

APPENDIX E

Water Agency Profile: City of Los Angeles

Recycled Water Summary

| | | 2005 | 2010 | 2015 | 2020 | 2025 | Source |
|---|--|-----------------------|---------|---------|---------|---------|-----------------------|
| 1 | Total Water Demand | 661,000 | 683,000 | 705,000 | 731,000 | 755,000 | 2005 UWMP, Exhibit 1K |
| 2 | Wastewater Treatment Plant Capacity, Tertiary Only | 135 MGD 151,200 AF | | | | | LADWP Interview |
| 3 | Wastewater Treatment Flows, Tertiary Only | 76 MGD 85,100 AF | | | | | LADWP Interview |
| 4 | Amount of Recycled Water Beneficially Used | 36.3 MGD 40,700 AF | | | | | LADWP Interview |
| 5 | Incremental Amount of Recycled Water that Could be Beneficially Used | 39.7 MGD 44,400 AF | | | | | LADWP Interview |

Note: All above numbers are in AFY, unless otherwise noted.

The City of Los Angeles (the City) is the second largest city in the nation with an area of 464 square miles and a population of four million. The City relies on a variety of water sources, including local groundwater supplies, imported water, and recycled water.

The Los Angeles Department of Water and Power (LADWP), a City department, is responsible for potable water service. Another City department, the Department of Public Works, operates the Bureau of Sanitation that collects and treats wastewater. The City's wastewater collections and treatment system is one of the largest in the world, comprised of 6,500 miles of sewers that serve 29 contracting cities and agencies. The sewers deliver wastewater for treatment to the City's four wastewater and water reclamation plants that process an average of 550 million gallons of wastewater every day.¹

The City relies on four primary sources of water: imported water from the Los Angeles Aqueduct, the State Water Project, and the Colorado River, and local groundwater. Recycled water has played a relatively small role in the overall water supply, meeting only 1% of its total water demand today. Its relative importance, however, is increasing to meet water demands for both industry and the irrigation needs of its parks and greenbelts.

In order to expand its recycled water use, LADWP will need to invest in additional distribution infrastructure, and potential customers must pay to connect to the system and retrofit their plumbing systems. The City anticipates spending \$100 million to expand its recycled water use from 4,600 AFY in 2007 to 23,400 AFY in 2013.

¹ City of Los Angeles Bureau of Sanitation website, viewed March 1, 2008; <http://www.lacity.org/san/wastewater/index.htm>.

Water Supply

The Los Angeles Department of Water and Power (LADWP) procures, treats, and delivers potable water to end-users in the City. The City's primary sources of potable water are the Metropolitan Water District of Southern California (MWD, primarily delivering imported water from the State Water Project and Colorado River Aqueduct), the Los Angeles Aqueduct (water deliveries from the eastern Sierra Nevada Mountains), and groundwater. LADWP's first preference is the high quality, gravity-conveyed water from the L.A. Aqueduct. Local groundwater, while relatively inexpensive, is LADWP's second preference, due to contamination and clean-up issues. Costlier imported water purchased from MWD fills the remainder of LADWP's demand.² Recycled water use is increasing in the City, offsetting imported potable water needs (much of which is often used for non-potable purposes).

The relative importance of each of LADWP's supplies varies on an annual basis (Figure E-1). For example, in years of heavy snow pack, water deliveries from the Los Angeles Aqueduct are higher (ranging up to 400,000 AF), resulting in less imported water from the MWD. Conversely, in dry years, deliveries from the L.A. Aqueduct may be as little as 75,000 AF, and imports from the MWD and groundwater pumping increase to make up for supply shortfalls. On average, from 1995 to 2004, the L.A. Aqueduct supplied approximately half of the City's water needs, with the MWD and groundwater supplies providing the remainder at 35% and 15%³, respectively.⁴ Recycled water presently accounts for approximately 1% of the City's water demand. In addition to the supplies described above, the City reclaims a portion of its wastewater, which is treated and used for irrigation and environmental applications. Increasing production of recycled water would offset imports of State Water Project supplies from the MWD.⁵

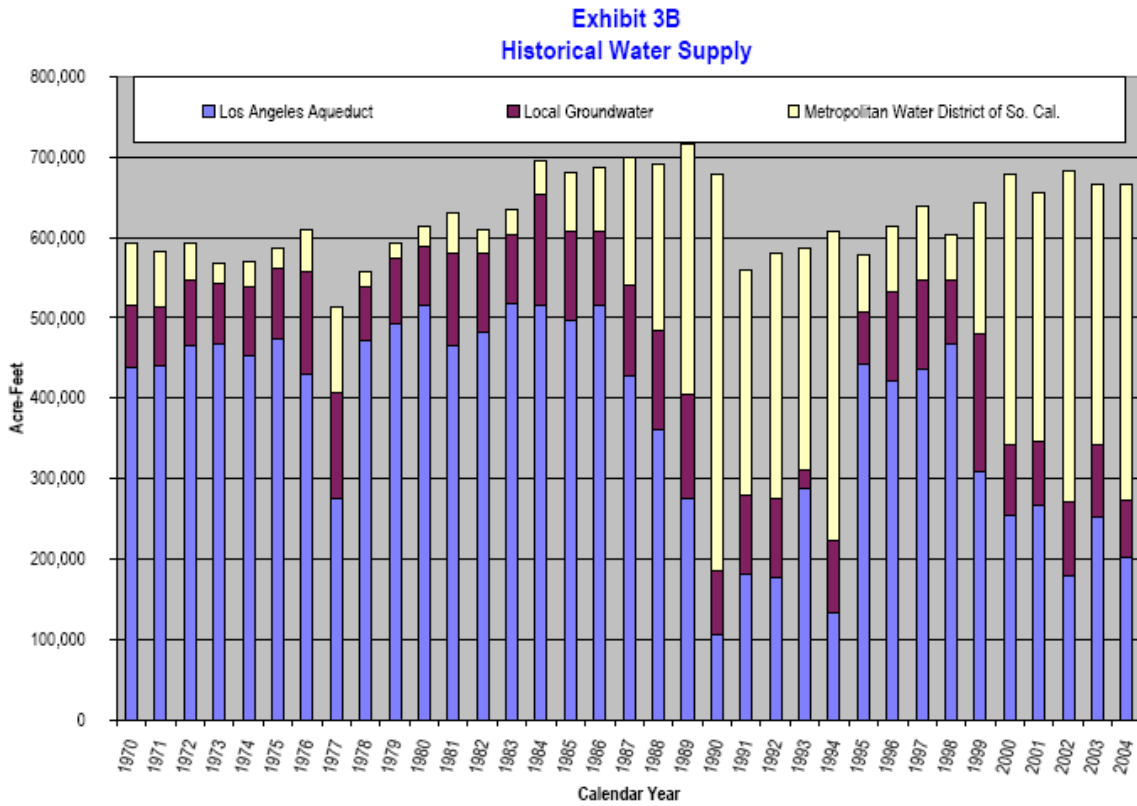
² Personal communication- Bill Van Wagoner at LADWP 9/10/07

³ 15% = approximately 92,400 AF, on average

⁴ From 1995 to 2004, the city's total demand ranged from 584,000 (1995) to 683,000 (2002) AFY, with an average of 643,200 AFY. (LADWP UWMP, p. 35)

⁵ Personal communication - Bill Van Wagoner at LADWP 9/10/07

Figure E-1. Historical Water Supply for LADWP⁶



The above chart illustrates the relative importance of water from the Los Angeles Aqueduct, groundwater wells, and imports from the Metropolitan Water District of Southern California during years of varying hydrology.

⁶ LADWP, 2005 UWMP, Chapter 3, p. 58. <http://www.ladwp.com/ladwp/cms/ladwp007157.pdf>

Table E-1. LADWP's Water Supply Portfolio Under Average Year Hydrology⁷

Service Area Reliability Assessment for Average Year

| Demand and Supply Projections (in acre-feet) | Average Weather Conditions | | | | |
|---|----------------------------|----------------|----------------|----------------|----------------|
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Total Demand¹ | 683,000 | 705,000 | 731,000 | 755,000 | 776,000 |
| Existing Supplies | | | | | |
| Los Angeles Aqueduct | 276,000 | 276,000 | 276,000 | 276,000 | 276,000 |
| Groundwater | 106,000 | 106,000 | 106,000 | 106,000 | 106,000 |
| M&I Recycled Water | <u>1,950</u> | <u>1,950</u> | <u>1,950</u> | <u>1,950</u> | <u>1,950</u> |
| Subtotal | 383,950 | 383,950 | 383,950 | 383,950 | 383,950 |
| Planned Supplies | | | | | |
| M&I Recycled Water | 15,000 | 18,000 | 20,000 | 25,000 | 29,000 |
| Seawater Desalination (phase 1) | 0 | 13,500 | 13,500 | 13,500 | 13,500 |
| Water Transfer | <u>30,000</u> | <u>40,000</u> | <u>40,000</u> | <u>40,000</u> | <u>40,000</u> |
| Subtotal | 45,000 | 71,500 | 73,500 | 78,500 | 82,500 |
| MWD Water Purchases | | | | | |
| With Existing/Planned Supplies | 254,050 | 249,550 | 273,550 | 292,550 | 309,550 |
| Total Supplies | 683,000 | 705,000 | 731,000 | 755,000 | 776,000 |
| Difference (supply minus demand) | 0 | 0 | 0 | 0 | 0 |
| Other Potential Supplies | | | | | |
| M&I Recycled Water | 0 | 0 | 34,050 | 29,150 | 25,000 |
| Seawater Desalination (phase 2) | 0 | 11,500 | 11,500 | 11,500 | 11,500 |
| Beneficial Use of Urban Runoff | 5,000 | 15,000 | 37,700 | 37,700 | 37,700 |
| Potential Water Conservation | <u>5,000</u> | <u>18,250</u> | <u>31,500</u> | <u>44,750</u> | <u>58,000</u> |
| Subtotal | 10,000 | 44,750 | 114,750 | 123,100 | 132,200 |
| MWD Water Purchases | | | | | |
| If Other Potential Supplies are Developed | 244,050 | 204,800 | 158,800 | 169,450 | 177,350 |
| Total Supplies | 683,000 | 705,000 | 731,000 | 755,000 | 776,000 |
| Difference (supply minus demand) | 0 | 0 | 0 | 0 | 0 |

¹ Projected with existing water conservation

⁷Los Angeles Department of Water and Power, 2005 Urban Water Management Plan, Exhibit 6C.

Figure E-2. Major Sources of Water Supply for Los Angeles⁸



Recycled Water Supply

The Bureau of Sanitation of the Department of Public Works provides wastewater collection and treatment to most of the City, in addition to 29 contracting cities, including Pasadena, Glendale, Santa Monica, Beverly Hills, and West Hollywood. Wastewater treatment is provided by four facilities, serving the City's seven sewersheds (Figure E-4). Three reclamation plants provide tertiary treatment (the Tillman, LA/Glendale, and Terminal Island facilities) and one large regional plant provides secondary treatment (Hyperion). The tertiary water produced by the Terminal Island TP has high TDS levels. Approximately 5 million gallons per day (MGD) receives advanced treatment, making it suitable for LADWP's recycled water customers. The City's main wastewater treatment plant (Hyperion) provides only secondary treatment.

The City recycles approximately 65,000 AF annually; LADWP supplies recycled water to its customers on a contractual basis, offering supply reliability and price certainty to customers. The tertiary-treated recycled water is sold to several sites, where it is primarily used for irrigation and environmental purposes. Approximately 32,000 AF are used for environmental enhancement (e.g., irrigating portions of Griffith Park, freeway landscaping, the Japanese Gardens, and Lake Balboa), and 4,600 AF are used for municipal and industrial purposes.⁹ The

⁸LADWP, 2005 Urban Water Management Plan, Exhibit 3A.

⁹ Personal communication, Paul Liu, LADWP, January 2, 2008, and Hiddo Netto, LA City Bureau of Sanitation, January 3, 2008.

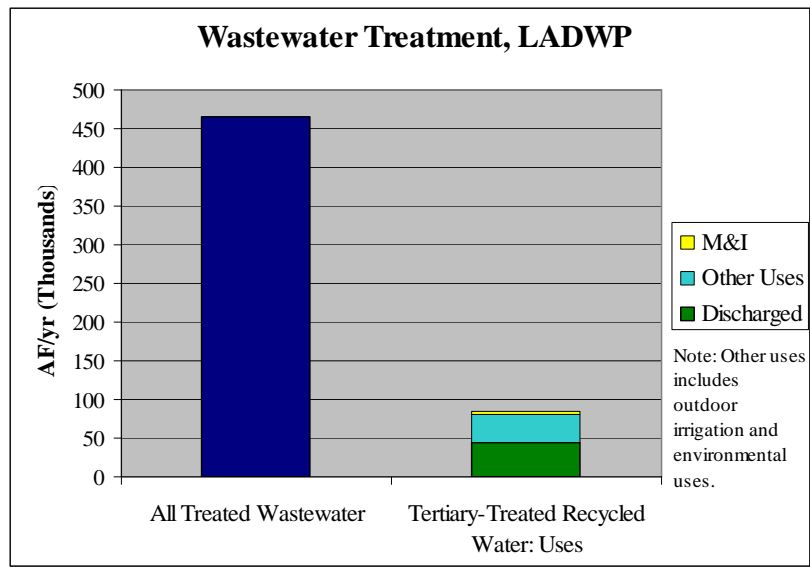
City is obligated to provide 27 MGD (30,000 AFY) of recycled water from the Tillman Plant to support habitat in the LA River. The Tillman plant delivers water to the Japanese Gardens, Balboa Lake, and Wildlife Lake. This water serves a dual benefit, supporting local habitat and discharges into the LA River. Excess recycled water from the Tillman and Los Angeles-Glendale plants is also discharged into the Los Angeles River.

Table E-2. The City of Los Angeles’ Three Tertiary Treatment Plants¹⁰

| Plant | Design Capacity | Current Flows (all tertiary treatment) | Recycled Water Used | Potential (Unplanned) Reuse from Current Flows |
|------------------------|--|--|--|--|
| Tillman | 80 MGD | 40 MGD | 28.1 MGD | 11.9 MGD |
| LA-Glendale | 25 MGD | 20 MGD | 3.9 MGD | 16.1 MGD |
| Terminal Island | 30 MGD (<i>tertiary-treated water is not <u>directly</u> usable due to high TDS</i>) | 16 MGD | 4.3 MGD (<i>This is advanced treated water.</i>) | 11.7 MGD (<i>Would require advanced treatment to be usable.</i>) |
| Total (MGD) | 135 MGD | 76 MGD | 36.3 MGD | 39.7 MGD |
| Total (AF/yr) | 151,200 AF/yr | 85,100 AF/yr | 40,700 AF/yr | 44,400 AF/yr |

Note: The above chart does not include secondary treatment facilities (see Figure E-3 below).

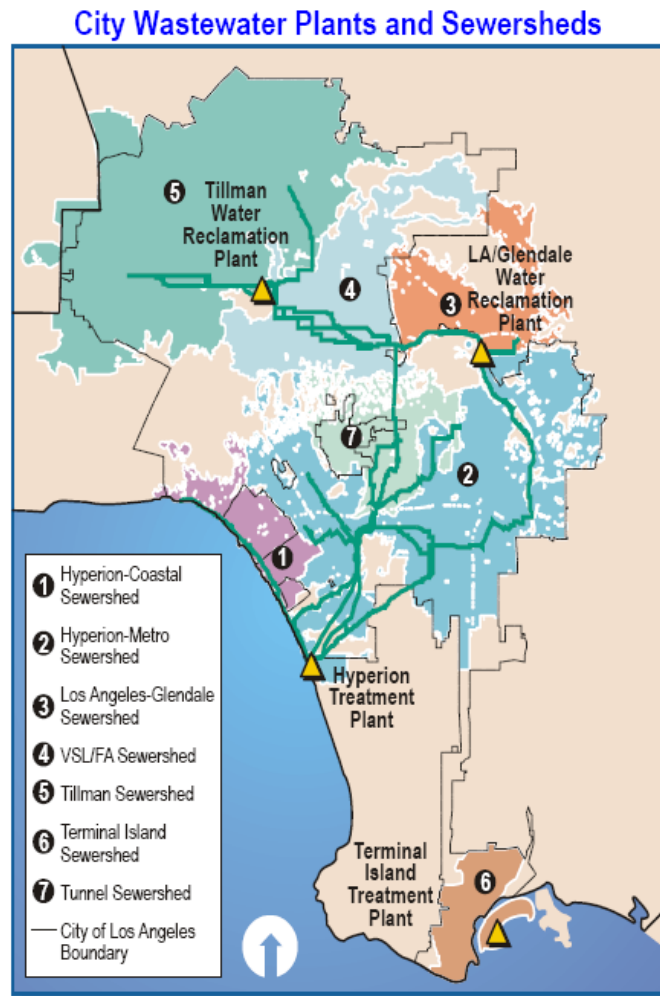
Figure E-3. Wastewater Treatment in the City of Los Angeles



¹⁰ Personal Communication with Hiddo Netto, Division Head, City of Los Angeles Water Reclamation Division, January 3, 2008.

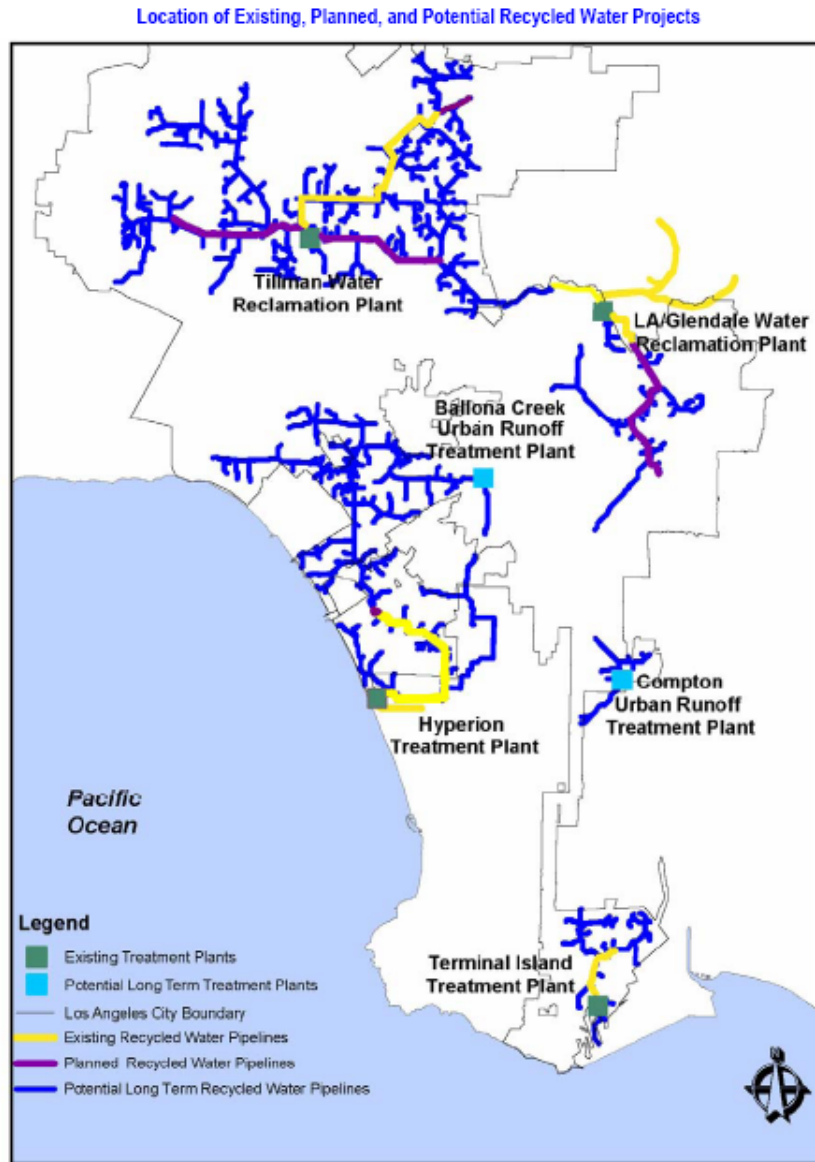
“All treated wastewater” includes wastewater treated to secondary and tertiary standards. A portion of the water treated to secondary standards is supplied to the West Basin MWD, which treats the water to tertiary standards and sells a portion back to L.A. This water is not represented in this figure.

Figure E-4. Map Showing the Locations of City Of Los Angeles’ Four Wastewater Treatment Plants and the Seven Sewersheds



The City plans to expand its recycled water system, focusing on increasing use in irrigation and the municipal and industrial sectors. The locations of existing, planned, and potential recycled water delivery facilities are shown in Figure E-5. In addition, the City’s Terminal Island Treatment Plant has been upgraded with advanced treatment for approximately 5 MGD of flow using microfiltration and reverse osmosis. This water is being used for industrial customers and injected into the ground as a seawater intrusion barrier.

Figure E-5. LADWP's Existing, Planned and Potential Recycled Water Project Infrastructure



Water Demand – Current and Future

In the City of Los Angeles, approximately 660,000 AF of water is used annually.¹¹ The City's use peaked in 1989 at 700,000 AFY, and subsequently declined as a result of public education campaigns and conservation policies. Despite these conservation tactics, the City's population is projected to grow to over 4.8 million people by 2020, with an associated growth in water use to over 800,000 AFY.¹² (Figure E-6).

¹¹ LADWP, 2005 UWMP.

¹² LADWP, 2005 UWMP.

Figure E-6. The City Of Los Angeles' Projected Water Demands Under Three Different Weather Scenarios¹³

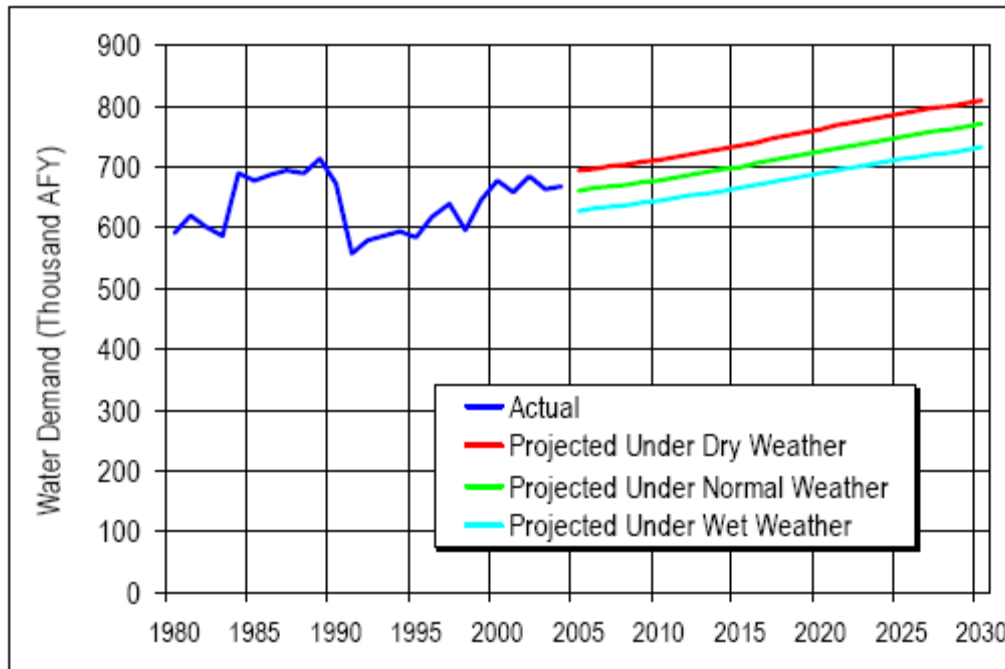


Table E-3. Historical and Projected Water Use in LADWP's Service Area under Normal Weather Conditions

| Year | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|--------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Total Water Use (AF) | 676,500 | 661,000 | 683,000 | 705,000 | 731,000 | 755,000 | 776,000 |
| Recycled Water Use (AF) | | 1,950 | 16,950 | 19,950 | 21,950 | 26,950 | 30,950 |

Data source: 2005 UWMP- Exhibits ES-G, 3R, and 1K

As demand increases, recycled water will become more important. Opportunities for recycled water use depend on the character of the demand. Overall, the greatest demand in the City is by residential users (60% of total demand). Commercial (21%), government (7%), and industrial (4%) demands follow, and non-revenue water (i.e., transmission losses) comprises the remainder of water used (8%).

The City delivers water through both retail and wholesale sales. Potable water is purveyed strictly through retail sales, but recycled water is delivered both to end users (through retail sales) and one wholesale customer, West Basin MWD. End users include private customers and

¹³ 2005 Urban Water Management Plan, p. 16.

the City Department of Recreation and Parks, which uses water for recreational lakes in the Sepulveda Basin and the Greenbelt system. West Basin MWD purchases partially treated wastewater from the Los Angeles Bureau of Sanitation’s Hyperion Plant. West Basin MWD then treats this water to tertiary standards and sells a portion of it back to LADWP.

Recycled Water Demand

The City has identified potential customers for recycled water. The greatest demand (both number of customers and total volume demanded) lies in irrigation, with potentially 93,500 AFY of recycled water demanded (Table E-4). Total recycled water demand, including use in the industrial sector, irrigation, and as a seawater intrusion barrier is projected to reach 107,000 AFY. The potential customers are identified in Figure E-7, with the most likely early pipeline extensions in the Tier 1 regions. Table E-4 summarizes the projected demands for recycled water.

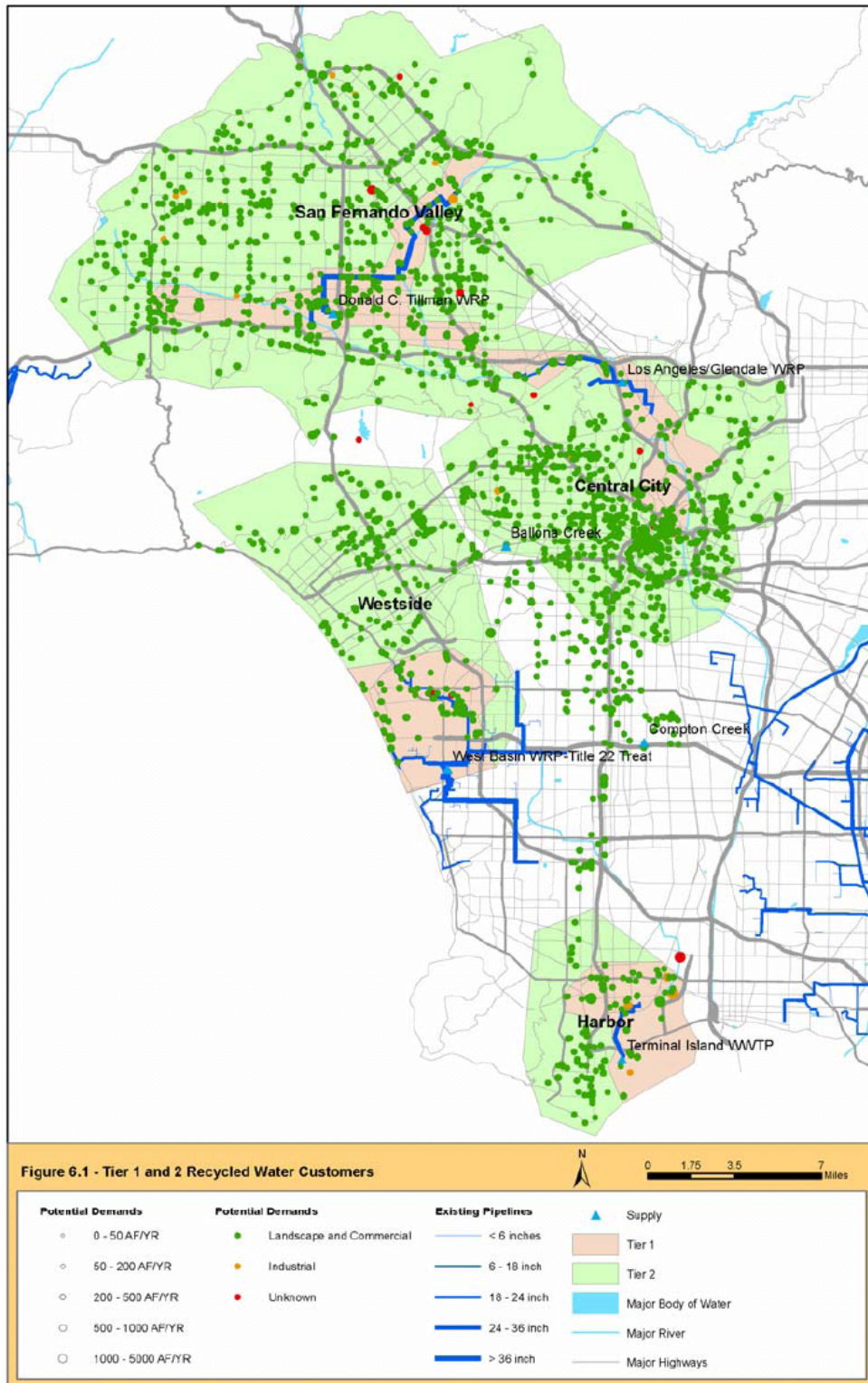
Table E-4. Potential Recycled Water Demand in the City of Los Angeles¹⁴

| Demand Category | Number of Potential Recycled Water Customers | Ultimate Potential Recycled Water Demand (AF/yr) |
|------------------|--|--|
| Industrial | 30 | 8,500 |
| Irrigation | 2,342 | 93,500 |
| Seawater Barrier | 1 | 5,000 |
| Total | 2,373 | 107,000 |

Note: These estimates do not include volumes required to maintain minimum flows in the Los Angeles River.

¹⁴ LADWP, 2005 UWMP, p. 77.

Figure E-7. Map of Potential Recycled Water Customers, Existing Pipelines, and Supply Expansion Regions¹⁵



¹⁵ 2005 Urban Water Management Plan, p.79.

**Table E-5. Summary of Use and Projected Supply of Recycled Water
for the City Of Los Angeles**

| | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Existing Use, M&I | 1,950 | 1,950 | 1,950 | 1,950 | 1,950 | 1,950 | 1,950 |
| Existing Use, environmental | <u>28,500</u> | <u>28,500</u> | <u>28,500</u> | <u>28,500</u> | <u>28,500</u> | <u>28,500</u> | <u>28,500</u> |
| Total Existing Use | 30,450 | 30,450 | 30,450 | 30,450 | 30,450 | 30,450 | 30,450 |
| Add'l Planned Use | | | <u>15,000</u> | <u>18,000</u> | <u>20,000</u> | <u>25,000</u> | <u>29,000</u> |
| Total Use, existing and planned | 30,450 | 30,450 | 45,450 | 48,450 | 50,450 | 55,450 | 59,450 |
| Total Demand | 677,000 | 661,000 | 683,000 | 705,000 | 731,000 | 755,000 | 776,000 |
| Recycled Use % | 4.5% | 4.6% | 6.7% | 6.9% | 6.9% | 7.3% | 7.7% |

Note: All above numbers are in AFY, unless otherwise noted.

In addition to the incremental recycling opportunities that are planned and funded (“baseline” opportunities), several other opportunities for system expansion have been identified.

Table E-6. Additional Opportunities for System Expansion in the LADWP Service Territory

| Additional Recycling Opportunities Identified and Not Appearing to be “Baseline” | |
|---|---|
| 1 | San Fernando Valley: Tillman Plant, <u>Acceleration</u> of “Tier 1” Expansion (add'l 14,000 AF/yr by 2030) (assumes “Tier 1” is part of “planned”) |
| 2 | San Fernando Valley: Tillman Plant, “Tier 2” Expansion (following Tier 1, up to add'l 28,000 AF/yr—assumes Tier 1 estimate was included in Tier 2 estimate) |
| 3 | Harbor: Terminal Island Plant, <u>Acceleration</u> of “Tier 1” Expansion (add'l 9,000 AF/yr by 2030) (assumes “Tier 1” is part of “planned”) |
| 4 | Harbor: Terminal Island Plant, “Tier 2” Expansion (following Tier 1, up to add'l 2,000 AF/yr—assumes Tier 1 estimate was included in Tier 2 estimate) |

Note: Recycled Water Master Plan (12/2006) indicates that Center City and Westside expansions will not be as cost-effective as San Fernando Valley and Harbor expansions.

Note: Most additional identified customers appear to be for landscape purposes, with the exception of the DWP Valley Generating Station (Tillman area) and Ultramar/Diamond Shamrock (Harbor Area).

Additional Factors

Cost

Typically, recycled water is sold at a lower rate than potable water. Currently, consumers' costs for recycled water are determined by LADWP on a case-by-case basis.

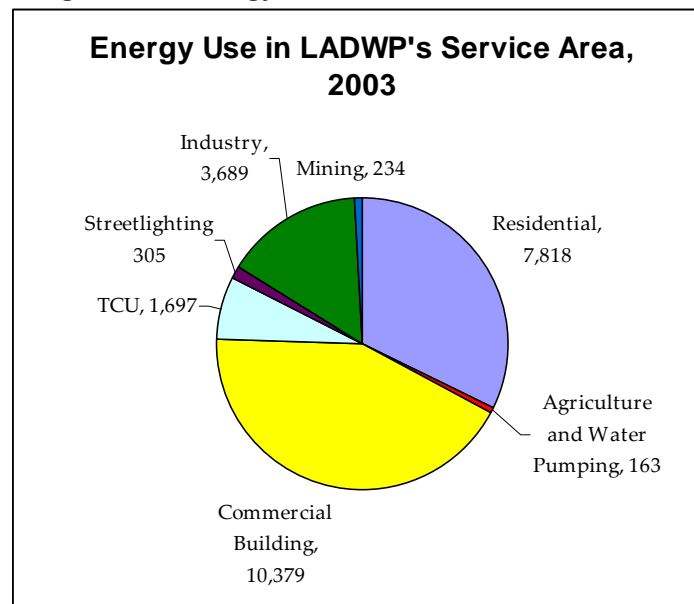
Barriers to Recycled Water Development

The City has outlined several hurdles to more extensive recycled water use, in addition to the obvious financial hurdles of implementing needed infrastructure. Water used to recharge groundwater basins is regulated by stringent standards, which may be prohibitively strict. In addition, advanced treatment and use options face challenges in the sphere of public opinion. For example, using recycled water as an indirect potable water supply by recharging groundwater aquifers will require a public outreach campaign to determine feasibility and acceptance.

Energy Use in Producing Water

As described above, LADWP has several primary sources of water. The energy intensity varies for each of these sources, depending on the location of the source and the quality of the water, among other factors. In 2003, LADWP used 163 GWh to procure, treat, and deliver water to its customers (Figure E-8). This accounts for approximately 0.7% of the utility's total electricity deliveries, and excludes the energy used by the consumer to heat, treat, or pressurize water.¹⁶

Figure E-8. Energy Use in LADWP's Service Area



Note: All above numbers are in GWh.

¹⁶ California Energy Commission, 2005. Energy Demands Forecast Methods Report, p. 20, <http://www.energy.ca.gov/2005publications/CEC-400-2005-036/CEC-400-2005-036.PDF>

Energy is used to convey, pump, treat, and distribute LADWP's water supplies. In addition, LADWP treats a portion of its wastewater to tertiary standards and distributes it to end users.

State Water Project Supplies

The State Water Project conveys water from the Sacramento-San Joaquin Delta to Southern California via the California Aqueduct. In the process, water is lifted over 3,000 feet by a series of pumping plants. South of the Tehachapi Pass and the Edmonston pumping station, the aqueduct splits into the West and East Branches. LADWP receives water from the West Branch of the aqueduct. Along this branch, water is directed through three additional pumping/generating stations before it reaches Castaic Lake, where it is stored. From Castaic Lake, water is released through the Foothill Feeder Power Plant.

LADWP receives both untreated and treated water from MWD. MWD owns several treatment plants that service LADWP, including Jensen, Weymouth, and Diemer. LADWP owns the Los Angeles Aqueduct Filtration Plant, which treats all water conveyed by the Los Angeles Aqueduct.

Untreated SWP water is delivered to LADWP between the Foothill Feeder Power Plant and the Jensen Treatment plant. Treated water is channeled through the Foothill Feeder Power Plant and the Jensen Treatment Plant before delivery to LADWP. Depending on the end user's location, this water may also pass through the Sepulveda and Venice generating plants.¹⁷

Colorado River Supplies

LADWP also receives imported water supplies from the Colorado River, delivered by MWD. While the majority of water delivered from MWD is supplied by the SWP, Colorado River water may be relied upon to make up the balance of deliveries. Colorado River water is withdrawn at Lake Havasu and pumped through the Colorado River Aqueduct. This water is pumped through five pumping stations before it is stored in Lake Matthews. From Lake Matthews, water is diverted to different water agencies in Southern California. This water is treated at MWD's Weymouth and Diemer treatment plants before delivery to LADWP.

Groundwater

Over 80% of the City's groundwater is withdrawn from the San Fernando Basin underlying the San Fernando Valley. The remainder is extracted from the Central Basin.

Local Surface Water

Surface runoff, which primarily comes in the form of stormwater runoff during the winter months, is, in some regions, diverted to groundwater recharge areas. The groundwater recharge operations are passive and do not require pumping energy.

¹⁷ Personal communication, Bill McDonnell and Jon Lambeck (MWD).

Recycled Water

As described in greater detail in earlier sections, Los Angeles Department of Public Works Bureau of Sanitation collects wastewater from its seven sewersheds and treats it at four wastewater treatment plants. The Los Angeles/Glendale, Tillman Water Reclamation, and the Terminal Island Treatment Plants serve recycled water directly to end users. Secondary recycled water produced at Hyperion is sold to West Basin Municipal Water District where it is treated to a tertiary level. Following treatment, some of this water is sold back to DWP for distribution to end users on the west side.

Los Angeles Aqueduct Water

As noted earlier, the Los Angeles Aqueduct serves as LADWP's primary source of water, and increased recycled water use will not offset deliveries from the Los Angeles Aqueduct. Therefore, specific energy data for the Los Angeles Aqueduct was not collected. According to LADWP, however, the Los Angeles Aqueduct is gravity-driven and a net producer of electricity, as water flows from the Owens Valley at an elevation of approximately 4,000 feet to Los Angeles, near sea level. Along the aqueduct, LADWP has 12 hydroelectric generating stations, with a total capacity of almost 250 MW.¹⁸

Energy Intensity of Supplies

The energy intensity of LADWP's water supplies covers a wide range of values. The water supplies are conveyed, treated, and distributed to end users in DWP's service area. Where possible, the energy intensity of each of these steps is identified and presented in Tables E-7 and E-8.

¹⁸ LADWP, 2005 UWMP, Chapter 3, p. 59.

Table E-7. Energy Intensity of LADWP’s Water Supplies (By Production Step)

| Stage | Facility | Water Type | Annual Production (af/yr) | Energy Intensity (kWh/af) | Annual Energy Usage (MWh) | Principal Energy Supplier | |
|-----------------|---|-----------------|---------------------------|---------------------------|---------------------------|--|-------|
| Conveyance | SWP – West Branch to Castaic Lake/Foothill Feeder Power Plant | Raw AND Treated | 202,500 ^[1] | 2,500 | 506,250 | DWR | |
| | Colorado River to Lake Matthews | Raw | 22,500 ^[1] | 2,000 | 45,000 | Hoover, Parker Dams (MWD, B. of R.), SCE | |
| | Local Groundwater | Raw | 92,400 | 0 ^[2] | 0 | LADWP | |
| | Los Angeles Aqueduct | Raw | 320,000 | Net producer | 0 | LADWP | |
| Treatment | Jensen Treatment Plant | Potable | 225,000 | 35.1 ^[3] | 6,780 ^[4] | LADWP | |
| | Weymouth Treatment Plant | Potable | | 42.1 | | SCE | |
| | Diemer Treatment Plant | Potable | | 13.2 | | SCE | |
| | Los Angeles Aqueduct Treatment Plant | Potable | 320,000 | 32 ^[5] | 10,930 | LADWP | |
| | Groundwater wells | Potable | 92,400 | 520 ^[6] | 52,269 | LADWP | |
| | Recycled Water | Tillman | Tertiary | 71,689 ^[7] | 100 ^[5] | 12,256 | LADWP |
| | | LA-Glendale | Tertiary | 16,802 | | | LADWP |
| Terminal Island | | Tertiary | 33,604 | LADWP | | | |
| Distribution | Potable water supplies, imported and local | Potable | 637,400 | 387 | 246,674 | LADWP | |
| | Recycled Water | Tillman | Tertiary | 71,689 | Data Not Available | LADWP | |
| | | LA-Glendale | Tertiary | 16,802 | | LADWP | |
| | | Terminal Island | Tertiary | 33,604 ^[8] | | LADWP | |

Notes: Volumes are average estimates from 1995 to 2004, unless otherwise noted.

[1] Based on total average annual deliveries of 225,000 AF from the MWD, typically 90% SWP imports and 10% Colorado River imports.

[2] Energy for pumping and treating groundwater from LADWP’s San Fernando Valley Wells is combined and represented in the treatment category.

[3] Data provided by Bill McDonnell (MWD) for the calendar year 2006. The energy use for these facilities includes tertiary treatment *and* other facility energy uses, such as water quality testing, or administrative functions.

[4] Data for the volume treated at each of the treatment plants were not available; this analysis uses an average energy intensity of 30.1 kWh/acre-foot for the three MWD facilities.

[5] The average energy intensity for the three plants, weighted by volume for 2005 is 525 kWh/acre-foot for both secondary and tertiary treatment. At the Terminal Island Treatment Plant, tertiary treatment represented approximately 19% of total energy use. Assuming that the other plants have this distribution of energy use, the incremental energy used to produce tertiary-treated water from secondary-treated water is 100 kWh/acre-foot.

[6] Data provided by LADWP for FY 2005-2006, during which period 48,486 AF were pumped.

[7] In 2004, 2005, and 2006, the Tillman Plant only produced 60 to 62 AF annually.

[8] This water is not usable at a tertiary level. Currently about 5 MGD is treated with advanced treatment.

Table E-8. Total Energy Intensity of LADWP's Water Supplies

| Source | Energy Use (kWh/AF) | | | |
|----------------------------------|----------------------------------|-------------------|--------------------|--------------------------|
| | Conveyance | Treatment | Distribution | Total |
| State Water Project, West Branch | 2,500 | 30 ^[1] | 387 | 2,917 |
| Colorado River | 2,000 | 28 ^[2] | 387 | 2,415 |
| Local Groundwater | (included in treatment estimate) | 567 | 387 | 954 |
| Recycled Water | 0 | 100 | Data Not Available | 100^[3] |
| Los Angeles Aqueduct | Net Producer | 32 | 387 | 419 |

Notes:

[1] Based on an average of energy used at the three MWD treatment plants.

[2] Based on an average of energy used at MWD's Diemer and Weymouth Treatment Plants (Jensen treats SWP water exclusively).

[3] Does not include distribution energy.

LADWP presently plans to spend approximately \$100,000,000 by 2013 on infrastructure to expand its recycled water use.¹⁹ These investments are expected to expand recycled water use in industrial, irrigation, and seawater barriers from 4,600 AFY in 2007 to 23,400 AFY in 2013. This estimate does not include that portion of customer costs to connect to the recycled water system, nor the cost of dual piping customer systems and premises to enable use of recycled water.

This substantial investment in recycled water is projected to offset demand for potable sources of water, whether from the Colorado River, SWP, or future desalination facilities. Each alternate supply has a higher energy intensity than recycled water. While expanding recycled water use may offer substantial energy savings relative to other, marginal supplies, it will incur high capital costs on the part of both the water utilities and customers.

¹⁹ Oral communication with LADWP, Paul Liu in January 2008.