% of Table A Amount Available	29%	26.5%	24%	21%	21%
Anticipated Deliveries (AF)[d]	6,180	5,645	5,110	4,470	4,470

Notes:

(a) Supplies to the PWD are based on DWR analyses presented in its "2019 State Water Project Delivery Capability Report, Technical Memorandum" (2019 DCR), assuming existing SWP facilities and current regulatory and operational constraints.
(b) Based on a repeat of the worst case historic single dry year of 1977 (from 2019 DCR).
(c) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four- year dry period of 1931-1934.
(d) Values are rounded.
(e) Supplies are linearly adjusted between "existing" and "future conditions" found in 2019 DCR technical addendum.

The projected imported water deliveries to PWD are shown in Table 4-9.

Table 4-9 Projected Imported Water Supplies (AF)

Water Source	2025	2030	2035	2040	2045
Imported SWP Supplies					
Normal Year	12,030	11,720	11,400	11,080	11,080
Single-Dry Year	1,490	1,705	1,915	2,130	2,130
Multiple-Dry Year	6,180	5,645	5,110	4,470	4,470

Source: See Table 4-8
Note: Modified from DWR Tables 6-9, 7-2, 7-3, and 7-4

4.2.3.3 Imported Water Reliability

SWP supplies originate in northern California, primarily from the Feather River watershed. The availability of these supplies is dependent on the amount of precipitation in the watershed, the amount of that precipitation that runs off into the Feather River, water use by others in the watershed and the amount of water in storage in the SWP's Lake Oroville at the beginning of the year. Variability in the location, timing, amount, and form (rain or snow) of precipitation, as well as how wet or dry the previous year was, produces variability from year to year in the amount of water that flows into Lake Oroville. However, Lake Oroville acts to regulate some of that variability, storing high inflows in wetter years that can be used to supplement supplies in dry years with lower inflows.

As discussed in Section 1.9 and in DWR's 2019 Delivery Capability Report (DCR), climate change adds another layer of uncertainty in estimating the future availability of SWP source water. Current literature suggests that global warming may change precipitation patterns in California from the patterns that occurred historically. While different climate change models show differing effects, potential changes could include higher temperatures and more precipitation falling in the form of rain rather than snow and earlier snowmelt, which would result in more runoff occurring in the winter rather than spread out over the winter and spring.

DWR prepares a biennial report to assist SWP contractors (including PWD) and local planners in assessing the near and long-term availability of supplies from the SWP. DWR issued its most recent update, the 2019 DCR, in August 2020. In the 2019 DCR, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for use in their 2020 UWMPs. The 2019 DCR includes DWR's estimates of SWP water supply availability under both current and future conditions.

DWR's estimates of SWP deliveries are based on a computer model that simulates monthly operations of the SWP and Central Valley Project systems. Key inputs to the model include the facilities included in the system, hydrologic inflows to the system, regulatory and operational constraints on system operations, and contractor demands for SWP water. In conducting its model studies, DWR must make assumptions regarding each of these key inputs.

In the 2019 DCR for its model study under existing conditions, DWR assumed: existing facilities, hydrologic inflows to the model based on 82 years of historical inflows (1922 through 2003), current regulatory and operational constraints including 2018 Coordinated Operations Agreement Amendment (see section 4.2.3.6), 2019 biological opinions and 2020 Incidental Take Permit (see section 4.2.3.12), and contractor demands at maximum Table A Amounts. The long-term average allocation reported in the 2019 DCR for the existing conditions study provide appropriate estimate of the SWP water supply availability under current conditions.

To evaluate SWP supply availability under future conditions, the 2019 DCR included a model study representing hydrologic and sea level rise conditions in 2040. The future condition study used all of the same model assumptions as the study under existing conditions, but reflected changes expected to occur from climate change, specifically, projected temperature and precipitation changes centered around 2035 (2020 to 2049) and a 45 cm sea level rise. For the long-term planning purposes of this UWMP, the long-term average allocations reported for the future conditions study from 2019 DCR is the most appropriate estimate of future SWP water supply availability.

SWP Public Water Agencies (PWAs) can rely on the main contractor tables or alternate tables in DCR. In the 2019 DCR, DWR estimates that for all contractors combined, the SWP can deliver on a long-term average basis a total Table A supply of 58 percent of total maximum Table A Amounts under current conditions to 52 percent under future conditions. In the single critically dry year, DWR estimates the SWP can deliver a total Table A supply of 7 under current conditions to 10 percent under future conditions. For this 2020 UWMP, for PWD the 5-year multiple dry year scenario, assuming a repeat of years 1931 to 1934, an average was assumed. Given a repeat of hydrologic conditions 1931 to 1934 the SWP is expected to deliver 29 percent of the PWD's Table A allocation during existing conditions to 21 percent for future conditions.

4.2.3.3.1 Lowest SWP Water Supply Allocation

DWR's 2019 Delivery Capability Report indicates that the modeled single dry year SWP water supply allocation is 7 percent under the existing conditions. However, historically the lowest SWP allocations were at 5 percent in 2014. Due to extraordinarily dry conditions in 2013 and 2014, the initial 2014 SWP allocation was a historically low 5 percent of Table A Amounts, was later reduced to 0 percent in January 2014, and was later raised back to 5 percent, the lowest ever final total SWP water supply allocation. The circumstances that led to the low 2014 SWP water supply allocation were unusual, and although possible, likely have a low probability of occurrence.

Each year by October 1, SWP contractors submit their requests for SWP supplies for the following calendar year. By December 1, DWR estimates the available water supply for the following year and sets an initial supply allocation based on the total of all contractors' requests, current reservoir storage, forecasted hydrology through the next year, and target reservoir storage for the end of the next year. The most uncertain of these factors is the forecasted hydrology. In setting water supply allocations, DWR uses a conservative 90 percent hydrologic forecast, where nine out of ten years will be wetter and one out of ten years drier than assumed. DWR re-evaluates its estimate of available supplies throughout the runoff season of winter and early spring, using updated reservoir storage and hydrologic forecasts, and revises SWP supply allocations as warranted. Since most of California's annual precipitation falls in the winter and early spring, by the end of spring the supply available for the year is much more certain, and in most years DWR issues its final SWP allocation by this time. While most of the water supply is certain by this time, runoff in the late fall remains somewhat variable as the next year's runoff season begins. A drier than forecasted fall can result in not meeting end-of-year reservoir storage targets, which means less water available in storage for the following year.

Water year 2013 was a year with two hydrologic extremes.1 October through December 2012 was one of the wettest fall periods on record but was followed by the driest consecutive 12 months on record. The supply allocation for 2013 was a low 35 percent allocation. However, the 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and less stored water available for

2014 supplies. Compounding this low storage situation, 2014 also was a critically dry year, with runoff for water year 2014 the fourth driest on record.

The exceedingly dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. As noted above, the circumstances that led to the low 2014 SWP water supply allocation were unusual, and likely have a low probability of occurrence in the future. Thus, the assumption for SWP contractors such as PWD is that a 5 percent allocation represents the “worst-case” scenario.

4.2.3.3.2 SWP Contract Amendments for 2020 UMWP

DWR provides water supply from SWP to 29 SWP Contractors (Contractors) in exchange for Contractor payment of all costs associated with providing that supply. DWR and each of the Contractors entered into substantially uniform long-term water supply contracts (Contracts) in the 1960s with 75-year terms. The first Contract terminates in 2035, and most of the remaining Contracts terminate within three years after that.

The majority of the capital costs associated with the development and maintenance of the SWP is financed using revenue bonds. These bonds have historically been sold with 30-year terms. It has become more challenging in recent years to affordably finance capital expenditures for the SWP because bonds used to finance these expenditures are limited to terms that only extend to the year 2035, less than 30 years from now. To ensure continued affordability of debt service to Contractors, it was necessary to extend the termination date of the Contracts to allow DWR to continue to sell bonds with 30-year terms.

Public negotiations to extend the Contracts took place between DWR and the Contractors during 2013 and 2014. An Agreement in Principle (AIP) was reached and was the subject of analysis under the requirements of the California Environmental Quality Act (CEQA) (Notice of Preparation dated September 12, 2014). On December 11, 2018 DWR Director approved the Water Supply Contract Extension Project. In accordance with CEQA, DWR also filed its Notice of Determination for the project with the Governor’s Office of Planning and Research. In addition, DWR filed an action in Sacramento County Superior Court to validate the Contract Extension Amendments (https://water.ca.gov/Programs/State-Water-Project/Management/Water-Supply-Contract-Extension). After CEQA was completed and contract language was finalized, DWR and 18 contractors have executed the Extension Amendment. The Extension Amendment extends the contracts through 2085 and improve the project’s overall financial integrity and management. The Extension Amendment is the subject to a validation action and two CEQA lawsuits.

4.2.3.3.3 Water Management Tools

In a December 2017 Notice to Contractors, DWR indicated its desire to supplement and clarify the water management tools through this public process. Seeking greater flexibility to manage the system in order to address changes in hydrology and further constraints placed on DWR’s operation of the SWP, PWAs and DWR conducted public negotiations in 2017 to improve water management tools (WMT Amendment). The goal of the negotiations was to develop concepts to supplement and clarify the existing SWP Contract’s water transfer and exchange provisions to provide improved water management amongst the PWAs. Importantly, the transfers and exchanges provided for in the contract amendment are limited to those transfers and exchanges amongst the PWAs with SWP Contracts.

In June 2018, PWAs and DWR completed an AIP which included specific principles to accomplish this goal. These principles included adding contract language to include a process for transparency for transfers and exchanges. The principles also include amending existing contract provisions to provide new flexibility for single and multi-year non-permanent water transfers, allowing PWAs to set terms of compensation for transfers and exchanges, and providing for the limited transfer of carryover and Article 21 water.

In October 2018, a Draft Environmental Impact Report (DEIR) was circulated for the contract amendments. The AIP at that time included cost allocation for the California WaterFix project (WaterFix). In early 2019, the Governor decided not to move forward with WaterFix and DWR rescinded its approvals for WaterFix. After this shift, the PWAs and DWR held a public negotiation session and agreed to remove the WaterFix cost allocation sections from AIP, but to keep all the water management provisions in the AIP. The AIP for water management provisions was finalized on May 20, 2019. In February 2020, DWR amended and recirculated the Partially Recirculated DEIR for the State Water Project Supply Contract Amendments for Water Management and in August 2020, DWR certified the Final EIR. The EIR is being challenged in court. The WMT Amendment is effective when 24 SWP PWAs approve the amendment. The transfer and exchange tools will be available during litigation unless there is a final court order prohibiting their implementation.

4.2.3.3.4 Delta Conveyance Project

The third set of amendments would allocate Delta Conveyance Project costs and benefits among the SWP PWAs. Public negotiations between DWR and PWA's for the Delta Conveyance Project began in 2019 and were completed in April 2020. These negotiations led to an AIP for an Amendment to the State Water Contract regarding the Delta Conveyance Project. The Parties' goal was to equitably allocate costs and benefits of a Delta Conveyance Facility and to preserve SWP operational flexibility. A decision by each participating PWA for approving a contract amendment with DWR would not occur until after the environmental review for the Delta Conveyance Project is completed. That decision would likely occur in 2023, at the earliest.

4.2.3.3.5 Coordinated Operations Agreement (COA)

The Coordinated Operation Agreement (COA) was originally signed in 1986 and defines how the state and federal water projects share the available water supply and the obligations including senior water right demands, water quality and environmental flow requirements imposed by regulatory agencies. The agreement calls for periodic review to determine whether updates are needed considering changed conditions. After completing a joint review process, DWR and Reclamation agreed to an addendum to the COA in December 2018, to reflect water quality regulations, biological opinions and hydrology updated since the agreement was signed.

The COA Addendum includes changes to the percentages for sharing responsibilities for in basin uses, sharing available export capacity, and the review process. The 1986 Agreement required the Central Valley Project (CVP) to meet 75 percent of the in basin uses and the SWP to meet 25 percent. The COA Addendum now distinguishes responsibility based on water year type and CVP responsibilities range from 80 percent in wet years to 60 percent in critical years. SWP responsibility ranges from 20 percent in wet years to 40 percent in critical years. Additionally, the COA Addendum changed sharing export capacity. Previously, export capacity was shared 50 percent to CVP and 50 percent to SWP. The COA addendum changed this formula to be 65 percent CVP and 35 percent SWP during balanced conditions and 60 percent CVP and 40 percent

SWP during excess conditions. Overall, based on modeling, these change results in an approximately 115,000 AFY on average reduction in SWP supplies.

Finally, the 2018 COA Addendum updated the review process to require review of the COA Agreement and Addendum every 5 years. Litigation regarding the COA addendum environmental review is ongoing. The litigation is unlikely to change the negotiated COA addendum and implementation has already begun.

4.2.3.3.6 Delta Conveyance Project

Consistent with Executive Order N-10-19, in early 2019, the state announced a new single tunnel project, which proposed a set of new diversion intakes along Sacramento River in the north Delta for SWP. In 2019 DWR initiated planning and environmental review for a single tunnel Delta Conveyance Project (DCP) to protect the reliability of supplies from the effects of climate change and seismic events, among other risks. DWR's current schedule for the DCP environmental planning and permitting extends through the end of 2024. DCP will potentially be operational in 2040 following extensive planning, permitting and construction.

DWR estimates of SWP supply reliability in its 2019 Delivery Capability Report are based on existing facilities, and so do not include the proposed conveyance facilities that are part of the DCP. Since this UWMP uses DWR's 2019 Delivery Capability Report to estimate SWP supplies at 2040, any changes in SWP supply reliability that would result from the proposed DCP are not included in this UWMP.

4.2.3.3.7 Emergency Freshwater Pathway Description (Sacramento-San Joaquin Delta)

It has been estimated by DWR that in the event of a major earthquake in or near the Delta, water supplies could be interrupted for up to three years, posing a significant and unacceptable risk to the California business economy. A post-event strategy would provide necessary water supply protections to avert this catastrophe. Such a plan has been coordinated through DWR, Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), California Office of Emergency Services (Cal OES), the Metropolitan Water District of Southern California, and the State Water Contractors.

4.2.3.3.8 DWR Delta Flood Emergency Management Plan

The Delta Flood Emergency Management Plan (DWR, 2018) provides strategies for response to Delta levee failures, up to and including earthquake-induced multiple island failures during dry conditions when the volume of flooded islands and saltwater intrusion are large, resulting in curtailment of export operations. Under these severe conditions, the plan includes a strategy to establish an emergency freshwater pathway from the central Delta along Middle River and Victoria Canal to the export pumps in the south Delta. The plan includes the prepositioning of emergency construction materials at existing and new stockpile and warehouse sites in the Delta, and development of tactical modeling tools (DWR Emergency Response Tool) to predict levee repair logistics, timelines of levee repair and suitable water quality to restore exports. The Delta Flood Emergency Management Plan has been extensively coordinated with state, federal and local emergency response agencies. DWR, in conjunction with local agencies, the Corps and Cal OES, conduct tabletop and field exercises to test and revise the plan under real time conditions.

DWR and the Corps provide vital Delta region response to flood and earthquake emergencies, complementary to Cal OES operations. These agencies perform under a unified command structure and response and recovery framework. The Northern California Catastrophic Flood Response Plan (Cal OES, 2018) incorporates the DWR Delta Flood Emergency Management Plan. The Delta Emergency Operations Integration Plan (DWR and USACE, 2019) integrates personnel and resources during emergency operations.

4.2.3.3.9 Pathway Implementation Timeline

The Delta Flood Emergency Management Plan has found that using pre-positioned stockpiles of rock, sheet pile and other materials, multiple earthquake-generated levee breaches and levee slumping along the freshwater pathway can be repaired in less than six months. A supplemental report (Levee Repair, Channel Barrier and Transfer Facility Concept Analyses to Support Emergency Preparedness Planning, M&N, August 2007) evaluated among other options, the placement of sheet pile to close levee breaches, as a redundant method if availability of rock is limited by possible competing uses. The stockpiling of sheet pile is vital should more extreme emergencies warrant parallel and multiple repair techniques for deep levee breaches. Stockpiles of sheet pile and rock to repair deep breaches and an array of levee slumping restoration materials are stored at DWR and Corps stockpile sites and warehouses in the Delta.

4.2.3.3.10 Emergency Stockpile Sites and Materials

DWR has acquired lands at Rio Vista and Stockton as major emergency stockpile sites, which are located and designed for rapid response to levee emergencies. The sites provide large loading facilities, open storage areas and new and existing warehousing for emergency flood fight materials, which augment existing warehousing facilities throughout the Delta. The Corps maintains large warehousing facilities in the Delta to store materials for levee freeboard restoration, which can be augmented upon request of other stockpiles in the United States. Pre-positioned rock and sheet pile are used for closure of deep levee breaches. Warehoused materials for rapid restoration of slumped levees include muscle (k-rail) walls, super sacks, caged rock containers, sandbags, stakes, and plastic tarp. Stockpiles will be augmented as materials are used.

4.2.3.3.11 Emergency Response Drills

Earthquake-initiated multiple island failures will mobilize DWR and Corps resources to perform Delta region flood fight activities within an overall Cal OES framework. In these events, DWR and the Corps integrate personnel and resources to execute flood fight plans through the Delta Emergency Operations Integration Plan (DWR and USACE, 2019). DWR, the Corps and local agencies perform emergency exercises focusing on communication readiness and the testing of mobile apps for information collection and dissemination. The exercises train personnel and test the readiness of emergency preparedness and response capabilities under unified command and provide information to help to revise and improve plans.

4.2.3.3.12 Levee Improvements and Prioritization

The DWR Delta Levees Subventions and Special Projects Programs have prioritized, funded, and implemented levee improvements along the emergency freshwater pathway and other water supply corridors in the central and south Delta. These efforts are complementary to the Delta Flood Emergency Management Plan, which along with pre-positioned emergency flood fight materials, ensures reasonable seismic performance of levees and timely pathway restoration after a severe earthquake. These programs have been successful in implementing a coordinated strategy of emergency preparedness to the benefit of SWP and CVP export systems.

Significant improvements to the central and south Delta levees systems along Old and Middle Rivers began in 2010 and are continuing to the present time. This complements substantially improved levees at Mandeville and McDonald Islands and portions of Victoria and Union Islands. Levee improvements along the Middle River emergency freshwater pathway and Old River consist of crest raising, crest widening, landside slope fill and toe berms, which improve seismic stability, reduce levee slumping, and create a more robust flood-fighting platform. Urban agencies, including Metropolitan, Contra Costa Water District, East Bay Municipal Utility District, and others have participated in levee improvement projects along or near the Old and Middle River corridors.

4.2.3.3.13 B. F. Sisk Dam Raise and San Luis Reservoir Expansion

U. S. Bureau of Reclamation (Reclamation) and San Luis & Delta Mendota Water Authority (SLDMWA) are proposing to raise Sisk Dam and increase storage capacity in San Luis Reservoir. The proposed 10-foot dam raise is in addition to the ongoing 12-foot raise of Sisk Dam to improve dam safety and would expand San Luis Reservoir storage by 130 TAF. The final supplemental EIS/EIR released on December 18, 2020, estimated that the SWP exports could potentially be reduced by about 23 TAF per year on average under the preferred alternative. This project is currently undergoing design, environmental planning and permitting. Construction is estimated to complete by 2030 following environmental planning and permitting.

DWR estimates of SWP supply reliability in its 2019 Delivery Capability Report are based on existing facilities, and do not include this project.

4.2.3.3.14 Sites Reservoir

Sites Reservoir is a proposed new 1,500,000 acre-feet off-stream storage reservoir in northern California near Maxwell. Sacramento River flows will be diverted during excess flow periods and stored in the off-stream reservoir and released for use in the drier periods. Sites Reservoir is expected to provide water supply, environmental, flood and recreational benefits. The proponents of Sites Reservoir include 31 entities including several individual SWP Public Water Agencies (PWAs). Sites Reservoir is expected to provide approximately 240 TAF (Sites Reservoir Value Planning Report, Table 8-1) of additional deliveries on average to participating agencies under existing conditions. Sites Reservoir is currently undergoing environmental planning and permitting. Full operations of the Sites Reservoir are estimated to start by 2029 following environmental planning, permitting and construction. Sites was conditionally awarded $816 million from the California Water Commission for ecosystem, recreation, and flood control benefits under Proposition 1. Reclamation may also invest in Sites under the Water Infrastructure Improvements for the Nation (WIIN) Act and recently transmitted a final Federal Feasibility Report to Congress for the project.

DWR estimates of SWP supply reliability in its 2019 Delivery Capability Report are based on existing facilities, and do not include the proposed Sites Reservoir.

4.2.3.3.15 SWP Seismic Improvements

DWR's recent SWP seismic resiliency efforts have focused heavily on SWP Dam Safety. The most prominent is the joint USBR/DWR corrective action study of Sisk Dam which will result in a massive seismic stability alteration project, which is expected to begin construction in 2021. Similarly, Perris Dam had a major foundation modification and stability berm added to the downstream face which has resulted in the removal of the DSOD imposed storage restriction. Several analyses have been conducted on SWP dam outlet towers/access bridges which has resulted in seismic upgrades (some completed/some on-going). Updated dam seismic safety evaluations are being performed on the Oroville Dam embankment and the radial gate control structure on the flood control spillway.

In addition to the dam safety elements, DWR has procured and stockpiled spare pipe sections for the South Bay Aqueduct to increase recovery times following seismic induced damage (as part of the 2015 South Bay Aqueduct Reliability Improvement Project). Seismic retrofits have also been completed on 23 SWP bridges located in four Field Divisions with additional retrofits in various development stages. DWR has also updated the earthquake notification procedures and has replaced and expanded instrumentation for the SWP's seismic network.

4.2.3.3.16 2019 Biological Opinion / 2020 Incidental Take Permit Litigation

In late 2019, the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) issued new Biological Opinions for the Long-Term Operation of the CVP and SWP. Reinitiation of consultation on the Biological Opinions began in 2016 to update the prior 2008 and 2009 Biological Opinions and provide Federal Endangered Species Act (ESA) compliance for the CVP and SWP. Additionally, in early 2020, the California Department of Fish and Wildlife (DFW) issued DWR an Incidental Take Permit for the Long-Term Operation of the SWP pursuant to the California Endangered Species Act (CESA with regards to state-protected longfin smelt and state- and federally protected delta smelt, winter-run Chinook and spring-run Chinook). Previously, DFW had issued the SWP an Incidental Take Permit for the state-listed longfin smelt and Consistency Determinations with the 2008 and 2009 Biological Opinions for the state and federally listed species, not a separate permit. Some of the operational restrictions in the 2019 Biological Opinions differ from those in the 2020 Incidental Take Permit. Specifically, even though the projects' operations are coordinated, the SWP is subject to additional operational constraints that reduce SWP supplies and create operational conflicts. Both the 2019 Biological Opinions and the 2020 Incidental Take Permit are subject to multiple court challenges.

4.2.3.3.16.1 ESA Biological Opinion Litigation

Two cases were filed challenging the Biological Opinions under the ESA, Administrative Procedure Act, and National Environmental Policy Act. The first case filed, *Pacific Coast Federation of Fisherman's Association, et al. v. Ross (Case No. 1:20-CV-00431-DAD-SAB ("PCFFA v. Ross")*, was brought by six environmental organizations. The second case, *California Natural Resources Agency, et al. v. Ross* (Case No. 1:20) ("*CNRA v. Ross*"), was brought by the California Natural Resources Agency, the California Environmental Protection Agency, and the California Attorney General. The State's case includes a cause of action under CESA alleging that the federal CVP must comply with CESA. The cases were coordinated and transferred to the Eastern District. State and federal water contractors have intervened as defendants in both cases.

In Spring of 2020, plaintiffs in both cases brought motions for preliminary injunction. The environmental organizations sought broad relief, asking the court to require the federal defendants to abide by the 2008 and 2009 Biological Opinions pending a determination on the merits. The State sought a narrow injunction requiring the federal defendants to operate pursuant to the inflow to export ratio in the 2009 NMFS Biological Opinion for the final 20 days of May based on alleged irreparable harm to delta smelt, longfin smelt and San Joaquin River steelhead. The court issued an order on May 11, 2020 granting the State's narrow injunction on limited grounds for the protection of steelhead. The court denied the other elements of the *PCFFA v. Ross* plaintiffs' motion for preliminary injunction finding the evidence presented was insufficient to show irreparable harm to the species or that the requested injunction was likely to materially improve conditions for the species during the specified period.

In *CNRA v. Ross*, the Federal Defendants and several intervenors filed motions to dismiss the State's CESA cause of action for lack of subject matter jurisdiction or, alternatively, failure to state a claim. As of this date, the court has not scheduled a hearing or ruled on the motion.

4.2.3.3.16.2 CESA Incidental Take Permit Litigation

Eight cases, listed below, have been filed in state court by public agencies, environmental organizations, and a Native American tribe challenging DWR's approval of the Long-Term Operations of the SWP and associated environmental review. Most of the cases also challenge CDFW's issuance of an Incidental Take Permit for the SWP.

- *North Coast Rivers Alliance, et al. v. Department of Water Resources, et al.*, County of San Francisco Superior Court Case No. CPF-20-517078, filed April 28, 2020;
- *State Water Contractors, et al. v. California Department of Water Resources, et al.*, County of Fresno Superior Court Case No. 20CECG01302, electronically filed April 28, 2020;
- *Tehama-Colusa Canal Authority, et al. v. California Department of Water Resources, et al.*, County of Fresno Superior Court Case No. 20CECG01303, electronically filed April 28, 2020;
- *The Metropolitan Water District of Southern California, et al. v. California Department of Water Resources, et al.*, County of Fresno Superior Court Case No. 20CECG01347, electronically filed April 28, 2020;
- *Sierra Club, et al. v. California Department of Water Resources*, County of San Francisco Superior Court Case No. CPF-20-517120, filed April 29, 2020;
- *Central Delta Water Agency, et al. v. California Department of Fish and Wildlife, et al.*, County of Sacramento Superior Court Case No. 34-2020-80003368, filed May 6, 2020;
- *San Bernardino Valley Municipal Water District v. California Department of Water Resources, et al.*, County of Fresno Superior Court Case No. 20CECG01556, filed May 28, 2020;
- *San Francisco Baykeeper, et al. v. California Department of Water Resources, et al.*, County of Alameda Superior Court Case No. RG20063682, filed June 5, 2020.

The challenges are raised on several legal grounds, including CESA, California Environmental Quality Act, the Delta Reform Act, Public Trust Doctrine, area of origin statutes, breach of contract, and breach of covenant of good faith and fair dealing. All eight cases have been coordinated in Sacramento County Superior Court.

Litigation over the 2019 Biological Opinions and 2020 Incidental Take Permit will likely take several years. The projects began operating to the new requirements in 2020. Throughout implementation any party may seek preliminary injunctive relief during the litigation, such as that sought by the plaintiffs in the 2019 Biological Opinion cases. It is likely that the 2019 Biological Opinions and 2020 Incidental Take Permit will govern operations until final judicial determinations on the merits are made. Thus, it is unlikely that SWP water supply would increase beyond that resulting from the limitations in the 2019 BiOps and 2020 ITP during this timeframe.

4.2.3.3.17 Water Quality Control Plan/Voluntary Agreement

The State Water Board is responsible for adopting and updating the Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Bay-Delta Plan), which establishes water quality control objectives and flow requirements needed to provide reasonable protection of beneficial uses in the watershed. The State Water Board has been engaged for many years in updating the Bay Delta Plan.

The Bay-Delta Plan is being updated through phases. Phase 1 is updating the Bay-Delta Plan objectives for the San Joaquin River and its major tributaries and the southern Delta salinity objectives. Phase 2 is updating the objectives for the Sacramento River and Delta and their major tributaries. (Plan amendments). On December 12, 2018, through State Water Board Resolution No. 2018-0059, the State Water Board adopted the Phase 1 Plan amendments and Final SED establishing the Lower San Joaquin River flow objectives and revised southern Delta salinity objectives. On February 25, 2019, the Office of Administrative Law approved the Plan amendments. This plan requires an adaptive range of 30-50 percent of the unimpaired flow to be maintained from February through June in the Stanislaus, Tuolumne, and Merced Rivers, with a starting point of 40 percent of the unimpaired flow. During this same time period, the flows at Vernalis on the San Joaquin River, as provided by the unimpaired flow objective, are required to be no lower than a base flow of 1,000 cfs, with an adaptive range between 800 and 1,200 cfs, inclusive.

The State Water Board is also considering Phase 2 Plan amendments focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows. Staff is recommending an adaptive range of 45-65 percent Unimpaired Flow (UIF) objective with a starting point of 55 percent. Once the State Water Board adopts Phase 2 Plan amendments, the Board will need to conduct hearings to determine, consistent with water rights, water users' responsibilities for meeting the objectives in both Phase 1 and 2. At this time, the potential impacts to the SWP are unknown but this objective would have a large impact on water users in the Phase 2 planning area.

The State and several water users began working on an alternative to the Bay-Delta Plan update in 2018, known as the Voluntary Agreement process. The Voluntary Agreement process offers an alternative to the State Water Board staff's flow only approach. A Voluntary Agreement, if agreed to by the State Water Board, would be a substitute for the UIF approach and would become the Program of Implementation for the Plan amendments Implementing the Voluntary

Agreement would not require a water rights hearing because the parties are agreeing to take the actions. The Voluntary Agreement approach provides flow, and funding for flows, habitat actions, and a robust science program. The Voluntary Agreement approach provides an opportunity to combine flow and habitat actions to protect public trust resources, while providing certainty for water users. It offers a chance to avoid years of hearings and litigation and to instead begin early implementation of Voluntary Agreement actions.

4.2.3.4 Delta Reliance

A portion of the water received by the PWD comes from the Sacramento-San Joaquin Delta (Delta). The 2020 UWMP Guidebook describes how urban water suppliers that anticipate participating in or receiving water from a "covered action" related to the Delta should provide information in their 2020 UWMPs to demonstrate consistency with *Delta Plan Policy WR P1, Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance* (Reduced Reliance Policy). DWR has suggested that any entity receiving imported water from the SWP should anticipate being part of a "covered action".

PWD gathered information to determine the volume of SWP received in past years. In Appendix H PWD:

- Establishes a base period for evaluation of Delta water use in the District
- Provides data on past service area demands and population
- Provides data on SWP water received in the past
- Provides a projection on service area demands and through 2045
- Provides information on supplier contribution to regional self-reliance (local supplies brought online 2010-2045 in 5-year increments)
- Projects SWP water that will be received by PWD through 2045

4.2.4 Potential Supply Inconsistency

PWD's supply reliability (discussed in detail in Section 7), can be impacted by many factors, including changes in the availability of supplies due to climatic or infrastructure changes, prolonged drought, as well as the efficient use of those supplies in both average and dry periods. These factors can result in acute impacts (facility failures), short-term impacts (SWP limitations), or long-term (drought) impacts to the reliability of its supplies. The factors resulting in the inconsistency of water supply, by source are identified in Table 4-10.

Table 4-10 Factors Resulting In Inconsistency of Water Supply

Water Source	Description	Limitation	Legal	Environmental	Water Quality	Climatic
Groundwater	Antelope Valley Groundwater Basin	Limited by well production capacity and adjudication	X		X	

Surface Water	Littlerock Reservoir	Limited by hydrology and diversion right	X			X
Imported Water	SWP (California Aqueduct)	Limited by Table A allocation and hydrologic conditions and/or regulatory constraints	X	X		X

4.3 Other Supplies

4.3.1 Transfers, Exchanges, and Groundwater Banking Programs

In addition to SWP water supplies, local surface water, and groundwater, PWD is currently exploring opportunities to utilize recycled water, groundwater banking, and other anticipated new sources.

4.3.1.1 Existing Transfer Agreement

PWD currently has a long-term lease agreement with Butte County for up to 10,000 AFY of their SWP Table A Amount. The amount available through this lease varies primarily on the final annual allotment from DWR to the State Water Contractors and can be roughly calculated by multiplying the final allotment percentage by 10,000 AF. This lease has been amended and extended through 2031. Butte and PWD anticipate renegotiating the agreement to extend past 2031.

The District assumes this supply for the purposes of this plan will continue through the planning period, to 2045. Supplies from this agreement are accounted for in PWD planned supplies and are anticipated to be available in future years based on SWP Table A Amounts projected for the PWD under normal, single-dry, and multiple-dry year scenarios as described in Section 4.2.3.2. Accordingly, 56.5 percent or 5,650 AFY is anticipated to be available in 2025 to 52 percent or 5,200 AFY past 2040, as shown in Table 4-1; 7 percent or 700 AFY is anticipated in a single-dry year in 2025 to 10 percent or 1,000 AF in a single-dry year after 2040; and 29 percent or 2,900 AF in a multi-dry year in 2025 to 21 percent or 2,100 AF in a multi-dry year after 2040.

4.3.1.2 Transfer and Exchange Opportunities

PWD has evaluated various transfer and exchange opportunities that could aid in meeting projected water demands and has participated in a number of water transfers over the last several years. PWD's anticipated new sources consist of additional water supply transfer and exchange opportunities. PWD will utilize a combination of various transfer and exchange opportunities, as necessary, to meet its projected water demands.

PWD recently completed and adopted its Strategic Water Plan (PWD 2018) wherein it identified additional needed surface water acquisitions and transfers as a component of its overall water supply strategy. Table 4-11 describes these potential water transfer and acquisition opportunities.

Table 4-11 Transfer and Exchange Opportunities

Transfer Agency	Transfer or Exchange	Short Term or Long Term	Proposed Volume (AF)
DWR	Excess Wet Year Water (Article 21)	Short Term	1,000-5,000
SWP	Wet-Year (1 Year)	Short Term	26,000
SWC/DWR	Dry year	Short Term	4,000-10,000
		Subtotal	***31,000-41,000***
SWP	Long-Term Lease	Long Term	12,000
SWP/Central Valley Project (CVP)	Permanent Transfer	Long Term	10,000
		Subtotal	***22,000***
SWP	Table A SWP Water	Short Term/ Permanent	10,000
CVP	CVP Water	Short Term/ Permanent	10,000
PRE-14	Non-SWP Water	Short Term/ Permanent	5,000-10,000
		Subtotal	***25,000-30,000***

For transfer and exchange strategic purposes, PWD will:

- Establish the ability to bank available imported water and develop supply reliability within the Antelope Valley Groundwater Basin as soon as possible.
- Pursue partners to participate in developing PWD's storage facilities including other Antelope Valley State Water Contractors Association (AVSWCA) members.
- Consider water banking in locations outside the PWD if they are cost effective and the project produces a value-added benefit (such as additional aqueduct delivery capacity).

At the current time these options are being explored and are not considered in the future supplies shown in Section 4.5.

4.3.2 Groundwater Programs

4.3.2.1 Palmdale Regional Water Augmentation Project

PWD does not operate a banking program but is actively pursuing this future water supply reliability option. PWD completed a preliminary feasibility study for a project that would utilize recycled water for surface water augmentation and/or groundwater injection. The Palmdale Regional Water Augmentation Project (PRWAP) would help to meet future water demands and improve PWD's water supply reliability.

As described in Section 5, PWD has an existing agreement with LACSD and is entitled to a maximum 5,325 AFY of tertiary water from the Palmdale WRP. PRWAP would utilize recycled water from the Palmdale WRP for surface water augmentation and/or groundwater injection. PWD would utilize full advanced treatment, including Reverse Osmosis (RO) and Advanced Oxidation Process (AOP) to treat the tertiary water to Title 22 standards. This includes construction of an 11.2 MGD Advanced Water Purification Facility (AWPF) with the treatment process, chemical storage, parking, and access roads and pipelines to convey the water from the Palmdale WRP to the new AWPF.

For surface water augmentation, the advanced treated water would be conveyed via new pipelines to Lake Palmdale, where it would be diluted and mixed with SWP water and water from Littlerock Dam Reservoir. It would then be treated at the Leslie O. Carter WTP for indirect potable reuse. For groundwater augmentation, the advanced treated water would be pumped from the AWPF to one or more new groundwater injection wells to be injected directly into the aquifer.

PRWAP is a solution that is drought resilient, provides local control of water resources, and helps PWD meet future water demands. The project is anticipated to provide at least 5,325 AFY of water for groundwater or surface water augmentation starting in 2025. More information can be found in the Final Technical Memorandum Recycled Water Alternatives Evaluation – Surface Water and Groundwater Augmentation Feasibility Study (Stantec, 2021).

4.3.2.2 Groundwater Banking Opportunities

There are water banks operating in a variety of locations throughout the state and in various forms. PWD is currently exploring banking opportunities within and outside the Antelope Valley. The list below includes PWD’s potential groundwater water banking options.

- **Storage North of Delta**: This would consist of an exchange or transfer with agricultural entities north of the Delta in site specific areas for an interim or short-term basis. PWD could store 5,000 to 10,000 AF and recover 2,500 to 5,000 AF.

- **San Joaquin Valley Storage**: This would consist of purchasing shares in the Semitropic Water Bank, which is currently in operation. PWD could store over 60,000 AF and recover 10,000 to 20,000 AFY. Other banking programs may also be available.

- **Storage within the Antelope Valley**: This would consist of banking above-average SWP allocations in planned water banking projects in locations within the Antelope Valley. PWD could store over 60,000 AF and recover 10,000 to 15,000 AFY.

- **Storage South of the PWD**: This would consist of banking above-average SWP allocations by providing these supplies to SWP contractor agencies for groundwater recharge or in-lieu recharge within their service areas and in turn, during dry years, the PWD would receive SWP water from these agencies. This groundwater banking opportunity could store 10,000 to 30,000 AF and recover 5,000 to 15,000 AFY.

4.3.3 Development of Desalination

4.3.3.1 Brackish Water and/or Groundwater Desalination

The groundwater that underlies the PWD service area is not brackish in nature and does not require desalination. However, PWD could provide financial assistance to other SWP contractors to construct brackish desalination facilities in exchange for SWP supplies delivered via the East Branch of the Aqueduct. Communities near a brackish desalination plant would receive the desalinated water and an equivalent volume of SWP supplies would be exchanged and allocated to the PWD. Should the need arise PWD may consider this option in the future.

4.3.3.2 Seawater Desalination

Since PWD is not located in a coastal area, it is not practical nor economically feasible to implement a seawater desalination program. However, PWD could provide financial assistance to other SWP Contractors to construct seawater desalination facilities in a coastal location in exchange for SWP supplies delivered via the East Branch of the Aqueduct.

At this point in time, PWD has determined that desalination is not a cost-effective solution for water supply needs due to the local project and water resource opportunities that are currently available at a lower cost.

4.3.4 Recycled Water

Currently PWD is actively working with the Sanitation Districts of Los Angeles County (LACSD) to develop recycled water supplies for its service area customers. Further details on the PWD's recycled water plans can be found in Section 5.

4.4 Planned Supplies

PWD regularly undertakes evaluation of its supplies. The 2018 PWD Strategic Plan, 2016 Water System Master Plan, and PRWA Recycled Water Master Plan were prepared to assist the District in developing a long-term water supply strategy that can meet demands now until buildout. These planned sources are meant to maximize local resources and minimize the need to import water. As described above, PWD has performed the appropriate planning, and has arranged financing for the water supply projects summarized in Table 4-12.

Table 4-12 Water Supplies (AFY)

	Joint Project with other suppliers?					
Name of Future Project/Program	Y/N	If Yes, Agency Name	**Description**	**Planned Implementation Year**	**Planned for Use in Year Type**	**Expected Increase in Water Supply to Supplier**
Palmdale Regional Water Augmentation Project (PRWAP)	No		The goal of the PRWAP is the beneficial use of 5,325 AFY of recycled water for either surface or groundwater augmentation to benefit the region. PRWAP is a solution that is drought resilient, provides local control of water resources, and helps meet future demands of PWD.	2025	All Year Types	5,325 AFY

Note: Modified from DWR Table 6-7

4.5 Anticipated Water Supply Sources in a Normal, Single Dry, and Multiple Dry Years

Tables Table 4-13, Table 4-14, and Table 4-15 provide details on supplies anticipated to be available to PWD in normal, single-dry, and multiple-dry years.

Table 4-13 Water Supply Estimates - Normal Year (AFY)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	12,030	11,720	11,400	11,080	11,080
Butte Transfer Agreement[(a)]	5,650	5,500	5,350	5,200	5,200
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**36,725**	**35,315**	**35,345**	**35,375**	**35,375**

Notes: Modified from DWR Table 7-2
Values are rounded.
(a) For details see Section 4.3.1.

Table 4-14 Water Supply Estimates - Single-Dry Year (AFY)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	1,490	1,705	1,915	2,130	2,130
Butte Transfer Agreement[(a)]	700	800	900	1,000	1,000
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**21,235**	**20,600**	**21,410**	**22,225**	**22,225**

Note: Modified from DWR Table 7-3
Values are rounded.
(a) For details see Section 4.3.1.

Table 4-15 Water Supply Estimates - Multiple-Dry Years (AFY)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	6,180	5,645	5,110	4,470	4,470
Butte Transfer Agreement[(a)]	2,900	2,650	2,400	2,100	2,100
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**28,125**	**26,390**	**26,105**	**25,665**	**25,665**

Note: Modified from DWR Table 7-4
Values are rounded.
(a) For details see Section 4.3.1.

4.6 Embedded Energy Current Supply Portfolio

Water energy intensity is the amount of energy, calculated on a whole-system basis, required for use of water in a specific location, such as the PWD service area. DWR provides guidance for calculating the operational energy intensity of water, defined as the total amount of energy expended by the urban water supplier on a per AF basis to take water from the location where the urban water supplier acquires the water to its point of delivery. DWR requires that urban water suppliers only report the energy intensity associated with water management processes occurring within their operational control and not include energy embedded in water supplies purchased from a wholesale water agency. Table 4-16 below provides an estimate, using the multiple water delivery approach, of the water energy intensity of PWD's potable water system. DWR's Energy Intensity spreadsheet is provided in Appendix I.

Table 4-16 Energy Intensity of the Water System

Table O-1C: Recommended Energy Reporting - Multiple Water Delivery Products

			Urban Water Supplier Operational Control							
Enter Start Date for Reporting Period	1/1/2020		Water Management Process						Non-Consequential Hydropower (if applicable)	
End Date	12/31/2020									
		Is upstream embedded in the values reported? ☐								
			Extract and Divert	Place into Storage	Conveyance	Treatment	Distribution	Total Utility	Hydropower	Net Utility
Water Volume Units	Total Volume of Water Entering Process (volume units)		6549	0	4153	11356	0	N/A	9709	N/A
AF		Retail Potable Deliveries (%)	100%	100%	100%	100%	100%		100%	
		Retail Non-Potable Deliveries (%)								
		Wholesale Potable Deliveries(%)								
		Wholesale Non-Potable Deliveries (%)								
		Agricultural Deliveries (%)								
		Environmental Deliveries (%)								
		Other (%)								
		Total Percentage [must equal 100%]	100%	100%	100%	100%	100%	N/A	100%	N/A
		Energy Consumed (kWh)	4533947	0	1861443	801978		7197368	1206418	8403786
		Energy Intensity (kWh/vol. converted to MG)	2124.6	#DIV/0!	1375.5	216.7	#DIV/0!	N/A	381.3	N/A

Water Delivery Type	Production Volume (volume units defined above)	Total Utility (kWh/volume)	Net Utility (kWh/volume)
Retail Potable Deliveries	22058	326.3	381.0
Retail Non-Potable Deliveries	0	0.0	0.0
Wholesale Potable Deliveries	0	0.0	0.0
Wholesale Non-Potable Deliveries	0	0.0	0.0
Agricultural Deliveries	0	0.0	0.0
Environmental Deliveries	0	0.0	0.0
Other	0	0.0	0.0
All Water Delivery Types	22058	326.3	381.0

Note: Modified from Table O-1C: Recommended Energy Reporting - Multiple Water Delivery

Section 5: Recycled Water

5.1 Overview

This section of the Plan describes the existing and future recycled water opportunities available to the PWD service area. The description includes estimates of potential recycled water supply and demand for 2020 to 2045 in five-year increments, as well as PWD's proposed incentives and implementation plan for recycled water.

5.2 Recycled Water Planning

Due to current and anticipated growth, as well as increasing uncertainty of PWD's ability to meet local water demands with imported water and groundwater, PWD is taking proactive steps towards expanding the use of non-potable water to meet a variety of non- potable and indirect potable uses. PWD has been actively working with the Los Angeles County Waterworks Districts, City of Palmdale, City of Lancaster, and LACSD to develop a regional recycled water system.

PWD developed a Recycled Water Facilities Plan in 2010 (RMC 2010) as part of the first non-potable reuse phase for the 2007 Antelope Valley Recycled Water Project Facilities Planning Report (Kennedy/Jenks 2006). This plan is meant to optimize the use of recycled water in the PWD service area.

In 2012, the Palmdale Recycled Water Authority (PRWA) was established to manage recycled water generated and used within the PWD service area, which coincides with the PRWA boundaries. PRWA is a joint entity comprised of the PWD and City of Palmdale which manages all aspects of recycled water use, including agreements to obtain recycled water from sanitation districts, planning for, designing, and constructing supporting facilities, and financing these efforts. Among the initial efforts of the PRWA, existing master planning documents were updated and consolidated within the 2015 PRWA Recycled Water Facilities Master Plan (Carollo 2015).

Implementation of the Recycled Water Facilities Master Plan, which is still in the planning phase, would include expansion of the existing non-potable distribution system. Projected recycled water supplies would be provided to PWD customers, primarily for landscape irrigation at parks, schools, and golf courses, as well as for recharge in the Lancaster subbasin, as described in more detail below.

5.3 Existing Wastewater Treatment Facilities

Wastewater collection and treatment for the cities of Palmdale and Lancaster are provided by LACSD, which provides service to the Antelope Valley through its Districts No. 14 and 20. The two districts serve a combined wastewater service area of approximately 76 square miles and approximately 310,000 people. Collection is provided through a network of 104 miles of trunk sewers, which are all designed to provide wastewater conveyance through gravity flow.

The Palmdale Water Reclamation Plant (WRP) is located in the City of Palmdale and currently provides tertiary treatment for approximately 12,000 AFY of wastewater generated in and around the City of Palmdale. In 2012, the Palmdale WRP was expanded to reach its current treatment capacity of 12 MGD. The Palmdale WRP is operated by the LACSD District No. 20. Currently, the tertiary-treated effluent is disposed of via agricultural irrigation of fodder crops on land leased by the LACSD from the City of Los Angeles World Airports. Table 5-1 presents influent and effluent flows at the Palmdale WRP in 2020.

Table 5-1 2020 Wastewater Flows at Palmdale WRP (AF)

Palmdale WRP Flows	2020
Influent	12,140
Effluent	10,770

Source: Palmdale WRP Annual Monitoring Report 2020.

All wastewater treated at the Palmdale WRP is treated to tertiary level and is used, discharged, or stored within the PWD service boundaries.

The Antelope Valley is a closed basin without an outlet to the ocean, and so treated wastewater either evaporates, is reused, or infiltrates into the Antelope Valley Groundwater Basin. LACSD anticipates reducing the amount of recycled water that it provides for agriculture as other beneficial uses are developed. However, until these alternative uses become effective, the recycled water must still be disposed of via agricultural irrigation (Carollo 2015, ESA 2014).

5.4 Recycled Water Supply

Recycled water available for use within the PWD service area is supplied from the LACSD Palmdale WRP. The contract with LACSD allows PWD up to 5,325 AF. The City of Palmdale had an agreement with the LACSD for 2,000 AFY of recycled water to provide to customers throughout the City's service area (Carollo 2015, ESA 2014), which has since been transferred to PRWA. The remaining recycled water from the Palmdale WRP and Lancaster WRP is expected to be allocated to the City of Palmdale in the ongoing reallocation negotiations. However, as noted above, uses for this recycled water are still being developed.

Currently the Palmdale WRP produces about 10,700 AFY of Title 22 recycled water on average. For future recycled water supply projections, it was assumed that recycled water production would grow linearly at the same rate as potable demands, which were estimated at approximately 1.0 percent per year on average for the period 2020 to 2045. As a result, the total recycled water supply is estimated to grow up to about 13,500 AFY by 2045, as shown in Table 5-2.

Table 5-2 Effluent Flow Projections For Palmdale WRP (AF)

	2020[a]	2025	2030	2035	2040	2045
PWRP Effluent Flows	10,770	11,300	11,800	12,300	12,900	13,500
Total Recycled Water Available to PWD	10,770	11,300	11,800	12,300	12,900	13,500

Notes:
(a) 2020 Effluent flows as reported in Palmdale WRP 2020 Annual Report.

5.5 Recycled Water Demand – Current and Projected

Primary existing recycled water customers served by the Palmdale WRP include growers and the City of Palmdale. The primary City demand is for landscape irrigation at McAdam Park, which makes up a small portion of total recycled water produced at the Palmdale WRP. The remaining major portion of Palmdale WRP recycled water is agricultural irrigation at agronomic rates on an agricultural site leased by the LACSD from Los Angeles World Airports. Seasonal storage ponds are used when more effluent water is produced than demanded. The stored recycled water is typically used in spring and summer months when agronomic crop needs exceed recycled water production from the Palmdale WRP. Actual recycled water use in 2020 is summarized in Table 5-3.

Table 5-3 Actual Recycled Water Use In 2020 (AF)

Water Use	Actual 2020 Recycled Water Use
PRWA/City of Palmdale Direct Reuse[a]	70
Total Recycled Water Use[b]	**70**

Notes:
(a) Based on correspondence from PWD and LACSD.
(b) Total recycled water demand within PWD service area. Values are rounded.

Market assessments by the PRWA have identified numerous potential recycled water customers including schools, parks, landscape maintenance districts, and others. Total annual demands of these customers were estimated at 2,392 AFY (Carollo 2015, ESA 2014). It is anticipated that the recycled water use for landscape irrigation will not exceed 2,000 AFY at buildout (Kennedy/Jenks 2015).

Additional major future recycled water uses include surface water augmentation or groundwater injection as follows.

Palmdale Regional Water Augmentation Project

Among the potential options to augment water supplies with local recycled water, there is potential to use recycled water for surface water augmentation at Lake Palmdale or groundwater injection within the Antelope Valley Groundwater Basin. The project entails construction of pipelines to convey tertiary treated water from the Palmdale WRP to an advanced water purification facility. New pipelines would convey the advanced treated water to Lake Palmdale for surface water augmentation, or to new injection wells that would inject advanced treated recycled water into the aquifer.

Projected Recycled Water Uses are shown in Table 5-4.

Table 5-4 Projected Recycled Water Demands (AF)

Water Use	2025	2030	2035	2040	2045
Palmdale Regional Water Augmentation Project (PRWAP)[(a)]	5,325	5,325	5,325	5,325	5,325
Direct Reuse[(b)]	500	1,000	1,500	2,000	2,000
Total Recycled Water Demands	**5,825**	**6,325**	**6,825**	**7,325**	**7,325**

Source: Data from Littlerock Creek Groundwater Recharge and Recovery Project (2015) and Title 22 Engineering Report (2016).
(a) Volume available for groundwater or surface water augmentation.
(b) Includes City direct demands and other potential landscape irrigation demands.

5.5.1 Recycled Water Use Comparisons

The 2015 UWMP anticipated 2020 recycled water use at 1,000 AF and assumed it would be used only for landscape and agricultural irrigation. Actual recycled water use within the PWD service area totaled 70 AFY in 2020, as shown in Table 5-5.

Table 5-5 Recycled Water Use Compared to Projected Use

User Type	2015 Projected for 2020[(a)]	2020 Actual
Municipal and Industrial, and Agricultural Irrigation	1,000	70
Groundwater Recharge	0	0
Total	**1,000**	**70**

Note:
(a) From 2015 PWD UWMP.

5.5.2 Proposed Recycled Water System

A Recycled Water Backbone System has been proposed for the Antelope Valley that would connect the Lancaster WRP and Palmdale WRP, allowing recycled water from both plants to be used throughout the region. The Lancaster WRP, operated by the LACSD District No. 14, provides tertiary treatment for, on average, 12 MGD of wastewater generated in each of the cities of Lancaster and Palmdale. PWD does not currently receive recycled water from the Lancaster WRP and there are no plans to use effluent from the Lancaster WRP within the PWD service area.

Portions of the Recycled Water Backbone System have already been constructed by the City of Lancaster, City of Palmdale, and Los Angeles County Waterworks District No. 40. The City of

Palmdale has partnered with Waterworks No. 40 to design and construct a portion of the Recycled Water Backbone System that will complete the connection of the Lancaster WRP and Palmdale WRP. The portions of the Recycled Water Backbone System that have been designed or constructed are all located outside of the District's service area. The primary benefit to the PRWA of these portions is the future ability to move recycled water between the Lancaster WRP and Palmdale WRP. The tertiary treated water that could be used in the PWD service area would originate at the Palmdale WRP (Carollo 2015, ESA 2014).

5.5.3 Encouraging Recycled Water Use

Future recycled water projects have the potential to use all available recycled water supplies through 2040, as described above. As necessary, PWD intends to use financial incentives to assist and encourage future users to connect to and utilize recycled water. These financial incentives will consist of recycled water rates that are lower than potable rates (typically 70 to 90 percent). A lower rate provides an incentive for existing or future customers to use recycled water in place of potable water.

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 will no longer be available for use. Water quality is dynamic in nature and can vary over the course of a year. This is true for both the State Water Project (SWP) and the local groundwater of the Basin. During periods of intense rainfall or snowmelt, routes of surface water movement are changed, and new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and potentially leach different materials from those strata. Water depth is a function of recharge from local rainfall and snowmelt and withdrawal from groundwater pumping. During periods of drought, the mineral content of groundwater increases. Water quality is not a static feature of water, and these dynamic variables must be recognized.

PWD understands the quality of supply sources can change over time and is therefore constantly working to anticipate and mitigate those changes. Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology, and the introduction of new treatment technology. All retail water purveyors are subject to drinking water standards set by the U.S. Environmental Protection Agency (EPA) and the State Division of Drinking Water (DDW).

PWD's regular monitoring of its water supply quality and understanding of current and potential regulations allows it to respond readily to any quality induced reliability issues. This section provides a general description of the quality of each of PWD's three water sources; groundwater from the Antelope Valley Groundwater Basin, imported water from the SWP, and seasonal supply from Littlerock Reservoir. SWP water is conveyed directly from the District turnout into Lake Palmdale, which feeds the Leslie O. Carter Water Treatment Plant (WTP).

Flows from Littlerock Reservoir are also conveyed into Lake Palmdale via an eight-and-a-half-mile earthen canal with sections of concrete lining and enclosed in a pipe for approximately one-mile, referred to as the Palmdale Ditch. The intake for the WTP is located along Lake Palmdale's north shore. All three sources are constantly tested and treated in compliance with all applicable regulations to ensure high water quality and dependability of the water system.

This section provides a general description of the water quality of both imported water, groundwater supplies, and surface water supplies. A discussion of potential water quality impacts on the reliability of these supplies is also provided.

6.2 Groundwater Protection and Quality

PWD obtains groundwater from the Antelope Valley Groundwater Basin though twenty-two wells. This water is treated with chlorine at the wellhead and pumped directly into the distribution system. Groundwater has proved to be of suitable quality for municipal, irrigation and most industrial uses.

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high-quality supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. As part of its protection activities, PWD has been taking the following actions:

- Water quality monitoring
- Wellhead protection
- Participation in the regional salt and nutrient management plan

6.2.1 Water Quality Monitoring

PWD monitors drinking water constituents consistent with federal and state laws. PWD annually provides a Consumer Confidence Report (CCR) detailing the water quality of its sources to all of its customers. This Report includes details about the source water, quality of the water, and how it compares to Drinking Water standards. Stringent water quality testing is performed before the water is delivered to consumers. In 2019 (2019a), PWD tested more than 3,500 samples and about 18,000 tests are done to ensure that PWD water meets or exceeds all Federal and State guidelines. Of the primary standard contaminants detected in 2019, all were at levels below the Maximum Contaminant Level (MCL) allowed by the State.

In the Antelope Valley region, the groundwater basin is primarily used for private and public water supply and irrigation. The predominant sources of groundwater are from the recharge of runoff from surrounding mountains, and water from direct infiltration by irrigation, sewer, and septic systems. The main discharge sources include pumping wells and evapotranspiration areas near dry lakebeds. Groundwater quality is assessed through the Groundwater Ambient Monitoring and Assessment (GAMA) Priority Basin Project (PBP), which consists of analyzing raw groundwater that provides drinking public water supply in the region. PBP sampled a large distribution of wells in the area and analyzed organic constituents as well as chromium, lead, molybdenum, sulfate, and chloride; all were detected at moderate concentrations, and volatile organic compounds were detected at low concentrations.

Two primary constituents that present concerns for groundwater quality in the Antelope Valley Groundwater Basin are Total Dissolved Solids (TDS) and nitrate. Past groundwater sampling data has shown TDS concentrations that range from 75 to 363 milligrams per liter (mg/L) (2019 AV IRWMP). Nitrate levels have ranged from non-detect to 14.4 mg/L. Arsenic has also emerged as a potential concern but is still well under the MCL of 0.01 mg/L. Water quality data is regularly reported on in the annual CCR; the most recent is the 2019 CCR.

PWD's drinking water sources are considered most vulnerable to the following activities associated with contaminants detected in the water supply: illegal activities, such as unauthorized dumping; recreation; highways; railroads; and sewer collection systems. A comprehensive source water protection program can prevent contaminants from entering the public water supply, reduce treatment costs and increase public confidence in the reliability and safety of drinking water.

6.2.2 Wellhead Protection

PWD has developed a Sanitary Survey of its water sources, including a Source Water Assessment of surface waters, which was updated in 2017 in compliance with State of California regulations. The assessment of surface water sources included Littlerock Reservoir and Palmdale Lake. A Groundwater Assessment and Protection Program was completed in January of 1999, and a Wellhead Protection Plan was completed in November 2000. The goal of local source water protection is to identify, develop and implement local measures that provide protection to the drinking water supply. Wellhead protection provides one more barrier to contamination in a multi-barrier protection treatment train.

6.2.3 Participation in the Antelope Valley Salt and Nutrient Management Plan

In February 2009, the SWRCB adopted the Recycled Water Policy to encourage and provide guidance for the use of recycled water in California. The Recycled Water Policy requires local water and wastewater entities, together with local stakeholders, to develop a Salt and Nutrient Management Plan (SNMP) in a cooperative and collaborative manner for each groundwater basin in California. The SNMPs are intended to help streamline the permitting of new recycled water and stormwater projects while ensuring compliance with water quality objectives, and beneficial uses of the groundwater basin are protected. Los Angeles County Department of Public Works (District 40), LACSD (Districts No. 14 and 20), and the Antelope Valley SNMP planning stakeholders' group (which includes PWD) prepared the Antelope Valley SNMP in 2014. As a stakeholder in the SNMP, PWD assisted with provision of water quality data for the plan, reviewed the modeling and other analyses of salt and nutrient assimilative capacity of local groundwater, and helped develop a plan to track the long-term impacts to groundwater quality resulting from past, current, and future land uses.

6.3 Imported Water Quality

PWD receives nearly 50 percent of its raw water supplies from SWP via the California Aqueduct. This water source begins in Northern California, flows into the Sacramento-San Joaquin Delta, and is pumped south through the California Aqueduct to Palmdale Lake. The District has a maximum contractual Table A Amount of 21,300 AFY. The annual allocations based on this contractual amount can vary based on the amount of stored water in northern California, demands by other SWP Contractors and various hydrologic factors. Imported water is generally of acceptable quality and receives treatment from the WTP. The District does not currently experience and does not foresee issues with its imported water quality given controls on the incoming water and treatment process.

One important property of SWP water is the mineral content. SWP water is generally low in dissolved minerals, such as calcium, magnesium, sodium, potassium, iron, manganese, and sulfate. Most of these minerals do not have health-based concerns. Nitrate is the main exception, as it has significant health effects for infants; however, the nitrate content of SWP water is very low.

Also of significance is the salinity content measured as TDS. Only at very high concentrations is TDS a health hazard, but TDS can be an aesthetic issue, can limit crop productivity, and can shorten the useful life of pipes and water-based appliances in homes and businesses. Although the quality of SWP water varies seasonally, the PWD does not foresee issues with imported water quality as it receives adequate treatment from the WTP.

6.4 Local Surface Water Quality

PWD's surface water is stored at Littlerock Creek Dam Reservoir and Lake Palmdale. PWD's Sanitary Survey assessed surface water sources from Littlerock Reservoir and Lake Palmdale and was updated in 2017 in compliance with state of California regulations. Littlerock Dam Reservoir has a current capacity of approximately 3,000 AF and is filled by natural runoff from the local San Gabriel Mountains. When the Littlerock Sediment Removal Project is completed, the Reservoir will have a capacity of 3,500 AFY. Water from Littlerock Reservoir is transferred to Palmdale Lake via the Palmdale Ditch, which is mostly an open channel connecting the two reservoirs. This local surface water supply accounts for 10 percent of PWD's raw water supply. PWD has noticed higher levels of TDS in the Littlerock Reservoir along with impacts of wildfires in the Littlerock Creek Watershed. This water receives treatment at the PWD's Leslie O. Carter WTP.

6.5 Water Quality Impacts on Reliability

The quality of water dictates numerous 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 and utilizing high quality sources of water simplifies management strategies by increasing water supply alternatives, water supply reliability, and decreasing the cost of treatment. The source water supplies are of generally good quality for PWD. Maintaining high quality source water allows for efficient management of water resources by minimizing costs.

Maintaining the quality of water supplies increases the reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. A direct result from the degradation of a water supply source is increased treatment cost before consumption. The poorer the quality of the source water, the greater the treatment cost. Water may degrade in quality to the point that it is not economically feasible for treatment. In this scenario the degraded source water is taken off-line. This in turn can decrease water supply reliability by potentially decreasing the total supply and increasing demands on alternative water supplies.

Overall, the management of water supplies by PWD will allow it to meet near term and long term demands within its service area. Therefore, no anticipated change in reliability or supply due to water quality issues is anticipated based on the present data, as shown in Table 6-1.

Table 6-1 Projected Water Supply Changes Due To Water Quality (Percentage Change)

Water source	2025	2030	2035	2040	2045
Groundwater	0%	0%	0%	0%	0%
Imported Water	0%	0%	0%	0%	0%
Local Surface Water	0%	0%	0%	0%	0%

Section 7: Water Service Reliability

7.1 Overview

The UWMP Act requires urban water suppliers to assess water service 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. This section presents the reliability assessment for PWD's service area.

PWD's water service reliability can be impacted by many factors, including changes in the availability of supplies due to climatic or infrastructure changes, as well as the efficient use of those supplies in both average and dry periods. These factors can result in immediate (such as facility failures), short-term (SWP allocation limitations), or long-term (climate change) impacts to reliability and must therefore be considered in future planning.

The impacts of these factors on supply reliability increase under single-dry and multiple-dry year hydrologic conditions. Although not all shortages can be prevented, PWD's overall goal to further diversify its supply portfolio is the most important factor in improving the immediate, near- and long- term reliability of supplies. If shortages do occur, PWD has implemented a water shortage contingency plan to manage these situations.

The reliability within the PWD service area is a composite of the reliability of each source of supply as briefly discussed below.

7.1.1 Groundwater Reliability

Groundwater is traditionally considered a highly reliable supply since it is not immediately susceptible to changes in climate and surface flows. However, the two main factors that impact the reliability of groundwater supplies are legal and water quality. See Section 4 for more discussion of the region's groundwater resources.

<u>Legal Factors</u>

On December 23, 2015, PWD as well as the majority of parties involved agreed to a stipulated judgment for the adjudication of the Antelope Valley Groundwater Basin[5]. This resulted in PWD receiving a groundwater production right of 2,770 AFY. Prior to the judgment, PWD had an unquantified right to pump water for beneficial use, and assumed projected pumping volumes at 12,000 AF based on pumping capacity. The judgment is on appeal, but PWD believes that it is unlikely that its groundwater production right will change significantly as a result of the appeal. In addition to the pumping allocation, return flow credits will be available to PWD, as described in Section 4.2.1.3.

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[5] Judgment, *Antelope Valley Groundwater Cases*, Los Angeles County Superior Court, Judicial Council Coordination Proceeding No. 4408 (filed Dec. 28, 2015) (provided in Appendix G).

Water Quality Factors

The water quality of groundwater supplies is a factor in PWD's reliability as it needs to meet drinking water standards. PWD relies on groundwater to provide a large portion of its water supply and therefore has taken measures to ensure protection of groundwater quality. These measures are discussed in detail in Section 6.

Climatic Factors

Regional climatic factors were considered in the 2016 adjudication process for the Antelope Valley Groundwater Basin.

7.1.2 Imported Water Reliability

PWD receives imported water from the SWP. The factors affecting the reliability of imported water supplies from the SWP include legal, environmental, water quality, and climatic factors.

Legal Factors

Legal factors include policies and contract stipulations from DWR. Any legal actions can impact supplies from SWP water supplies in various ways, such as the various court decisions limiting SWP pumping due to perceived impacts on endangered fish in the Sacramento-San Joaquin Delta (Delta) estuary.

Environmental Factors

Environmental factors such as impacts to endangered species, their habitat, and other related concerns can impact SWP water supplies, as above.

Water Quality Factors

The quality of SWP water sources can impact the treatment processes needed to ensure compliance with drinking water standards, however no impact to water supply availability is projected to occur.

Climatic Factors

Imported water supplies rely heavily on runoff from rainfall and snowpack. If annual snowpack and rainfall amounts change significantly without corresponding investment in infrastructure and/or management practices, the quantity of water available from the SWP in any given year is subject to potential reductions. At this time, the impacts of climate change to imported water supplies are uncertain, however, climate models suggest a future reduction in water supplies due to decreased snowpack from higher temperatures and increased precipitation falling as rain rather than snow. These preliminary assumptions from climate models validated by the Department of Water Resources are included in the supply reliability section below.

7.1.3 Local Surface Water Reliability

PWD expects a certain amount of Littlerock Dam Reservoir water to be available for supply in all years. This amount is estimated at 50 percent of the average available historical yield (8,000 AF) such that 4,000 AF is available in all years.

Climatic Factors

PWD diverts surface water from Littlerock Dam Reservoir, which receives flows from Littlerock Creek. Littlerock Creek flows can be variable given changes in local precipitation and ETo. Most Littlerock Creek flows occur seasonally during the winter months and decrease significantly during the dry months. PWD recognizes that annual climatic changes can potentially impact the reliability of Littlerock Dam Reservoir.

7.2 Projected Water Service Reliability

There are two aspects of service and supply reliability. The first relates to immediate service needs and is primarily a function of the availability and adequacy of supply facilities. The second aspect is climate-related and involves the availability of water during varying dry periods. This section considers PWD's water supply reliability during three water scenarios: normal water year, single-dry water year, 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. The supply quantities for this condition are derived from historical average yields.
- **Single-Dry Year**: This is defined as the year with the minimum useable supply. The supply quantities for this condition are derived from theminimum historical annual yield.
- **Multiple-Dry Years**: This is defined as the five consecutive years with theminimum cumulative useable supply. Water systems are more vulnerable to these droughts of longer duration because they deplete water storage reserves in local and state reservoirs and in groundwater basins. The supply quantities for this condition are derived from historical three-year running minimum average yields.

For groundwater, it is assumed PWD will receive a groundwater allocation of approximately 2,770 AFY (see Section 3.2.1.3). It is expected that these supplies will be consistently available under normal, single-dry year, and multiple-dry years. For Littlerock Dam Reservoir, PWD used the driest year on record of 1951 to estimate reliable availability. Accordingly, PWD expects to have up to 4,000 AF of its diversion rights under normal, single-dry year, and multiple-dry years. This amount is calculated as 50 percent of the average available yield from the Littlerock Dam Reservoir (50 percent of 8,000 AF) and is considered to be available for supply in all years.

For SWP water, PWD used the 2019 SWP DCR to identify its single-dry and multiple-dry water years. A single year drought, such as the one that occurred in 1977, would result in a yield of approximately 7 - 10 percent of the District's Table A Amount. In an extended drought, such as the one that occurred in 1931-1934, PWD expects to receive an average of 29 to 21 percent of its Table A Amount. Groundwater pumping and Littlerock Dam Reservoir diversions are expected to remain the same during a normal water year, single-dry year, and multiple-dry years. SWP water is the only water supply source PWD expects to have variability during single-dry and multiple-dry years.

7.3 Normal Water Year

This section summarizes PWD's water supplies available to meet demands over the 25-year planning period during an average/normal year and compares them to demands for the same period. Assumptions about supplies and demands are provided in Sections 2 and 3. Table 7-1 demonstrates that PWD anticipates adequate supplies for years 2020 to 2045 under normal hydrologic conditions.

Table 7-1 Comparison of Supplies and Demands - Normal Year (AF)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	12,030	11,720	11,400	11,080	11,080
Butte Transfer Agreement[(a)]	5,650	5,500	5,350	5,200	5,200
Recycled Water(	500	1,000	1,500	2,000	2,000
Total Supplies	**36,725**	**35,315**	**35,345**	**35,375**	**35,375**
Potable Water Demands	19,720	20,310	21,480	22,780	24,250
Recycled Water Demands	500	1,000	1,500	2,000	2,000
Total Demand[(b)]	**20,220**	**21,310**	**22,980**	**24,780**	**26,250**
Difference (Supply-Demand)	***16,505***	***14,005***	***12,365***	***10,595***	***9,125***

Notes: Values are rounded.
(a) For details see Section 4.3.1.
(b) Demands are not expected to change during drought conditions; the region typically receives little rain, and with implementation of DMM's water demands for irrigation do not increase in the PWD under single-dry and multiple-dry year conditions.

7.4 Single-Dry Year

The water supplies and demands for the PWD service area over the 25-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in California in 1977. Table 7-2 summarizes the existing and planned supplies available to meet demands during a single-dry year (assuming 7-10% of SWP supply from the 2019 DCR).

Table 7-2 shows that PWD anticipates demands to exceed existing supplies starting in 2030 under single-dry year hydrologic conditions. A discussion on how PWD anticipates making up for supply deficits is discussed below in Section 7.7.

Table 7-2 Comparison of Supplies and Demands - Single-Dry Year (AF)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	1,490	1,705	1,915	2,130	2,130
Butte Transfer Agreement[(a)]	700	800	900	1,000	1,000
Recycled Water	500	1,000	1,500	2,000	2,000
Total Supplies	**21,235**	**20,600**	**21,410**	**22,225**	**22,225**
Potable Water Demands	19,720	20,310	21,480	22,780	24,250
Recycled Water Demands	500	1,000	1,500	2,000	2,000
Total Demand[(b)]	**20,220**	**21,310**	**22,980**	**24,780**	**26,250**
Difference (Supply-Demand)	***1,015***	***-710***	***-1,570***	***-2,555***	***-4,025***

Note: Values are rounded.
(a) For details see Section 4.3.1.
(b) Demands are not expected to change during drought conditions; the region typically receives little rain, and with implementation of DMMs water demands for irrigation do not increase in the PWD under single-dry and multiple-dry year conditions.

7.5 Multiple-Dry Year (5-years)

The water supplies and demands for PWD service area over the 25-year planning period were analyzed in the event that a five-year multiple-dry year event occurs, similar to the drought that occurred during the years 1931 to 1934. Table 7-3 summarizes the existing and planned supplies available to meet demands during multiple-dry years (assuming 29% SWP supply from the 2019 DCR). Table 7-3 shows that PWD anticipates demands to exceed existing supplies starting in 2045 under multiple-dry year hydrologic conditions. A discussion on how PWD anticipates making up for supply deficits is discussed below in Section 7.7.

Table 7-3 Comparison of Supplies and Demands - Multiple-Dry Year (AF)

	2025	2030	2035	2040	2045
Existing Supplies					
Groundwater	4,220	2,770	2,770	2,770	2,770
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	5,325	5,325	5,325	5,325	5,325
Local Surface Water (from Table 4-6)	4,000	4,000	4,000	4,000	4,000
Imported SWP Water (from Table 4-9)	6,180	5,645	5,110	4,470	4,470
Butte Transfer Agreement[(a)]	2,900	2,650	2,400	2,100	2,100
Recycled Water (from Table 5-4)	500	1,000	1,500	2,000	2,000
Total Supplies	**28,125**	**26,390**	**26,105**	**25,665**	**25,665**
Potable Water Demands	19,720	20,310	21,480	22,780	24,250
Recycled Water Demands	500	1,000	1,500	2,000	2,000
Total Demand[(b)]	**20,220**	**21,310**	**22,980**	**24,780**	**26,250**
Difference (Supply-Demand)	***7,905***	***5,080***	***3,125***	***885***	***-585***

Note: Values are rounded.
(a) For details see Section 4.3.1.
(b) Demands are not expected to change during drought conditions; the region typically receives little rain, and with implementation of DMMs water demands for irrigation do not increase in the PWD under single-dry and multiple-dry year conditions.

7.6 Drought Risk Assessment

The Water Code requires that every urban water supplier include in its UWMP, a drought risk assessment for its water service to its customers. This is to benefit and inform the demand management measures and water supply projections and programs to be included in the UWMP.

7.6.1 Data and Methodologies Used

7.6.1.1 Water Demands

The water demands for this UWMP utilize water demand forecast developed in February 2021 based on extensive data on existing land use and water demands and projected land uses. The water demand estimates changes in demand due to water conservation and codes and standards that have occurred over time. Using the anticipated land uses and associated water demand factors, PWD has estimated water demands from 2021 through 2025, as shown in Table 7-4, below and in Section 2.4.

7.6.1.2 Water Supplies

This Drought Risk Assessment looks at all the water supplies anticipated to be available in a 5-year consecutive drought, from 2021 to 2025, including any limitations due to infrastructure and regulations.

Imported Water

PWD is a direct contractor of the State Water Project (SWP). PWD's contractual maximum allocation that can be received in a year, is 21,300 AF. The DWR 2019 DCR estimates that supplies may vary from 41% to 10% in a consecutive dry year scenario based on a repeat of the historic five-year dry period of 1988-1992. The maximum allowed amount received from the Butte Transfer Agreement is 10,000 AF. Table 7-4 assumes the Butte Transfer Agreement available SWP supplies will also vary from 10% to 41% in a consecutive five year drought.

Groundwater

PWD receives its groundwater from the Antelope Valley Groundwater Basin. In 2015, the basin was adjudicated and PWD received a new pumping right of 2,770 AFY. The adjudication allowed for PWD to ramp down production and comply with the new pumping right within seven years, or 2023. Additionally, PWD is entitled to a portion of the unused federal share, approximately 1,370 AFY, until the year 2025. PWD also has the ability to receive return flows in the amount of 5,000 AFY. These values are reflected in Table 7-4.

Surface Water

PWD anticipates being able to supply up to 4,000 AF of surface water from Littlerock Reservoir from 2021 through 2025.

Recycled Water

PWD anticipates being able to deliver up to 100 AF or recycled water in 2021 even in a drought year. With the planned recycled water projects, this will increase to 500 AF by 2025, assuming drought years. These volumes assumed reduced inflows to the wastewater treatment plant, due to drought, decrease normal recycled water production.

Table 7-4 Summary of Anticipated Supplies and Demand Consecutive Dry Years (2021 - 2025)

Supply	2021	2022	2023	2024	2025
Groundwater	4,220	4,220	4,220	4,220	4,220
Groundwater Return Flow Credits	5,000	5,000	5,000	5,000	5,000
Groundwater or Surface Water Augmentation	0	0	0	0	5,325
Local Surface Water	4,000	4,000	4,000	4,000	4,000
Imported SWP Water	2,130	8,730	2,555	2,555	4,260
Butte Transfer Agreement	1,000	4,100	1,200	2,000	1,800
Recycled Water	100	100	500	500	500
Total Supplies	**16,450**	**26,155**	**17,475**	**19,980**	**24,680**
Potable Demands (Table 2-7)	**19,310**	**19,405**	**19,520**	**19,615**	**19,720**
Non-Potable Demands	100	100	100	100	500
Total Demands	**19,410**	**19,505**	**19,620**	**19,715**	**20,220**
Difference	***-2,960***	***6,650***	***-2,145***	***265***	***4,460***

Note: Modified from DWR Table 7-5

7.7 Summary of Comparisons

As shown in the analyses above, PWD projects adequate supplies to meet demands during normal years throughout the planning period. However, PWD anticipates that during single-dry year conditions, demands will exceed existing supplies starting in 2030 and that during multiple-dry year conditions, demands will exceed existing supplies starting in 2045. During a consecutive five-year drought, PWD anticipates demand exceeding supplies in 2021 and 2023. Therefore, additional supplies or a reduction in demand are assumed to be needed to meet demands under those conditions.

As described in Section 4, PWD is currently in the process of developing the Palmdale Regional Water Augmentation Project (PRWAP), which is anticipated to provide 5,325 AFY for surface water augmentation or groundwater injection. In addition, PWD has identified numerous short- and long-term transfer and exchange opportunities, as described in Section 4.3.3.2, which would provide additional supplies to help overcome supply shortages. The Water Shortage Contingency Plan, provided in Appendix J, identifies potential demand reduction actions to reduce shortage gaps.

Therefore, it is anticipated that existing supplies in combination with identified future and potential water supply opportunities and demand reduction responses will enable PWD to meet all future water demands under all hydrologic conditions through the end of the planning period.

Section 8: Water Demand Management Measures

8.1 Demand Management 2016-2020

This section describes the Demand Management Measures (DMMs) that PWD is currently implementing and plans to implement in order to meet its urban water use reduction targets (see Section 3).

In addition, Governor Edmund J. Brown's April 2014 emergency declaration requires that all state agencies that distribute funding for projects that impact water resources, including groundwater resources, will require recipients of future financial assistance to have appropriate conservation and efficiency programs in place.

Recent legislation significantly revised the UWMP Act to simplify and clarify the DMM reporting requirements for the 2020 UWMP cycle. Since PWD is a member of the California Urban Water Conservation Council (CUWCC) it may continue to submit its annual reports as required by Section 6.2 of the Memorandum of Understanding Regarding Urban Water Conservation in California in order to comply with this section of the Act.

PWD recognizes that conserving water is an integral component of a responsible water management strategy. PWD has a uniquely low water use for a high desert area, located in the South Lahontan Hydrologic Region. Based on data reported in the 2010 UWMPs, the South Lahontan Hydrologic Region had a population-weighted baseline 5-year average water use of 258 GPCD with an average population-weighted 2020 target of 207 GPCD (DWR 2014). With a 2015 GPCD of 128 gallons, the PWD's water use is significantly lower than the rest of the South Lahontan Hydrologic Region. The District has achieved its goals largely by focusing on system performance, rate increases and a community culture of conservation and small landscapes. It will maintain this level of demand, and possibly reduce demand even further, by continuing to implement the CUWCC BMPs.

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 for retail water suppliers such as PWD:

1. Water waste prevention ordinances
2. Metering
3. Conservation Pricing
4. Public Education and Outreach
5. Programs to assess and manage distribution system real loss
6. Water conservation program coordination and staff support

Activities outside of the Foundational DMMs that encourage less water use in PWD's service area fall in the "Other" category.

8.1.1 Foundational DMMs

8.1.1.1 Water Waste Prevention Ordinances and Prohibition

In 2001 the Board of Directors adopted the Waste of Water Policy, which outlines actions to be taken by PWD to prevent and address waste and unreasonable use of water, including penalties for violations. In December 2009, the Board of Directors adopted and approved Resolution No. 09-19 declaring water conservation regulations, with the intent to meet the water use reduction goals of 20 percent by 2020 and ensure adequate water supply for human consumption, sanitation, and fire protection.

8.1.1.2 Metering

PWD is fully metered with all customers have metered accounts. PWD is in the process of replacing all meters within its service area with a new AMI metering system to ensure more accurate reading and data capture. This is considered a water conservation initiative, in addition to a financial best management practice.

8.1.1.3 Conservation Pricing

PWD uses a budget based tiered rate approach for water pricing. The most recent September 17th 2014 Proposition 218 process redistributed the old Tier 1 pricing into a new two- tier approach. Tier 1 now is a customer's Indoor allocation for use of all residential activities inside the home. Tier 2 is a customer's Outdoor water allocation. Pricing varies between the two Tiers. Tier 1 is the least expensive while Tier 2 water increases in price due to increased water usage for irrigation. Four (4) additional tiers remain, with the cost per unit increasing progressively at each tier.

8.1.1.4 Public Education and Outreach

PWD has school education programs in place that provide educational materials and instructional assistance. This program is intended to reach the youngest water users and emphasize the need to engage them in water conservation.

To provide PWD customers with the tools to maintain water conservation goals, public education efforts have included, radio spots, bill inserts, newsletters, press releases, rebate programs including Water Wise Landscape Conversion Program and some indoor high efficiency appliances, booths at local events, public speaking engagements, web-based presentations, and school interaction. PWD is committed to providing its customers with the education and tools to maintain their low use, all of which can be found on PWD's website at: http://www.palmdalewater.org/conservation/ .

8.1.1.5 Programs to assess and mange distribution system real loss

PWD regularly checks and evaluates the mainline piping system to detect leaks. Distribution system loss is discussed in Section 2.2.2 and reported in Appendix E.

8.1.1.6 Consistency with State Water Loss Standards

At the current time, a water loss standard has not been adopted by the State of California. Future UWMPs prepared by PWD will report on compliance with any State water loss standards.

8.1.1.7 Water conservation program coordination and staffing support

Water conservation activities include significant public outreach efforts as described earlier. In addition, there are two full-time Water Use Efficiency Specialists with a moderate budget. Contact information: Robert Rosati, Water Use Efficiency Specialist, 661-456-5943; Maria Avelar, Water Use Efficiency Specialist, 661-456-1001.

8.1.2 Other DMMs

8.1.2.1 Rebate Programs

PWD started several rebate programs for customers in the later part of 2009. Customers were given rebates as credits on their water bills if they filled out an application after buying the rebated product and returning the original receipt and a copy of the water bill to PWD. In addition, PWD implements a number of rebate programs to encourage water conservation:

1. High Efficiency Toilet (HET) Rebate Program: A HET rebate program was instituted in 2009 for residential and commercial customers. The rebate amount for this program is a credit on their water bill of $100.00 per toilet installed.

2. High-Efficiency Urinal Rebate Program: A urinal rebate program is available for residential and commercial customers that install a urinal with a use of 0.125 gpf or less.

3. High Efficiency Washing Machines Rebate Program: A washing machine rebate program is available for customers who wish to purchase a water efficient washing machine with a water factor of 3.7 or less. The rebate amount for this program is a credit on the customer's account of $150.00 per washer bought.

4. Water-Wise Landscape Conversion Program. This program encourages the replacement of grass with "water-smart" landscaping to conserve water.

5. Weather Based Irrigation Controller Rebate Program: This rebate offers up to $150 credit on the customers water bill for water sense labeled controllers.

8.1.3 Planned Implementation of DMMs to Achieve Water Use Targets

PWD currently has a water conservation program and will continue to expand this program over the next five years and is dedicated to water conservation as a vital part of its water supply portfolio. Several water conservation programs have been implemented over the last few decades, including classroom education programs, public outreach, and various rebate programs. PWD will continue to provide these programs as part of its conservation efforts on a yearly basis.

PWD will continue to implement its conservation program and the DMMs described in this UWMP. These programs, taken together, will help to maintain progress on meeting 20x2020 water use reduction targets as described in Section 3 of this UWMP.

Section 9: Water Shortage Contingency Planning

PWD has prepared a separate stand-alone Water Shortage Contingency Plan (WSCP), contained in Appendix J. The WSCP was adopted on June 14, 2021 at the regular Board of Directors meeting. This section includes a brief description summary of the WSCP required by the UWMP Guidelines.

9.1 Purpose of the WSCP

PWD has developed a WSCP to provide guidance if triggering events occur - whether from reduced supply, increased demand, or an emergency declaration — and to identify corresponding actions to be taken during the various stages of a water shortage. The plan includes voluntary and mandatory stages which are intended to be fair to all water customers and users while having the least impact on business, employment, and quality of life for residents.

9.2 Annual Assessment

New provisions in Water Code Section 10632.1. require that an urban water supplier such as PWD, conduct an annual water supply and demand assessment (“Annual Assessment”), on or before July 1 of each year, to be submitted to DWR. As part of the WSCP PWD has identified the timeline, staff and outside agency coordination, and other actions necessary to conduct the Annual Assessment.

9.3 Shortage Stages

The WSCP describes water shortage stages corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage.

9.4 Water Shortage Response Actions

The WSCP identifies water shortage response actions, including:

- Water supply augmentation
- Operational Changes
- Demand Reduction Actions

Section 10: References

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