2015
URBAN WATER MANAGEMENT PLAN

April 2016
Draft Copy

2015

URBAN WATER MANAGEMENT PLAN

City of Glendale

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April 2016 Draft Copy

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SECTION 1: INTRODUCTION

The City's potable and recycled water service area closely coincides with the City's boundaries. The estimated current resident population served by the City's water system is approximately 196,682 persons

SECTION 1: INTRODUCTION

1.1 PURPOSE AND SUMMARY

This is the 2015 Urban Water Management Plan (UWMP) for the City of Glendale (City). This plan has been prepared in compliance with the Urban Water Management Planning Act (Act), which has been codified at California Water Code sections 10610 through 10657 and can be found in **Appendix B** to this 2015 Plan.

As part of the Act, the legislature declared that waters of the state are a limited and renewable resource subject to ever increasing demands; that the conservation and efficient use of urban water supplies are of statewide concern; that successful implementation of plans is best accomplished at the local level; that conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources; that conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions; and that urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

The Act requires "every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually, to prepare and adopt, in accordance with prescribed requirements, an urban water management plan." These plans must be filed with the California Department of Water Resources (DWR) every five years describing and evaluating reasonable and practical efficient water uses, reclamation, and conservation activities. (*See generally* Wat. Code § 10631).

The Act has been amended on several occasions since its initial passage in 1983. New requirements of the Act due to SBx7-7 state that per capita water use within an urban water supplier's service area must decrease by 20 percent by the year 2020 in order to receive grants or loans administered by DWR or other state agencies. The legislation sets an overall goal of reducing per capita urban water use by 20 percent by December 31, 2020. The state shall make incremental progress towards this goal by reducing per capita water use by at least 10 percent by December 31, 2015. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by this bill are not eligible for state water grants or loans.

1.2 COORDINATION

In preparing this 2015 Plan, the City has encouraged broad community participation. Copies of the City's draft plan were made available for public review at Glendale Water & Power Administration Office, the Glendale Central Library, and the Glendale City Clerk Office. The City noticed a public hearing to review and accept comments on the draft plan with more than two weeks in advance of the hearing. The notice of the public hearing was published in the local press and the City's website and mailed to the City Clerk. On June 7, 2016, the City held a noticed public hearing to review and accept comments on the draft plan.

Table 1.1
Coordination and Public Involvement

	Participated In Plan Preparation	Contacted for Assistance	Commented on Draft	Notified of Public Hearing	Attended Public Hearing
City Water & Power Department	x	x	x	x	x
City Planning and Public Works Department		x	x	x	x
City Manager's Office				x	x
Glendale City Council				x	x
The Metropolitan Water District of Southern California		x			x
CA Dept. of Water Resources				x	
LADWP				x	
LACDPW				x	
City of Burbank Water & Power				x	
City of Pasadena Water & Power				x	
Crescenta Valley Water District				x	
Foothill Municipal Water District				x	
Valley Water Company				x	
Interested General Public			x	x	x

Notice of the public hearing was published in the local press. Following the consideration of public comments received at the public hearing, the City adopted the 2015 Plan on _____, 2016. A copy of the City Council resolution approving the 2015 Plan is included in **Appendix D**.

As required by the Act, the 2015 Plan is being provided by the City to DWR, the California State Library, and the public within 30 days of the City's adoption.

1.3 UPDATES TO THE UWMP ACT

Since the 2010 UWMPs, there have been several changes to the UWMP Act affecting the 2015 UWMPs as follows:

- **Demand Management Measures (DMMS):** Updates to the DMMs (CWC § 10631 (f) (1) & (2) AB 2067, 2014

- **Submittal Date:** Submittal Date has been extended (CWC § 10621 (d) (1) & (2) AB 2067, 2014
- **Electronic Submittal:** New Submittal Format to DWR (CWC § 10644 (a) (2) SB 1420, 2014
- **Standardized Forms:** Must Use Standardized Forms for DWR Submittal (CWC § 10644 (a) (2) SB 1420, 2014
- **Water Loss:** New Submittal Format to DWR (CWC § 10631 (e) (1) (J) and (e) (3) (A) and (B) SB 1420, 2014
- **Estimating Future Water Savings:** Water Use Projections Should Assume Water Savings Per Appendix K (CWC § 10644 (e) (4) SB 1420, 2014
- **Voluntary Reporting of Energy Intensity:** Provide details of Energy to Produce Water (CWC § 10631.2 (a) (b) SB 1036, 2014
- **Defining Water Features:** Provide details of Energy to Produce Water (CWC § 10632 (b) SB 2049, 2010

1.4 FORMAT OF THE PLAN

The sections and information contained in this 2015 UWMP correspond to the items in the UWMP Act and other amendments to the Water Code, including SBx7-7, as follows:

Section 1 - Introduction

This section describes the UWMP Act, the City's planning and coordination process, the history of the City's water supply system, and a description of its existing water service area. This section also describes the local climate, population served, land use, and the City's water distribution system.

Section 2 - Water Sources & Supplies

This section describes the City's water supplies, including imported water purchased from the Metropolitan Water District of Southern California (MWD), local groundwater extracted from the San Fernando and Verdugo Basins, and recycled water from Los Angeles-Glendale Water Reclamation Plant This section also discusses potential future water supplies.

Section 3 – Water Quality

This section discusses the quality of the City's imported and groundwater sources, including a discussion on the treatment and testing of water. This section also discusses water quality effects on management strategies and supply reliability.

Section 4 – Water Demands

This section describes past, current, and projected future water demands within the City's service area prior to the implementation of future demand management measures. This chapter also discusses the requirements of the Water Conservation Act of 2009 (SBx7-7).

Section 5 – Reliability Planning

This section discusses the need for reliability planning due to historic and recent droughts.

This section also presents an assessment of the reliability of the City's water supplies by comparing projected future water demands with expected water supplies under three different hydrologic conditions: a normal year; a single dry year; and multiple dry years.

Section 6 – Demand Management

This section addresses the City's compliance with water conservation measures as a member of the California Urban Water Conservation Council (CUWCC) with the current Best Management Practices (BMPs).

Section 7 – Contingency Planning

This section describes the City's current conservation activities, as well as those efforts that will be utilized in the event of a water supply interruption, such as drought. The City's water shortage contingency plan (Water Shortage Response Plan – **See Appendix G**), adopted by Council in 2009 and updated in 2015, was developed in consultation and coordination with other MWD member agencies. In addition, MWD's Water Surplus and Drought Management Plan (WSDM) is also described.

Section 8 – Recycled Water

This chapter describes past, current and projected recycled water use, along with a description of wastewater collection and treatment facilities.

Appendices

The appendices contain references, supplemental information, and specific documents relating to the City of Glendale used to prepare this 2015 UWMP.

1.5 UPDATES TO THE 2015 UWMP

In addition to updated data (numbers) for the years 2010-2015, City of Glendale's UWMP has undergone significant changes since the 2010 UWMP. The most significant change is the re-arrangement and/or consolidation of some sections of the 2010 UWMP. A summary of the changes to the 2010 UWMP is provided below:

- **Consolidated & re-arranged the eight (8) Chapters of the 2010 UWMP**
- **Expanded on topics previously discussed in the 2010 UWMP**
- **Added new topics not previously discussed in the 2010 UWMP**
- **Updated data, facts, & figures previously included in the 2010 UWMP**
- **Added new data, facts, & figures not previously included in the 2010 UWMP**

1.6 WATER SYSTEM HISTORY

The City of Glendale was incorporated in 1906 and it consisted of 1,486 acres. Since then many annexations have occurred, the largest of these was the 662.8 acre Inter-Valley Ranch, now known as the George Deukmejian Wilderness Park. Currently the City spans over 31 square miles and is home to nearly 200,000 people, becoming the third most populous city in Los Angeles County following the Los Angeles and Long Beach.

Figure 1.1: City of Glendale – Brand Blvd. (circa 1938)

The City of Glendale gradually became integrated into the Los Angeles Metropolitan Area as development in the Los Angeles Basin grew.

As a result of the expanding population and continued development, the City of Glendale along with 12 other local governments formed the Metropolitan Water District (MWD) in 1928. MWD was originally created to build the Colorado River Aqueduct to supplement the water supplies of the original founding members. In 1972, MWD augmented its supply sources to include deliveries from the State Water Project via the California Aqueduct. Today, the MWD delivers water to 26 public member agencies – 14 cities, 11 municipal water districts, one county water authority- which in turn provides water to more than 19 million people in Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura counties.

Figure 1.2: City of Glendale Today

The City of Glendale continues to purchase MWD water to supplement its local water supply. The City continues the development of new water strategies, water conservation efforts, maintaining the water distribution system and providing high quality water that meets or exceeds drinking water quality standards with the objective to reduce purchase of imported water and insure a reliable water supply for its customers.

1.7 CITY WATER SERVICE AREA

Glendale spans over 31 square miles and is home to nearly 200,000 people. The City's potable and recycled water service area closely coincides with the City boundary, bordered by the City of Los Angeles to the north and south, and the City of Burbank to the west. On the eastern side, the City's service area is bounded by Crescenta Valley Water District (CVWD), La Cañada Irrigation District, Valley Water Company, and the City of Pasadena. A portion of the northern side of the City boundary is served by both the City and CVWD. **Figure 1.3** depicts City of Glendale Service Area Boundary on page 1-9.

Land use is primarily dominated by retail and service industries and has one of the highest percentages of multi-family units in Southern California. There has been a substantial growth in new development in the City consisting of mixed-use buildings and new multi-family housing, such as apartments and condominiums. There are only a small number of new single-family development projects occurring in the City consisting primarily of infilling and small subdivisions. For planning purposes, only major developments that were defined as at least 50 dwelling units (du) or 10,000 square feet were considered to have a significant impact on the City's water demand and were included as part of the demand forecasting. Twenty-seven known near-term developments were identified that result in 4,002 new residential units, 95 hotel rooms, and 412,447 square feet of commercial space. The City's existing land use designation is based on the South Glendale Community Plan that was most recently updated in 2015. **Figure 1.4** shows an

official City of Glendale Zoning Map on page 1-10.

1.8 CLIMATE

The City has a mild climate with an average temperature of 75 degrees Fahrenheit (°F). Summer temperatures are commonly above 85°F and may exceed 100°F for several consecutive days. In winter, temperature could go as low as the 30's °F. Annual average rainfall was approximately 15 inches annually. **Table 1.2** lists the historical average rainfall for the City from 1906 to 2012.

Table 1.2
Historical Climate Characteristics

Month	Average Total Precipitation (inches)
Jan	3.07
Feb	3.73
Mar	2.42
Apr	0.97
May	0.31
Jun	0.08
Jul	0.01
Aug	0.05
Sep	0.21
Oct	0.66
Nov	1.04
Dec	2.44
Totals:	**15**

Source: NOAA

As the State of California and the LA region has undergone a several-year drought, rainfall has been much lower in the City. This is reflected in **Table 1.3** on the right.

Evapotranspiration (ETo) is the quantity of moisture that is transpired by plants and evaporated from soil. Historic ETo for the City from 1997 to 2014 average approximately 45 inches.

Table 1.3
Recent Climate Characteristics

Month	Rainfall (in) - 2015	ETo (in) - 2014
Jan	1.09	2.42
Feb	0.83	2.53
Mar	0.87	3.66
Apr	0.13	4.84
May	0.93	6.15
Jun	0.01	6.25
July	0.38	6.08
Aug	0.0	5.76
Sep	2.39	4.81
Oct	0.25	3.73
Nov	0.48	2.62
Dec	3.88	1.92
Totals:	**11.24**	**51**

Source: NOAA (Rainfall) – CIMIS (ETo)

1.9 POPULATION

The current 2015 population of the City is approximately 199,182 residents according to the most recent California Department of Finance (DOF) figures dated January 1st, 2015, an increase of 1.7 percent with respect to 2014. It is important to note that these population estimates are based on reported Census values. City staff believes part of the City's population is not reported, resulting in lower reported values than the actual City population. Population forecast data for 2020 to 2035 was taken from the Southern California Association of Governments (SCAG) census tracts that fell within the City boundaries.

Note as well that the population estimated by SCAG for 2020 of 198,900 is less than the accounted for by the DOF at 199,182 in 2015. SCAG estimates the 2035 population at 209,300 residents. The City's population service area also is less than the population within its boundaries since Crescenta Valley Water District serves about 1% of Glendale's population. For planning purposes the projected City's service area was calculated using the average service population from 2001 to 2015 with an increase of 0.29 percent per year. The assumption here is that the City's future development is mostly redevelopment so the population is expected to grow modestly over the next 25 years as shown in **Table 1.4** below:

Table 1.4
Population Service Area Projections
(Based on 0.29 percent Growth Rate per year)

Year	Estimated Population (Service Area)
2020	199,606
2025	202,574
2030	205,586
2035	208,643
2040	211,745

1.10 WATER SYSTEM

Currently, the potable water facilities that provide service to meet existing demands within the City's service area includes three MWD imported water connections, 14 active wells, 28 water storage reservoirs and tanks, 26 booster pumping stations (PSs), 6 pressure-reducing stations (PRSs), and approximately 380 miles of pipeline. Additionally, the city owns and operates two water treatment plants that remove contaminants from local groundwater. The existing water system map is shown in **Figures 1.5** on page 1-11.

Imported Water

Imported water from MWD accounts for the majority of the City's potable supplies at about 69 percent of the total supplies between 2005 and 2014.

The City's potable water distribution system delivers water from three imported water connection MWD G-1, MWD G-2, and MWD G-3. **Table 1.5** lists the capacities of the City's imported connections:

Table 1.5
Imported Connections with MWD

Description	Capacity (mgd)	Capacity (afy)
MWD G-1	31	34,751
MWD G-2	6.5	7,240
MWD G-3	12.9	14,480

Groundwater

The City receives groundwater from fourteen groundwater wells that pump water from the Verdugo and San Fernando Basins. Groundwater wells in the Verdugo Basin include the Foothill Well, Glorietta Wells, and Verdugo Wells. Groundwater wells in the San Fernando Basins include the Glendale North Operable Unit Wells and Glendale South Operable Unit Wells. The City's wells capacity is approximately 7,400 gpm as listed in **Section 2** (see **Table 2.2)**.

In 2014, approximately 5 percent and 23 percent of the city's supply was obtained from the Verdugo Basin and San Fernando Basin, respectively. Despite reduced production in the Verdugo Basin due to ongoing drought conditions, the City was able to meet demands as a member agency of MWD due to MWD's investments in dry

year storage facilities and capacity.

Recycled Water System

The City is entitled to 50 percent of the effluent from the Los Angeles – Glendale Water Reclamation Plant (LAGWRP), which is a 20 mgd facility co-owned by the City and the City of Los Angeles. Its current level of treatment is Title 22 (tertiary) with nitrogen removal (NDN). Recycled water from LAGWRP is used for landscape irrigation to cemeteries, schools, parks, high rises, and for dual plumbing in several buildings and facilities.

In 2014, the City served recycled water to 75 service connections with a combined demand of nearly 1,721 acre-feet or near 1.5 mgd. The City's existing recycled water system consists of approximately 22 miles of purple pipe, five storage facilities, and six pump stations. Figure 6.1 (See Section 6) depicts all these facilities.

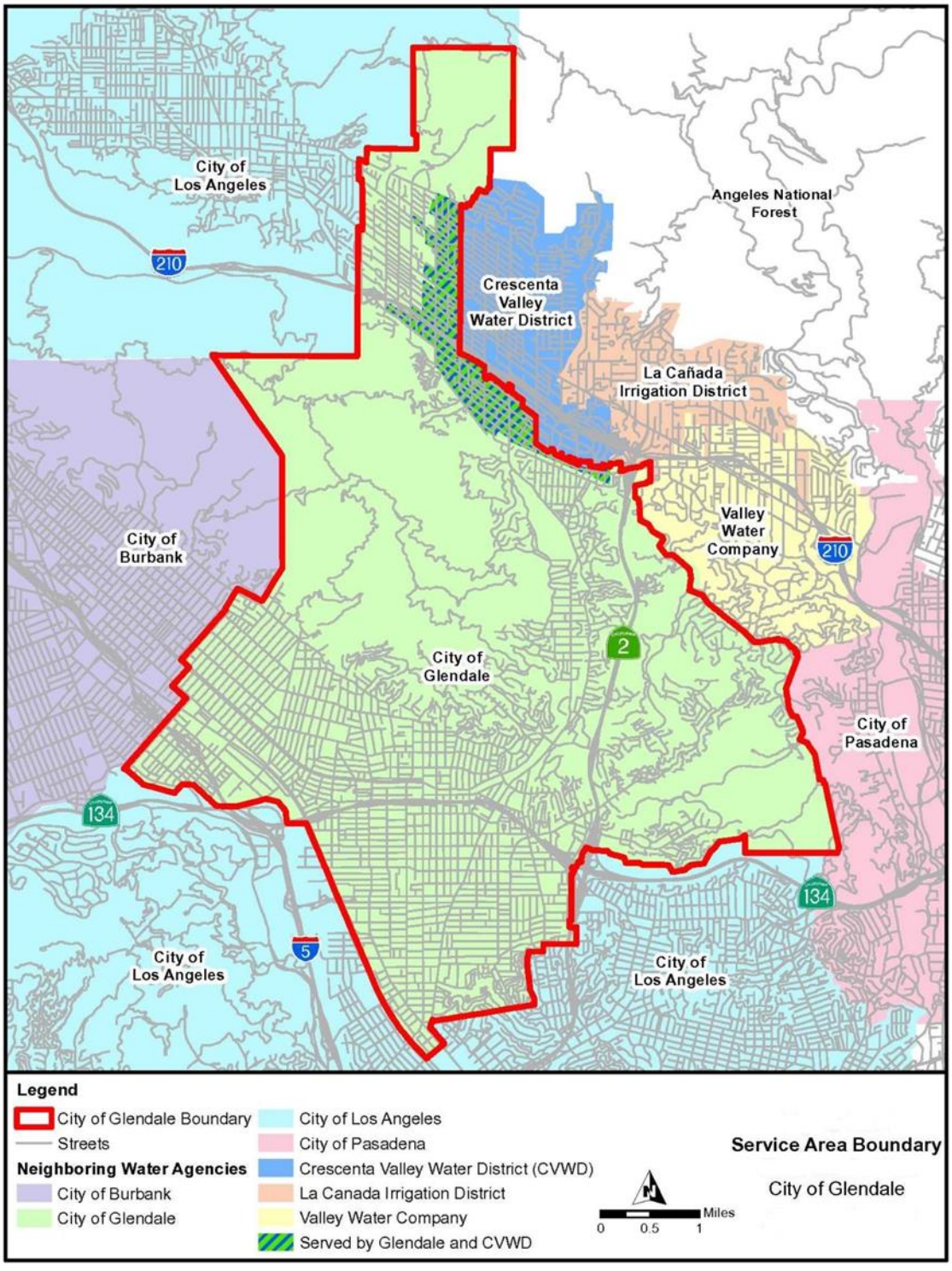

Figure 1.3: City of Glendale – Service Area Boundary

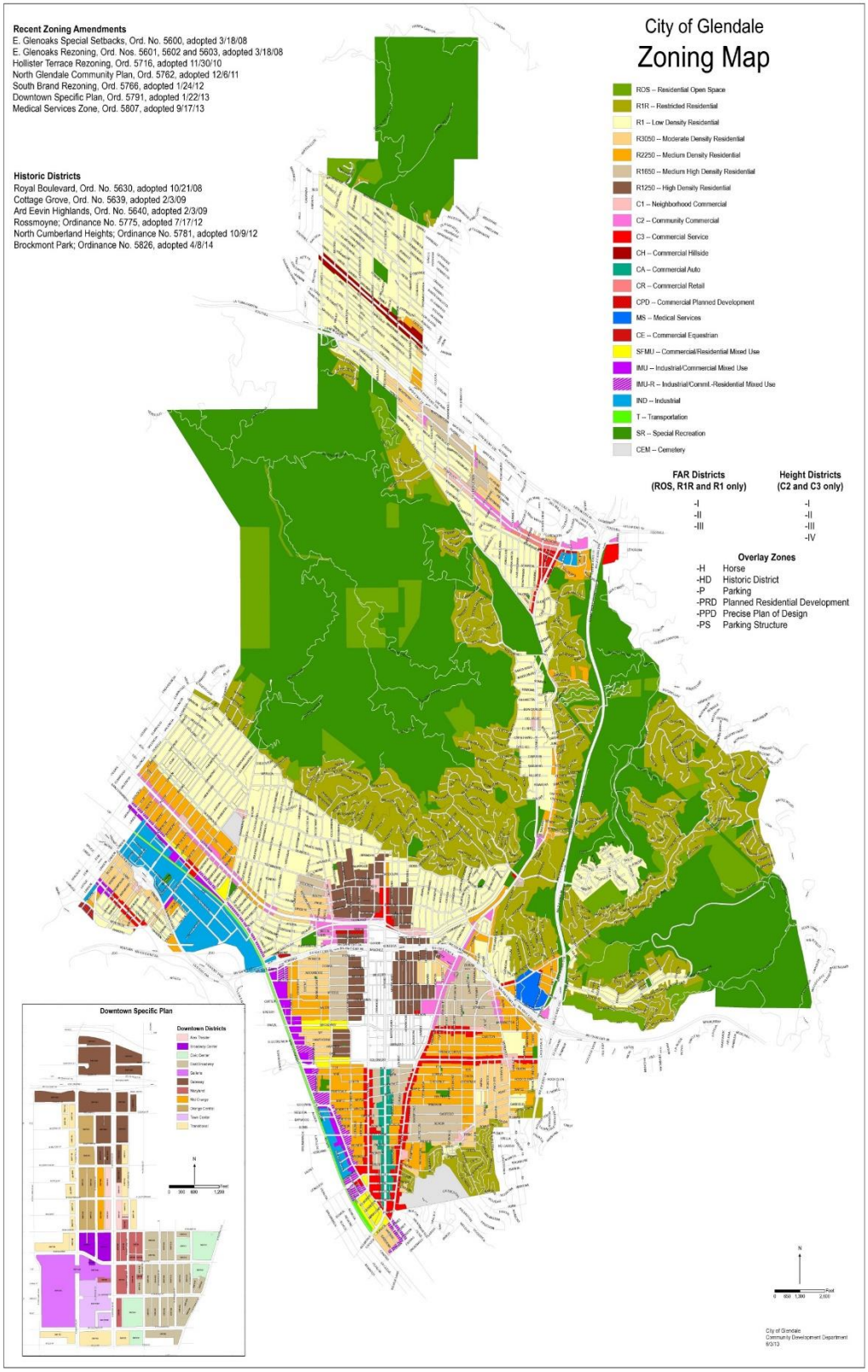

Figure 1.4: City of Glendale - Zoning Ma

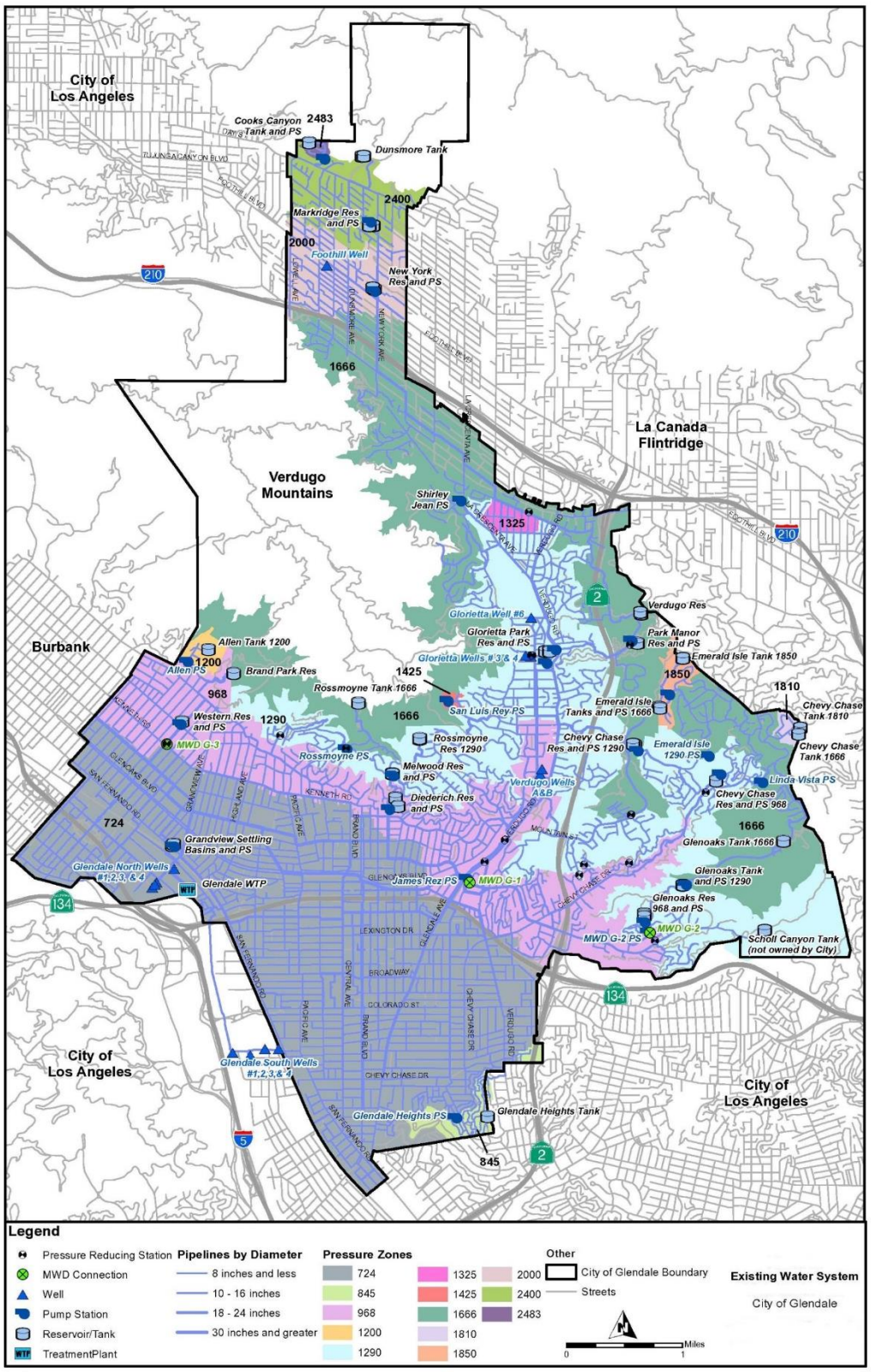

Figure 1.5: City of Glendale – Existing Water System

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SECTION 2:
WATER SOURCES & SUPPLIES

The City's water supply sources consist of imported water from the Metropolitan Water District (MWD), groundwater produced from the San Fernando and Verdugo Basins, and recycled water produced from the LAGWRP facility.

SECTION 2: WATER SOURCES & SUPPLIES

2.1 INTRODUCTION

The City's water supply consists of imported water purchased from MWD, groundwater produced from the Verdugo and San Fernando Basins, and recycled water produced at its LAGWRP facility. The entry points in the Glendale water system for the various supplies are shown in **figure 2.1** on page 2-3**,** as well as the location of the "out of the area" water sources which includes all interconnections with other agencies.

2.2 WATER SUPPLY SOURCES

2.2.1 Imported Water

The City has access to imported MWD water from the Colorado River and the Sacramento-San Joaquin River Delta in Northern California through the State Water Project (SWP). MWD has a SWP concentrated entitlement of approximately 2 million acre-feet (MAF) of water annually.

The Colorado River supplies California with 4.4 MAF annually for agricultural and urban uses with approximately 3.85 MAF used for agriculture in Imperial and Riverside Counties. The remaining unused portion (600,000 - 800,000 AF) is used for urban purposes in MWD's service area.

In addition to the Colorado River, the Sacramento-San Joaquin River Delta provides a significant amount of supply annually to Southern California. The Delta is located at the confluence of the Sacramento and San Joaquin Rivers east of the San Francisco Bay and is the West Coast's largest estuary. The Delta supplies Southern California with over 1 MAF of water annually.

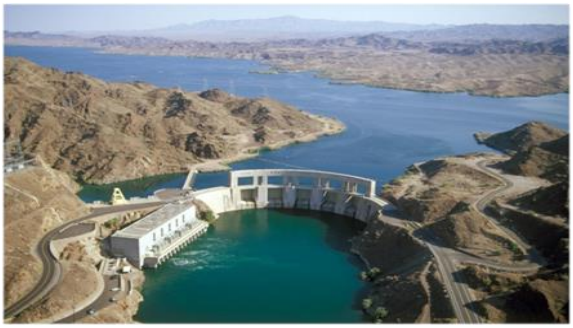

Figure 2.2: Parker Dam at Colorado River

The use of water from the Colorado River and the Sacramento-San Joaquin Delta continues to be a critical issue. In particular, Colorado River water allotments have been debated among the seven basin states and various regional water agencies at both the federal and state levels. The use of Delta water has been debated as competing uses for water supply and ecological habitat have jeopardized the Delta's ability to meet either need and have threatened the estuary's ecosystem.

Figure 2.3: Sacramento-San Joaquin Delta

In order to provide the City with imported water, MWD utilizes two separate aqueduct systems (one for each source of supply) to obtain its supplies. These two aqueduct systems convey water from each source into two separate reservoirs whereupon MWD

pumps the water to one of its five treatment facilities. One of these aqueduct systems is known as the Colorado River Aqueduct (CRA). The CRA was constructed as a first order of business shortly after MWD's incorporation in 1928. The CRA is 242 miles long and carries water from the Colorado River to Lake Matthews and is managed by MWD.

Figure 2.4: Colorado River Aqueduct

In addition to the CRA, MWD receives water from northern California via the California Aqueduct. Also known as the State Water Project, the California Aqueduct is 444 miles long and carries water from the Delta to Southern California and is operated by the Department of Water Resources.

Figure 2.5: California Aqueduct

The previously mentioned aqueducts supply Southern California with a significant amount of its water and are crucial to its sustainability. In addition to these two water systems, there are also many other aqueducts that are vital to the State. The major aqueducts in California are shown in **Figure 2.6** on page 2-4.

As a wholesale agency, MWD distributes imported water to its 26 member agencies throughout Southern California as shown in **Figure 2.7** on Page 2-5. The City is a member agency of MWD and therefore beneficiary of their water management plans. Glendale receives imported water through three service connections G-1, G-2, G-3 with a capacity of 31 mgd, 6.5 mgd, and 12.9 mgd, respectively. Imported water from MWD accounts for the majority of the City's potable supplies at about 69 percent of the total supplies between 2005 and 2014.

Table 2.1 presents the City's recent five-year imported water purchases from 2010 to 2015. Imported over this time period has accounted for over 64 percent of the City's supply totals.

The City's Tier 1 limit from MWD is approximately 26,222 AFY. As indicated by **Table 2.1**, the City's imported water purchases are well under the limit during each of the past five years thanks to conservation efforts.

Table 2.1
Five-Year Imported Water Supply
(Purchases from MWD)

Year	Purchases (AF)
2015	14,726
2014	19,275
2013	19,419
2012	17,702
2011	17,629
2010	16,550
Average:	**17,550**
2005-2009 Average:	**22,316**

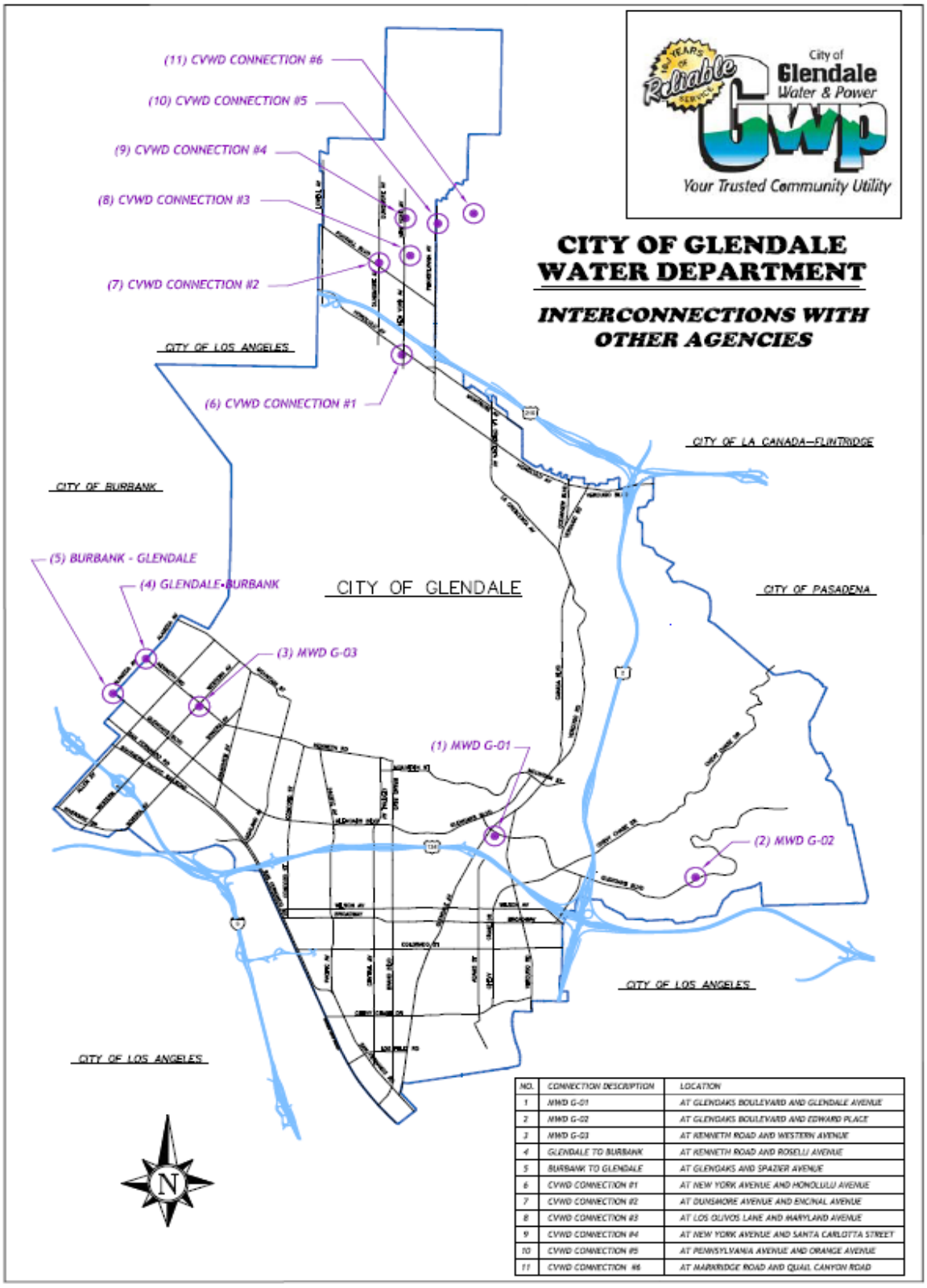

Figure 2.1: Glendale Interconnections with Other Agencies

Figure 2.6: Aqueduct Systems in California

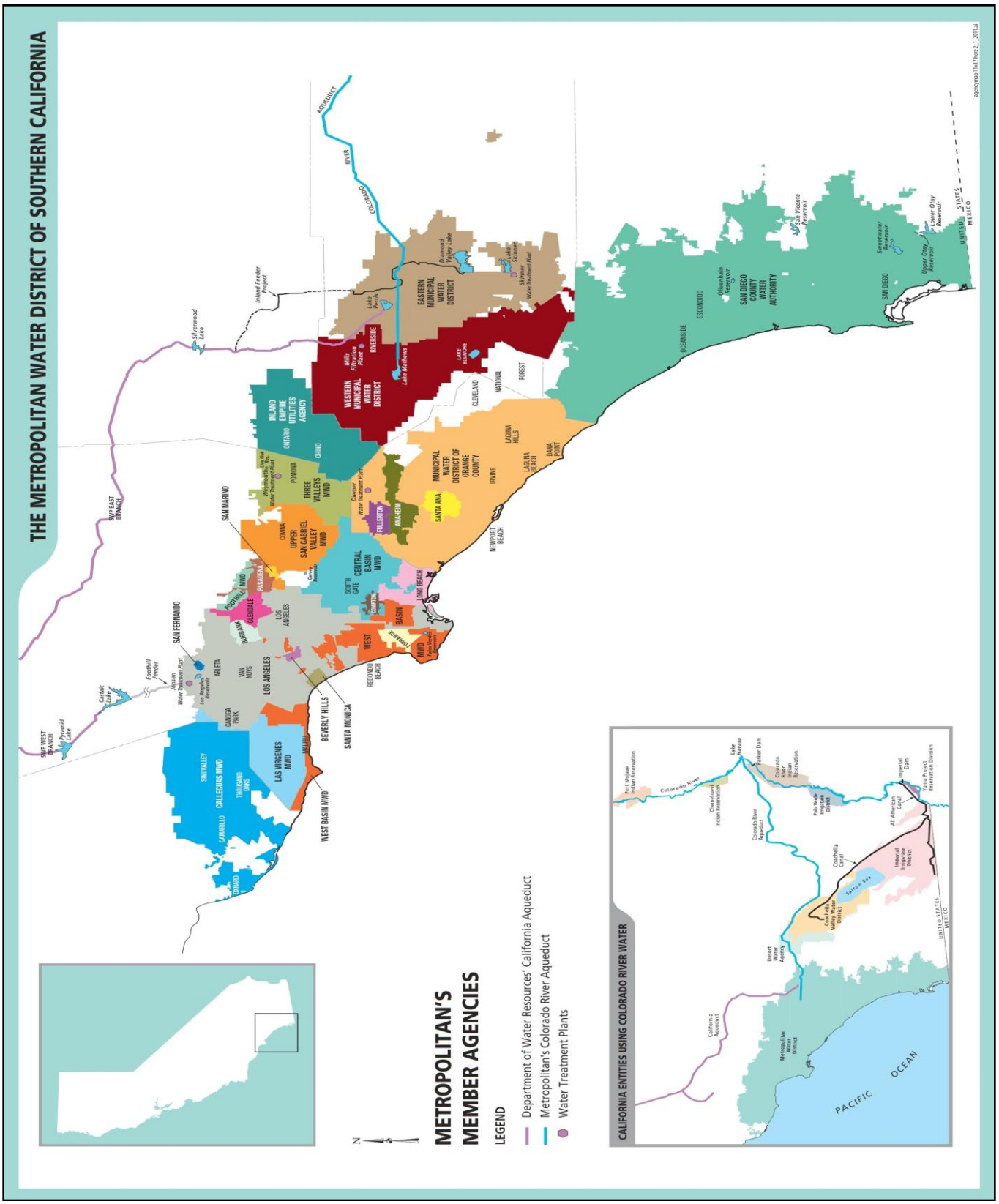

Figure 2.7: MWD Service Area Map

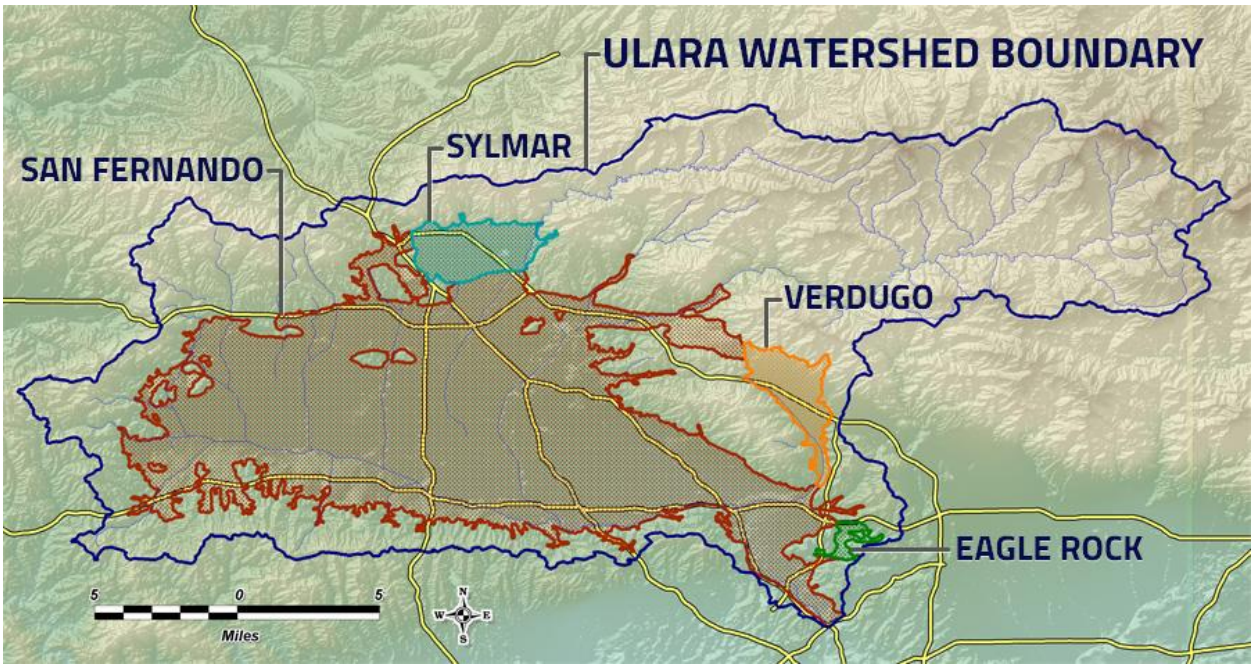

Figure 2.8: San Fernando and Verdugo Basins

2.2.2 Groundwater

The City obtains its groundwater from the San Fernando and Verdugo Basins. The San Fernando basin consists of 112,000 acres and it is bounded on the east and northeast by the San Rafael Hills, Verdugo Mountains, and San Gabriel Mountains; on the north by the San Gabriel Mountains and the eroded south limb of the little Tujunga Syncline which separates Sylmar Basin; on the northwest and west by the Santa Susan Mountains and Simi Hills; and on the south by the Santa Monica Mountains.

Ground water from the San Fernando Basin generally flows from the edges of the basin toward the middle of the basin, then beneath the Los Angeles River narrows into the Central Sub-basin of the Coastal Plain of Los Angeles Basin. In the northeastern part of the basin, groundwater moves from the La Crescenta area southward beneath the surface of Verdugo Canyon toward the Los Angeles river near Glendale, whereas the groundwater in the Tujunga area flows west following the Tujunga Wash around the Verdugo Mountains to join groundwater flowing from the west following the course of the Los Angeles River near Glendale. The total storage capacity of the San Fernando Basin is calculated at 3.67 million acre-feet (MAF).

The Verdugo basin, north and east of the Verdugo Mountains, consists of 4,400 acres. It is bounded on the north by the San Gabriel Mountains; on the northwest by a groundwater divide, which separates it from the San Fernando Basin; on the east by a groundwater divide separating it from the Monk Hill Subarea of the Raymond Basin; on the southeast by the San Rafael Hills; and on the south and southwest by the Verdugo Mountains. All the surface water channels feed into the Verdugo Wash, which is located along the west side of the basin.

The groundwater storage capacity of the Verdugo Basin is approximately 160,000 AF. The City of Glendale has rights to extract 3,856 acre-feet per year (AFY).

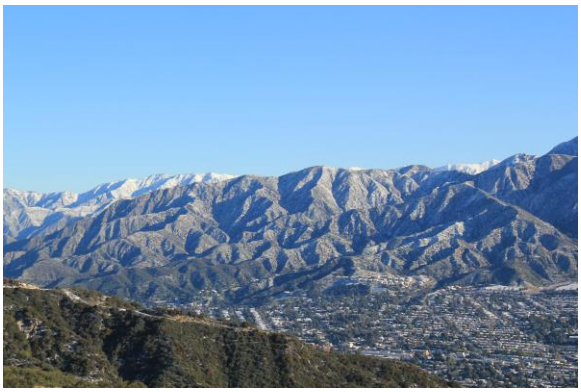

Figure 2.9: Verdugo and San Gabriel Mountains

The San Fernando and Verdugo Basins are managed by the Upper Los Angeles River Area (ULARA) which encompasses all the watershed and tributaries of the Los Angeles River and four groundwater basins as shown in **Figure 2.8**.

The water supply of the basins are separate and are replenished by deep percolation from rainfall, surface runoff and from a portion of the municipal-supply water that is delivered for use within these basins. Precipitation in the San Fernando Valley ranges from 15 to 23 inches per year and averages about 17 inches.

Groundwater Production

As late as 1940, groundwater from the San Fernando and Verdugo Basins were the only sources of water in the City. The city's water right to San Fernando Basin supplies is defined by the judgment (See Appendix F) entitled "Court Judgement on Groundwater rights in the San Fernando and Verdugo Basins". While the judgment awarded the native water rights to Los Angeles, it did allow a return flow credit (a water right based on a percentage of water used in the City that is returned to the groundwater basin). The City was also allowed to accumulate these credits if its water rights are not used. In the water year October 1, 2010, the City has an estimated storage credit of 53,823 AF within the basin. Much of this accumulation was a result of the City not being able to pump from the basin because of the groundwater contamination. Also, there is a right to produce water beyond the city's credits subject to a payment obligation to the City of Los Angeles based primarily on the cost of MWD alternative supplies. This right to produce water in excess of the return flow credit and the accumulated credits are significant to the operation of the Glendale Water Treatment Plant (GWTP), which is part of a U.S. Environmental Protection Agency (EPA) Superfund clean-up project in Glendale. The project is of a 5,000 gallon-per-minute (gpm) facility and delivers approximately 7,800 AFY to the City (about 28 percent of the City's total demand). Further discussion of this can be found later in this report. The various San Fernando Basin supplies are:

Return Flow Credit – Glendale is entitled to a return flow credit of 21 percent of all delivered water (including recycled water) in the San Fernando Basin and its tributary hill and mountain area. It is calculated by determining the amount of total water used in the City less 105 percent of total sales by Glendale to Verdugo Basin and its tributary hills. This credit ranges from about 5,000 AFY to 5,400 AFY depending on actual water use. This is the City's primary water right in the San Fernando Basin.

Physical Solution Water – Glendale has an agreement to extract excess water chargeable against the rights of the City of Los Angeles upon payment of specified charges generally tied to MWD's water rates. Glendale's physical solution right is 5,000 AFY.

Pumping for Groundwater Cleanup – Section 2.5 of the Upper Los Angeles River

Area's Policies and Procedures, dated July, 1993, provides for the unlimited extraction of basin water for SUPERFUND activities, subject to payment of specified charges similar to physical solution water. This right became a significant factor with the completion of the Glendale Water Treatment Plant (GWTP) in 2000 shown in **Figure 2.10**

Figure 2.10: Glendale Water Treatment Plant

The Glendale Water Treatment Plant was established to remove the VOCs in ground water supplies. Two of the most prevalent VOCs are trichloroethylene (TCE) and tetrachloroethylene (PCE). The source for the treatment plant consists of eight wells. The eight wells and the Glendale Water Treatment Plant together are referred to as the Glendale Operable Unit (GOU).

At the Grandview pumping plant shown in **Figure 2.11**, aqua ammonia is added to the treated water to form chloramines prior to entering the distribution system.

The Glendale Water Treatment Plant also treats groundwater affected by chromium contaminants.

Prior to the setting of a Cr6 MCL by the State of California, the City of Glendale began treating for Chromium through a series of demonstration-scale removal facilities as part of various research studies that were ultimately used in setting the MCL. These studies were completed in 2015 and a permanent treatment facility will begin operation in 2016.

The GOU provides about 7,700 AFY to the City and will meet about 28 percent of projected water demands.

Figure 2.11: Grandview Pumping Plant

Carry-over extractions – In addition to current extractions of return flow water and stored water, Glendale may, in any one year, extract from the San Fernando Basin an amount not to exceed 10 percent of its last annual credit for import return water, subject to an obligation to replace such over-extraction by reduced extraction during the next water year. This provides an important year-to-year flexibility in meeting water demands.

For the San Fernando Basin, the rights described above give the City the right to extract from a practical point of view, subject to certain conditions and payment in some cases, any quantity of water anticipated to be needed for the City's future water resource program. Each water right used to produce from the San Fernando Basin has its own costs and availability considerations.

Historically, groundwater supplies from the Verdugo Basin contributed a portion of the City's water supplies. This has been from wells and an underground water infiltration system. The Judgment in the Los Angeles lawsuit gave Glendale the right to extract 3,856 AFY from the Verdugo Basin. Crescenta Valley Water District also has water rights to extract 3,294 AFY and is the only other entity allowed to extract water from the Verdugo Basin.

Glendale has been actively trying to identify possible new water well sites to increase its groundwater production capacity from this basin. Currently, a majority of Glendale's groundwater extractions are from its eight GOU wells in SFB. In October 2007, Glendale initiated the rehabilitation of its Foothill Well and this work was completed in 2010. Currently, the Foothill well is online, and produces groundwater at a rate of approximately 130 gpm. Drilling and construction of the City's Rockhaven well, located at the Rockhaven Sanitarium site, was completed in April 2011; also in 1996, the City completed construction of the Verdugo Park Water Treatment Plant (VPWTP) This facility has a capacity of 1,150 gpm and treats water from the two low capacity wells (referred to as Verdugo Wells A & B) and from the water supplies in the old Verdugo Pickup, horizontal infiltration system. Actual flows from these sources range between 300 and 400 gpm and is considered to be under the influence of the surface water for regulatory purposes. The three existing wells referred to as Glorietta Wells 3, 4, and 6 and the Verdugo Park Water Treatment Plant alone will not utilize the City's entire water rights to the Verdugo Basin supplies and additional extraction capacity in the Verdugo Basin will be required to reach the water right capacity. The existing wells and VPWTP produce about 2000 AFY.

The most prevalent contaminant in the Verdugo Basin is the high concentrations of nitrates. It is believed that the nitrates are from the historical use of septic tanks in the La Crescenta area. Now that the areas are sewered, the nitrate levels are expected to decrease in the future. PCE has been detected as well in the Glorietta Wells ranging from 1 to 3 ppb. Levels have been stable over the years and EPA has determined that no remedial action will be required for the Verdugo Basin. In 2008, methyl-tert-butyl ether (MtBE) was detected at approximately 0.5 ppb (the drinking water MCL is 13 ppb) in one of the three Glorietta wells. Since then the level of MtBE has not increased. Water from the Glorietta wells is blended with MWD supplies in one of the City's large storage facilities. The resulting levels do not have any impact in the usability of the groundwater supplies.

To increase production from the Verdugo Basin, the Glendale Water & Power (GWP) completed the rehabilitation of the Foothill Well with a capacity of 250 gpm. In 2014, the City and Crescenta Valley Water District (CVWD), worked together as a joint project to construct and develop the Rockhaven Well. The new Rockhaven Well began operation in March 2016.

Figure 2.12: Foothill Well

At present the City extracts groundwater

from fourteen (14) active groundwater wells with a combined production capacity of 7,400 gpm. In 2014, approximately 23 percent of the City's supply was obtained from the San Fernando Basin and 5 percent from the Verdugo Basin. The City's groundwater well statistics are listed below in **Table 2.2**:

Table 2.2
City Groundwater Wells

Well Name/No.	Basin	Capacity (gpm)
Glendale Operable Unit Wells	San Fernando	5,000
Foothill Well	Verdugo	250
Glorietta Wells # 3, 4, & 6	Verdugo	1,000
Verdugo Wells A & B	Verdugo	1,150
	Total Capacity:	**7,400**

All of the City's wells are equipped with flowmeters to measure water production, and treated as appropriate with wellhead treatment or at treatment facilities before being sent into the distribution system. Water production is recorded monthly by City water staff and reported annually to the Department of Water Resources (DWR). Over the past five years, groundwater extraction has ranged from 7,291 AF to 9,788 AF (average of 8,578 AF). **Table 2.3** displays the City's groundwater supplies for the past five years:

Table 2.3
Five-Year Groundwater Production
(All Wells)

Year	*Production (AF)
2015	8,097
2014	7,291
2013	8,280
2012	9,442
2011	8,567
2010	9,788
Average:	**8,578**
2005-2009 Average:	**8,939**

Groundwater includes San Fernando and Verdugo Basins.

2.2.3 Recycled Water

The City receives recycled water from LAGWRP located near Colorado Boulevard and the Los Angeles River, and it is jointly owned by Glendale and Los Angeles. In the late 1970's, the City began delivering recycled water from the Los Angeles-Glendale Water Reclamation Plant for irrigation purposes and for use in the cooling towers at the Glendale Power Plant. Expansion of the recycled water system, beginning in the early 1990's, greatly increased recycled water use.

Wastewater generated by residents and businesses is collected and conveyed by the City's sewer infrastructure and discharge to either the City of Los Angeles's Hyperion Treatment Plant (LAHTP) or to the Los Angeles – Glendale Water Reclamation Plant (LAGWRP), with the sludge discharged to the Hyperion System. The LAGWRP treatment consists of a series of processes that successively remove solids until the resulting water meet Title 22 tertiary effluent requirements. Four levels

of purification are provided: preliminary, primary, secondary, and tertiary treatment with disinfection.

The City is entitled to 50 percent of the effluent from the LAGWRP, which is a 20 mgd facility and is depicted in **Figure 2.13.** Treated wastewater that is not used in either the Glendale or Los Angeles system is discharged to the Los Angeles River and eventually reaches the ocean.

Figure 2.13: Wastewater Treatment at LAGWRP

The City's existing recycled water system consists of approximately 22 miles of "purple pipe", five storage facilities, and six pump stations. In 2014, the City served recycled water to 75 service connections with a combined demand of nearly 1,721 acre-feet or near 1.5 mgd. While some of the recycled water demand is used for the Grayson Power Plant cooling towers and dual plumbing sites citywide, the majority of the recycled water demand is used for irrigation. The City's existing recycled water system is depicted on **Figure 2.14** on the following page.

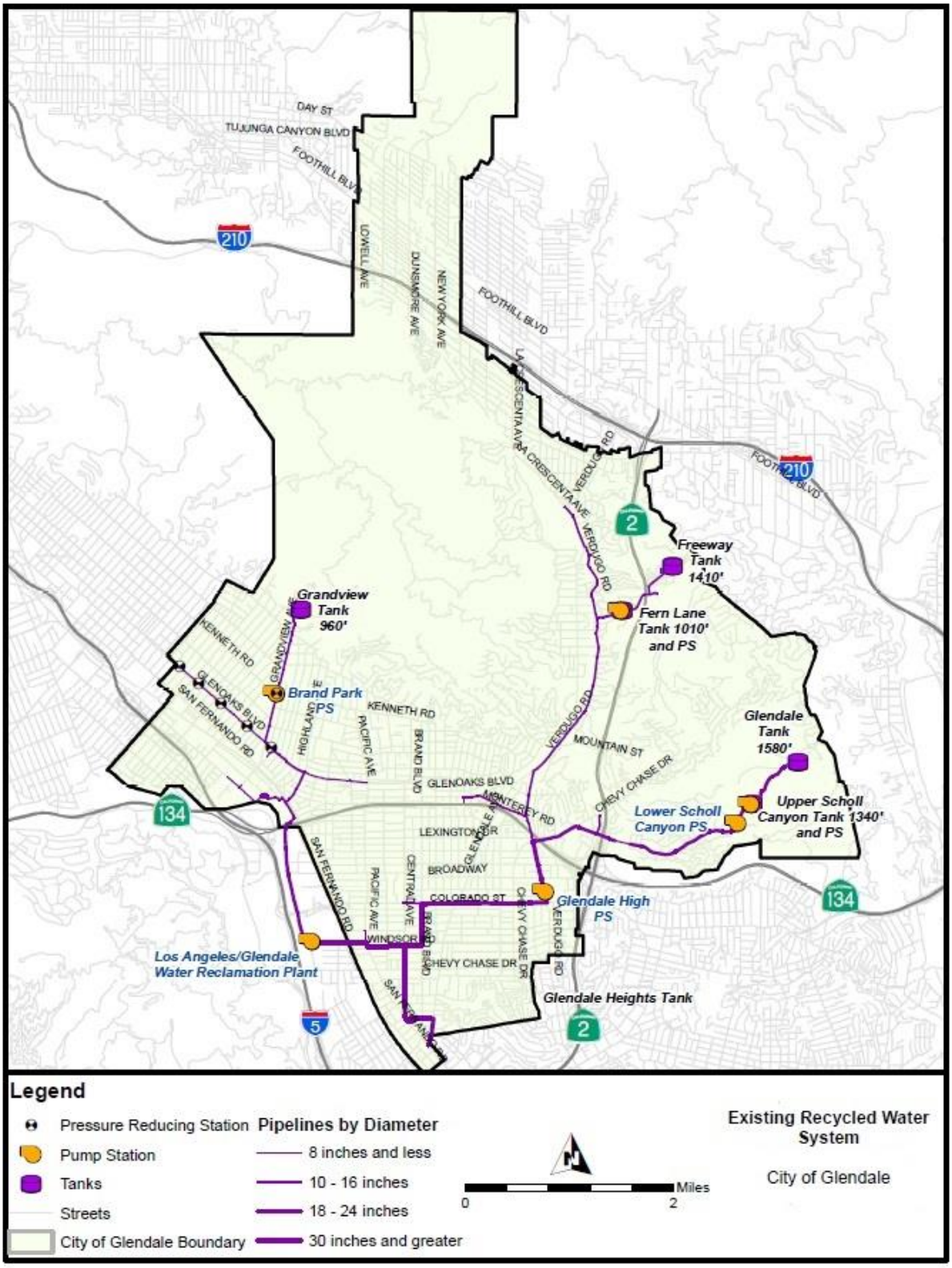

Figure 2.14: Glendale – Existing Recycled Water System

The City requires the use of recycled water when appropriate as determined by the City's General Manager of Glendale Water & Power. As a result, even if recycled water cannot be provided at the time, the potential users may still be required to install a separate irrigation system so that recycled water can be delivered at a later date without major modifications to the irrigation system. In these projects, the "purple" irrigation pipe and control boxes must be used. Pressure test are conducted to assure no cross-connection exists between the potable system and irrigation. Records are kept which will permit an easy conversion of the system to recycled water use in the future. The City also requires dual plumbing systems in new high-rise office buildings so as recycled water becomes available, it can be used for sanitary flushing purposes in the buildings without retrofitting. Developers of new buildings have accepted this requirement and it is routine to require this installation.

Recycled Water Production

Over the past five years, recycled water has accounted for 6 percent of the City's overall water supply (potable plus recycled). **Table 2.4** below lists the total production of recycled water:

Table 2.4
Five-Year Recycled Water Production

Year	Production (AF)
2015	1,733
2014	1,721
2013	1,877
2012	1,462
2011	1,445
2010	1,662
Average:	**1,650**
2005-2009 Average:	**1,391**

Since 2005, recycled water production has been increased with a high of 1,877 AFY in 2013.

2.3 WATER SUPPLY SUMMARY

Imported water from MWD accounts for the majority of the City's potable supplies at about 64 percent of the total supplies between 2010 and 2015, and the San Fernando Basin and Verdugo Basin contributed about 30 percent. As previously mentioned the City relies mostly on imported water and. 2010-2015 water supply averages and percentages are indicated in **Table 2.5** below:

Table 2.5
Water Supply Averages (Percentages)
2010-2015

Source	Supply Amount (AF)	Percent of Supply	Percent 2005-2009
MWD	17,550	63%	69%
GW	8,578	31%	27%
Recycled	1,650	6%	4%

As noted by **Table 2.5**, the City has made and continuous making improvements towards reducing its reliance on imported water and achieve its sustainability goals by 2020 (as discussed in **Section 4**) with the additional supplies and facilities, operation of the Glendale Water Treatment Plant (GWTP) and increased recycled water use.

2.4 ENERGY TO PRODUCE WATER

Producing water is not only an engineering challenge for the City, but also a financial one. The City must maintain the financial viability of its water system during time of

increasing conservation. Not only must the City consider means of additional revenue, but also ways to reduce operating costs. One of the largest costs the City deals with is energy (electricity) costs. In a typical distribution or supply system the largest consumers of energy are treatment plants, followed by pumping and booster stations. On the other hand, water storage facilities such as reservoirs or distribution facilities such as pressure regulating stations typically have relatively insignificant energy consumption in comparison.

Groundwater has a higher direct energy cost than purchased MWD water because MWD water is delivered at a higher pressure gradient than local system pressure. However, the cost of energy in the purchased MWD water is embedded within the overall MWD purchased water rate. The City recovers some of this cost by taking delivery of the majority of MWD water through and energy recovery turbine and uses this energy to offset other pumping costs. Energy costs are also incurred in the City's pump stations to pump both groundwater and purchased MWD water to higher elevations and pressure zones throughout the City. These costs are mitigated by controlling pumping through the SCADA system to program pumping during off-peak hours utilizing the storage capacity in the reservoirs and tanks to meet demands during on-peak hours.

2.5 PROJECTED WATER SUPPLY

As population and land-use densities increase, the City understands the need to discover and support local water supply projects to augment imported supplies. The objective of the City's Water Resource Plan, first prepared in 1985, is to develop more local supplies and identify the facilities to increase the use of local resources thereby reducing the need for imported water.

Glendale foresees very little change in available sources and the amount of water supply needed to meet water demands. In the next 25 years, we expect the same amount of supply from the San Fernando Basin. On the other hand, we will be utilizing the City's full water rights in the Verdugo Basin with the addition of new wells. Recycled water, further discussed in Section 8, will remain constant with very little addition.

Table 2.6 presents the City's projected water supplies available from all sources from 2020-2040:

Table 2.6
Projected Water Supply Available

Year	Imported (AF)	*Ground (AF)	Recycled (AF)
2020	26,222	11,656	1,662
2025	26,222	11,656	1,662
2030	26,222	11,656	1,662
2035	26,222	11,656	1,662
2040	26,222	11,656	1,662

Groundwater includes San Fernando (7,800 AF) and Verdugo (3,856) Basins.

Imported water from MWD as stated in MWD's 2015 UWMP, shows that the region can provide reliable water supplies under both the single driest year and the multiple dry year hydrologies (MWD 2015 UWMP, 2-3). Projected imported water supply represents supply available to the City, if needed, based on the City's MWD Tier 1 Limit of 26,222 AFY (MWD 2015 UWMP, Table 2.13). The City will also benefit indirectly from regional conservation efforts and also through MWD's efforts to augment its supplies and improve storage capacities.

2.6 ALTERNATE WATER SOURCES

This section provides an overview of alternative water sources and their potential uses. Alternative water sources include recycled wastewater, greywater, and desalinated seawater.

2.6.1 Recycled Wastewater

Background

The City of Glendale has been delivering recycled water since the late 1970's from the Los Angeles - Glendale Water Reclamation Plant (LAGWRP).

Wastewater Collection & Treatment System

The City owns, operates, and maintains one wastewater pumping station (Doran Street Wastewater Pumping Plant) that lifts sewage from a low point in the collection system to a maintenance hole at a higher elevation. The pumping plant is equipped with four 1,150-gpm, 25-horsepower submersible pumps (one emergency standby) and one 3-horsepower sump pump.

Existing wastewater collection system within Glendale consists of approximately 360 miles of underground wastewater pipelines. These pipelines range from 8 inches to 42 inches in diameter, and approximately 87 percent of them are 8-inches in diameter. Vitrified clay pipes (VCP) are the most commonly used in the wastewater collection system.

The existing wastewater system collects sewage at its point of origin and conveys wastewater in a southerly and southwesterly direction to the Los Angeles North Outfall Server (NOS), located along the Los Angeles River. Similar to most wastewater systems, Glendale's collection system uses the natural topography to allow gravity to convey wastewater to its point of final discharge into the NOS. Glendale's topography, in combination with physical configuration of the system, has divided the service area into eight major drainage basins or tributary areas.

Wastewater flows are measured at prescribed locations prior to final discharge. The City, in cooperation with the City of Los Angeles, constructed six flume facilities, one site with in-line telemetering equipment, and installed a flow meter at the pump station to measure the flows.

In addition to the development of the areas associated with these major drainage basins, each basin was further divided into smaller tributary areas or sub-basins. These basins were derived to distribute wastewater flows throughout the system and were based on existing pipeline connectivity, unique demand patterns, isolation of areas with known hydraulic constraints, and integration of facilities downstream of significant dischargers.

Wastewater generated by residents and businesses is collected and conveyed by the City's sewer infrastructure and discharge to either the City of Los Angeles's Hyperion Treatment Plant (LAHTP) depicted in **Figure 2.15**, or to the Los Angeles-Glendale Water Reclamation Plant (LAGWRP), with the sludge discharged to the Hyperion System. Most solids are separated from the wastewater during the primary and secondary processes at the LAGWRP. The resulting sludge is returned to the NOS to the Hyperion Treatment Plant. The remaining wastewater is then further treated to eliminate any remaining impurities. Final product is used in recycled water programs or discharge to the Los Angeles River.

LAGWRP is what is referred to as a "skimming plant" designed to reduce the flows of raw sewage in the transmission pipelines and also to provide treated wastewater for recycling "inland" purposes. LAGWRP has a capacity of about 20 MGD. The current level of treatment is Title 22 (tertiary) with nitrogen removal (NdN).

Figure 2.15: Wastewater Treatment at Hyperion

Recycled Wastewater Use

Currently the City benefits from the use of recycled wastewater with its majority of recycled water demand used for irrigation including parks, schools, medians, golf clubs, others. Dual-plumbed buildings are also receiving recycled wastewater.

Future Plans for Recycled Wastewater

The City has already developed a future recycled water system layout that will serve potential customers including facilities for each expansion segment, however the use of recycled wastewater within the City's service area for the next 25 years is uncertain as funding for infrastructural improvements are needed to distribute recycled water from the LAGWRP to those potential recycled water customers.

Indirect Potable Reuse (IPR)

Glendale is looking at diversifying further its portfolio of water sources to supplement variable rainfall and meet the demands of population growth using a process known as Indirect Potable Reuse (IPR). IPR is one of the water recycling applications that has developed, largely as a result of advances in treatment technology that enables the production of high quality recycled water at increasingly reasonable costs and reduced energy inputs. This high quality recycled water then will be allowed to percolate into the groundwater basins with the intent of augmenting drinking water supplies. Percolation is considered a world's best practice since the ground between the percolation system and the aquifer acts as environmental buffer to further purify water.

There are numerous advantages associated with IPR. Possibly the most attractive is that IPR allows the supply of potable water to increase with population size. When population increases, the amount of wastewater generated also increases. The more wastewater is generated, the more water is available for recycling using IPR system. IPR therefore has the potential to provide a stable, constant source of potable water in the face of droughts or contamination.

Publicly-owned open spaces and parks provide excellent groundwater recharge areas such as the natural green belt form on the north side of Glendale around the Crescenta Valley. The will of the community to preserve these open spaces along with desire to limit new hillside developments allow the City to maintain natural beauty, preserve habitats, protect areas for groundwater recharge, and keep consistent City growth policy.

2.6.2 Rainwater Harvesting

This alternate water supply reduces potable

water demand while reducing the amount of polluted storm water runoff from entering the Los Angeles River. The City actively promotes the use of rainwater for landscape irrigation through numerous free workshops for professionals and homeowners.

Figure 2.16: Captured Rainwater Helps Irrigate Home

2.6.3 Greywater

Greywater has been used as an alternate source of water in California since its adoption in 1995 and on January 12, 2010, the California Building Standards Commission (CBSC) adopted provision into Title-24, California Code of Regulations (CCR) pertaining to the acceptance of plumbing systems for the use and distribution of greywater. Such provisions have been adopted into Part 5 of Title-24, which is commonly referred to as the California Plumbing Code (CPC). As a result of the adoption of greywater plumbing regulations into the CPC, use of greywater systems are possible throughout the City of Glendale.

The California Department of Housing and Community Development (HCD) took steps to ensure that the greywater standards are simplified to facilitate installation of small-scale greywater systems by individual homeowners. The standards will maintain an acceptable level of public safety, while simplifying the standards for residential graywater systems.

In fact, these standards allow single-family homeowners to install a basic graywater system without requiring a building/plumbing permit, provided the system utilizes only a single domestic clothes washing machine and does not require cutting of any existing plumbing pipes. Other residential greywater systems, which exceed the scope of a simple clothes-washer system, may also be considered, but a permit would be required and additional regulation would apply.

Greywater is used as irrigation water in order to reduce potable water use. The City has promoted its use actively via free workshops for professionals and homeowners.

Figure 2.17: Home Irrigated with Greywater

2.6.4 Desalinated Water

Seawater desalination is a process whereby seawater is treated to remove salts and other contents to develop both potable and non-potable supplies. There are over 10,000 desalination facilities worldwide that produce over 13 million AFY. Desalinated water can add to Southern California's supply reliability by diversifying its water supply sources and mitigating against

possible supply reductions due to conservation.

Figure 2.18: Seawater Desalination Plant

With its Seawater Desalination Program (SDP), MWD facilitates progress and provides financial incentives for the development of seawater desalination facilities within its service area. A total of five member agencies submitted projects totaling 142,000 AFY. In 2004, MWD adopted an Integrated IRP update which included a desalination goal of 150,000 AFY by the year 2025. Currently, the five member agency projects are in various levels of development.

The economics of building and operating a desalinization plant would be prohibited based on the City's distance from the ocean. In addition, Glendale does not have adequate perched brackish water and energy availability to encourage the construction of brackish desalinization plants. Therefore, the City does not have any current plans to develop any desalination facilities.

2.7 TRANSFERS OR EXCHANGES

Glendale's water system is also interconnected with the City of Burbank and Crescenta Valley Water District for short-term/emergency water service (**Figure 2.1**). When the need arises, these connections can be opened to deliver water into the Glendale distribution system to supplement demands and vice-versa. These should be viewed as only short-term transfer of water.

For the long term, MWD is engaged in "out-of-area" dry transfer and exchanges to improve local water supply reliability. It is discussed in MWD's 2015 Urban Water Management Plan in Section 3- "Implementing the Plan". Glendale does not have the basic capability to implement these types of programs. We rely on MWD to perform these activities.

The inter-tie with Crescenta Valley Water District was completed. The preliminary design for an interconnection with Los Angeles is in the planning.

2.8 PLANNED SUPPLY PROJECTS

The City of Glendale will supply the majority of its potable water via its imported water from MWD. The remainder of its supply will be provided by groundwater from the San Fernando and Verdugo Basins. In the future the City Water Master Plan identified future improvement projects, including replacing aging Cast Iron water mains and upsizing transmission mains to accommodate pump station upgrades, repair and rehabilitation of distribution system pipelines, storage reservoirs, treatment, and wells with the objective to continue improving system reliability, water quality, and reduce the City's dependence on imported water.

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SECTION 3: WATER QUALITY

To ensure the highest water quality possible, imported water supplied by the City is treated at one of five separate MWD treatment plants (pictured). The City's groundwater is also checked for quality. The City recognizes that water quality is a concern to not only public health but also to their future water supply.

SECTION 3: WATER QUALITY

3.1 WATER QUALITY SUMMARY

In 1974, Congress passed the Safe Drinking Water Act in order to protect public health by regulating the nation's drinking water supply. As required by the Safe Drinking Water Act, the City provides annual Water Quality Reports to its customers. Currently, all of the water that the City distributes to its customers meets federal EPA standards and Division of Drinking Water (DDW) Standards.

The quality of water distributed to the City's water system is directly related to the quality of the supply sources from which the City obtains its water. This section explores the quality of the City's supply sources and examines important water contaminants that the City actively monitors as part of its efforts to supply safe drinking water to its customers

3.2 QUALITY OF SOURCES

3.2.1 Imported Water

The City receives imported water from MWD in order to supplement its groundwater supplies and for blending needs to meet Federal and DDW standards. Imported water obtained from the SWP and the CRA contain specific contaminants which are characteristic of the Bay Delta and the Colorado River regions. Some of the contaminants of concern include: salinity, biological loads, disinfection by-products, percholorate, uranium, and arsenic. MWD's 2015 RUWMP discusses the water quality concerns of its supplies.

To provide safe drinking water to its customers, MWD treats its water supply at five (5) separate treatment plants, three of which blend a mixture of SWP and CRA water. Of the five plants that serve Southern California, the City has access to treated effluent from the Weymouth Treatment Plant via MWD's Middle Feeder pipeline and/or the Jensen Water Treatment Plant.

Figure 3.1: Weymouth Treatment Plant

Although MWD water meets all regulatory requirements, MWD understands the need for strong testing and quality assurance for its customers. Water is analyzed and tested at one central, state-of-the-art treatment facility in addition to five satellite laboratories at each treatment facility to ensure the quality and safety of its water.

3.2.2 Groundwater

Groundwater extracted from the San Fernando Basin contains Volatile Organic Compounds (VOCs). Two of the most prevalent VOCs are trichloroethylene (TCE) and tetrachloroethylene (PCE). Based on the levels of VOCs detected, the basin was designated as a Superfund site in the 1980s and considered by the Division of Drinking Water (DDW) to be an extremely impaired source.

The Glendale Water Treatment Plant (GWTP) was established to remove the VOCs in ground water supplies, it uses packed tower aeration (PTA) to remove the VOCs, followed by liquid phase granular activated carbon (GAC) treatment before the water is disinfected and sent to the Grandview pumping plant where aqua ammonia is added to the treated water to form chloramines and the treated water can also be blended with water purchased from the Metropolitan Water District (MWD) prior to entering the distribution system. The source for the treatment plant consists of eight wells. The eight wells and the Glendale Water Treatment Plant together are referred to as the Glendale Operable Unit (GOU).

Though the GWTP was originally built to remove the volatile organic chemicals in the San Fernando Basin, hexavalent chromium removal capabilities was added to the plant.

Historically, the water quality parameter of concern for groundwater pumped from the Verdugo Basin has been the high concentrations of nitrates. It is believed that the nitrates are from the historical use of septic tanks in the La Crescenta area. Now that the areas have a sewer system, the nitrate levels are expected to decrease in the future.

PCE has been detected in the groundwater production from the Verdugo Basin ranging from 1 to 3 ppb. Levels have been stable over the years and EPA has determined that no remedial action will be required for the Verdugo Basin. In 2008, methyl-tert-butyl ether (MtBE) was detected at approximately 0.5 ppb (the drinking water MCL is 13 ppb) in one of the three Glorietta wells in the Verdugo Basin. In the 2 and ½ years since the initial detection, the level of MtBE has not increased.

The Verdugo Park Water Treatment Plant (utilizing diatomaceous filtration followed by chlorination) was built in the early 90's to capture water from existing underground water infiltration pick-up system. Since the expected production is highly variable, two shallow wells were added to deliver water to the system. This source is considered to be under the influence of the surface water for regulatory purposes. The nitrates levels at the effluent ranges from 2 to 4 ppm as N. The MCL for nitrate as N is 10 mg/L.

Figure 3.2: Water Laboratory Testing

Table 3.1 below summarizes the City's groundwater treatment activities for its major contaminants:

Table 3.1
Glendale Basin
Major Contaminants

Basin	Contaminant Treated
San Fernando	VOCs (TCEs and PCEs); Chromium VI
Verdugo Basin	Nitrates

All groundwater supplied to the City's distribution system by Glendale Water & Power continuously meets all state and federal drinking water regulations. This is accomplished by ongoing testing of the City's water and continual improvements of

its water system facilities.

Figure 3.3: The Division of Drinking Water (DDW) regulates public drinking water systems

The City of Glendale Water & Power Division (GWP) expends considerable resources keeping its water treatment system up to date and performing properly.

Recycled Water

The City's Glendale uses a state-of-the-art treatment process at the Los Angeles-Glendale Water Reclamation Plant (LAGWRP) to treat wastewater to California Title 22 standards.

3.3 WATER QUALITY EFFECTS

The previous section discussed water quality issues affecting the City's water supply operations. Due to advanced treatment procedures and an approved blending plan, the City does not anticipate any reductions in its water supplies due to water quality issues in the near future. Future regulatory changes enacted by the EPA and/or the State legislature will be met through additional mitigation and treatment actions in order to meet the standards and to maintain water supply to the City's customers. Thus, the City does not expect water quality to be a major factor in its supply reliability considerations. However, water quality issues will continue to influence day-to-day water operations and management decisions as mitigation and treatment procedures are evaluated to determine their cost and treatment effectiveness against alternative procedures.

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SECTION 4: WATER DEMANDS

The City of Glendale supports water conservation while maintaining the beauty of its community parks, schools, and recreational facilities both in the private and in the public sector.

SECTION 4: WATER DEMANDS

4.1 FACTORS AFFECTING DEMAND

Water use within the City is variable and depends on a number of factors that range from increases and decreases in irrigation and water losses to changes in plumbing fixtures and customer usage habits. This section explores the water usage trends within the City and quantifies total usage per customer type.

Urbanization's Effect on Water Use

The City of Glendale, like most of Southern California, began as a small, suburban town with plenty of room for development. Previous land uses in the City at that time were mostly residential with some commercial use for hotels. By 1930, the City's population reached 62,736 persons. In the 1970s the City experienced significant development with the completion of the Glendale Freeway (Highway 2) and the Ventura Freeway (Highway 134) with its population soaring to 132,664.

Figure 4.1: Early City of Glendale

The City was incorporated in February 15, 1906 and began its water operations during the early 1900s. In 1928, the City joined 12 other local cities in forming the Metropolitan Water District (MWD).


Figure 4.2: Glendale Today

Water Use within City

The City's image as a sustainable City (one of the leaders in the nation), is due to its dedication to conserving its resources while maintaining the beauty of its community parks, schools, and recreational facilities both in the private and in the public sector.
Since the City is zoned mainly for residential use, the City has a significant number of residential lots which require consistent irrigation to maintain landscapes. The City therefore has a “no water waste ordinance” prohibiting specific water wasting activities.


Figure 4.3: Residential Irrigation

In addition to water demand for residential irrigation purposes, there are a number of other significant water demands within the City's service area. These include commercial properties and institutional facilities such as the Americana at Brand, Glendale Community College, and Disney Corporation- Glendale.

Figure 4.4: Glendale Community College

Although the City enjoys a relatively healthy economic stature, overall water use characteristics within the City's service area reflect regional water use characteristics within Southern California. The City's water consumption trends do not necessarily compare to other high-end communities as a result of the City's pro-active conservation efforts.

4.2 HISTORIC WATER DEMAND

Past Water Use

Potable water demands represent water that leaves the distribution system through metered or unmetered connections, or at pipe joints (leaks) or breaks. Potable water demands occur throughout the distribution system based on the number and type of consumers in each location. Historically, water use in the City has reflected the balance of its identity as a commercial and cultural hub with its identity as an environmentally conscious City. Annual water use since 1996 to 2009 has ranged from about 28,095 AF to 34,264 AF as shown below in **Table 4.1**:

Table 4.1
City of Glendale - Past Water Use

Year	Total Consumption (AF)
2009	29,699
2008	31,908
2007	32,846
2006	31,079
2005	30,745
2004	32,666
2003	31,039
2002	28,095
2001	31,119
2000	34,264
1999	31,176
1998	29,411
1997	32,352
1996	31,470
Average:	**31,276**

Given its size and culture, and the expanse of the City's population from 1996 to 2009, the City should have expected to experience at least an upward trend in water use. As indicted by the relatively constant numbers in **Table 4.1**, water use did not increase marginally during this time period.

Recent Water Use

Recent water use has been trending downward in the City, primarily due to increased awareness of conservation and stricter City ordinances. However due to the recent drought water consumption increased from 2011-2014, prior to the Governor Brown State of Emergency

declaration in 2014 and mandated in 2015 in which potable demand diminished as indicated by **Table 4.2** below:

Table 4.2
Five-Year Recent Water Use
(Service Area Total)

Year	Potable Demand (AF)
2015	22,154
2014	25,731
2013	26,580
2012	25,932
2011	24,439
2010	24,233
Average:	**24,845**
2005-2009 Average:	**31,255**

4.3 WATER DEMANDS BY SECTOR

Service Accounts

The City maintains records of water consumption and bills its customers on a bi-monthly basis for its water service. The City maintains approximately 34,011 service accounts with a mixture of residential, commercial, institutional, and landscape accounts. Since these are billing accounts, the accounts can vary from on a yearly or monthly basis and are not necessarily a reflection of actual main-to-meter connections. The current number of accounts is shown in **Table 4.3**:

Table 4.3
Current Number of Service Connections
(Active Accounts)

Sector	No. of Service Accounts
Single Family Residential	22,324
Multi-Family Residential	7,381
Commercial/Institutional	3,704
Industrial	190
Landscape Irrigation (potable)	309
Other (Potable)	26
Commercial/Institutional (Recycled)	1
Landscape Irrigation (Recycled)	66
Other (Recycled)	10
Current Total No. of Service Connections:	**34,011**

Nearly 87 percent of the total service connections are either single family or multi-family residential as over half of the City is zoned for residential use. Commercial and institutional accounts comprise about 11 percent of the total accounts. Landscape irrigation and "other" accounts comprise the remaining portion of the City's metered connections.

Water Demand by Sector

The water use by each sector type for the past five years and the unaccounted for water is listed on **Table 4.4** below. The average proportions of water use by sector listed in this table will be used to analyze projected water use by sector in **Section 4.5.**

Table 4.4
Historic Demand by Sector and Unaccounted Water (AF)

Sector	2010	2011	2012	2013	2014	2015
Single Family Residential	10,061	10,075	11,112	11,297	10,916.	8,218
Multi-Family Residential	9,620	9,795	9,958	10,196	9,696	9,137
Commercial/Institutional	3,098	3,498	3,617	3,805	3,810	3,757
Industrial	468	628	675	702	714	624
Landscape Irrigation	982	441	565	564	559	376
other	4	2	5	16	36	42
Subtotal (Demand):	**24,233**	**24,439**	**25,932**	**27,300**	**25,731**	**22,154**
Total Water Production (Supply) Purchase and Groundwater – Table 2.1 & 2.3	**26,338**	**26,196**	**27,144**	**27,699**	**26,566**	**22,823**
Unaccounted for Water (Supply minus Demand)	2105 (8.0%)	1,757 (6.7%)	1,212 (4.5%)	1,119 (4.0%)	835 (3.1%)	669 (2.9%)

As noted by **Table 4.4** above, Multi-Family Residential accounts are the highest consuming sector in the City, due to the fact that most of the City is zoned mostly for single and multi-family accounts (with higher densities for multi-family accounts). Industrial accounts actually have the highest consumption rate at average of nearly 3.5 AFY per connection over the past five years. Conversely, single family residential accounts have the lowest consumption rate, at around 0.5 AFY per connection (about 103 gallons per capita per day assuming a 4 person household).

Table 4.4 above also includes "unaccounted for water" which is defined as the difference between water production (supply) and consumption (bill to customers – Demand). Water loss may be attributed to leaking pipes, unmetered or unauthorized water use, inaccurate meters or meter reads, treatment losses, or other events causing water to be withdrawn from the system and not measured. Specific events that cause water loss include reservoir drainage for repairs, flushing for water quality purposes, hydrant flushing, sewer cleaning, street cleaning, and firefighting. The City's estimated average unaccounted for potable water is 4.0 percent over the past five years. As noted in **Table 4.4** the amount of potable water loss was the greatest in 2011 at 6.7 percent and improved significantly by 2015 to 2.9%. The biggest contributing factor to this decrease was the installation of Automated Meter Infrastructure and the replacement of nearly all customer meters in starting in 2011 and finishing in 2012. This indicates that the majority of "water loss" was not actual loss but metering inaccuracies. This improvement is expected to continue as the City has noted several water main replacements and rehabilitations between

the years 2013 and 2018 in their Five-Year Water Capital Improvement Program (CIP) Plan (Glendale, 2013).

According to American Water Works Associate (AWWA) standards, the water loss for well-operated systems is typically less than 10 percent and many systems have water losses of less than 5 percent annually. As shown in **Table 4.4**, the City's unaccounted for potable water is far less than the typical range of water losses of other water purveyors.

4.4 WATER CONSERVATION ACT

Act Background (SBx7-7)

Due to reductions of water in the San Joaquin Delta, the Legislature drafted the Water Conservation Act of 2009 (SBx7-7) to protect statewide water sources. The legislation called for a 20 percent reduction in water use in California by the year 2020. The legislation amended the water code to call for 2020 and 2015 water use targets in the 2010 UWMPs, updates or revisions to these targets in the 2015 UWMPs, and allows the Department of Water Resources (DWR) to enforce compliance to the new water use standards. Beginning this year (2016) failure to comply with interim and final targets will make the City ineligible for grants and loans from the State.

In addition to an overall statewide 20 percent water use reduction, the objective of SBx7-7 is to reduce water use within each hydrologic region in accordance with the agricultural and urban water needs of each region. Currently, the Department of Water Resources (DWR) recognizes 10 separate hydrologic regions in California as shown on the following page in **Figure 4.5**. Each hydrologic region has been established for planning purposes and corresponds to the State's major drainage areas. The City of Glendale is located in the South Coast Hydrologic Region (HR), which includes all of Orange County, most of San Diego and Los Angeles County, parts of Riverside, San Bernardino, and Ventura counties, and a small amount of Kern and Santa Barbara Counties. The South Coast HR is shown in **Figure 4.6** on page 4-7.

Per capita water use, measured in gallons per capita per day (GPCD), in the South Coast HR varies between different water agencies, depending on the geographic and economic conditions of the agency's service area. Regions or cities with more affluence, such as the City of Beverly Hills, typically consume more water and therefore have higher per capita water use numbers. As previously indicated in their 2010 UWMP Guidelines, DWR indicated that the South Coast Hydrologic Region had an overall baseline per capita water use of 180 GPCD. Thus DWR had established a regional target of 149 GPCD for the region as a compliance target to satisfy SBx7-7 legislation.

Figure 4.5: California's 2020 Water Conservation Goals (By Hydrologic Region)

Figure 4.6: South Coast Hydrologic Region

SBx7-7 Methodologies

To satisfy the provisions of SBx7-7, the City previously established a per capita water use target for the year 2020 as well as an interim target (2015). DWR provided guidelines for determining these targets in its *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (2011) and also in the 2010 and 2015 UWMP Guidebooks. In the 2010 UWMP, the City's baseline water use was determined on the City's historic water use from 1999 to 2009 by the procedures shown in **Figure 4.7** on the following page.

In the same fashion, the City was responsible for determining a 5-year baseline water use in accordance with DWR's guidelines. The *Methodologies* guidebook made provisions that allowed a water supplier to meet the target

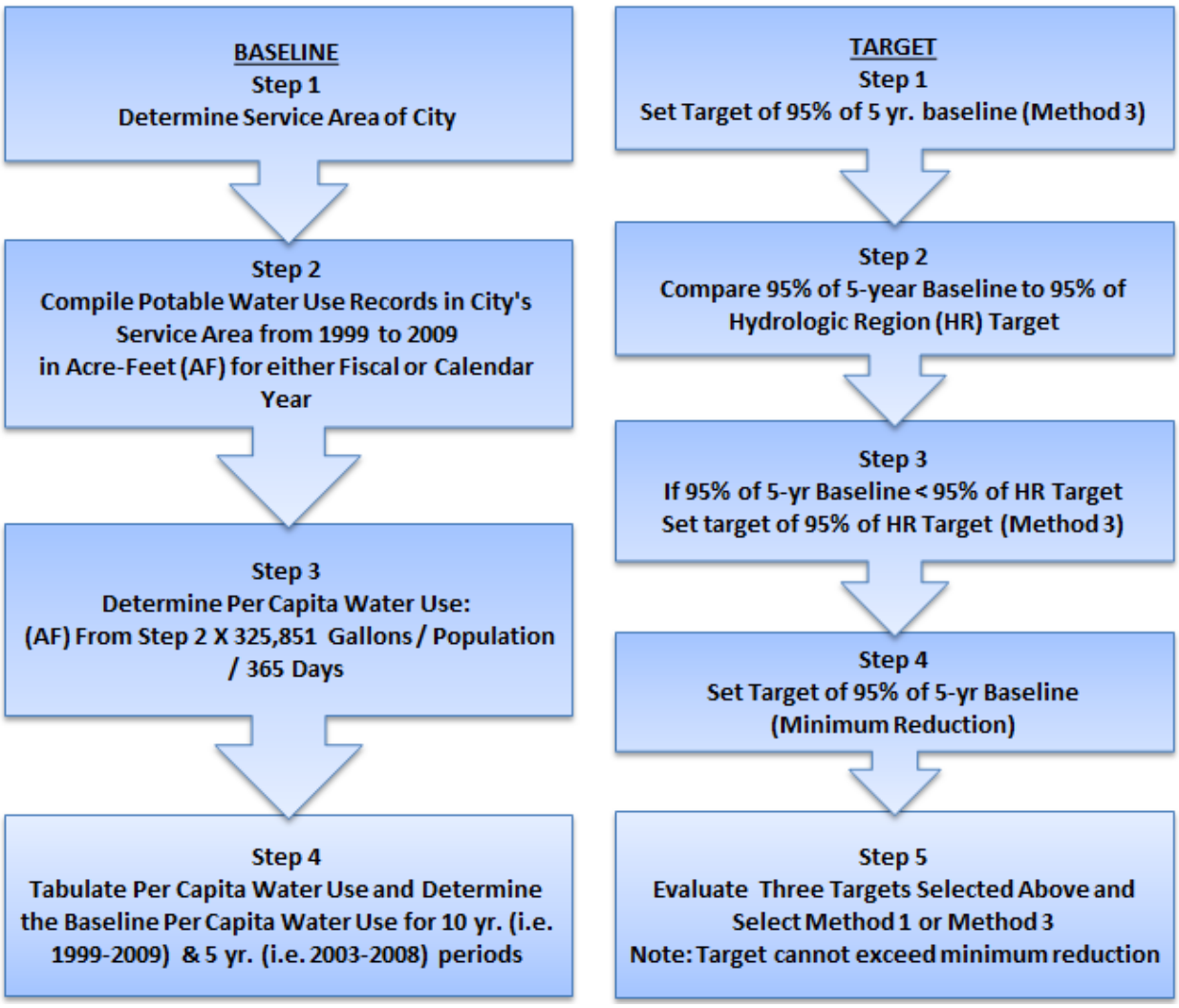

Figure 4.7: Procedure for Determining Baseline & Per Capita Water Use

requirements by achieving any one of a number of target requirements, provided that the water supplier's per capita water use is low enough relative to the region within which it supplies water. The basic options included a minimum reduction requirement of five percent (Water Code § 10620), a five percent reduction from the Regional (South Coast HR) target (Water Code § 10608.20 (b) (3)), or a strict 20 percent reduction.

These options were established in order to avoid placing any undue hardship on water agencies that have already been implementing water conservation measures for some time. The basic procedure for determining the applicable water reduction target is illustrated by **Figure 4.7** above. If an agency's 10-year baseline is slightly higher than the Hydrologic Region's Target, that agency still must achieve a five percent reduction from its 5-year baseline. If an agency has a per capita water use of 100 GPCD or less, that agency will not have to adhere to any reduction targets as that agency is already considered water efficient.

SBx7-7 Targets

Table 4.5 shows historic (2000-2009) as well as recent (2010-2015) water use, and also includes the baseline statistics that were previously included in this table**:**

Table 4.5
City of Glendale
Recent & Past GPCPD Water Use

Year	Total Consumption (AF)	Population (*)	Per Capita (GPCD)
2015	22,154	196,682	101
2014	25,731	195,799	117
2013	26,580	191,152	124
2012	25,932	192,674	120
2011	24,439	196,372	111
2010	24,233	201,893	107
2009	29,699	198,903	133
2008	31,908	197,580	144
2007	32,846	197,037	149
2006	31,079	197,277	141
2005	30,745	197,251	139
2004	32,666	196,382	148
2003	31,039	193.983	143
2002	28,095	191,594	131
2001	31,119	188,952	147
2000	32,587	186,573	156
10-yr. Baseline (2000-2009) (SB7: 10608.20)			**143.1**
5-yr. Baseline (2004-2008) (SB7: 10608.22)			**144.3**
South Coast HR:			**149**

**Serving Population*

As determined previously in the City's 2010 UWMP, the City's 10-yr and 5-yr baselines were determined to be 143.1 GPCD and 144.3 GPCD, respectively. Current SBx7-7 baselines targets are indicated in **Table 4.6** below:

Table 4.6
City of Glendale
2020 Water Use Targets

Min. Reduction Requirement (10608.22)	20% Target (10608.20) (b)(1)	5% Reduction from Regional Target (10608.20) (b)(3)
137	114	141.6
2020 Per Capita Target:		**137**
2015 Interim Target:		**140.1**
Recent (2011-2015) Per Capita Water Use:		**115**
2015 Water Use:		**101**

As previously indicated in the 2010 UWMP, the City selected a SBx7-7 target of 137.0 GPCD for 2020 (five percent from its 5-year baseline) as this amount is less than 141.6 GPCD (five percent reduction from the South Coast HR's regional target). The City is presently well below its 2020 target as depicted in **Table 4.6** and has no intentions of changing that target in this 2015 UWMP.

Methods to Achieve SBx7-7 Target

Although the requirements of SBx7-7 seem stringent, it is noteworthy to mention that the City has seen an overall increase in water efficiency from 2005-2015. This is due in part to the success of conservation measures, including water-saving plumbing fixtures and overall water conservation awareness.

The City understands the unique needs of its customers and also the importance of efficient water use. As a result, the City will utilize management strategies specific to the needs of its residents. The methods to be used by the City in achieving its 2020 reduction requirements consist of the CUWCC Best Management Practices (BMPs) listed in **Section 6** and additional City conservation programs (if different from the CUWCC BMPs).

In addition, the City may enact additional water use restrictions in accordance with its Water Shortage Contingency Plan, which was recently updated in 2015. With increased public awareness of SBx7-7 requirements and Governor Brown's 25% mandate in April 2015, it is likely that the public will begin to understand the importance of water conservation and will begin to use water more efficiently.

Impacts on Bay-Delta

Through adherence to conservation measures, the City can participate in statewide efforts to conserve Sacramento-San Joaquin Bay-Delta Water and to protect the ecological habitat of the region. The Bay-Delta is crucial to the health of the state's natural environment, its residents, and the economy. As an estuary (an inland body of water where fresh river water mixes with salty sea water), the Delta and its islands create a habitat for hundreds of aquatic and terrestrial species, some of which are unique to the region. Delta water irrigates local farms where much of the nation's domestic fresh produce is grown. Finally, freshwater originating in the Sierra Nevada flows through the Delta, providing water supplies for 25 million Californians and the economies in the San Francisco Bay Area, the Central Valley, and of course Southern California.

Figure 4.8: Bay-Delta Water Must Be Preserved

Through conservation measures and the use of renewable, local groundwater supplies, the City can reduce demand for Bay-Delta water. The City will also continue the push for sustainability from local water sources by 2020 to safeguard the State's imported water sources, including the Bay-Delta as well as the Colorado River.

4.5 PROJECTED WATER USE

Future water use projections must consider significant factors on water demand, such as development and/or redevelopment, and climate patterns, among other less significant factors that affect water demand. Although redevelopment is expected to be an ongoing process, it is not expected to significantly impact water use. Rainfall, however, will continue to extend a major influence on demand as drought conditions will increase demand at a time when these supplies are limited and may therefore result in water use restrictions in accordance with the City's Water Shortage Contingency Plan (i.e. Advisory, Stage 1, etc). As the City's population continues to grow and as water conservation measures continue to be implemented, the City should experience moderate increases in its water consumption due only to population increases.

For planning purposes, the City's projected

water use for 2020-2040 using historical GDCP for the last 10 years. The average GDCP of 126 was calculated between 2010 and 2015 then multiplied by the projected population for 2020 to 2040. Future demands were broken down by the percentage average for each sector. The residential sector includes low-income housing units. The City of Glendale's planning department estimates that 3.5% of households were low-income single family owners (about 1,049 homes), and 21.5% of households were low-income multi-family renters (about 9,668 MF-residential). The average household demand of 19 HCF / month which equals 0.52 acre-feet/unit/year and thus 5,617 acre-feet/year is needed to supply these projected lower income housing units. These water demands are included in the future water demand projections for single and multi-family homes shown in **Table 4.7** below.

Table 4.7
Projected Water Use by Sector

Sector	2020	2025	2030	2035	2040
Water Service Area Population	199,606	202,574	205,586	208,643	211,745
Demands					
Single Family Residential	11,555	11,727	11,901	12,078	12,257
Multi-Family Residential	10,991	11,155	11,320	11,489	11,660
Commercial/Institutional	4,227	4,290	4,354	4,419	4,484
Industrial	705	715	726	736	747
Landscape Irrigation	648	658	668	678	688
Other	56	57	58	59	60
Subtotal:	**28,182**	**28,601**	**29,027**	**29,458**	**29,896**

**Based on consumption rate of 126 GPCD (Historical GPDC from 2005 to 2015). The estimated consumption rate not only accounts for the City's SBx7-7 goals, but also accounts for changes in water use trends in the City due to the City's own policies, codes, ordinances and planning efforts related to land use. These are known as "passive savings".*

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SECTION 5: RELIABILITY PLANNING

The recent drought (pictured) has resulted in significant impacts on the State's water supplies. The Water Conservation Act of 2009 (SBx7-7) was signed into law by Gov. Schwarzenegger which requires mandatory water conservation up to 20% by 2020. The City routinely reviews practices that will provide its customers with adequate and reliable supplies.

SECTION 5: RELIABILITY PLANNING

5.1 INTRODUCTION

Drought conditions continue to be a critical issue for Southern California's water supply. As the population of Southern California continues to increase and as environmental regulations restrict imported and local water supplies, it is important that each agency manage its water consumption in the face of drought. This can be accomplished through conservation and supply augmentation, and additionally through prohibitions under penalty of law during times of seasonal or catastrophic shortage in accordance with local ordinances.

This section discusses local and regional efforts to ensure a reliable supply of water and compares projected supply to projected demand up to the year 2040. Demand and supply projections are provided in **Tables 5.3 - 5.9** on the following pages.

5.2 HISTORIC DROUGHTS

California experienced a drought during 1976-77, considered the worst drought in state history until today. The local region experienced the next prolonged drought from 1987 through 1992 but it was the drought from 2007 to 2009 for which a first statewide proclamation of emergency was issued prompting the City of Glendale to declared Phase II Mandatory Conservation. Phase II Ordinance limits outside watering to three days a week for 10 minutes at each watering station; except for California-friendly landscaping, there shall be a deferral of all new or retrofit landscaping or turf planting requiring potable water service irrigation for private or City landscaping projects.

The City met its customers' needs by investing in an aggressive water demand reduction program to provide a mandatory water conservation plan to minimize the effect of a shortage of water to the customers of the city and to adopt provisions that will significantly reduce the consumption of water over extended period of time thereby extending the available water required for the customers of the city, to protect basic human health, safety and quality of life, to share the impacts caused by the water shortage in accord with the severity of the water shortage, and to minimize the hardship to the city and the general public to the greatest extent possible.

Figure 5.1: Lake Oroville: 2009 Drought

To say the least, the City of Glendale is committed to protecting, preserving, and restoring the natural environment.

Figure 5.2: Effects of Recent Drought on California's Reservoirs

5.3 RECENT DROUGHT (2011-2015)

A significant drought has hit the state of California since 2011. 2013 was the driest calendar year on record, and January and February 2015 were the driest months on record. The drought has depleted reservoir levels all across the state, as reflected by **Figure 5.2** above. In January of 2014, Governor Brown declared a state of emergency and directed state officials to take all necessary actions to prepare for water shortages. As the drought prolonged into 2015, to help cope with the drought, Governor Brown gave an executive order in April 2015 which mandated a statewide 25% reduction in water use.

In January of 2016, the California Department of Water Resources and the U.S. Bureau of Reclamation have finalized the 2016 Drought Contingency Plan that outlines State Water Project and Central Valley Project operations for February 2016 to November 2016. The plan was developed in coordination with staff from State and federal agencies. One of the key purposes of this plan is to communicate goals for 2016 water management and the potential operations needed to achieve those goals for water resources stakeholders and the public.

The drought has more significantly impacted surfaces waters and other agencies that use water for agriculture, on April 14, 2015, The Metropolitan Water District Board restricted wholesale water deliveries to member agencies with cutbacks amounting to a 15 percent reduction in supplies starting in July 1 and included stiff surcharges for member agencies that go over their allocation. On April 28, 2015 the City of Glendale approved Phase III Mandatory Water Conservation which allows landscape

watering only two days a week per 10 minutes at each station.

To date, Californians have reduced water use by about 25 percent since emergency conservation regulations took effect in June. This continues to meet Governor Brown's 25 percent mandate (despite a decline in the statewide water-savings rate for the last two months).

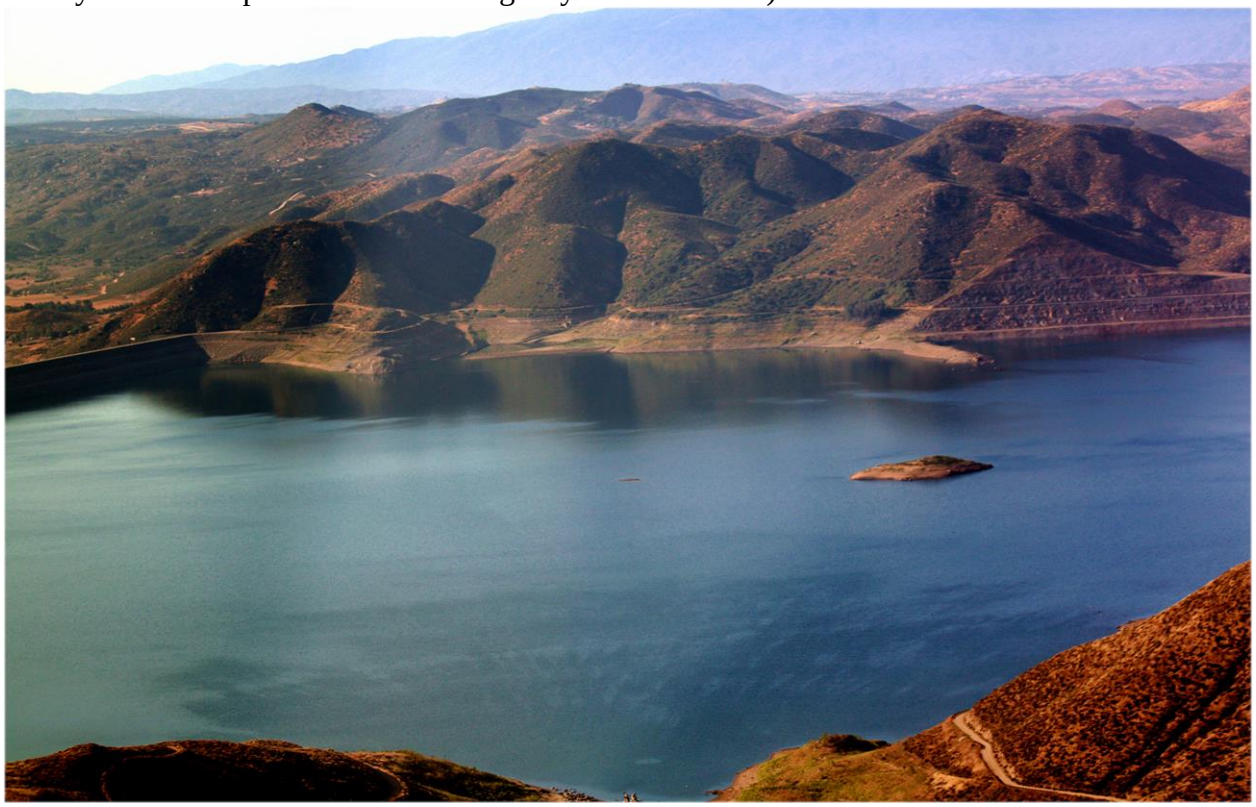

Figure 5.3: MWD's 800,000 AF Diamond Valley Lake

5.4 REGIONAL SUPPLY RELIABILITY

As a result of continued challenges to its water supplies, MWD and its member agencies understand the importance of reliable water supplies. Along with close participation of its member agencies, MWD strives to meet the water needs of Southern California by developing new projects to increase the capacity of its supplies while encouraging its member agencies to develop local supply project to meet the needs of its customers. Also, MWD is committed to developing and maintaining high-capacity storage reservoirs, such as Diamond Valley Lake, to meet the needs of the region during times of drought and emergency.

MWD operates Diamond Valley Lake, an 800,000 AF reservoir, to avoid the repercussions of reduced supplies from the SWP and CRA. In addition, MWD operates several additional storage reservoirs in Riverside, San Bernardino, and San Diego Counties to store water obtained from the SWP and the CRA. Storage reservoirs like these are a key component of MWD's supply capability and are crucial to MWD's ability to meet projected demand without having to implement the Water Supply Allocation Plan (WSAP). This is crucial since the SWP and CRA have become more restricted, which could render the City's supplies more vulnerable to shortage.

Colorado River Aqueduct Reliability

Water supply from the CRA continues to be a critical issue for Southern California as MWD competes with several agricultural water agencies in California for unused water rights to the Colorado River. Although California's allocation has been established at 4.4 million acre-feet (MAF) per year, MWD's allotment stands at 550,000 AFY with additional amounts, which increase MWD's allotment to 842,000 AFY if there is any unused water from the agricultural agencies.

MWD recognizes that competition from other states and other agencies within California has decreased the CRA's supply reliability. In 2003, the Quantification Settlement Agreement (QSA) was signed, which facilitated the transfer of water from agricultural agencies to urban uses. This historic agreement provides California the means to implement transfers and supply programs that will allow California to live within the state's 4.4 MAF basic annual apportionment of Colorado River water.

State Water Project Reliability

The reliability of the SWP impacts MWD's member agencies' ability to plan for future growth and supply. DWR's Bulletin 132-12, August 2014, provides certain SWP reliability information, and in July 2015, the DWR Bay-Delta Office prepared a report specifically addressing the reliability of the SWP. This report, The State Water Project Final Delivery Capability Report, provides information on the reliability of the SWP to deliver water to its contractors assuming historical precipitation patterns.

On an annual basis, each of the 29 SWP contractors including MWD request an amount of SWP water based on their anticipated yearly demand. In most cases, MWD's requested supply is equivalent to its full Table A Amount. After receiving the requests, DWR assesses the amount of water supply available based on precipitation, snow pack on northern California watersheds, volume of water in storage, projected carry over storage, and Sacramento-San Joaquin Bay Delta regulatory requirements. For example, the SWP annual delivery of water to contractors has ranged from 552,600 AFY in 1991 to 4.2 MAF in 2015. Due to the uncertainty in water supply, contractors are not typically guaranteed their full Table A Amount, but instead a percentage of that amount based on the available supply.

Each December, DWR provides the contractors with their first estimate of allocation for the following year. As conditions develop throughout the year, DWR revises the allocations. Currently, the 2016 is set at 4.2 MAF.

Figure 5.4: State Water Project (SWP)

Due to the variability in supply for any given year, it is important to understand the reliability of the SWP to supply a specific amount of water each year to the contractors.

Current Reservoir Levels

Statewide, storage reservoir levels rise and fall due to seasonal climate changes, which

induce increase in demand. During periods of drought, reservoir levels can drop significantly and can limit the amount of supplies available. As a result, both DWR and MWD monitor their reservoir levels regularly. In 2009, conditions of several key reservoirs indicated drought conditions. Currently, reservoir levels are high, as indicated by **Figures 5.5** and **5.6** on the following pages, due to the recent "Miracle March" which double the average precipitation in the northern Sierra since the beginning of March 2016.

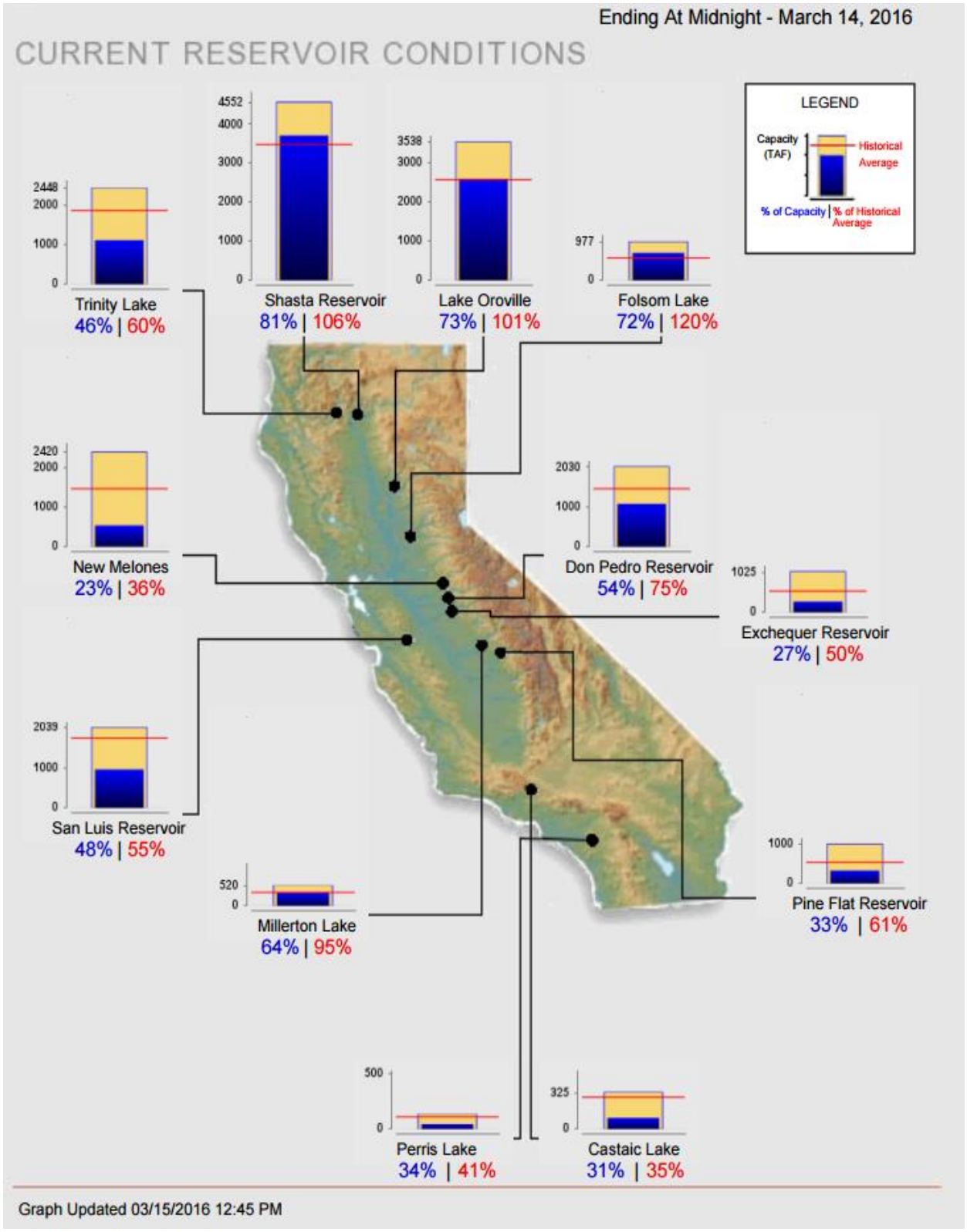

Figure 5.5: California State Reservoir Levels

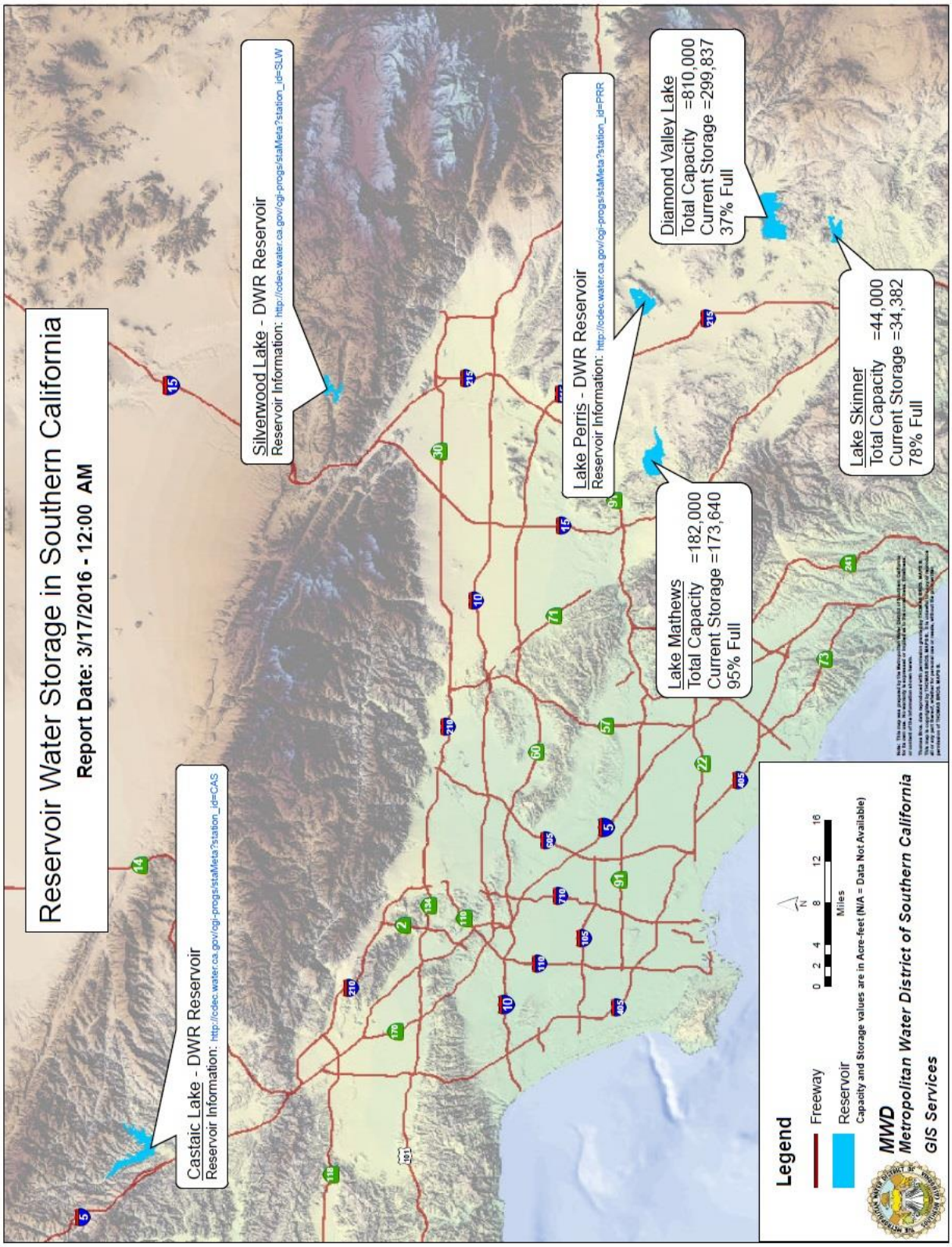

Figure 5.6: MWD Reservoir Levels

5.5 SUPPLY VS. DEMAND

As the City obtains its water sources from local groundwater, recycled water, but mainly from imported water, the City's supply reliability increases when a continuous access to this imported water is maintained. The City's water supply reliability is also based on the capacity and vulnerability of its infrastructure in addition to the seasonal demand changes brought about by periods of drought. Population growth will also continue to be a factor in future reliability projections.

Regional Supply Reliability

Southern California is expected to experience an increase in regional demands in the years 2015 through 2040 as a result of population growth. Although increases in demand are expected, they are limited due to the requirements of SBx7-7, which provides a cap on water consumption rates (i.e. per capita water use). It can be reasonably expected that the majority of agencies will be at or near their compliance targets by 2020 and thereafter as conservation measures are more effectively enforced.

Tables 2.4-2.6 of MWD's 2015 UWMP shows supply reliability projections for average and single dry years through the year 2040. The data in these tables is important to effectively project and analyze supply and demand over the next 25 years for many regional agencies. It is noteworthy that Projected Supplies During a Single Dry Year and Multiple Dry Years indicates MWD's projected supply will exceed its projected single dry year and multiple dry year demands in all years. Likewise, for average years, MWD supply exceeds projected demands for all years. The data contained in these tables has an indirect effect on the City's imported supply capacity, and thus this data will also be used to develop the City's own projected supply and demand over the next 25 years. **Tables 5.2** and **5.3** on the following pages show MWD's supply reliability.

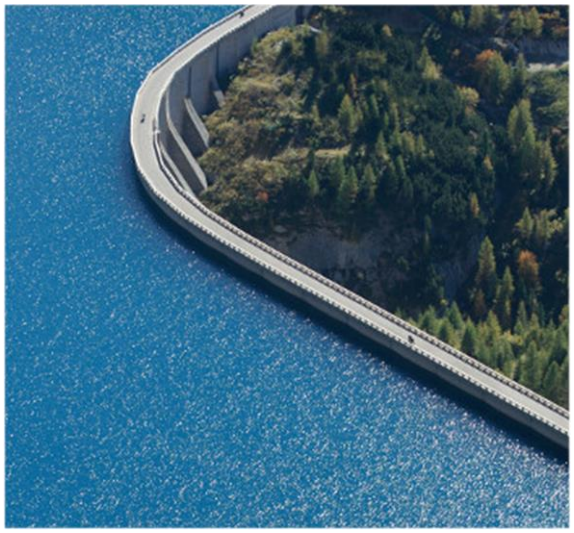

Figure 5.7: Reservoir Storage

City Supply Reliability

To project future supply and demand comparisons, it will be assumed that demand will increase annually based on population growth and a constant of 109 GPCD in accordance with SBx7-7 requirements. During times of drought, however, demand will increase at a time when supply will decrease. To project demands during drought periods, the following factors measured from actual demand data from dry years 2012-2014 will be assumed:

- **Single Dry Year Demand Increase**: 103.6% of Normal

Tables **5.1** to **5.9**, shown on the following pages, provide an analysis of MWD and City supply and demand projections.

Table 5.1
MWD Regional Imported Water Supply Reliability Projections
Average and Single Dry Years (AF)

Row	Region Wide Projections	2020	2025	2030	2035	2040
Supply Information						
A	Projected Supply: Average Year	3,653,000	3,755,000	3,925,000	4,055,000	4,091,000
B	Projected Supply: Dry Year	2,537,000	2,639,000	2,744,000	2,874,000	2,910,000
C = B/A	Projected Avg. Yr. / Dry Yr. Supply (%)	**69.4%**	**70.3%**	**69.9%**	**70.9%**	**71.1%**
Demand Information						
D	Projected Average Year Demand	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
E	Projected Dry Year Demand	2,005,000	2,066,000	2,108,000	2,160,000	2,201,000
F = E/D	Projected Dry Year / Average Year (%)	**107.8%**	**107.7%**	**107.6%**	**107.6%**	**107.5%**
Surplus						
G = A-D	Projected Surplus: Average Year	1,793,000	1,837,000	1,966,000	2,047,000	2,044,000
H = B-E	Projected Surplus: Dry Year	532,000	573,000	636,000	714,000	709,000
Programs Under Development						
I	Projected Capability of Programs (Average Year)	63,000	100,000	343,000	385,000	425,000
J	Projected Capability of Programs (Dry Year)	63,000	100,000	316,000	358,000	398,000
Potential Surplus						
K=A+I-D	Projected Surplus: Average Year	1,856,000	1,937,000	2,309,000	2,432,000	2,469,000
L=B+J-E	Projected Surplus: Dry Year	532,000	573,000	636,000	714,000	709,000
Comparisons						
I = A/D	Projected Avg. Yr. Supply/Demand (%)	**196.4%**	**195.8%**	**200.4%**	**201.9%**	**199.9%**
J = A/E	Projected Dry Yr. Supply/Demand (%)	**126.5%**	**127.7%**	**130.2%**	**133.1%**	**132.2%**

Table 5.2
MWD Regional Imported Water Supply Reliability Projections
Average and Multiple Dry Years (AF)

Row	Region Wide Projections	2020	2025	2030	2035	2040
Supply Information						
A	Projected Supply: Average Yr.	3,653,000	3,755,000	3,925,000	4,055,000	4,091,000
B	Projected Supply: Multiple Dry Yr.	2,151,000	2,202,000	2,246,000	2,298,000	2,316,000
C = B/A	Proj. Avg. Yr./Mult. Dry Yr. Supply (%)	**58.9%**	**58.6%**	**57.2%**	**56.7%**	**56.6%**
Demand Information						
D	Projected Average Year Demand	1,860,000	1,918,000	1,959,000	2,008,000	2,047,000
E	Projected Multiple Dry Year Demand	2,001,000	2,118,000	2,171,000	2,216,000	2,258,000
F = E/D	Projected Dry Year / Average Year (%)	**107.6%**	**110.4%**	**110.8%**	**110.4%**	**110.3%**
Surplus						
G = A-D	Projected Surplus: Average Year	1,793,000	1,837,000	1,966,000	2,047,000	2,044,000
H = B-E	Projected Surplus: Multiple Dry Year	150,000	84,000	75,000	82,000	58,000
Programs Under Development						
I	Projected Capability of Programs (Average Year)	63,000	100,000	343,000	385,000	425,000
J	Projected Capability of Programs (Multiple Dry Year)	43,000	80,000	204,000	245,000	286,000
Potential Surplus						
K=A+I-D	Projected Surplus: Average Year	1,856,000	1,937,000	2,309,000	2,432,000	2,469,000
L=B+J-E	Projected Surplus: Multiple Dry Year	150,000	84,000	75,000	82,000	58,000
Comparisons						
I = A/D	Projected Avg. Yr. Supply/Demand (%)	**196.4%**	**195.8%**	**200.4%**	**201.9%**	**199.9%**
J = A/E	Projected Dry Yr. Supply/Demand (%)	**107.5%**	**104.0%**	**103.5%**	**103.7%**	**102.6%**

Table 5.3
City of Glendale Supply Availability & Demand Projections
Normal Water Year (AF)

Water Sources	2020	2025	2030	2035	2040
Population					
Water Service Area Population	199,606	202,574	205,586	208,643	211,745
Supply					
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater (San Fernando and Verdugo Basins)	11,656	11,656	11,656	11,656	11,656
Recycled Water	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Demand					
Total Normal Demand	**28,182**	**28,601**	**28,027**	**29,458**	**29,896**
% of 2010-2014 Avg. Demand (25,383)	111.0%	112.7%	114.4%	116.1%	117.8%
Supply/Demand Comparison					
Supply/ Demand Difference	**11,358**	**10,939**	**10,513**	**10,082**	**9,644**
Supply/Demand (%)	**140.3%**	**138.2%**	**136.2%**	**134.2%**	**132.3%**

Table is intended only to show City has the capacity to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPCD from 2005 to 2015) multiplied by population projections shown above.

2. Imported Water Supply represents supply available to the City, if needed, based on the City's MWD Tier 1 Limit of 26,222 AFY – 2015 MWD UWMP, Table 2.13 (Method Differs from 2010 UWMP).

3. Groundwater Supplies: In the next 25 years, the City expects the same supply from the San Fernando Basin (7,800 AFY) and full water rights usage from the Verdugo Basin (3,856 AFY).

4. Recycled Water: In the next 25 years recycled water is expected to remain constant with little addition (1,662 AFY).

This Table not intended to be a projection of City's actual groundwater production. City may pump amounts different (above or below) from its adjudicated rights based on production and treatment capacity of its Wells facility.

**This Table is not intended to be a projection of City's actual demand. Demand of 126 GPCD is based on Historical GPCD from 2005 to 2015, which is lower than the City's SBx7-7 -2020 Per Capita Target of about 137GPCD. Actual demand may be above or below of 126 GPCD in accordance with water usage needs in the City.*

Table 5.4
City of Glendale Water Supply Availability & Demand Projections
Single Dry Year (AF)

Water Sources	2020	2025	2030	2035	2040
Population					
Water Service Area Population	199,606	202,574	205,586	208,643	211,745
Supply					
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Water	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%
Demand					
Total Dry Demand	**29,198**	**29,632**	**30,072**	**30,520**	**30,973**
Normal Year Demand	28,182	28,601	29,027	29,458	29,896
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
Supply/Demand Difference	10,342	9,908	9,468	9,020	8,567
Supply/Demand (%)	135.4%	133.4%	131.5%	129.6%	127.7%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPCD from 2005 to 2015) multiplied by population projections shown above.

2. Imported Water Supply represents supply available to the City, if needed, based on the City's MWD Tier 1 Limit of 26,222 AFY – 2015 MWD UWMP, Table 2.13 (Method Differs from 2010 UWMP).

3. Groundwater Supplies: In the next 25 years, the City expects the same supply from the San Fernando Basin (7,800 AFY) and full water rights usage from the Verdugo Basin (3,856 AFY).

4. Recycled Water: In the next 25 years recycled water is expected to remain constant with little addition (1,662 AFY).

**See notes below Table 5.4 for explanation of groundwater supply / overall demand.*

Table 5.5
City of Glendale Water Supply Availability & Demand Projections
Multiple Dry Years (2016-2020) (AF)

Water Sources	2016	2017	2018	2019	2020
Population					
Water Service Area Population	197,263	197,847	198,431	199,018	199,606
Supply					
	Multiple Dry Years				
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Dry Weather Urban Runoff	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%
Demand					
	Multiple Dry Years				
Total Normal / Mult. Dry Demand	**28,855**	**28,940**	**29,026**	**29,112**	**29,198**
Normal Year Demand	27,852	27,934	28,017	28,099	28,182
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
	Multiple Dry Years				
Supply/Demand Difference	10,685	10,600	10,514	10,428	10,342
Supply/Demand (%)	137.0%	136.6%	136.2%	135.8%	135.4%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPDC from 2005 to 2015) multiplied by population projections shown above and by multiple dry year increase of 103.6%

2. All other items derived in similitude to Table 5.3.

**See notes below Table 5.3 for explanation of groundwater supply / overall demand.*

Table 5.6
City of Glendale Water Supply Availability & Demand Projections
Multiple Dry Years (2021-2025) (AF)

Water Sources	2021	2022	2023	2024	2025
Population					
Water Service Area Population	200,196	200,788	201,382	201,977	202,574
Supply					
	Multiple Dry Years				
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Dry Weather Urban Runoff	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100%	100%	100%	100%	100%
Demand					
	Multiple Dry Years				
Total Normal / Mult. Dry Demand	**29,284**	**29,371**	**29,457**	**29,545**	**29,632**
Normal Year Demand	28,266	28,349	28,433	28,517	28,601
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
	Multiple Dry Years				
Supply/Demand Difference	10,256	10,169	10,083	9,995	9,908
Supply/Demand (%)	135.0%	134.6%	134.2%	133.8%	133.4%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPDC from 2005 to 2015) multiplied by population projections shown above and by multiple dry year increase of 103.6%

2. All other items derived in similitude to Table 5.3.

**See notes below Table 5.3 for explanation of groundwater supply / overall demand.*

Table 5.7
City of Glendale Water Supply Availability & Demand Projections
Multiple Dry Years (2026-2030) (AF)

Water Sources	2026	2027	2028	2029	2030
Population					
Water Service Area Population	203,173	203,774	204,376	204,980	205,586
Supply					
	Multiple Dry Years				
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Dry Weather Urban Runoff	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%
Demand					
	Multiple Dry Years				
Total Normal / Mult. Dry Demand	**29,719**	**29,807**	**29,895**	**29,984**	**30,072**
Normal Year Demand	26,686	28,771	28,856	28,941	29,027
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
	Multiple Dry Years				
Supply/Demand Difference	9,821	9,733	9,645	9,556	9,468
Supply/Demand (%)	133.0%	132.7%	132.3%	131.9%	131.5%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPDC from 2005 to 2015) multiplied by population projections shown above and by multiple dry year increase of 103.6%

2. All other items derived in similitude to Table 5.3.

**See notes below Table 5.3 for explanation of groundwater supply / overall demand.*

Table 5.8
City of Santa Glendale Supply Availability & Demand Projections
Multiple Dry Years (2031-2035) (AF)

Water Sources	2031	2032	2033	2034	2035
Population					
Water Service Area Population	206,194	206,803	207,415	208,028	208,643
Supply					
	Multiple Dry Years				
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Dry Weather Urban Runoff	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%
Demand					
	Multiple Dry Years				
Total Normal / Mult. Dry Demand	**30,161**	**30,251**	**30,340**	**30,430**	**30,520**
Normal Year Demand	29,113	29,199	29,285	29,371	29,458
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
	Multiple Dry Years				
Supply/Demand Difference	9,379	9,289	9,200	9,110	9,020
Supply/Demand (%)	131.1%	130.7%	130.3%	129.9%	129.6%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPDC from 2005 to 2015) multiplied by population projections shown above and by multiple dry year increase of 103.6%

2. All other items derived in similitude to Table 5.3.

**See notes below Table 5.3 for explanation of groundwater supply / overall demand.*

Table 5.9
City of Glendale Supply Availability & Demand Projections
Multiple Dry Years (2036-2040) (AF)

Water Sources	2036	2037	2038	2039	2040
Population					
Water Service Area Population	209,260	209,878	210,499	211,121	211,745
Supply					
	Multiple Dry Years				
Imported Water	26,222	26,222	26,222	26,222	26,222
Groundwater	11,656	11,656	11,656	11,656	11,656
Recycled Dry Weather Urban Runoff	1,662	1,662	1,662	1,662	1,662
Total Supply	**39,540**	**39,540**	**39,540**	**39,540**	**39,540**
Normal Year Supply	39,540	39,540	39,540	39,540	39,540
% of Normal Year	100.0%	100.0%	100.0%	100.0%	100.0%
Demand					
	Multiple Dry Years				
Total Normal / Mult. Dry Demand	**30,610**	**30,700**	**30,791**	**30,882**	**30,973**
Normal Year Demand	29,545	29,633	29,720	29,808	29,896
% of Normal Year	103.6%	103.6%	103.6%	103.6%	103.6%
Supply/Demand Comparison					
	Multiple Dry Years				
Supply/Demand Difference	8,930	8,840	8,749	8,658	8,567
Supply/Demand (%)	129.2%	128.8%	128.4%	128.0%	127.7%

Table is intended only to show City will be able to meet demand for all years per the following*:

1. Total Demand based on 126 GPCD (Historical GPDC from 2005 to 2015) multiplied by population projections shown above and by multiple dry year increase of 103.6%

2. All other items derived in similitude to Table 5.3.

**See notes below Table 5.3 for explanation of groundwater supply / overall demand.*

Based on the data contained in **Tables 5.3-5.9**, the City can expect to meet future demands through 2040 for all climatologic classifications. Projected groundwater and imported water supply capacities are not expected to be significantly affected during times of low rainfall and over short term dry periods of up to three years; however, during prolonged periods of drought, the City's imported water supply capacities may potentially be reduced significantly due to reductions in MWD's storage reservoirs resulting from increases in regional demand.

5.6 VULNERABILITY OF SUPPLY

Due to the semi-arid nature of the City's climate and as a result of past drought conditions, the City is vulnerable to water shortages due to its climatic environment and seasonally hot summer months. While the data shown in **Tables 5.3** through **5.9** identifies water availability during single and multiple dry year scenarios, response to a future drought would follow the water use efficiency mandates of the City's Water Shortage Contingency Plan along with implementation of the appropriate stage of regional plans, such as the WSDM Plan (MWD). These programs are discussed in **Section 7**.

5.7 WATER SUPPLY OPPORTUNITIES

City Projects

In general, the City continually reviews practices that will provide its customers with adequate and reliable supplies. As discussed in previous sections, the City is dedicated to maximizing its supply sources to meet or go beyond its established 2020 GPDC targets. In the 2010 UWMP, the City stated the implementation of two planned future water supply projects or programs that will increase water supply. One of the projects mentioned was to construct a new well within Verdugo Basin to increase water production. The second project was the replacement of the Chevy Chase 968 Reservoir from an originally 14.5 MG to a 15 MG including a new pump station. The remaining projects are all system improvement projects and thus will not increase water supply. The City is also planning to continue increasing recycled water use by adding small users and expand the marketing effort to neighboring agencies, as well as the continuation of programs that consider other alternate sources such as greywater, and rainwater harvesting.

The City also expects to continue operating the Glendale Water Treatment Plant (GWTP) at full capacity.

The increased development of Glendale local water sources will firm up water supplies available to the City as the local water supplies are expected to be available during wet or dry years and even in times of extended drought. The imported supplies from Northern California and, to a lesser extent, the Colorado River may be affected during drought years. The MWD's storage programs also improve MWD's overall water reliability to provide all the water Glendale needs even during dry periods.

Regional Projects (MWD)

MWD is implementing water supply alternative strategies for the region and on behalf of member agencies to ensure available water in the future, including:

- Conservation
- Water recycling & groundwater recovery
- Storage and groundwater management programs within the region

- Storage related to SWP & CRA
- Other water supply management programs outside of the region

MWD has made investments in conservation and supply augmentation as part of its long-term water management strategy. MWD's approach to a long-term water management strategy was to develop an Integrated Resource Plan (IRP) to include many supply sources. A brief description of the various programs implemented by MWD to improve reliability is included in **Table 5.10** below.

Table 5.10
MWD IRP Regional Resources Status

Supply	Description	
Colorado River Aqueduct (CRA)	MWD holds a basic apportionment of Colorado River water and has priority for an additional amount depending on availability of surplus supplies. Water management programs supplement these apportionments.	
State Water Project (SWP)	MWD receives water delivered under State Water Contract provisions, including Table A contract supplies, use of carryover storage in San Luis Reservoir, and Article 21 interruptible supplies.	
Conservation	MWD and the member agencies sponsor numerous conservation programs in the region that involve research and development, incentives, and consumer behavior modification.	
	Code-Based Conservation	Water savings resulting from plumbing codes and other institutionalized water efficiency measures. Sometimes referred to as "passive conservation," this form of conservation would occur as a matter for course without any additional action from water agencies.
	Active Conservation	Water saved as a direct result of conservation programs and practices directly funded by a water utility, e.g., measures outlined by the California Urban Water Conservation Council's (CUWCC) Best Management Practices (BMPs). Water savings from active conservation completed through 2008 will decline to zero as the lifetime of those devices is reached. This will be offset by an increase in water savings for those devices that are mandated by law, plumbing codes or other efficiency
	Price Effect Conservation	Reductions in customer use attributable to changes in the real (inflation adjusted) cost of water. Because water has a positive price elasticity of demand, increases in water price will decrease the quantity demanded.
Local Resources	*Groundwater*	Member-agency produced groundwater from the groundwater basins within the service area.
	Groundwater Recovery	Locally developed and operated, groundwater recovery projects treat contaminated groundwater to meet potable use standards. MWD offers financial incentives to local and member agencies through its Local Resources Program for recycled water and groundwater recovery. Details of the local resources programs are provided in
	Los Angeles Aqueduct (LAA)	A major source of imported water is conveyed from the Owens Valley via the LAA by Los Angeles Department of Water and Power (LADWP). Although LADWP imports water from outside of MWD's service area, MWD classifies water provided by the LAA as a local resource because it is developed and controlled by a local agency.
	Recycling	Recycled water projects recycle wastewater for M&I use.

	Surface Water	Surface water used by member agencies comes from stream diversions and rainwater captured in reservoirs.
Groundwater Conjunctive Use Storage Programs	MWD sponsors various groundwater storage programs, including, cyclic storage programs, long-term replenishment storage programs, and contractual conjunctive use programs.	
Surface Water Storage	MWD reservoirs (Diamond Valley Lake, Lake Mathews, Lake Skinner) and flexible storage in California Department of Water Resources (DWR) reservoirs (Castaic Lake, Lake Perris).	
Central Valley Storage & Transfers	Central Valley storage programs consist of partnerships with Central Valley water districts to allow MWD to store SWP supplies in wetter years for return in drier years. MWD's Central Valley transfer programs consist of partnerships with Central Valley Project and SWP settlement contractors to allow MWD to purchase water in drier years.	

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SECTION 6: CONSERVATION MEASURES

The installation of water efficient plants and efficient sprinkler controllers can conserve between 20%-50% water and reduce runoff by up to 70%.

SECTION 6: CONSERVATION MEASURES

6.1 INTRODUCTION

As a result of diminished existing supplies and difficulty in developing new supplies, water conservation is important to Southern California's sustainability. Therefore, the City acknowledges that efficient water use is the foundation of its current and future water planning and operations policies.

Figure 6.1: Water Waste is Prohibited by City Code

To conserve California's water resources, several public water agencies and other interested parties of the California Urban Water Conservation Council (CUWCC) drafted the Memorandum of Understanding Regarding Urban Water Conservation (MOU) in 1991. The MOU establishes 14 Best Management Practices (BMPs) which are defined roughly as policies, programs, practices, rules, regulations, or ordinances that result in the more efficient use or conservation of water.

Updates to BMPs for 2015 UWMPs

In previous years, the 14 CUWCC BMPs coincided with the 14 Demand Management Measures (DMMs) defined in the UWMP Act. The DMMS are intended to reduce long-term urban demands from what they would have been without their implementation. The DMMs are in addition to programs which may be instituted during occasional water supply shortages.

For 2015 UWMPs, the Department of Water Resources (DWR) has refined the list of DMMs required to be reported in the 2015 UWMPs.

- ***Water Waste Prohibition Ordinances***
- ***Metering***
- ***Conservation Pricing***
- ***Public Education & Outreach***
- ***Programs to Assess and Manage Distribution System Real Loss***
- ***Water Conservation Program Coordination and Staffing Support***
- ***Other Demand Management Measures*** *(that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented)*

As with previous UWMPs, agencies that are members of the CUWCC can submit the annual reports in lieu of proving details on the agency's DMMs. That is, in lieu of providing a description of each DMM, provide data on recent implementation and provide plans for future implantation.

6.2 CUWCC MEMBERSHIP

In 1991, the City became a signatory of the CUWCC by signing the MOU and has expedited implementation of water conservation measures. The City actively implements all measures with good faith effort by achieving and maintaining the staffing, funding, and in general, the priority levels necessary to achieve the level of

activity called for in each BMP's definition as described in the MOU. Water conservation is an integral part of the City's water policies.

As a member of CUWCC, the City is required to submit Bi-Annual Reports to the CUWCC that document the implementation of each BMP. The City has maintained compliance with the BMPs since becoming a signatory. **Appendix E** includes the CUWCC reports.

Updates to CUWCC BMPs

As with the DMMs, the CUWCC BMPs have changed for CUWCC members. The BMPs are now listed as:

- ***BMP 1**: Utility Operations*
- ***BMP 2**: Public Education & Outreach*
- ***BMP 3**: Residential Programs*
- ***BMP 4**: Commercial, Institutional, and Industrial Programs*
- ***BMP 5**: Landscape Programs*

The changes listed above are reflected in the City's annual CUWCC BMP reports from 2010-2015.

6.3 CONSERVATION MEASURES

As signatory to the MOU, the City has committed to use good-faith efforts to implement the BMPs. In addition, the City has continued to work with the Metropolitan Water District (MWD) to increase the effectiveness of its DMM programs and educate people on the importance of water conservation.

Overall, the City's conservation efforts as a member of CUWCC have led to efficient water use. The City's BMPs are summarized in **Table 6.1** below:

Table 6.1
City BMPs (CUWCC)

BMP
BMP 1: Utility Operations *Deals with water waste prohibitions, water efficiency ordinances, metering, conservation pricing, and other items related to managing water use.*
BMP 2: Public Education & outreach *Deals with outreach efforts including emails, newsletters, advertisements, presentations, promotions, etc. related to outreach & education.*
BMP 3: Residential Programs *Deals with showerheads, faucets, toilets, and leak detection surveys related to residential water use.*
BMP 4: Commercial, Institutional, & Industrial Programs *Deals with toilets, urinals, steamers, cooling towers, food/restaurant equipment, medical equipment, and items related to commercial, institutional, and industrial water use.*
BMP 5: Landscape Programs *Deals with establishing parameters for large landscapes, including measurements, budgets, audits, prohibitions, incentives, etc., related to large landscapes.*

The city uses the GPCD method to meet the requirements of BMP 3, BMP 4 and BMP 5.

In addition to the BMPs listed above, the City also maintains the following conservation programs:

City of Glendale Water-Efficient Landscape Programs

- Landscape Design, Installation, and Maintenance: The City provides information on how to transform a water guzzling landscape into a water efficient landscape on its website: http://glendalewaterwisegardening.com/, and free classes are held occasionally for homeowners and landscape professionals.
- Water Conservation Ordinances: The City actively enforces its water conservation ordinance, which prohibits irrigation runoff and water waste.

City Water-Efficient Indoor Programs

- Rebates for qualified water-saving products such as High Efficiency Toilets installation. Glendale's customers can also obtain rebates through MWD's regional rebate programs.

6.4 CITY CONSERVATION POLICIES

The City has developed mandatory water conservation in several different phases. In July 2009, the City Council approved a revised and expanded Water Conservation Ordinance and in response to the most recent Executive Order from the Glendale City Council, the City approved Phase III of Glendale's Mandatory Water Conservation on April 28, 2015. In Phase III, landscape watering has been restricted to certain days of the week and lengths of time. Restrictions are also placed on car washing practices and dining establishments. The City strictly enforces the restrictions and issues penalties when appropriate.

The actual uptake of these programs by City customers determines how much water is being saved by the current program. This will require that the City be proactive in marketing and educating customers as to the benefits of installing water efficient devices and changing water use habits.

As part of these policies, the City of Glendale is committed to implementing water conservation and water recycling programs to protect, preserve and restore the natural environment. Commitment that is currently implemented, as previously mentioned, by the City creating partnerships with several companies and organizations to offer rebate incentive programs. On a residential level, the city provides rebates on various household appliances as a part of their Smart Home Rebate Program.. In addition, the City promotes residential and commercial rebates through MWD's programs. The following division's websites offers indoor and outdoor water saving tips, educational programs, and links to other environmental sites with water saving information.

http://www.glendaleca.gov/government/departments/glendale-water-and-power/residential-customers/water-conservation-information

http://www.glendaleca.gov/home/showdocument?id=28588

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SECTION 7: CONTINGENCY PLANNING

The "Water Shortage Contingency Plan" was adopted as part of the City's Code to implement a phased approach to reduce water usage during times of water shortages.

SECTION 7: CONTINGENCY PLANNING

7.1 INTRODUCTION

Water supplies may be interrupted or reduced significantly in a number of ways including droughts, earthquakes, and power outages which hinder a water agency's ability to effectively delivery water. The ability to manage water supplies in times of drought or other emergencies is an important part of water resources management for a community. As the City receives imported water from MWD and extracts groundwater from the San Fernando and Verdugo Basins, the City's response to an emergency will be a coordinated effort of its own staff in conjunction with other local and regional water agencies.

During water shortage emergencies, the City will implement its Water Shortage Contingency Plan, which imposes up to a 50 percent reduction in the total water supply. A complete copy of the City of Glendale's Water Shortage Contingency Plan can be found in Appendix G. The City will also work in conjunction with MWD to implement water shortage plans on a regional level.

7.2 CITY RESPONSE PLAN

In 2009, Glendale City Council updated its Water Shortage Contingency Plan (WSCP), pursuant to City Municipal Code 13.36.010 to 13.36.110 (specifically 13.36.070), which establishes five stages of water shortage severity based on predicted or actual water supply reductions. Each stage establishes water use reductions through voluntary or mandatory measures. Triggers for implementing the WSCP may include such events as a state or local emergency; natural disaster; a localized event that critically impacts the water supply; drought or the City's wholesale water agency imposing water allocation restrictions.
The objectives of the WSCP are to:

1. Prioritize essential uses of available water
2. Avoid irretrievable loss of natural resources
3. Manage current water supplies to meet ongoing and future needs
4. Maximize local municipal water supplies
5. Eliminate water waste city-wide
6. Create equitable demand reduction targets; and
7. Minimize adverse financial effects

The following priorities for use of available water are listed in order from highest to lowest priority:

1. Health and Safety including: consumption and sanitation for all water users
2. Essential services such as fire suppression; hospitals, emergency care, nursing / convalescent homes and other similar health care facilities; shelters and water treatment
3. Institutions, including government facilities and schools such as public safety facilities, essential government operations, public pools and recreation areas
4. All non-essential commercial and residential water uses
5. New water demand

Stages of Action

The WSCP establishes five (5) stages of severity based on predicted or actual water supply reductions. To determine when each stage should be implemented, the City monitors water usage by conducting readings of actual water usage in monthly meter reads. Should the usage exceed the allowable allotment, action will be taken to reduce water usage. In addition, the City implemented the Advance Meter Infrastructure (AMI) which allows the City to collect real time data of water usage which helps with the monitoring. Each stage establishes water use reductions either through voluntary or mandatory measures. Mandatory water restrictions include water use allowance for each water customer category. **Table 7.1** above outlines the stages of water shortage and water use reduction goals.

Table 7.1
Water Shortage Reduction Targets

Stage	Water Use Restrictions	Total Water Supply Reduction Percentage
Advisory	Voluntary	Shortage is Probable
Stage 1	Mandatory	5-10%
Stage 2	Mandatory	10-20%
Stage 3	Mandatory	20-30%
Stage 4	Mandatory	30+%
Stage 5	Mandatory	50%

The City Council may declare by resolution that an Advisory or Stage 1, 2, 3 or 4 Water Supply Shortage exists and that the actions outlined in the WSCP are necessary. The type of event which may prompt the City Council to declare an Advisory or Stage1, 2, 3, 4 Water Supply Shortage may include, among other factors, drought, state or local emergency, a natural disaster that critically impacts the water treatment or water distribution system, and a localized event that critically impacts the water supply. The water supply can be impacted due to deficient water treatment and/or water quality, and problems with storage, transmission, or the water distribution system. Also, restricted use could be triggered by the City's wholesale water agency requesting extraordinary water conservation efforts in order to avoid mandatory water allocations in accordance with the Water Supply Allocation Plan (WSAP).

Should it become necessary to achieve a 50 percent reduction in water use, the City could implement a number of programs as identified in **Table 7.2** on the following page to enforce reduction in use.

Table 7.2
Consumption Reduction Methods (AF)

Consumption Reduction Method	Stage When Method Takes Effect	Project Reduction (%)
Voluntary rationing	1	10
Incentive to reduce consumption	1	10
Plumbing fixture replacement	1	10
Mandatory rationing	2	10-50
Restrict Building Permits	2	15-50
Use prohibitions	1	20-50
Water shortage pricing	5	50

Metropolitan WSDM Plan

In addition to the provisions of the City's WSCP, the City will also work in conjunction with MWD to implement conservation measures within the framework of MWD's Water Surplus and Drought Management (WSDM) Plan. The WSDM Plan was developed in 1999 by MWD with assistance and input with its member agencies. The plan addresses both surplus and shortage contingencies.

Figure 7.1: Severe Droughts Highlight the Importance of Conservation Ordinances

The WSDM Plan guiding principle is to minimize adverse impacts of water shortage and ensure regional reliability. The plan guides the operations of water resources (local groundwater and surface water resources, Colorado River, State Water Project, and regional storage) to ensure regional reliability. It identifies the expected sequence of resource management actions MWD will take during surpluses and shortages of water to minimize the probability of severe shortages that require curtailment of full-service demands. Mandatory allocations are avoided to the extent practicable; however, in the event of an extreme shortage, an allocation plan will be adopted in accordance with the principles of the WSDM Plan.

7.3 THREE-YEAR MINIMUM SUPPLY

The quantities of water from the various sources and demands are expected to be the same except from imported water because it is contingent upon demand variances and available supplies during dry years. However, MWD predicts 100% reliability of its supplies in the near future to meet demands during all climatic seasons.
Water supplies from the San Fernando, Verdugo Basin, and recycled water should be unaffected by the drought conditions.

Based on normal demands and the conditions described above, the City's three year minimum supply estimate is listed below in **Table 7.3**:

Table 7.3
Projected 3-yr Minimum Water Supply (AF)

Source	Supply (AF) 2016	Supply (AF) 2017	Supply (AF) 2018
Imported	26,222	26,222	26,222
Groundwater (S. Fernando and Verdugo Basins)	11,656	11,656	11,656
Recycled	1,662	1,662	1,662
Total	**39,540**	**39,540**	**39,540**

Numbers shown in Table 7.3 could change depending on the severity of supply deficiency however if there is a need for significant demand reduction efforts, various voluntary or mandatory conservation efforts can be implemented. The City anticipates that during any three-year drought, Glendale should have a sufficient supply to meet demand.

7.4 CATASTROPHIC INTERRUPTIONS

During a disaster, the City will work cooperatively with MWD through their Member Agency Response System (MARS) to facilitate the flow of information and requests for mutual-aid within MWD's 5,100 square mile service area. Additionally, the City will work in conjunction with other local and regional agencies.

The City's Emergency Response Tactical Plan addresses the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies. Under this Plan, Glendale's primary objectives and initial responses to an emergency will be:

- Determine the level of mobilization necessary to save lives, maintain personnel and public safety, and provide for the delivery of water. Initial preliminary inspection of Glendale's facilities after an earthquake will dictate the level of mobilization that is required.
- Identify need for and prioritize locations for water distribution including needs of critical facilities
- Provide for water quality assurance.
- Evaluate, plan, and implement actions to acquire and distribute alternative potable water.
- Establish/ maintain emergency water connections with adjacent water companies.
- Provide information to the public and media as appropriate.

Depending on the type of emergency, Glendale staff could contact the City of Burbank and Crescenta Valley Water District (CVWD) to activate water system Interconnections. If these agencies are experiencing similar problems with their system, such as might occur in an earthquake, the City will need to review the availability of outside source from private companies.

The City will also rely on MWD's catastrophic event plan to utilize the Diamond Valley Lake reservoir, which can be filled with double the storage capacity for Southern California and provide six months of emergency supply. If there were a catastrophic failure of the California Aqueduct or the CRA conveyance facilities, MWD could draw on emergency supplies in Diamond Valley Lake.

Additional emergency services in the State of California include the Master Mutual Aid Agreement, California Water Agencies Response Network (WARN), and Plan Bulldozer. The Master Mutual Aid

Agreement includes all public agencies that have signed the agreement and is planned out of the California Office of Emergency Services. WARN includes all public agencies that have signed the agreement to WARN and provides mutual aid assistance. It is managed by a State Steering Committee. Plan Bulldozer provides mutual aid for construction equipment to any public agency in times of disasters when danger to life and property exists.

Figure 7.2: Diamond Valley Lake

All actions to be undertaken during an emergency will follow the City's Emergency Response Tactical Plan and the WSCP.

7.5 PROHIBITIONS

Mandatory Prohibitions

In accordance with the WSCP, the City has enacted several water use restrictions which are permanently enforced as part of the City's Municipal Code. Restrictions include the following:

- "No Water Waste Policy" in effect at all times in the City.
- No landscape watering (9am-6pm) except for irrigation using recycled water.
- No runoff or overspray from excessive irrigation.
- No watering down hardscapes for cleaning.
- No water leaks: failure to repair any leak within 72 hours after costumer is notified will trigger penalties.
- No washing of cars except with a hand-held bucket and positive action quick release shutoff valve.
- No filling of fountains, lakes, or ponds unless such features have a recycling system.
- Water for Construction purposes shall only be used in an efficient manner which will not result in runoff.
- Pools and spas must be covered to prevent evaporation.
- Eating establishments shall serve water only upon request.

The City's prohibitions on water use can be found in Section 13.36.060 of the Glendale municipal Code.

Consumption Reduction Methods

As previously mentioned, the City may implement consumption reduction methods during a water shortage such as:

- Reduce pressure in water mains
- Flow restrictions
- Restrict building permits
- Restrict for only priority uses
- Water Shortage pricing
- Mandatory rationing

The City's consumption reduction methods are included in the City's Emergency Response Plan for its water system. It is worthy to note that these reduction methods are in addition to the City's demand management measures in place.

Penalties or Charges

Violation of the regulations and restrictions on water use set forth in the "No Water Waste" Ordinance constitutes an infraction punishable not exceeding $100 for a first violation, a fine not exceeding $200 for a second violation within one year, and a fine not exceeding $500 for each additional violation within one year. Any willful misrepresentation constitutes a misdemeanor punishable by a fine not to exceed one thousand dollars or by imprisonment for a period not to exceed six months or both for any person to knowingly misrepresent any material fact to any representative of the City in any attempt or effort to circumvent or otherwise diminish the effectiveness of any of the requirements imposed by any part of the "No Water Waste" Ordinance.

7.6 FISCAL IMPACTS

The City adopted a Drought Charge as part of its adopted rate structure. To compensate for the portion of fixed costs associated with variable revenues, the Drought Charge automatically goes into effect when Mandatory Conservation is implemented by Council action. The charges vary depending on the Mandatory Conservation Phase and are calibrated to coincide with the percent reductions of that Phase.

Under normal water supply conditions, potable water production figures are recorded daily. Totals are reported monthly to the Water Resources Division Manager and incorporated into the water supply report. As previously mentioned, during periods of mandatory water conservation and implementation of the City's mandatory Water Conservation Plan (lower water consumption) the City, in addition, to adjust water rates due to revenue shortages also imposes on customers penalties for no compliance with water conservation provisions. Such penalties include a written courtesy notice, civil remedies and criminal penalties.

7.7 COUNCIL ORDINANCE

On May 5, 2015, the Council of the City of Glendale passed an Ordinance No. 5854 amending sections 13.36.040, 13.36.060 and 13.36.090 of Chapter 13.36 of the Glendale Municipal Code, 1995, relating to water conservation. Additionally, the City Council may implement the provisions of this plan by resolution, following a public hearing to determine the appropriate water shortage stage. A copy of the City's WSCP is included in Appendix G.

7.8 MECHANISMS TO DETERMINE REDUCTIONS IN WATER USE

Reductions in water use are tracked through the City's billing system, which tracks bi-monthly use for all metered connections. The use of a tiered rate structure also discourages high water use, and GWP works with the public to reduce consumption.

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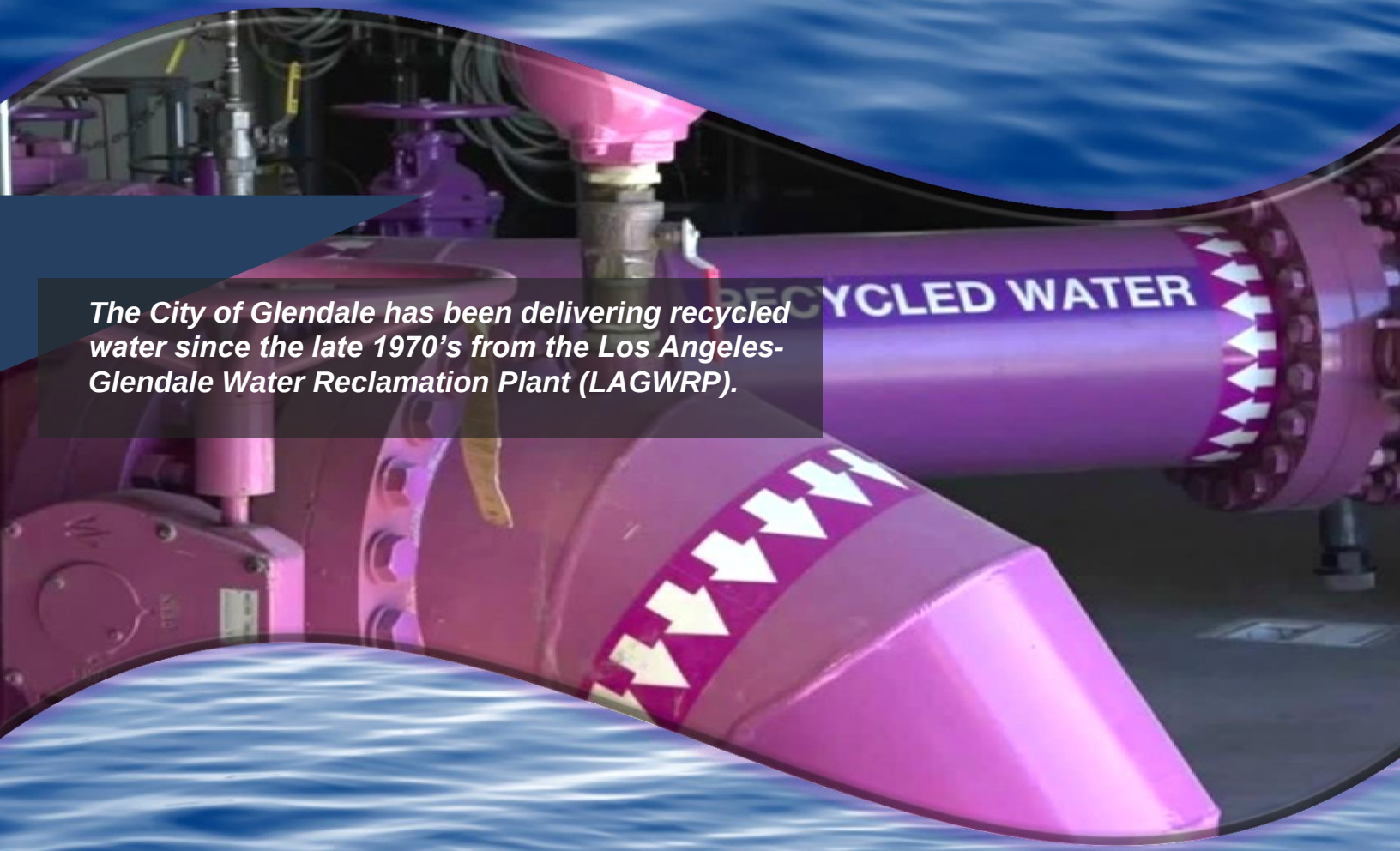
SECTION 8: RECYCLED WATER



The City of Glendale has been delivering recycled water since the late 1970's from the Los Angeles-Glendale Water Reclamation Plant (LAGWRP).

SECTION 8: RECYCLED WATER

8.1 INTRODUCTION

The Southern California region, from Ventura to San Diego, discharges over 1 billion gallons of treated wastewater to the ocean each day. This is considered a reliable and drought-proof water source and could greatly reduce the region's reliance on imported water. As technological improvements continue to reduce treatment costs, and as public perception and acceptance continue to improve, many reuse opportunities should develop. Recycled water is a critical part of the California water picture because of the area's high likelihood of drought. As treatment technology continues to improve, demand for recycled water will also increase.

The city of Glendale has been delivering recycled water since the late 1970's from the Los Angeles- Glendale Water Reclamation Plant (LAGWRP). LAGWRP is strategically located to serve the City of Glendale.

8.2 RECYCLED WATER POTENTIAL

Wastewater Collection & Treatment

In 1976 the Los Angeles-Glendale Water Reclamation Plant started operations as the first water reclamation plant in the City. This is a 20 million gallon-per-day (MGD) plant co-owned by the cities of Los Angeles and Glendale with the responsibility for its operations and maintenance in hands of Los Angeles Sanitation. Each city pays 50% of the cost and receives an equal share of the recycled water.

The LAGWRP treatment consists of four levels of purification, preliminary, primary, secondary, and tertiary treatment (Nitrification/Denitrification – NdeN) with disinfection that successively remove solids until the resulting highly treated wastewater meets and exceeds the water quality standards, Title 22, for recycle water for irrigation and industrial processes.

Most solids are separated from the wastewater during the primary and secondary processes and the resulting sludge is returned to the NOS to the Hyperion Treatment Plant. The balance of wastewater effluent currently is discharged to the Los Angeles River and eventually flows to the ocean.

Figure 8.1: Glendale Councilwoman Paula Devine tours LAGWRP in August, 2015

In addition to its role as a leading producer of recycled water, LAGWRP is another regionally strategic facility within the Los Angeles County's overall wastewater system. By processing wastewater flows in the eastern San Fernando Valley, the plant is able to provide critical hydraulic relief to the major sewers downstream, which serve other communities of Los Angeles. This water reuse conserves over one billion

gallons of potable water per year.

Information on past, present, and projected wastewater treatment at LAGWRP and discharge to the Los Angeles River is provided in **Table 8.1.**

Table 8.1
Quantities on Wastewater Treatment at LAGWRP and discharge to the Los Angeles River

Year	Quantity Treated (AF)	Quantity Discharge (AF)
2005	13,884	10,594
2010	19,962	15,573
2015	17,966	13,474
2020	18,864	14,148
2025	19,807	14,855
2030	20,798	15,598
2035	21,838	16,378

8.3 RECYCLED WATER PLANNING

The City continues to support the use of recycled water within and beyond the City boundaries. Glendale has identified nine potential recycled water users in the future and has determined pipeline expansions to serve these customers.

In 2014, the City served 75 service connections with a combined demand of nearly 1,721 AFY. The top 10 users are listed in **Table 8.2.** As shown, the top user, Forest Lawn Memorial Park, uses 27 percent of the City's total recycled water demand. The second top user, Oakmont Country Club, uses 23 percent of the City's total recycled water demand.

Table 8.2 - Top 10 Recycled Water Customers

	Customer Name	Demand (AFY)	% of Total Demand
1	Forest Lawn Memorial Park	384	27%
2	Oakmont Country Club	340	24%
3	Grayson Power Plant	197	14%
4	Scholl Canyon Golf Course	148	11%
5	LA County Sanitation District-Scholl Canyon Landfill	127	9%
6	Public Works – Parkway Irrigation	67	5%
7	Brand Park	40	3%
8	Caltrans	36	3%
9	Walt Disney	31	2%
10	Grandview Memorial Park	26	2%

**** Demand based on 2014 billing data provided by the City.***

The City's existing recycled water system consists of approximately 22 miles of "purple pipe" ranging from 2 to 30 inches in diameter, five storage facilities, and six pump stations. The existing system is depicted in Section 2 – Figure 2.13.

As previously mentioned the City has identified nine potential recycled water customers, which have a total estimated demand of 3,431 AFY (3.1 MGD), including a delivery of 3,100 AFY (2.8 MGD) to the City of Pasadena Water and Power (PWP). The pipeline alignments proposed by the city have been grouped into four expansion segments as shown on **Figure 8.2** on the following page with the exception of the City of Pasadena connection pipeline.

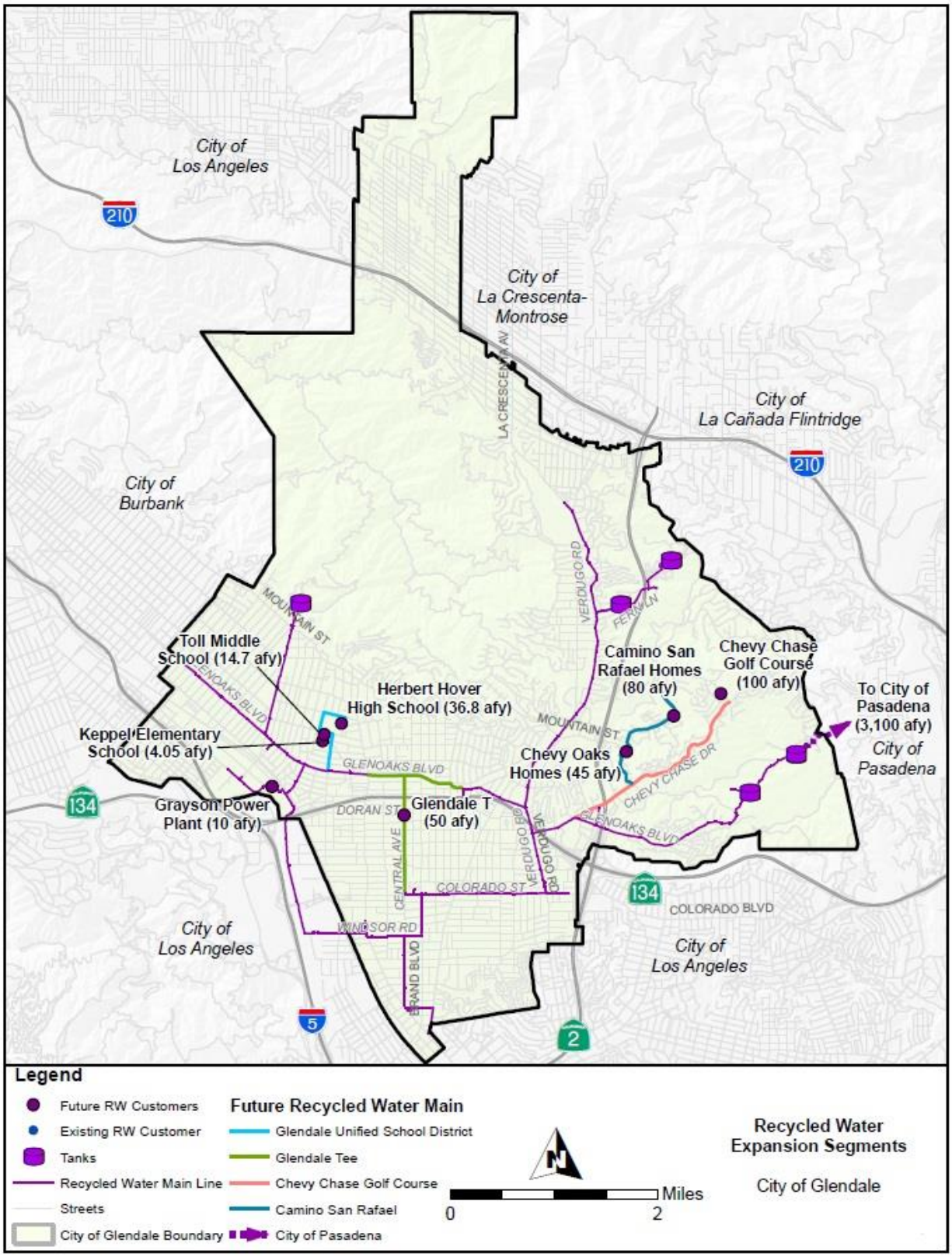


Figure 8.2: Glendale – Future Recycled Water System (Expansion Segments)

Further plans for recycled water use will continue to develop in the future based on economics and the City's needs. Though, the overall goal of the future recycled water system is to maximize the usage of recycled water within the service area to reduce the reliance on imported water The City of Glendale expects to be able to achieve the SBx7-7 requirement of 20% reduction by 2020 without the recycled water expansion projects.

High Rise Office Building and New Developments

The City requires dual plumbing systems in new high-rise office buildings so as recycled water becomes available, it can be used for sanitary flushing purposes in the buildings without retrofitting. Developers of new buildings have accepted this requirement and it is routine to require this installation.

The City also requires new developments to connect to a recycled water system if this is available in the area.

Recycle Water Regulation

The City requires the use of recycled water when appropriate as determined by the City's Director of Water & Power. As a result, even if recycled water cannot be provided at the time, the potential users may still be required to install a separate irrigation system so that recycled water can be delivered at a later date without major modifications to the irrigation system. In these projects, the "purple" irrigation pipe and control boxes must be used. Pressure test are conducted to assure no cross-connection exists between the potable system and irrigation. Records are kept which will permit an easy conversion of the system to recycled water use in the future.

Actions to Encourage Use

The City encourages recycled water use by providing water at a 20 percent discount from the potable water rates. This is designed to assist users in the costs incurred in converting to recycled water use, regulatory involvement in the use of recycled water, etc. For major users, this can be a major savings in water costs. **Table 8.3** summarizes the many actions to encourage recycled water use.

Table 8.3
Actions Used to Encourage Recycled Water Use

Actions	Used
Grants	Yes/No
Dual Plumbing Standards	Yes
Regulatory Relief	No
Regional Planning	Yes
Incentive Program	Yes
Long Term Contract	Yes
Rate Discount	Yes
Prohibit Specific Fresh Water Use	Yes
Low Interest Loan	No
Public Education and Information	Yes
Require Recycled Water Use	Yes
Others	-

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