



September 4, 2019

Controlling Lead in Public Drinking Water Supplies

Communities nationwide are facing a range of issues associated with aging water infrastructure, including detection of elevated lead levels in drinking water. In affected communities, drinking water is a source of lead exposure. Other sources of lead exposure include lead-based paint and contaminated soil and dust from deteriorated lead-based paint.

Nationally, the phaseouts of leaded gasoline and lead-based paint, along with other regulatory controls, have reduced lead exposures. Since the late 1970s, overall blood lead levels in children (ages one to five) have declined an estimated 94%. However, because of lead's toxicity, even at low levels, reducing lead exposures from drinking water and other sources remains a public health priority.

Sources of Lead in Drinking Water

Unlike lead, most contaminants, when found in public water supplies, are detected and treated at the plant. Lead in drinking water occurs primarily where water is corrosive and lead is leached from pipes, plumbing materials, and fixtures (e.g., faucets). Corrosion is a chemical reaction between the water and the plumbing materials. Factors affecting corrosion include the water's acidity, temperature, water use patterns, and the presence or absence of protective coatings of mineral deposits that can accumulate inside pipes, among others. Accordingly, controlling corrosion has been the principal method used to keep lead from leaching into public water supplies.

The presence of leaded pipes and materials in community water systems and homes generally depends on the age of the water system and residences. Before the 1950s, lead pipes, known as lead service lines (LSLs), were commonly used to extend water service from the water main under the street to a residence or other building inlet. A 2016 analysis estimated that the number of LSLs nationwide declined from approximately 10 million to 6 million over three decades. Leaded plumbing materials (e.g., brass fixtures) in homes and buildings can also contribute to lead in drinking water.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) authorizes the U.S. Environmental Protection Agency (EPA) to regulate the quality of water delivered by public water systems. Under SDWA, Congress has addressed exposure to lead in drinking water using several approaches. These include (1) limiting lead in plumbing materials and fixtures (SDWA §1417) and (2) authorizing EPA to regulate contaminants, such as lead, in public water systems through national primary drinking water regulations (SDWA §1412). Further, Congress amended SDWA to address lead in child

care programs and schools and establish a program to remove lead-lined drinking water coolers (SDWA Part F).

Limiting Lead in Plumbing Materials

In 1986, Congress amended SDWA to prohibit the use of plumbing (e.g., pipes or pipe fittings) that were not "lead-free," which was defined at the time as solder and flux with no more than 0.2% lead and pipes with no more than 8% lead (P.L. 99-339). Congress authorized states to enforce these provisions and authorized EPA to withhold a portion of grant funds from a state for failure to enforce these requirements (SDWA §1417).

Congress expanded the lead prohibition to include fixtures in 1996 (P.L. 104-182) and reduced the allowable lead content in "lead-free" plumbing materials in 2011 (P.L. 111-380). *Lead-free* is now defined as no more than 0.25% lead across wetted surfaces of plumbing materials. Many communities may still have older plumbing that contains more lead than is allowed for newer materials.

Regulating Lead in Public Water Supplies

SDWA authorizes states to assume primary responsibility for oversight and enforcement of public water system compliance with drinking water regulations. EPA, among other responsibilities, retains oversight authority over state programs. Public water systems can be owned and operated by private or public entities, including municipalities or local governments.

EPA regulates lead in drinking water through the 1991 Lead and Copper Rule (LCR), as revised. This rule replaced a standard for lead in drinking water of 50 parts per billion (ppb), which was measured where treated water enters the distribution system. Because lead or copper generally enters the water after it leaves the plant, the current LCR includes a treatment technique, which primarily relies on corrosion control and water quality and tap water monitoring. The LCR also establishes an action level, which is a screening tool (not an enforceable standard) for determining whether further actions are required.

Under the LCR, public water systems are required to optimize and maintain treatment to control corrosion. Usually, corrosion control treatment involves adjusting the water's acidity to mitigate the treated water's potential to corrode lead from the water system or household plumbing. Corrosion control treatment can provide a cost-effective way to control lead in drinking water, but maintaining control of corrosion is complex and requires consideration of factors such as source water quality and composition of distribution system and interior plumbing in individual properties. Further, actions to comply with other SDWA drinking water regulations may increase the water's acidity.

Among the rule's initial requirements, LCR required owners or operators of water systems to survey the materials of their distribution systems. This information enables systems to target tap-water monitoring at homes and other locations expected to be at high risk of lead contamination. The LCR establishes an action level at 15 ppb for lead and 1,300 ppb for copper. If more than 10% of tap water samples exceed the rule's action level, a community water system is not in violation of the rule, but the water system is required to take actions, including optimizing corrosion control, public education, water quality parameter monitoring, source water treatment, and, in some cases, LSL replacement. For more on the LCR, see CRS In Focus IF10446, *Regulating Lead in Drinking Water: Issues and Developments*.

LSL Replacement

If a large community water system (50,000 or more individuals) cannot limit lead in water through corrosion control or other source water treatment, the LCR requires the water system operator to replace LSLs. Typically, the water system owns the portion of line that extends from a water main to a residence's property line, a water meter, or a shut-off valve between the main water line and the building, while the remaining portion is owned by the property owner. The LCR requires community water systems that exceed the action level to replace annually 7% of their LSLs, based on the rule's initial materials evaluation, until the action level is not exceeded for two consecutive six-month monitoring periods. In cases when the LSL scheduled for replacement extends past the property line, the LCR requires public water systems to offer the owners an opportunity to have their portion of the LSL replaced, but the system is not required to pay for the owners' replacement costs for their portions of LSLs.

Revisions to the Lead and Copper Rule

In 2004, EPA initiated a review of the LCR after increased lead levels were detected in the District of Columbia's drinking water after a water treatment change. This review resulted in short-term revisions and clarifications that EPA promulgated in 2007. These revisions require water systems to notify the state agency if the system plans to change the source or treatment of its water supply. The requirements are intended to ensure that the state and system evaluate the potential impact such changes may have on corrosion control treatment.

EPA continues to work on comprehensive revisions to the LCR. In 2015, EPA received recommendations for LCR revisions from the National Drinking Water Advisory Council (NDWAC). NDWAC recommendations specific to LSL replacement included requiring all water systems to establish a proactive LSL replacement program, which would be costly and likely take decades to fully remove all LSLs. As such, NDWAC recognized corrosion control's importance and recommended that EPA revise the rule's action level and requirements for corrosion control treatment and monitoring, among other revisions. According to the *Spring 2019 Unified Regulatory Agenda*, EPA plans to propose LCR revisions in 2019 and issue a final rule by July 2020.

1452(a) to require public water systems to include—to the extent practicable—the cost to replace LSLs in future drinking water capital improvements needs surveys. SDWA requires EPA to conduct the survey every four years, and EPA uses the results to determine the allotment among the states for the annual grants for the Drinking Water State Revolving Fund (DWSRF) program. The inclusion of the cost to replace LSLs in the survey may affect the allotments of DWSRF grants among the states.

Implementation Challenges

As communities identify options to address lead in water supplies, LSL replacement is often identified as a way to permanently remove a potential pathway of lead exposure or as a way to minimize reliance on corrosion control treatment. LSL replacement raises a number of implementation challenges for water systems and communities. Among others, these challenges include the costs to replace these lines, which may result in partial LSL replacement (i.e., when the water system replaces some of the LSL it owns and the remaining portion is not replaced).

The estimates of costs to replace LSLs vary widely (e.g., \$2,500-\$5,500 per line, with some industry estimates at \$8,700 per line). While disagreement may exist about LSL replacement costs, community water systems and individual property owners are likely to face financial challenges to replace LSLs. In circumstances where the LSL is partially owned by a property owner, under the current LCR, the public water system cannot compel the owner to replace the owner's portion of the LSL. Therefore, if the property owner is unable or unwilling to pay for their portion of the LSL replacement, lead may continue to leach into drinking water from the remaining portion of the LSL.

As noted, partial LSL replacement is allowed under the LCR. Some studies have indicated that cutting into a LSL may disturb lead in the remaining portion, resulting in elevated lead levels for some period (e.g., days to weeks or several months) after partial LSL replacement. EPA is considering requiring full LSL replacement as a part of LCR revisions. (For sources of federal funding for water infrastructure projects, see CRS Report RL30478, *Federally Supported Water Supply and Wastewater Treatment Programs*.)

Lead in fixtures and interior plumbing can pose further challenges to addressing lead in drinking water. Even with full LSL replacement, interior plumbing or fixtures in private property may remain a potential source of lead exposure. If water systems undertake proactive LSL replacement, the issues of partial LSL replacement and of leaded interior plumbing or fixtures suggest that water systems may need to maintain corrosion control treatment to prevent lead from leaching into water. As a part of LCR revisions, EPA recognized the continued importance of corrosion control treatment in reducing lead exposure and is considering a range of options to strengthen corrosion control requirements. EPA is also evaluating the LCR's action level and the monitoring, sampling, and public notification requirements, along with other LCR changes.

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