



# Denver, CO

## Denver Water: Large-scale Lead Line Replacements

### Project at a Glance

#### Utility Overview

- Utility: Denver Water
- Location: Denver, Colorado
- Population served: 1.5 million
- Service area: 335 square miles

#### Challenges

- Elevated Levels of lead in Drinking Water
- Aging and Damaged Infrastructure
- Equity and Affordability

#### Solution

- A Lead Reduction Program with a holistic approach that significantly reduces lead exposure without adding chemicals to the Denver Water system and area waterways.

#### Costs and Funding Sources

- Total project cost: \$676,675,000
- Funding Sources:
  - Water rates
  - Revenue bonds
  - New service fees
  - Hydropower generation

#### Benefits



Community Engagement



Increased Access to Benefits



Reduced Risks from Lead Exposure



Water Supply Resilience



Economic Development and Green Jobs



Water Quality Compliance



Improved Drinking Water Quality



Public Health Engagement

## BACKGROUND

Established in 1918, Denver Water is Colorado's oldest and largest water utility. Denver Water's service area covers more than 355 square miles, including the City and County of Denver and the broader Denver-metro area. In 1971, Denver Water banned the use of lead in customer-owned service lines, however it is more likely that homes in Denver built before 1951 have lead service lines. Congress followed in 1986 by passing the Safe Drinking Water Amendments which banned lead pipes and phased out lead solder. Because of these service lines, Denver area residents living in older homes are at risk of lead exposure. Denver Water estimates there are 64,000 - 84,000 properties that may have lead service lines in its service area.



## CHALLENGE

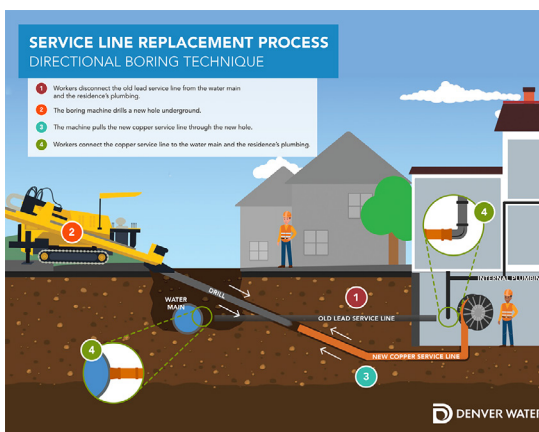
As a toxin harmful to public health even at low level exposure, the Environmental Protection Agency (EPA) regulates the amount of lead in drinking water. Under these regulations, including the Lead and Copper Rule and others, Denver Water monitors its drinking water for lead. In 2012, Denver Water's test results confirmed that water from homes with lead service lines exceeded EPA's action level. The action level is an indicator that a utility may need to adjust its water treatment to reduce its corrosivity to help minimize the risk of lead getting into drinking water from lead pipes and plumbing in customer homes and buildings. In response, Denver Water launched a public outreach campaign, and over the next five years, researched corrosion control methods to enhance protection for customers with lead service lines and plumbing. In 2018, the state regulators designated orthophosphate as the corrosion control method to reduce the risk of lead in drinking water and required Denver Water to add orthophosphate to its drinking water by March 2020.

Orthophosphate is a food additive that coats the interior of pipes to prevent further corrosion of lead service lines, but Denver Water was concerned that it did not actually remove the main source of lead in drinking water. And while orthophosphate has been safely and successfully used for decades across the country, concerns have been raised about the potential environmental impacts of this nutrient to wastewater treatment plants and downstream reservoirs, streams, and rivers.

Denver Water and other stakeholders along the Front Range studied the impacts of orthophosphate on its water system and the effects on surrounding waterways, such as the South Platte River, where this additive could affect the fish, wildlife, and environment along the river, as well as communities downstream that rely on the river for their own drinking water. Based on these impacts, the utility opted to take a holistic approach that tackled lead at its source and apply for a variance from EPA that would accelerate lead removal without using orthophosphate.

### Getting the Lead Out

The primary source of lead in drinking water is customer-owned lead service lines – the pipe that brings the water from the water main in the street to the plumbing in the home. Denver Water estimates there are 64,000 - 84,000 properties that may have lead service lines in its service area



In 2019, the EPA and state regulators approved the variance allowing Denver Water to focus on **replacing all lead service lines**, as opposed to indefinite orthophosphate treatment. As a result, Denver Water’s Lead Reduction Program to replace all 64,000 - 84,000 lead service lines in its service area with new copper lines at no direct charge to the customer launched in early 2020.

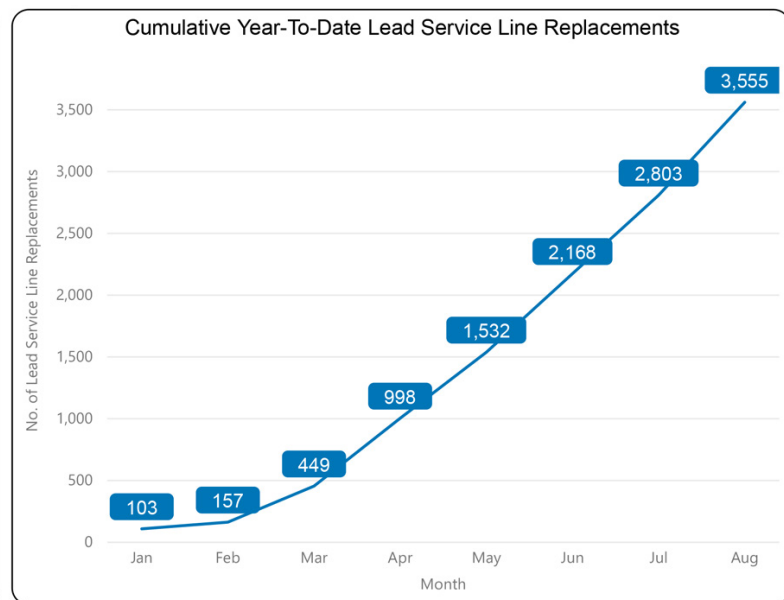
### The Lead Reduction Program has five major components:

1. **Lead Service Line Replacement:** Replacing all customer-owned lead service lines with copper lines at no direct charge to the customer.
2. **pH Adjustment:** Increasing the pH level of the water to reduce the risk of lead and other metals getting into drinking water from lead service lines or household plumbing. This change was made to reduce the corrosivity of the water and protect customers with lead in their plumbing system.
3. **Inventory:** Developing and maintaining a publically accessible inventory of all customer-owned lead service lines in Denver Water’s service area. A full inventory helps Denver Water to target underserved areas, and the most vulnerable and at-risk from lead exposure, as well as improve replacement efficiency during planned construction activities.
4. **Filter Program:** Providing a free water pitcher, filter, and replacement filters, certified to remove lead, to all customers suspected of having lead services lines until six months after their line is replaced. A free replacement filter is mailed every six months.
5. **Public Engagement:** Ongoing communication, education, and outreach programs.

Through the Lead Reduction Program, Denver Water is accelerating the pace of replacing customer-owned lead service lines, shortening the timeline from several decades to just 15 years. With this accelerated pace, Denver is prioritizing replacements in places such as schools and daycares that bring drinking water to the most vulnerable and at-risk from lead exposure, particularly infants and children. The utility also prioritizes areas with the highest concentration of lead service lines—underserved neighborhoods—and where there is ongoing construction.

Denver Water made achieving full lead service line replacements within 15 years and at no additional cost to its customers possible by debt financing its program.

Using the proceeds from a revenue bond, among other funding sources, to pay for replacements on both public and private property provided the utility the upfront dollars it needed to scale up its past replacement program. And by using a long-term 30-year capital financing approach, Denver kept the rate impact low. Cash-funding its \$676 million program would have had a much higher rate impact—a level of impact that would have made the program virtually impossible. The utility also applied a streamlined accounting approach known as Regulated Operations accounting. This accounting



Denver Water Lead Reduction Program Key Metrics Dashboard

Denver Water applied a streamlined accounting approach known as **Regulated Operations** accounting.



This accounting treatment allowed Denver Water to use its bond dollars to replace privately owned service lines without owning or controlling those private lines.

treatment allowed Denver Water to use its tax-exempt bond dollars to replace privately owned service lines without owning or controlling those private lines.

## SOLUTIONS

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### Health Benefits

Denver Water's Lead Reduction Program is setting a national example on prioritizing public health and safety for the long term. By accelerating its replacement rate from 1,200 service lines per year to 5,000 annual replacements, Denver will help protect its customers from the harmful health impacts of lead exposure.

As of June 2022, Denver had replaced 12,381 lead service lines and distributed over 100,000 filters certified to remove lead for customers with lead service lines.

### Environmental benefits

Denver Water's Lead Removal Program is a holistic approach to chemical treatment that removes lead at its source. By focusing on replacing all lead service lines in the service area, Denver Water avoids adding orthophosphate (a common corrosion control treatment to reduce lead concentrations in drinking water) to their water systems, which in turn mitigates the potential impacts of orthophosphate to wastewater treatment plants and downstream reservoirs, streams, and rivers. The South Platte River has historically experienced increased levels of phosphorus entering the waterways. Elevated levels of phosphorus, of which orthophosphate is derived, can lead to increased growth of algae and decreased dissolved oxygen, also known as eutrophication. When this occurs areas of the waterway can become "dead zones" and often results in mass mortality of fish and other aquatic life. Denver's program helps keep harmful pollutants out of the South Platte River.

### Regulatory benefits

By implementing the Lead Service Line Replacement Program, Denver Water has reduced lead in its drinking water pursuant to the Lead and Copper Rule and its EPA variance.

Reducing lead levels through pH and alkalinity corrosion control treatment is a critical component to the overall success of the Lead Reduction Program Plan. Since increasing pH and alkalinity in drinking water in March 2020, lead levels have decreased by 60%. Denver Water's 90th percentile lead level in the first half of 2022 was 3.9 parts per billion, which is below EPA's action level of 15 part per billion for lead.

### Economic benefits

According to the Value of Lead Prevention calculator by Altarum, Colorado's total lifetime economic burden of childhood lead exposure is \$1.4 billion. This accounts for costs associated with reduced lifetime productivity, increased health care costs, education, social assistance spending, and premature mortality. Denver's program, which permanently removes a major source of lead in drinking water, helps mitigate these costs on the State's economy in the future.

### Social benefits

Since the program's implementation, Denver-area residents are more aware of their local water infrastructure. As of June 2022, Denver distributed lead outreach and education materials through a combined 7.7 million mailings, digital, communications, and phone outreach efforts, and 143 events resulting in 16,300 event attendees. Denver Water also engaged with an additional 4,200 customers using multilingual and culturally relevant outreach. The utility incorporated feedback from customers, discussed water pitcher and filter use, and how to prepare for lead service line replacement. Establishing open lines of communication improves community input, outreach, and education, building trust.



### Sources

- [Images](#)
- [Denver Water Service Area](#)
- [Denver Water Lead Reduction Program](#)
- [Denver Water 2021 Approved Budget](#)
- [EPA Public Notice Regarding Denver Water Proposed Variance](#)
- [Value of Lead Prevention - Colorado](#)
- [Denver Water System Fact Book](#)
- [EPA Indicators: Phosphorus](#)