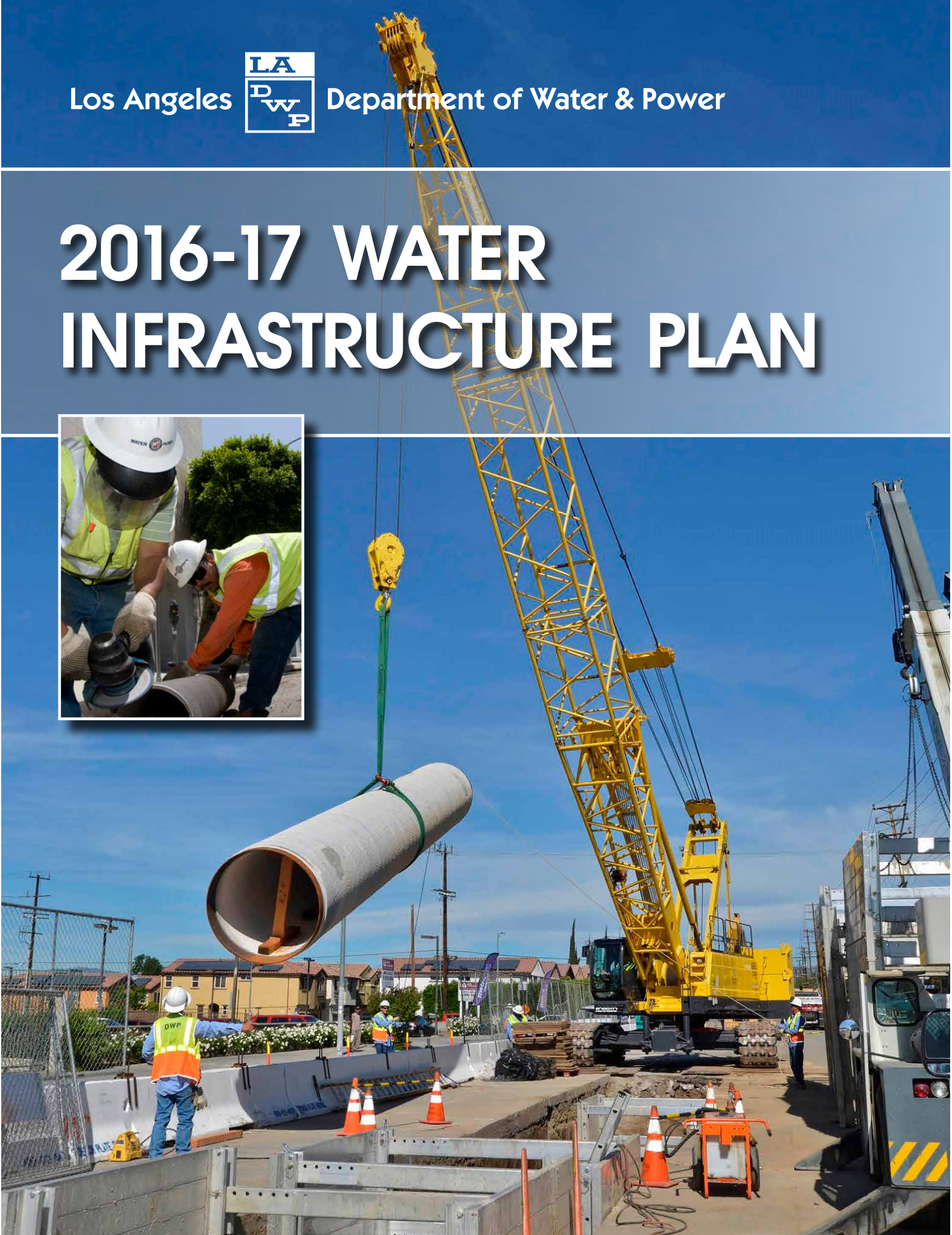


Los Angeles



Department of Water & Power

2016-17 WATER INFRASTRUCTURE PLAN



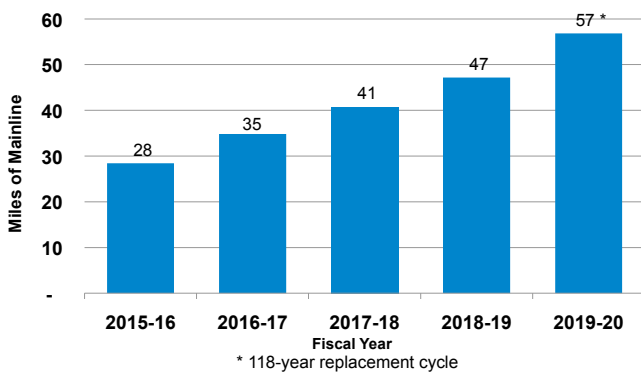
Introduction

All major components of the Water System infrastructure are evaluated as part of the ongoing Asset Management (AM) Program. The goal of AM is to systematically manage assets in a way that will result in the lowest cost of ownership. The Water Infrastructure Plan (WIP) summarizes infrastructure upgrades identified in the planned five-year \$2.4 billion budget. The main elements of the WIP are discussed below.

Distribution Mainline

Distribution mainlines (pipes 20 inches or less in diameter) constitute the backbone of LADWP's water distribution system. There are approximately 6,780 miles of mainline throughout the City of Los Angeles. Over 27% (about 1,840 miles) of LADWP's mainlines are over 80 years old, while the average lifespan of an iron water main is about 100 years. Moving forward, LADWP plans to ramp up the replacement of water distribution mainline to bring the pipe replacement cycle closer to the expected pipe life cycle by 2020.

Mainline Replacement Goal



2015-16 Achievements:

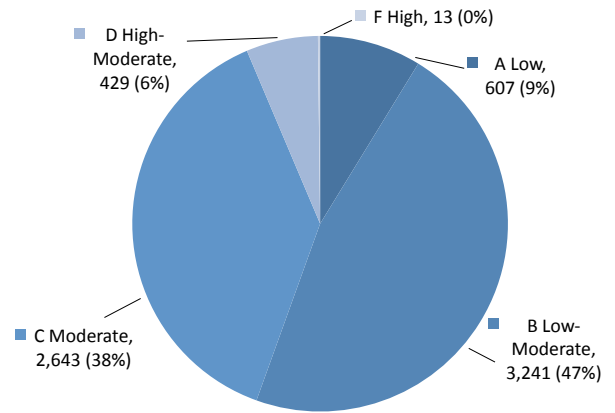
- Replaced over 32 miles of mainline pipe.

Replacements are prioritized based on the following factors:

- Leak history (number and type of leaks, most recent leak count, and duration between leaks)
- Soil conditions (corrosiveness, hillside, landslide, fault line, and liquefaction potential)
- Age of pipe (including design and construction method used at time of installation)
- Risk of service interruption and community disruption
- Coordination with planned projects by Bureau of Street Services

Using the prioritization factors listed above, LADWP assigns letter grades from A (best) to F (worst) to pipe segments. The AM Program analyzes risk tolerance levels for mainlines throughout the water distribution system, and considers factors such as likelihood and consequence of pipe failure. Based on the analysis, about 6% of LADWP's water distribution mainlines are considered high risk if they were to fail. Replacing these pipes is a high priority.

Mainline Condition - Risk of Failure (in Miles)



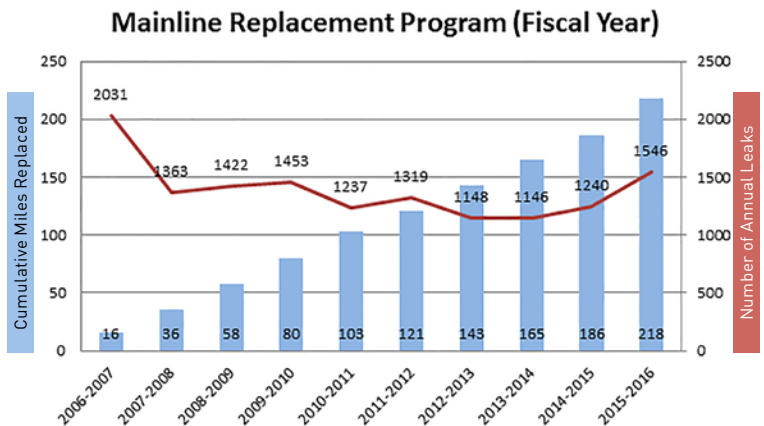
Key Points:

- LADWP mainlines are approaching the historic average peak at 100 years of age.
- LADWP's leak rate is better than the national industry average at 17 per 100 miles compared to 25 per 100 miles.
- Total water loss is 5.2% — half of the industry average.

Long-Term Goals:

- Achieve and sustain a replacement cycle that is consistent with the expected 100-year life of water mains.
- Replace 500 miles of leak-prone and high-risk mainlines throughout the city in the next 10 years.
- Enhance the water distribution pipeline network through the use of earthquake resistant pipe.
- Further improve customer service through a resilient water distribution infrastructure.
- Minimize water distribution system life cycle costs, including capital and operations and maintenance costs.

Mainline Replacement and Number of Leaks

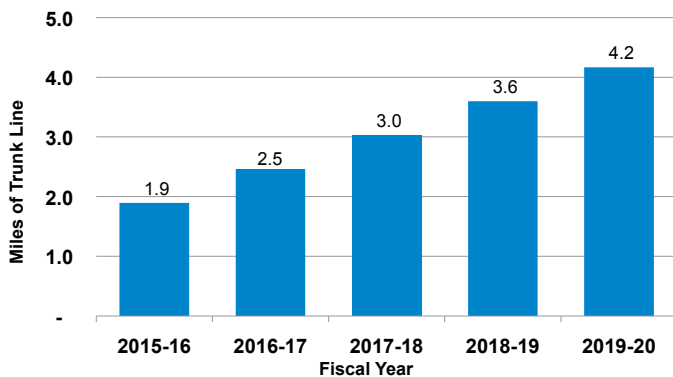


Trunk Lines

Trunk lines (pipes greater than 20 inches in diameter) provide the transmission capacity to move large amounts of water around the city – from reservoirs and tanks to the smaller distribution mainlines. There are approximately 557 miles of transmission pipelines throughout the City of Los Angeles. Prioritization for trunk line replacement is similar to the process for mainlines, taking into account leak history, soil conditions, pipe age, risks due to failure, along with other factors.



Trunk Line Replacement Goal



2015-16 Achievement:

- Replaced approximately 2 miles of trunk line pipe.

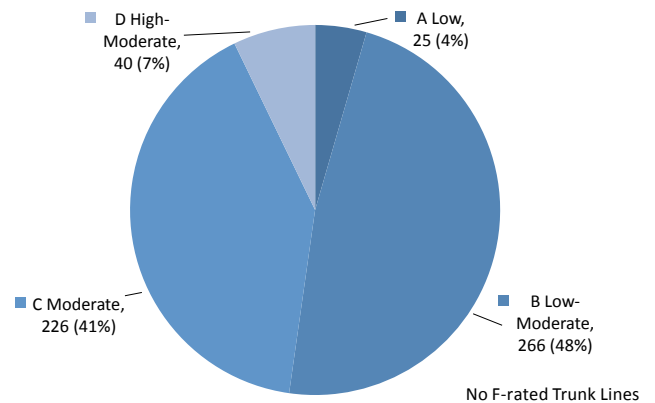
Key Points:

- Trunk line replacements are typically multi-year projects. As such, it is important to identify and implement mitigation measures as needed during construction.
- Trunk line ruptures are infrequent with two major breaks occurring in the past decade.

Long-Term Goals:

- Accelerate design and construction of trunk line projects to replace moderately high risk trunk lines.
- Replace approximately 40 miles of trunk lines that include D-graded pipes over the next decade.
- Continue the corrosion protection program.
- Continue pipe replacements required to meet drinking water regulatory compliance.
- Enhance trunk line piping network through the use of earthquake resistant pipe.
- Continue to work with stakeholders to communicate projects and implement mitigation measures to minimize impacts due to construction.
- Minimize trunk line system life cycle costs, including capital and operations and maintenance expenses.

Trunk Line Condition - Risk of Failure (in Miles)



Large Valves

LADWP has 2,806 large valves (16-inches or greater in diameter) in the water system network. Large valves are flow control devices that are critical for water system operations.



A double butterfly valve is installed as part of the First Street Trunk Line project.

Large valve replacement is based on operational needs. LADWP's goal has been to replace five large valves per year, based on recommendations from the Large Valve Assessment Program. There are currently 31 valves identified for replacement. LADWP's plan is to continue with a targeted large valve replacement program that strategically prioritizes replacements on large valves in the water distribution system. As changes to the Water System are made, replacement priorities are adjusted.

2015-16 Achievement:

- Replaced 5 large valves.

Long-Term Goals:

- Maintain and update a complete list of broken and/or difficult to operate valves.
- Continue the periodic valve exercise program to minimize valve damage and extend the valves' useful life.
- Continue the installation and renewal of large valves in conjunction with trunk line construction projects.

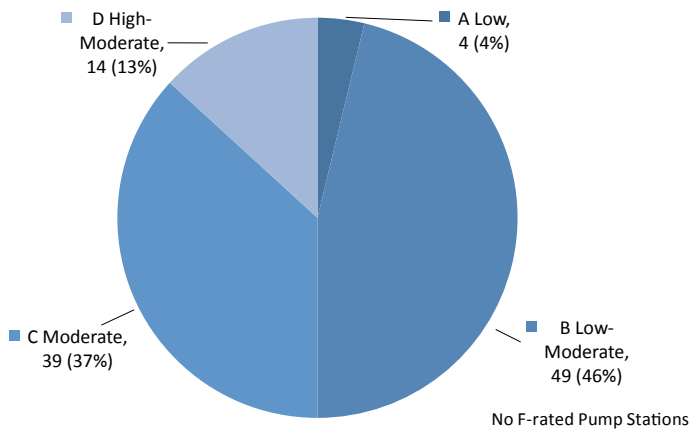
Pump Stations

There are 96 pump stations that pump water up to customers or storage tanks at higher elevations in the city.

Objectives:

- Prevent service disruptions.
- Maintain operations during construction/replacement.
- Minimize operational costs.
- Reduce repair costs through appropriate preventative maintenance.

Pump Station Condition - Risk of Failure



2015-16 Achievement:

- Replaced or rehabilitated 18 pumps/motors.

Long-Term Goal:

- Evaluate and rehabilitate station structures, electrical equipment, and piping components.



Pressure Regulator and Relief Stations

There are 233 regulator stations and 92 relief stations, totaling 325 stations combined. Regulator and relief stations control water pressure by adjusting for changes in flow and accommodating customer peak usage.

Objectives:

- Prevent service disruptions.
- Maintain system operations during construction.
- Minimize life-cycle costs.

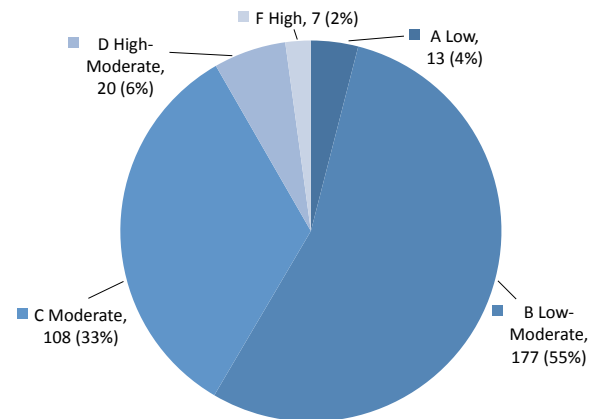
2015-16 Achievement:

- Retrofitted 4 stations that were highly corroded, leaking, and inoperable.

Long-Term Goals:

- Based on Asset Management evaluation, 4-6 station retrofits per year are needed through 2022.
- Some full station replacements are required due to structural requirements and expanded operational needs.
- Focus on structural integrity of pipes in the near future.

Pressure Regulator Station and Relief Station Condition - Risk of Failure

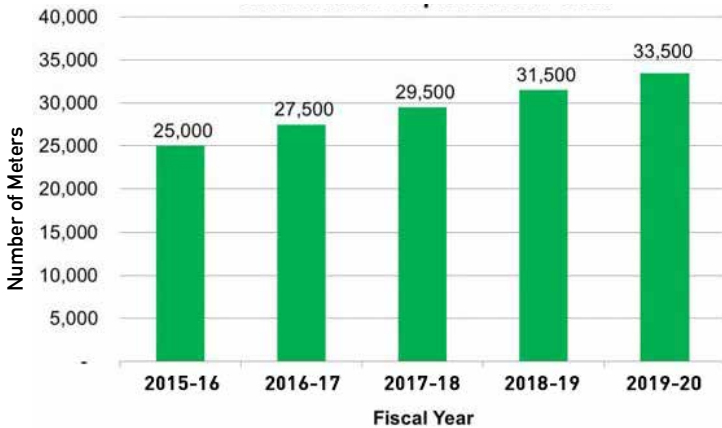


Water Meter Replacement Program

There are about 3,000 large meters (3 inches and larger) and 700,000 small meters (less than 3 inches) in the water distribution system. Accurate metering is necessary to fully account for water use by all customers as well as quantify water loss within the distribution system. LADWP has completed its cycle for large meter replacement, and is focused on replacing small meters, which constitute the vast majority of the Water System's meter inventory.

LADWP's current small meter replacement goal is 25,000 meters per year, which equates to a 28-year replacement cycle. The industry average life cycle of a small meter is 20 years, before wear and tear on its moving parts cause loss of measuring accuracy. Over the next five years, LADWP plans to ramp up to a replacement cycle of 20 years.

Small Meter Replacement Goal

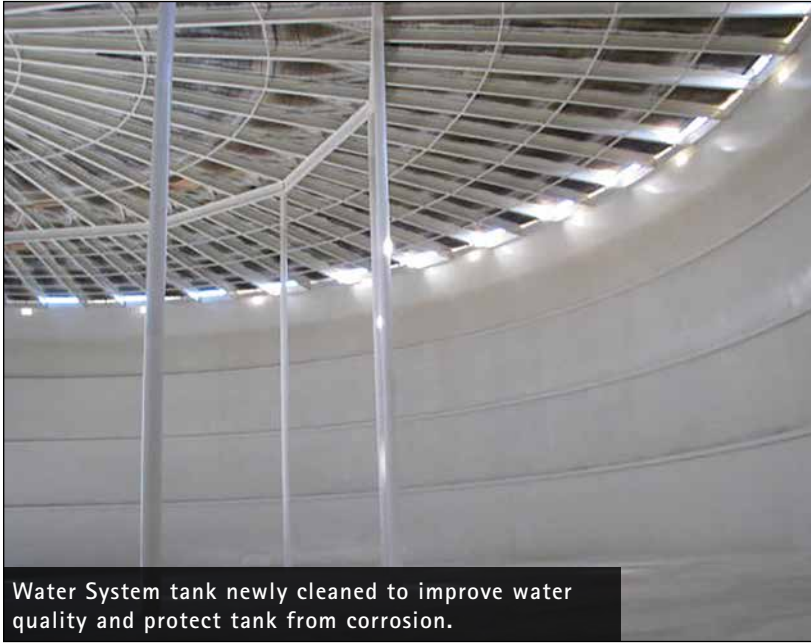


2015-16 Achievement:

- Replaced 30,771 meters, exceeding the goal by over 5,000 meters.

Long-Term Goals:

- Increase the small meter replacement rate to achieve a 20-year replacement cycle.
- Continue to evaluate automated meter programs that may provide the highest value to LADWP and our customers through real-time water use monitoring.
- Achieve at least 80% completion rate for repair and/or replacement of stuck or defective meters within 30 days after the service order is released by the Field Investigations Group.



Water System tank newly cleaned to improve water quality and protect tank from corrosion.



Los Feliz Tank

In-City Reservoirs and Tanks

Within the Los Angeles basin, LADWP operates nine major active reservoirs and 110 smaller storage facilities, all of which create operational flexibility to balance water supplies and customer demands. The following is an update on the nine major active reservoirs: Eagle Rock, Lower Franklin No. 2, Green Verdugo, Santa Ynez, and Lower Van Norman Bypass reservoirs are protected with a roof or floating membrane; Headworks East is a buried structure; Los Angeles Reservoir utilizes shade balls and ultraviolet disinfection; and floating covers are being installed at Elysian and Upper Stone Canyon. A 10th reservoir, the Headworks West buried structure, is currently in construction.

Additionally, the following five large reservoirs are no longer in service: Encino, Lower Hollywood, Upper Hollywood, Silver Lake, and Lower Stone Canyon. Ivanhoe Reservoir will be taken out of service in 2017. Various levels of maintenance are necessary at these locations due to potential emergency use, micro-filtration plants, and limited public access.

Storage tanks have capacity ranges from 9,000 gallons to 30 million gallons. The typical useful life for steel and concrete tanks is 60 years and 100 years, respectively. However, regular maintenance on steel tanks requires re-roofing every 20 years and internal re-coating every 30 years.

Objectives:

- Preserve water quality and structural integrity.
- Replace reservoir floating covers based on a 20-year useful life, or earlier if needed due to deterioration and damage, or as required by the Division of Drinking Water.
- Retrofit and/or replace tanks based on condition assessment of tank structural and mechanical elements, materials, and seismic stability.
- Maintain dam surveillance on reservoirs as required by the Division of Safety of Dams.
- Continue inspection and maintenance program for reservoirs and tanks.

2015-16 Achievement:

- Completed the floating cover replacement at Eagle Rock Reservoir.

Long-Term Goals:

- Cover two remaining open-water reservoirs, Elysian and Upper Stone Canyon.
- Complete the floating cover replacement at Lower Franklin No. 2.
- Complete Headworks West.

Los Angeles Aqueduct (LAA) Reservoirs & Dams

There are eight LAA reservoirs and dams beyond the city limits.

Objective:

- Evaluate and maintain dam structural integrity by conducting site-specific stability studies, as required and overseen by the State of California Division of Safety of Dams.

Goals:

- Complete the design for seismic improvements to North Haiwee Dam and identify a risk reduction project for Tinemaha Dam by FY 2016-17.



Los Angeles Aqueduct System

There are approximately 300 miles of LAA tunnels, open channels, covered channels, and sag pipes that convey water from the Eastern Sierra and Owens Valley to Los Angeles.

Objective:

- Maintain operations through in-place refurbishment of the entire LAA system.

2015-16 Achievements:

- Completed structural relining of 3 miles of concrete channel.
- Removed and replaced 15,807 feet of top cover for LAA1.

Long-Term Goals:

- Re-coat 800 feet of LAA1 Sag-Pipe.
- Structural lining of 3 miles of concrete channel.
- Re-coat exterior of sag pipes. Completed 9.5 miles to date with 5 miles remaining.
- Construct 2 cathodic protection stations a year. Out of 30 stations in total, 14 are completed to date.
- Replace an average of 3 miles of concrete lid on the covered channels annually. Of these, 21 miles are completed to date with 77 miles remaining. The goal for top cover replacement is 15,000 feet per year.
- Re-drill and replace groundwater wells in the Owens Valley averaging 2 per year. There are 35 wells operating out of a total of 130 due to various constraints.

The LADWP Water System's mission is to deliver a dependable supply of safe, high quality water to our customers in an efficient and publicly responsible manner.

LADWP serves 167 billion gallons of water per year to 681,000 service connections.

Infrastructure

7,337 miles of pipe

LA Aqueduct: 300 miles

119 tanks and reservoirs

96 pumping stations

2,806 large valves

25 chlorination stations

325 regulator and relief stations

60,714 fire hydrants



www.ladwp.com