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Managing Lead in Drinking Water at Schools and Early Childhood Education Facilities

Horsley Witten Group, Inc. and commissioned by the

W.K. Kellogg Foundation

MANAGING LEAD IN DRINKING WATER

at SCHOOLS and EARLY CHILDHOOD EDUCATION FACILITIES

FEBRUARY 2016

**Prepared by the Horsley Witten Group, Inc.
and commissioned by the
W.K. Kellogg Foundation**

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Foreword

This report on managing lead in drinking water at schools and early childhood education facilities is an important tool for educators and community leaders to limit children's exposure to lead. It's intended to help people learn about the harmful effects of lead and how to test, detect and reduce waterborne lead levels.

Lead is recognized as the single most significant environmental health threat to America's children, according to the 1997 National Resources Defense Council study, *Our Children at Risk: The Five Worst Environmental Threats to Their Health*. The toxicity of lead in relatively small doses is associated with learning disabilities, poor attention spans and lowered IQ scores.

The prevalence of lead in drinking water isn't an isolated issue. Will Keith Kellogg, the founder of the W.K. Kellogg Foundation, said, "The greatest good for the greatest number can come only through the education of the child, the parent, the teacher, the family physician, and the community in general." This crisis impacts all communities with aging infrastructures, not simply economically-distressed cities. We must tackle this together and partner in using these guidelines to facilitate future lead remediation.

In fact, considerable progress has been made over the past 30 years in reducing exposures and blood lead levels of children in the United States. This progress was created by public policies that banned leaded gasoline, lead in paint, lead solder in cans, and leaded piping and plumbing fixtures. Public health campaigns for lead abatement in individual homes also contributed to reductions in child lead poisonings, but waterborne lead remains a hazard.

This report is an important tool that community leaders can use to identify ways to limit harmful childhood lead exposures. Today, children spend most of their waking hours in schools and early childhood education facilities and much of the water they consume in a day occurs in these facilities. Ironically, children are in these buildings to learn, but

can be exposed in them to toxins known to be direct barriers to learning. It will help local school administrators and community leaders get involved in the processes of testing, detecting and reducing waterborne lead levels.

The lead in drinking water crisis represents a crisis of environmental justice, counter to our efforts and falling woefully short in our basic function as a democracy to educate and keep our children safe. Yet, it also presents an opportunity for all of us to proactively engage and be accountable to each other and for each other – from our elected officials to our community leaders. Unacceptable risk must be eliminated. Deficits should not lead to a tragedy. We cannot prioritize basic human rights against cost-cutting. We must be transparent and steadfast in ensuring our children thrive.

The W.K. Kellogg Foundation is pleased to have partnered in developing this tool for communities. It is packed with user-friendly guidance that answers basic questions about protecting our nation's children from the ubiquitous toxin - lead that may possibly be flowing through our public and institutional water systems. It is our hope that this guide creates more interest in and understanding about an important public health challenge, while it helps communities make their schools and early childhood education facilities healthier places for children.

La June Montgomery Tabron
President and CEO
W.K. Kellogg Foundation

Executive Summary

School and early childhood education (ECE) facilities need to know if the drinking water that they provide to children contains high levels of lead. Lead can enter drinking water supplies through the corrosion of pipes, fittings and fixtures. If too much lead enters the body, serious health problems can arise, particularly in infants and young children. Because children spend a significant portion of their waking hours in school and ECE facilities, it is important to determine if lead is leaching into their drinking water. Therefore, even though a public water supplier may deliver water that meets all federal and state public health standards for lead, facility plumbing may leach lead into the drinking water. The potential for lead to leach into water can increase the longer the water remains in contact with lead plumbing. Currently, only schools that have their own wells are legally required to sample for lead in their drinking water.

Many parents, students and communities across the country have found themselves in the position of discovering high levels of lead in their school's drinking water either through a media news story or through the school's sampling efforts. Schools and ECE facilities should develop their own program, or plan of action to determine if lead in drinking water is a problem. Schools that have developed their own lead testing and remediation programs generally find themselves able to develop and tailor a program to their unique situation, rather than undertaking a reactionary program that may lead to oversampling and excessive costs.

This guide synthesizes lessons learned and best practices regarding lead sampling and analysis in schools and ECE facilities across the country. Case studies throughout the document include examples from schools and ECE facilities that have dealt with lead in drinking water sources, and reference guidance from federal, state, local government agencies and other organizations. Overall, the guide can help with the following topics:

- Understanding the danger of lead in drinking water – *Why is lead a problem for children?*

- Acknowledging the need for a lead testing program – *What information do you need to determine whether there is a lead problem?*
- Getting school or external partner buy-in for a program – *Who should be involved in developing a program?*
- Developing sampling procedures – *What is necessary to build the best sampling program for your situation?*
- Implementing lead testing procedures – *How can you incorporate best practices?*
- Choosing remediation options – *What is the right fix for your facility?*
- Engaging with the public – *How can you share information effectively with the public?*

Who should use this guide?

The aim of this guide is to help school and ECE staff, as well as other stakeholders (e.g., parents, students) develop their own affordable, voluntary program. In addition, other groups, such as public health partners, community members and researchers, may choose to use this guide to support the implementation and evaluation of these efforts among schools and ECE facilities in their area.

How can you use this guide?

This guide is organized in a step-by-step fashion for those who may be unfamiliar with the issue of lead in drinking water in schools and ECE facilities. These steps outline how school or ECE facilities can investigate whether there is lead in their drinking water, remediate sources of lead in the drinking water and communicate with the public about the lead testing and remediation program. School or ECE facilities may have already completed some of the steps outlined in the guide, can proceed directly to the relevant section for their situation.

Facility staff and stakeholders can use this guide to help determine whether facility water is safe. Issues can be identified and remediated, so that school and ECE facility staff can promote children's consumption of drinking water.

Many resources were reviewed in detail to develop this guide. Some are included as hyperlinks in the document and additional resources are provided in the Literature Review section.

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Section 1: Understand the Danger of Lead in Drinking Water

According to the U.S. Centers for Disease Control and Prevention (CDC), there are approximately half a million U.S. children ages 1-5 with blood lead levels (BLL) above 5 micrograms per deciliter (μg/dL), the reference level at which the CDC identifies a child as having elevated blood lead levels. However, no safe BLL in children has been identified.[1] If too much enters the body from drinking water or through other sources, lead can cause serious health problems:

- Increased lead levels have been shown to cause damage to the brain and kidneys;
- Increased lead levels interfere with the production of red blood cells that carry oxygen to all parts of your body;
- Scientists have linked the effects of lead on the brain with lowered intelligence quotient (IQ) in children;
- Adults with kidney problems and high blood pressure can be affected by lower levels of lead more than healthy adults;
- Lead is stored in the bones and it can be released later in life; and
- During pregnancy, the fetus receives lead from the mother's bones, which may affect brain development (Environmental Protection Agency, 2013a).

Because childhood lead exposure often occurs with no immediate symptoms, it frequently goes unrecognized until it is too late. Some children may exhibit cognitive effects that might never be recognized.

Children and Exposure to Lead in Drinking Water

Although the main sources of exposure to lead are ingesting paint chips and inhaling dust, the Environmental Protection Agency (EPA) estimates that 20 percent or more of human exposure to lead may come from lead in drinking water. Infants who consume

[1] For more information about reducing a child's exposure to lead, visit CDC's Childhood Lead Poisoning Prevention Program website (CDC, *Lead website – Online Resource*).

mostly mixed formula can receive 40 to 60 percent of their exposure to lead from drinking water (EPA, *Basic Information about Lead in Drinking Water – Online Resource*). An infant's diet is mostly liquid, so making formula with contaminated tap water could introduce large concentrations of lead into their systems. Older children in schools and early childhood education (ECE) facilities may be exposed through the water they drink or food that has been prepared with contaminated water (EPA, 2002). The Minnesota Department of Health (MDH) notes that children are especially susceptible to lead exposure, because their bodies absorb metals at higher rates than the average adult does. Children younger than 6 years old are most at risk due to their rapid rate of growth (MDH, 2014).

Because scientists and government officials previously identified ingesting paint chips and inhaling dust as very significant causes of high exposures to lead, there have been many concerted efforts and programs to remediate lead paint hazards in homes and schools across the country. As a result, lead in drinking water is increasingly becoming an important source of exposure for many children. Lead may enter the tap water through corrosion of plumbing materials (e.g., pipes, solder) and fixtures in the facility plumbing.[2]

Schools and Drinking Water

Most schools and ECE facilities receive their drinking water from a public water system (PWS), which is a publicly or privately owned company that provides drinking water to at least 15 service connections or 25 persons. However, some schools have their own on-site water systems (e.g., well) and are therefore considered a PWS. Public water systems are required to regularly test the water to ensure it meets federal and state drinking water standards. Therefore, a school's PWS is responsible for water quality until it

[2] Many factors influence lead corrosion and release, such as (but not restricted to): pH; alkalinity; water velocity; temperature; chlorine residual type and levels; chloride concentration; orthophosphate concentration; deposits of iron, manganese and aluminum; the age and condition of plumbing; and the amount of time water is in contact with plumbing. The occurrence and rate of corrosion depend on the complex interaction between a number of these and other chemical, physical, and biological factors (AwwaRF, 1990; EPA, 2013a; Schock, 2011).

reaches a facility, but once the water enters the service line to a facility, the school or ECE facility is responsible. Figure 1 illustrates where PWS responsibility ends – at or near a property line – and customer responsibility begins. Therefore the school or ECE facility administrator must determine not only if there are lead components in the facility plumbing, but also in the service line supplying the building. More information about how to determine if lead could be present in your school and ECE facility can be found in Section 2.

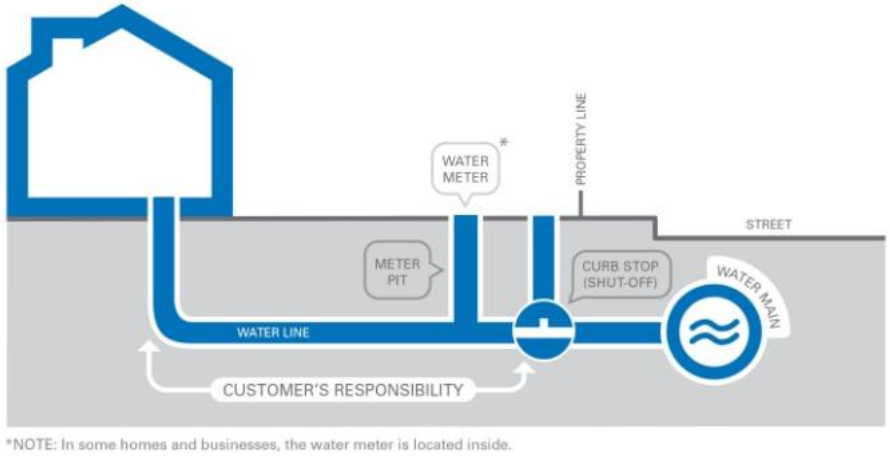

Figure 1: PWS/Customer Responsibility (Source: Evansville Water and Sewer Utility)

Water-Use Patterns in Schools

In schools and childcare facilities, water often stagnates in pipes overnight, and during weekends and extended breaks. These typical water use patterns can contribute to elevated lead levels in drinking water if the plumbing includes lead-containing components. Therefore, facility staff should investigate all plumbing components thoroughly to determine the risk of lead entering the drinking water. This is an important step in understanding how lead could enter a facility's drinking water and the efforts required to reduce children's overall exposure to lead.

Lead in School Drinking Water

Finding elevated levels of lead in schools and ECE facilities' drinking water is not an isolated issue. The EPA requires PWSs, including schools and ECE facilities with their

own water supply, to regularly test for lead, with some monitoring every six months, some every year and some every three years. National sampling results are available through the Safe Drinking Water Information System (SDWIS) in three-year periods. Figure 2 shows the total number of schools/ECE facilities across the country classified as PWSs that have reported at least one sample with an action level exceedance (ALE) in the three most recent reporting periods (e.g., 2006-2008, 2009-2011, 2012-2014).

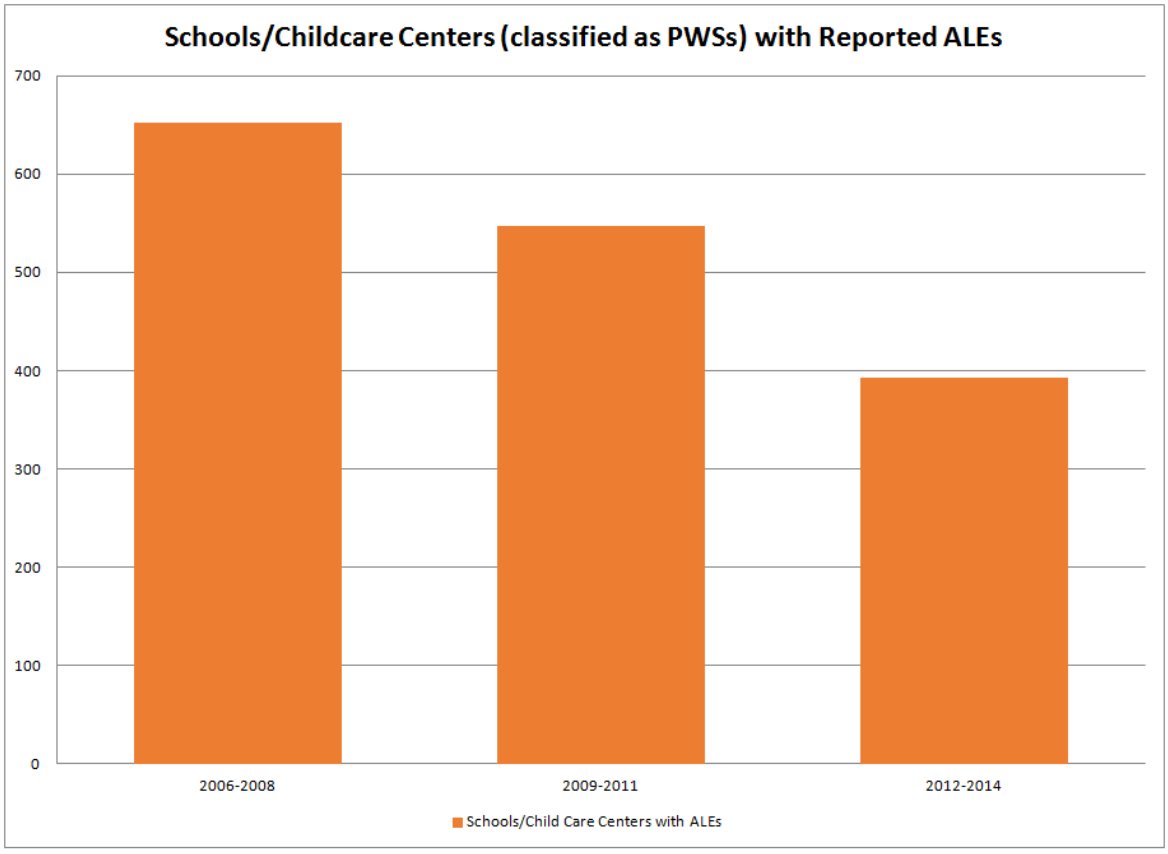

Figure 2: (Source: Safe Drinking Water Information System)

The data also shows that the number of schools/ECE facilities (classified as PWSs) with ALEs has decreased over time – likely due to the implementation of treatment changes or remediation measures – but it is still an issue. It is highly likely that many schools and ECE facilities not classified as PWSs could also have problems with lead in their drinking water. This reiterates the importance of all schools and ECE facilities implementing a testing program to determine if lead is present in a facility's drinking water.

Section 2: How Federal Regulation has Reduced Exposure to Lead in Drinking Water

Congress passed the Safe Drinking Water Act (SDWA) in 1974 to protect public health by regulating the nation's public drinking water supply. Several specific provisions under the SDWA also relate to lead in drinking water. According to the CDC, and illustrated in the graphic below, the percentage of children younger than 6 years old tested each year with a BLL of greater than 10 micrograms per deciliter (µg/dL) has dropped from 7.61 percent in 1997 to 0.56 percent in 2013 (CDC, *Lead Website – Online Resource*).

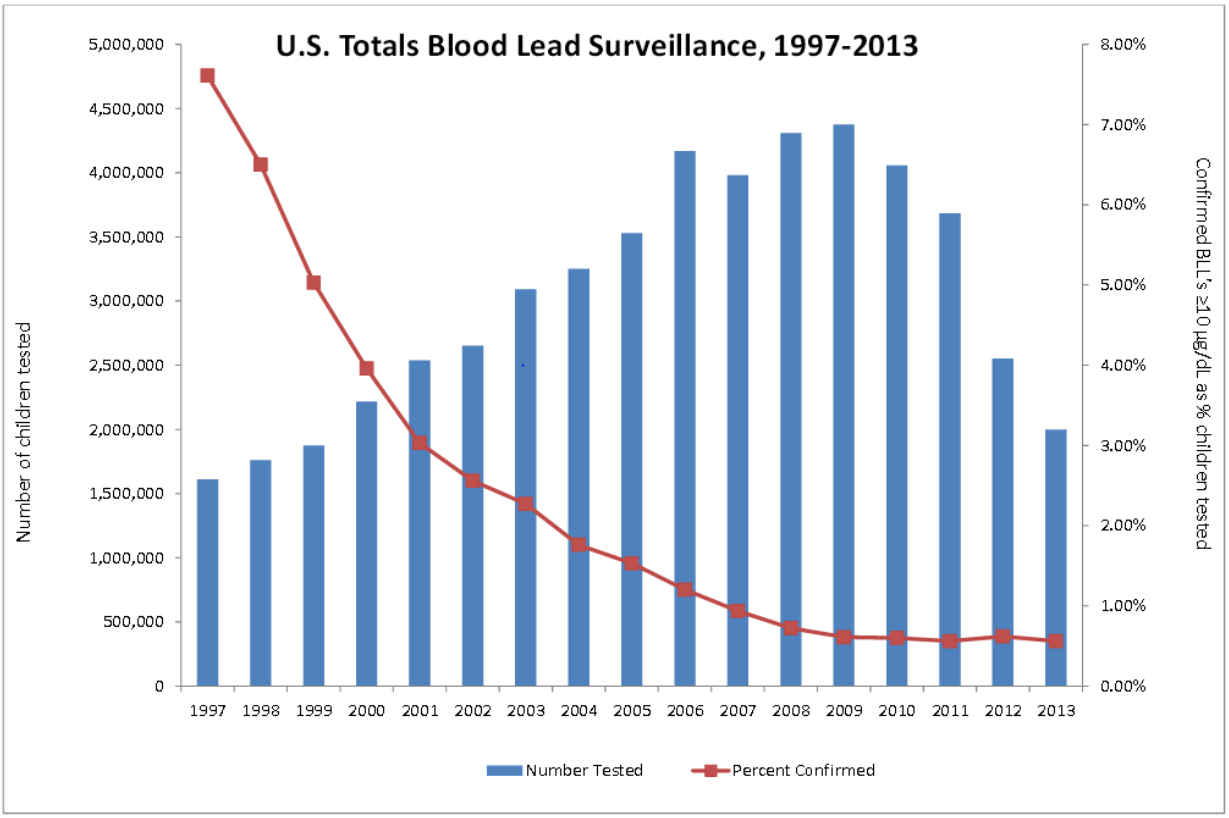

Figure 3: (Source: Centers for Disease Control)

Since the SDWA passed, additional laws were created to protect people from lead in drinking water exposure and to provide drinking water access in schools and ECE facilities.

1986 Lead Ban

The 1986 SDWA Lead Ban requires the use of "lead-free" pipe, solder and flux in the installation or repair of any plumbing in a residential or non-residential facility used for drinking water. This law states that solders and flux are “lead-free” if they contain less than 0.2 percent lead, while pipes and fittings must be less than 8 percent lead. Before this ban took effect, solders joining water pipes typically contained about 50 percent lead. Plumbing fixtures without a “lead-free” designation were banned from sale after Aug. 6, 1998 (EPA, *Water: School and Child Care Facilities – Online Resource*).

1988 Lead Contamination Control Act

The purpose of the 1988 Lead Contamination Control Act (LCCA) was to reduce overall lead exposure by reducing lead levels in drinking water at schools and ECE facilities. The LCCA requires:

- “A recall of drinking water coolers with lead-lined tanks;
- Prohibition of the sale and manufacturing of any drinking water cooler that was not “lead-free;”
- Development of guidance to educational agencies and schools including childcare facilities on sampling and testing protocols; and
- Public notification of the availability of lead testing results (American Water Works Association [AWWA], 2005).

The LCCA resulted in federal guidance applicable to schools and ECE facilities, but it did not set regulatory requirements (EPA, *Basic Information about Lead in Drinking Water – Online Resource*). Therefore, states have the voluntary responsibility to

enforce the provisions of the act through their own authority. EPA, as well as many other federal agencies and partners strongly recommend that schools and ECE facilities test for lead in the drinking water (EPA, 2005a).

1991 Lead and Copper Rule

The 1991 Lead and Copper Rule (LCR) requires PWSs to monitor for lead and establishes a lead action level of 0.015 mg/L. Under the LCR, PWSs are required to monitor homes and buildings considered "high risk" including locations with lead service lines, lead interior plumbing and copper pipes with lead solder throughout distribution systems (EPA, 2010). PWSs must treat for corrosive water if more than 10 percent of sample locations have lead or copper levels above the action level, with copper's action level being 1.3 mg/L (EPA, 2010). Information about how to calculate whether more than 10 percent of samples have reached the action level, or 90th percentile, is available in the "Lead and Copper Rule: A Quick Reference Guide for Schools and Child Care Facilities that are Regulated Under the Safe Drinking Water Act" (EPA, 2005b). LCR testing is only required within a school or ECE facility if it maintains its own drinking water source and is therefore classified as a PWS. For more information on lead action levels, see Section 6.

Case Study: To encourage school lead sampling, the Massachusetts Department of Environmental Protection (MassDEP) requires PWSs to maintain a list of all public and private schools and childcare facilities in their service area. Each time a PWS is required to take a round of Lead and Copper Rule (LCR) samples, they are required to test two taps at two schools/childcare facilities in their service area. Each year, the PWS must sample a different school/childcare facility until all are sampled at least once. In subsequent years, when a previously sampled facility is up for resampling, the two new samples must be taken at different taps than the previous times. Facilities with lead results above an action level of 0.015 mg/L should follow the steps outlined in the "Factsheet: Follow-up Steps for Schools or Child Care Facilities Based on Lead and Copper Sampling Results" (Source: Ken Pelletier, Lead in Drinking Water Contact; telephone interview: March 12, 2015).

The EPA developed the following documents for those schools and ECE facilities classified as a PWS that must comply with the LCR:

- "Lead and Copper Rule: A Quick Reference Guide for Schools and Child Care Facilities that Are Regulated Under the Safe Drinking Water Act" (EPA, 2005b)
- "3Ts for Reducing Lead in Drinking Water in Schools" (EPA, 2006d)
- "Drinking Water Best Management Practices: For Schools and Child Care Facilities With Their Own Drinking Water Source" (EPA, 2013b).

The EPA also developed the following resources for schools and ECE facilities interested in developing their own voluntary programs:

- "Drinking Water Best Management Practices: For Schools and Child Care Facilities Served by Municipal Water Systems" (EPA, 2013a)
- "3Ts for Reducing Lead in Drinking Water in Schools" (EPA, 2006d)

Case Study: State of Washington legislation (WAC 246-366A-130 Water quality monitoring—Lead) that mandates lead water quality monitoring at all schools will be effective on July 1, 2017. The law will require ongoing monitoring for lead every five years. The Washington State Department of Health (DOH) also developed a "Preliminary Cost-Benefit Analysis Summary" as part of the rule development.

EPA recommends that schools and ECE facilities take action if samples from any drinking water outlets show lead levels greater than 0.02 mg/L.

2010 Healthy, Hunger-Free Kids Act

In December 2010, Congress passed the Healthy, Hunger-Free Kids Act. Section 203 of this law states that "schools participating in the school lunch program under this Act shall make available to children free of charge, as nutritionally appropriate, potable water for consumption in the place where meals are served during meal service." In

addition, the law established a requirement that ECE facilities participating in the Child and Adult Care Food Program (CACFP) must make water available throughout the day as well (CDC, 2014a). However, the Healthy, Hunger-Free Kids law still does not require schools or ECE facilities served by a PWS to test for lead in drinking water.

2011 The Reduction in Lead in Drinking Water Act

The 2011 Reduction of Lead in Drinking Water Act took effect on Jan. 4, 2014. All water systems that provide water for human consumption must use materials, devices and components that meet an updated "lead-free" requirement. The Reduction of Lead in Drinking Water Act lowered the allowable lead content of wetted surfaces from 8.0 percent to a weighted average of 0.25 percent and created exemptions for non-potable services and other uses where the water is not anticipated for human consumption (EPA, 2013c).

To verify that a component meets the new definition of "lead-free," it is best to use only tested and certified products. The SDWA does not require third-party certification, but third-party certification bodies or agencies may be used by manufacturers to inform customers which products meet a voluntary standard. One such standard, NSF/ANSI Standard 372, is consistent with the requirements of the Reduction of Lead in Drinking Water Act (EPA, 2013c). The following are examples of resources that a school or ECE facility administrator could consult to help staff verify its plumbing components meet the new "lead-free" standard:

- "How to Identify Lead Free Certification Marks for Drinking Water System & Plumbing Products" (EPA, 2015)
- "Questions & Answers: The Reduction of Lead in Drinking Water Act" (Washington State Department of Health, 2013)

As lead in drinking water in schools continues to be an important topic, future legislation at both the federal and state levels should continue to focus on policies that

reduce the number of children with high BLLs. School and ECE facility administrators should check with their state drinking water agency to determine what other initiatives are being considered.

Section 3: Decide if a Lead Testing Program Is Necessary

This section discusses steps a school or ECE facility administrator can take to decide whether a lead testing program is needed.

Develop a Plumbing Profile

Lead in drinking water is not normally an issue in the water prior to entering a building's water service line. It is important to investigate potential sources of lead at your facility, also known as developing a plumbing profile. A plumbing profile can help identify the location(s) and source(s) of lead contributing to lead in drinking water. A plumbing professional can determine if any of the following items in a school or ECE facility contain lead:

TIP: Do not assume that plumbing in a newly built school is lead-free. In some cases, newer plumbing fixtures may also release lead into the drinking water – especially those purchased or installed prior to the effective date of the 2011 Reduction in Lead in Drinking Water Act (Arizona Department of Health Services, 2004 and EPA, Lead in Drinking Water website).

- Facility plumbing
  - Lead piping and solder will appear dull gray in color and shiny when lightly scratched. While pipes may be similar in color, a magnet will not stick to a lead pipe, but it will stick to galvanized steel pipe. The use of lead was banned in 1986.
  - Faucet aerators may trap sediments containing lead.
  - Old galvanized pipe may have lead in the original coating that is caught in the scale, or could accumulate and trap lead from upstream lead service piping.
  - Brass pipes, faucets, fittings and valves may contain alloys of lead. Even many chrome-plated faucets contain brass on the inside (EPA, 2006d).
- Water service line – pipes that carry water from the PWS main to the facility.

- Water fountains – specific brands of water fountains contain lead parts or have lead lined water tanks. New water fountains must be lead free as mandated in 1986, but older facilities may have outdated models. The EPA published a list of water coolers that contain lead parts or lead lined tanks (EPA, 2013a). A list of water coolers with lead components and lead lined tanks is in Appendix E of "3Ts for Reducing Lead in Drinking Water in Schools" (EPA, 2006d).

Figure 4 further illustrates the locations where lead could be present in a school or ECE facility.

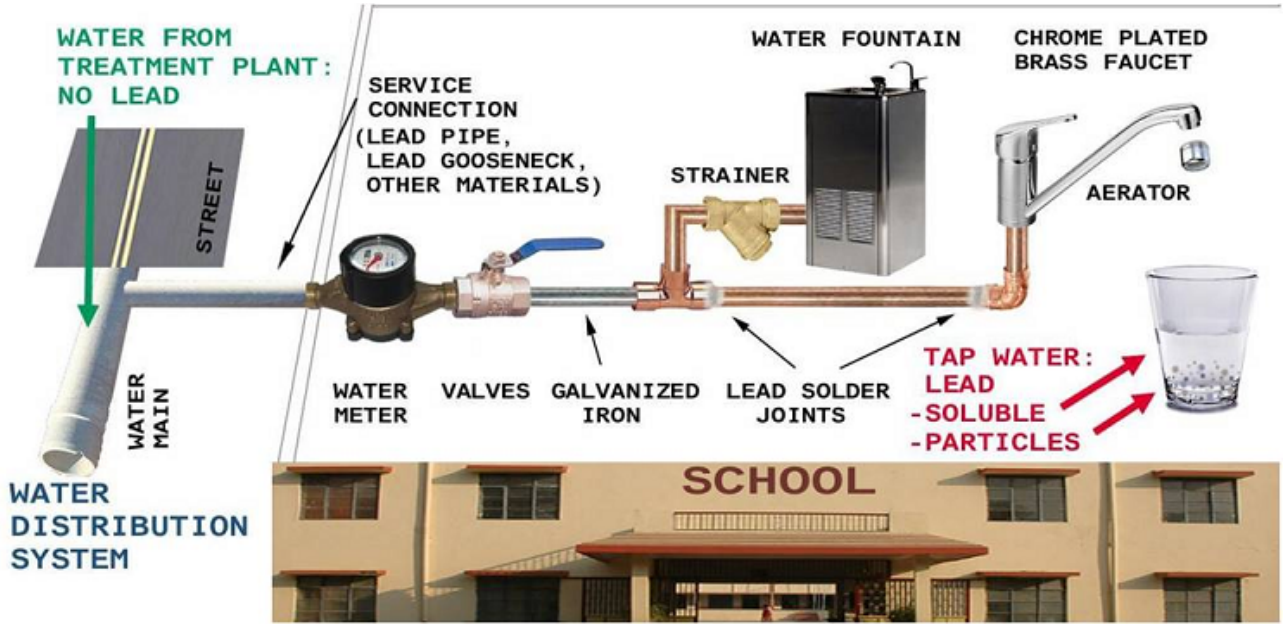

Figure 4: Lead in Drinking Water Sources (Source: Edwards, 2009)

Although it may not be possible to investigate every potential source of lead in drinking water at a school or ECE facility, developing a profile (even if it is incomplete) will help gauge the likelihood of finding lead in drinking water when sampling. Resources to help in the development of a plumbing profile are available from the following publications.

- The New York City Board of Education, Office of Environmental Health and Safety "Potable Water Sampling Protocol for Lead Concentration" includes a plumbing profile questionnaire (New York City Board of Education, 2002).
- The MassDEP created a Lead Maintenance Checklist that schools can use to determine if lead is likely to be a problem at their facilities (MassDEP, 2005).
- The AWWA "Assisting Schools and Child Care Facilities in Addressing Lead in Drinking Water" report includes Appendix E: Sample Facility Plumbing Profile and Appendix F: Understanding the Significance of Plumbing Profile. The report's appendices list questions that a school should answer prior to instituting a program, as well as how to interpret results (AWWA, 2005).
- The EPA's "3Ts for Reducing Lead in Drinking Water in Schools," specifically Exhibit 3.1, identifies plumbing profile questions and the significance of the answers (EPA, 2006d).

Review Publicly Available Health Information

A local health department can provide information about whether high BLL is an issue in a community. The National Association of County and City Health Officials provides a directory of local health departments. High BLLs in the community do not specifically identify locations where contamination is happening. Therefore, it is worthwhile to rule out a school or ECE facility's drinking water as contributing to the problem.

Review PWS Sampling Results

Public water systems take steps to reduce the corrosiveness of the water; however, if a school or ECE facility's plumbing is made of lead or has lead in its fixtures, corrosion could release lead into the water. Remember that lead contamination is site-specific, so the risk is reduced by PWS administrators instituting corrosion control treatment, but there is still a risk – especially if there is lead in facility plumbing. Staff should ask their PWS administrator the following questions to determine if the water could contribute to a lead problem in a school or ECE facility:

TIP: Contact your PWS to get a copy of their latest CCR or visit the EPA's "Where You Live: Your Drinking Water Quality Reports Online" website to check if it is available online.

- Does (or could) the PWS take any LCR samples at schools or childcare centers?
- Has the PWS had a lead action level exceedance in its most recent compliance period?
- What steps have been taken to maintain compliance with the LCR?
- Can the PWS provide a copy of the most recent annual water quality report, also known as a consumer confidence report (CCR)?
- Does the PWS add a corrosion control chemical to the water? How can this reduce the amount of pipe corrosion?
- Is there construction or water main maintenance work in the area of the facility, that could disturb plumbing containing lead, or create hydraulic disturbances (such as air bubbles) that can scour lead from the plumbing into the water?
- Does the water distribution system have any lead piping, and if so does the system plan to remove these sources of lead (EPA, 2006).

Public Perception and the Media

In addition to the safety of children, public opinion has created another major incentive to test school drinking water. In general, the media is very interested in the safety of drinking water in schools. There have been instances where concerned parents or reporters have taken samples at schools, and the discovery of high lead level results has created a public outcry for more testing and remediation. To avoid potential public outcry, schools and ECE facility staff should initiate their own proactive sampling and testing programs and keep the public informed of the steps taken to remediate any problems. Many school districts, including the Seattle Public Schools and the Los Angeles Unified School District (LAUSD) began or ramped-up lead testing programs due to media inquiries and reports of elevated lead levels in samples taken from taps in their schools.

Case Study: In 2008, the results of a media investigation led the LAUSD superintendent to mandate testing for all taps in every school. Therefore, LAUSD sampled 70,000 taps over a 10-month period in 2008 and 2009. Sampling was completed by skilled in-house staff (e.g., plumbers, carpenters, others) who were trained using an EPA protocol. Staff took samples in the first two hours before school started. After a competitive bid process, eight different laboratories were chosen to analyze samples. Challenges with taking so many samples included data management and labor, requiring the development of a bar-coded labeling system for all taps/fountains. LAUSD remediation challenges are discussed in Section 8 of this guide. (Jennifer Flores, Environmental Health Supervisor; telephone interview: February 10,

Case Study: Since 1999, EPA Region II has been working with schools in the region to implement the 3Ts (Training, Testing, Telling) program for reducing lead at drinking water taps. Region II targets two school districts per year to participate in this voluntary program. Region II determines which school districts have the greatest need for testing based on available data, including but not limited to environmental justice, risk factors for childhood lead exposure (e.g., age of housing), childhood lead screening rates and children's BLLs. Region II does not limit this program to schools. From 2003-2006, Region II sampled facilities in tribal nations and in 2012, Region II and the Administration for Children and Families entered into an agreement to extend the 3Ts program to Head Start facilities. Head Start programs house children of the pre-kindergarten age (EPA, Region 2 Highlights and Evangelia Palagian, Program Manager; telephone interview: January 7, 2015).

Case Study: The District of Columbia Water and Sewer Authority (DC Water) owns and operates a system that delivers water produced by the U.S. Army Corps of Engineers Washington Aqueduct to customers in Washington, D.C. From 2000to 2004, DC Water exceeded the 15 micrograms per liter (µg/L) lead action level at the 90th percentile in home tap sampling. This means that more than 10 percent of samples taken were above the action level during that time. The Washington Aqueduct began adding the common food-grade chemical orthophosphate to reduce pipe corrosion in August 2004. Orthophosphate works by creating a thin, protective coating inside pipes and plumbing fixtures to prevent water from corroding pipes, thus reducing the presence of lead. As a result, DC Water has met the lead action level since 2005 (EPA, Lead in DC Drinking Water).

Section 4: Get School Buy-In for a Program

It takes dedicated staff to implement and sustain a successful drinking water testing program. Therefore, it is important to create a collaborative team at the program's inception. This section describes how to identify and gather support from key school staff and identify internal funding options.

Identify Key Individuals

The first step in building a successful lead testing program is to identify individuals who will likely implement the program. It is also important to seek out individuals or groups associated with the facility, district and community who are interested in drinking water safety.

School or ECE Facility Staff

- Principal/Director – he/she is a good point of contact. Include the superintendent if this is a multi-facility initiative.
- Custodial and facilities staff – these individuals will have in-depth knowledge about school plumbing and history, and can be trained to take water samples.
- School nurse – this individual will have knowledge of overall student health, as well as an awareness of the dangers of lead poisoning and the importance of safe drinking water. This individual may already work

Case Study: The Public Schools Facilities Department in Stoughton, Massachusetts, has been responsible for taking samples and identifying remediation options in all district schools since the start of their program. The program involves annual water testing in district schools over one weekend. Staff sample water from the fountains and faucets used by students and teachers, and determine the number of samples that need to be taken on a per student basis (Joel Harding, Director of Maintenance and Operations; telephone interview: Nov. 21, 2014).

with the local health department, be able to identify local laboratories for testing samples and can also recommend where parents can get their children's blood lead level tested if they have concerns.

- Cafeteria staff – these individuals are aware of water use in food preparation. They can identify the faucets that are regularly used in food or drink preparation and any unused faucets.
- School District Wellness Committees – congressional legislation mandated that schools participating in the National School Lunch Program or other child nutrition programs create school wellness policies (USDA, *Team Nutrition – Online Resource*).
- Athletics staff – these individuals will know the sources of water used to fill water jugs or those used when teams are practicing or playing games outdoors.

Case Study: Many LAUSD cafeterias had "pot fillers" – taps over a stove that could be used in food preparation. The cafeteria staff said that these were no longer used. Instead of replacing the pot filler taps if they tested high for lead, they were all taken out of service (Jennifer Flores, Environmental Health Supervisor; telephone interview: Feb. 10, 2015).

Other Stakeholders

- School board – those responsible for developing budgets and recommending district-wide initiatives.
- Students – those most affected by lead in drinking water and should feel empowered to complain if they notice poor water quality.
- Teachers – those affected by lead in drinking water and able to assist with lead testing programs. Teachers also might be sources of information on water use (e.g., knowing which fountains are most used).

- Parent Teacher Associations (PTAs) – student advocacy groups made up of parents.
- Parents – advocates for the children in schools.
- Local plumbing and construction contractors/suppliers – those working on facilities that can use lead-free materials and certified plumbing products in construction and repair.

Case Study: Made up of approximately 7,000 residents, Huron is a relatively small city in Fresno County, California. Based on discoloration and the visible debris in the water at Huron Elementary School, parents began to complain that students' health was at risk. After filing a complaint against the school district and informing other parents and teachers about the formal complaint process, these concerned community members formed a group known as Padres Unidos, Mejores Escuelas (Parents United for Better Schools, or PUME). The PUME members conducted school site inspections and collaborated with an EPA-certified laboratory to test the drinking water at Huron Elementary School. Water samples were taken both from the point where the water enters the school's distribution system and from school water fountains. Test results showed that iron, lead and trihalomethane levels increased as the water traveled through the school's water distribution system. After receiving 75 complaints, school officials responded and began to address a majority of parents' concerns, such as replacing old, dilapidated water fountains with newer ones. The water quality issue, though not fully resolved, has improved (Firestone, 2009).

Identify Funding Options

When developing a program, staff should discuss how a program will be funded. The costs of the water sampling, analysis and remediation can be incorporated into a school's budget. School or ECE facility administers and operators can also save money by training its staff to take the samples. Some of the school districts interviewed during the development of this document rely on facility maintenance staff to conduct the testing and have been able to pay for many of the remediation projects as part of the

maintenance budget. If the lead testing program involves sampling at multiple facilities, consider allocating costs into a larger, district-wide budget. The budget may also need to include capital projects that could cover lead testing and remediation programs. Section 8 describes different short-term and long-term remediation options.

Case Study: In the case of Stoughton Public Schools in Massachusetts, annual sampling and analysis costs were $5,000-$7,000 at the start of the program, but have decreased significantly to $1,500-$1,700 as the program has matured and the sources of lead have been remediated (Joel Harding, Director of Maintenance and Operations; telephone interview: Nov. 21, 2014).

The following resources provide examples of different funding options:

- "Water Quality Funding Sources for Schools" (EPA, 2006c)
- "Water Works: A Guide to Improving Access to and Consumption of Water in Schools to Improve Health and Support Learning" ☐ refer to "Action 5 – Fund Your Water Program" ☐ (Grummon et al., 2014).

Case Study: The Seattle Public Schools have paid for remediation programs as part of voter-approved capital projects. Some of this funding is through the Building Excellence (BEX) capital program that funds the construction of new school buildings, new additions and major renovations to existing buildings. Every six years, the Seattle School Board requests BEX capital program funding from Seattle voters via a ballot measure. In 2006, a request for funds to replace drinking water lines went to the voters and was approved. Between 2007 and 2014, 31 schools received complete drinking water pipe replacements. In addition, some previously closed schools (for many years leased to other tenants) are being reopened due to increased enrollment in the school district. The school district is completing drinking water line replacements at those locations before reopening them as schools through new capital projects (Shelly Kerby and Richard Staudt, Risk Management; telephone interview: Nov.20, 2014).

Section 5: Involve External and Community Partners

Schools and ECE facilities benefit from community partnerships that provide additional expertise or an option to split or help cover costs for water sampling and remediation projects. The EPA's "A Guide for Community Partners" provides succinct information that schools and childcare facility administrators can use to identify and approach partners in their communities or states that could support a drinking water program (EPA, 2006b). The following section identifies federal, state and community partners a school or ECE facility should consider working with when instituting a water-testing program.

Case Study: MassDEP is developing a new flyer that promotes collaboration between schools and childcare facilities and PWSs concerning lead sampling. The program has observed that while schools and childcare facilities and PWSs fulfill their individual obligations, collaboration between the two is often lacking or could be improved. One example provided was a PWS that sampled a kitchen sink at a school, but did not specify which kitchen sink in the sample. When the sample came back exceeding the action level, the school was not sure which of the multiple kitchen sinks in the facility failed. For this reason, it is important to work with PWSs early on to ensure consistent and understandable sampling protocol (Source: Ken Pelletier, Lead in Drinking Water Contact; telephone interview: March 12, 2015).

Water Utilities

Public water systems employ staff trained to collect drinking water samples. They have the expertise to help schools and ECE facilities in all facets of program development. Helpful resources that discuss ways PWS staff can assist schools and childcare facilities include:

- The AWWA's Assisting Schools and Child Care Facilities in Addressing Lead in Drinking Water includes a "Sample Utility Letter to Schools and Child Care Facilities" to start the conversation between utilities and schools. The letter provides a summary of why schools and ECE facilities should initiate a lead testing program and is available in Appendix B of the report (AWWA, 2005).
- The EPA's "Factsheet for Public Water Suppliers" describes how PWS staff can assist schools and ECE facilities they serve (EPA, 2007).

Case Study: Louisville Water Company (LWC) has been monitoring lead samples at schools in Jefferson County, Kentucky. Historically, the Jefferson County Public School District (JCPS), which is the largest district in the state with 156 schools, has been proactive in monitoring for lead in schools. In 2004, LWC and JCPS formed a partnership and initiated a proactive annual monitoring program that includes education, training, sampling and analysis.

Based on EPA guidelines, LWC developed a lead testing program that would monitor two fountains at 15 percent of the Jefferson County schools annually. After seven years of work, two fountains at every single facility have been sampled. LWC set an action level of 10 parts per billion (ppb) rather than the EPA standard of 15 ppb. If a fountain's results were above the 10 ppb action level, the JCPS facility coordinator took that fountain out of service. The water company worked collaboratively with the schools on follow-up corrective actions (e.g., re-collection, analysis) and the schools were responsible for remediation actions. In 2014, LWC provided two handheld field analyzers to JCPS for pre-screen testing on all the fountains in the school and will validate and confirm any pre-screening results approaching the action level of 10 ppb.

Case Study (LWC) continued:

Other school districts in Bullitt County (15 schools) and Oldham County (10 schools) have also become part of the LWC school lead program. Since these school districts are much smaller, LWC will test two fountains at each school once every three years and provide those school districts with analyzers in the future to conduct their own prescreening tests. In addition, LWC offers to take two tests per school at all area private schools (82). Initially, there was only a 35 percent participation rate; however, the participation rate has risen to 80 percent in recent years due to enhancements in communication (Emily Fritz, Water Quality Compliance Scientist; telephone interview: Jan. 21, 2015).

Local Health Departments

Most local health departments have established lead poisoning prevention programs. Although resources may be limited, the office may be willing to provide assistance in a variety of ways. For example, a representative may be able to attend a PTA meeting to discuss potential health effects of lead exposure from drinking water, as well as to act as a contact with state programs to obtain information and assistance (EPA, 2006d). A representative may even be able to assist in developing the plumbing profile, conducting sampling or taking follow-up actions.

TIP: Your local health office phone number should be in the listings under county or city government. Many offices also have a website. The "Health Guide USA" website contains information about many local health departments listed by state (EPA, 2006).

Regional Pediatric Environmental Health Specialty Units (PEHSUs) are another useful resource that may provide risk communication support to school districts (EPA, 2006d).

They provide information and resources to school and community groups to help increase public understanding of children's environmental health.

Case Study: The Connecticut Office of Early Childhood requires schools and childcare centers to collect lead samples. Childcare centers served by a PWS are required to submit a copy of a lead water test completed every two years for all water supplies. If a sample comes back above the lead action level, the facility will be required to use bottled water until the tap water quality problem is resolved. More information is available in the "Initial Application for Licensure" (Connecticut Office of Early Childhood, February 2015).

Case Study: Calhoun County Public Health Department (CCPHD) has collaborated with the EPA on the Good to Grow, a voluntary pilot project that provides lead sampling in schools and childcare facilities in Calhoun County, Michigan, served by PWSs. Over the entire three-year grant period, 82 (of 132 eligible) schools and childcare facilities have participated in the program. A goal is to create an efficient lead sampling and educational program that can be replicated nationwide and used regardless of the contaminant of concern.

The CCPHD works directly with school superintendents, principals, PTAs, as well as childcare facility contacts. County staff have been successful in approaching school and childcare facility staff face-to-face to answer questions and alleviate any concerns and also benefit from an established relationship with school nurses who work within each school. Key school staff involvement includes facility maintenance personnel, administrative staff, cafeteria staff and the principal. The success of the program can be attributed to a robust planning process and willingness to work closely with the schools and childcare centers involved.

At each facility, CCPHD staff sample a maximum of 23 taps and usually take three samples per tap. Staff take a split first draw sample (e.g., two 125-mL samples) and a 30-second flush sample. The number of samples taken at each facility can vary and a CCPHD epidemiologist has helped determine the best number of representative samples. Analysis is provided by several EPA regional laboratories (Paul Makoski, Environmental Health Manager and Jim LeFevre, Environmental Health Educator; telephone interview: March 12, 2015).

State Drinking Water Agency

State drinking water programs are responsible for ensuring that PWSs comply with the state and federal regulations regarding lead in drinking water. Many state drinking water agencies also support school lead in drinking water programs. In March 2004, the

EPA's Acting Assistant Administrator for Water, Benjamin Grumbles, sent a letter to directors of state environmental and health agencies requesting information on state and local efforts to monitor and protect children from exposure to lead in drinking water at school and day care facilities. As a result, the agency developed the "Controlling Lead in Drinking Water for Schools and Day Care Facilities: A Summary of State Programs" report, which includes a summary of how states are approaching this subject. For specific information about a particular state, refer to "Alabama through Nebraska" or "Nevada through Wyoming" (EPA, 2004b). State primacy agency initiatives are subject to change, so it is important to contact the state primacy agency. The EPA's "Health and Environmental Agencies of U.S. States and Territories" website provides state agency contact information.

Case Study: Every five years, the MassDEP, in coordination with the Department of Early Education and Care (EEC) and Department of Elementary and Secondary Education (ESE), sends letters about lead in school drinking water sampling to all school superintendents, principals, health departments, elected officials and PWSs. These letters recommend that schools and childcare facilities complete the Lead Maintenance Checklist. These school and childcare facility partners are notified to encourage sampling at facilities statewide and promote lead sampling as a collaborative effort between the school and childcare facility and one or more stakeholder partners – a partnership that could lead to a shared burden of costs. The MassDEP's "Lead in School Drinking Water Program" includes many resources that can help schools develop their own sampling program (Source: Ken Pelletier, Lead in Drinking Water Contact; telephone interview: March 12, 2015).

Environmental Protection Agency

The EPA promotes testing for lead in school drinking water through a variety of initiatives. The "3Ts for Reducing Lead in Drinking Water in Schools" is used by many school districts around the country as a basis to start their own voluntary programs

(EPA, 2006d). In addition, EPA regional offices are involved with promoting the sampling and analysis for lead in school drinking water.

Case Study: The EPA Region II's 3Ts For Reducing Lead in Drinking Water in Schools program offers limited sampling assistance to schools. Typically, Region II collects and analyzes samples from up to 10 schools or 400 outlets in each district. The schools must address all taps with elevated lead results (greater than 20 μg/L). Region II asks that the district turn off the contaminated outlets until they are remediated or placard the contaminated locations with "Do Not Drink Water" signs until post remediation results indicate that high levels of lead have been reduced to below the action level. The school district decides which remediation techniques they will apply to address the elevated lead levels found. The school district bears the cost of implementing the remediation options that range from installing filters on the water outlets and cleaning aerators to developing a flushing plan (Evangelia Palagian, Program Manager; telephone interview: Jan. 7, 2015).

In 2010, the EPA working with the New Jersey Department of Environmental Protection (NJDEP) and three New Jersey school districts, successfully lowered lead in drinking water at elementary schools in Union City, Atlantic City and Weehawken, New Jersey. Sampling by the EPA initially found elevated lead levels in drinking water at 28 of the 343 school drinking outlets sampled. Parents, teachers and school staff were kept informed throughout the process and the EPA worked closely with NJDEP and the three school districts to identify the lead problem and make sure that the health of students in the affected schools was protected (EPA, 2012).

Private Foundations

Private foundations have provided funding related to water testing at schools across the country. Many of the programs focus on water access and overall drinking water quality. The EPA's "Water Quality Funding Sources for Schools: A Resource Guide for K-12

Schools and Child Care Facilities" is designed to help school and ECE facility staff identify potential funding sources for water quality related projects (EPA, 2006c). In addition to water quality projects, this guide can be used to identify potential funding sources for a variety of other programs related to children's health and environment. The majority of funding sources listed in this guide are foundations that provide support to a specific community, state or region. These foundations have a history of awarding grants to schools and ECE facilities and many of them focus on environmental and health issues in their grant-making priorities. Other resources that have identified funding options include:

- County Health Rankings and Roadmaps: Guide to Funding Your Community Health Initiative (County Health Rankings and Roadmaps, 2013)
- United States Department of Agriculture: Local Wellness Policy Resources: Grants and Funding Opportunities (Grummon et al., 2014)
- California Examples: Guide to Community Drinking Water Advocacy ☐ see Appendices 1.8 and 1.9 ☐ (Firestone, 2014)
- "Increasing Drinking Water Access in Schools" includes examples throughout (CDC, 2014b).

Researchers at private foundations may be able to assist with the development of a program or may know of potential funding opportunities.

Case Study: The California Endowment is a private, statewide health foundation with a mission to expand access to affordable, quality health care for underserved individuals and communities, and to promote fundamental improvements in the health status of all Californians.

In many rural California communities, inadequate infrastructure and contaminated water are commonplace. The California Endowment launched Agua4All, a pilot project in partnership with nonprofit organizations Rural Community Assistance Corporation (RCAC), Community Water Center (CWC) and Pueblo Unido Community Development Corporation. Agua4All raises awareness about the lack of safe drinking water access in schools and communities, creates unique public-private partnerships to install water taps where they are most needed and advocates for sustainable long-term solutions to ensure safe drinking water for all. As part of the project, pilot funding is used to install filters and water bottle filling stations in various locations (e.g., schools, community centers) throughout the Eastern Coachella Valley and Southern Kern County.

The goal of Agua4All is to increase access and consumption of safe drinking water through tap purchases and installation as well as water promotion and public education (Sarah Buck , RCAC Rural Development Specialist and Shen Huang, CWC Technical Analyst; telephone interview: Jan. 9, 2015).

Private Businesses and Corporations

Private businesses may also be able to provide support for school water programs, as many are interested in investing in the communities where they are located. Schools and ECE facilities should consider approaching local businesses or chambers of commerce in the area to discuss their lead testing program. Types of assistance provided include:

- "Direct financial support, such as grants or donations (visit company websites to see if they have a foundation or philanthropic division; see what types of programs they typically fund)
- Discounted or free products (e.g., new water sources, reusable water bottles, cups or promotional materials)
- Technical assistance or in-kind support (e.g., a media company might assist in developing promotional materials at no charge, or a plumbing company might donate the labor needed to install new water units)" (Grummon et al., 2014).

A technical resource for schools and ECE facilities could be the Water Quality Association (WQA), a nonprofit association for the residential commercial and industrial water treatment industry. Their membership is comprised of equipment manufacturers, suppliers, dealers and distributors of water quality improvement products and services.

Case Study: With help from two other companies, Superior Water and Air, a private corporation based in Utah, donated filters to purify the water in more than 18,000 drinking fountains in 750 Utah schools (Grummon et al., 2014).

Community-based Organizations

Local nonprofit and community-based organizations may also have monetary or in-kind resources available. Potential partners in this area include:

- Organizations focused on health promotion;
- Organizations focused on children and youth;
- Healthcare providers or organizations (e.g., local hospitals, healthcare groups, community clinics);
- Faith-based organizations;
- After-school programs; and
- Rotary Club, Kiwanis Club, Lions Club and other service organizations (Grummon et al., 2014)

Section 6: Prepare to Sample

Lead in drinking water can be a localized problem and can vary from tap to tap. Lead leaching into the water at one outlet does not mean that all taps are vulnerable or contaminated. At the same time, one tap sample free from lead does not mean that all taps are clear. It is important to test all of the drinking water outlets in a facility, especially those that provide water for drinking, cooking and preparing juice and infant formula (EPA, 2002).

Get Organized

Bring together all those who are familiar with the water use at a facility and the buildings' plumbing before starting a testing program. Set up an initial meeting with your internal and external team to complete the following tasks:

- Review information collected while developing the plumbing profile.
- Create an inventory of all drinking water fixtures (e.g., taps, fountains). Appendix 3 of "Keep It Flowing: A Practical Guide to School Drinking Water Planning, Maintenance & Repair" includes an example in-depth inventory form (Harvard Public School of Health, 2014).
- Decide if other drinking water parameters should be analyzed in addition to lead. Sampling for lead could also be an opportunity to test for other drinking water contaminants of concern in your local area.

TIP: Be aware that some unexpected fixtures may be used for drinking or food preparation (e.g., bathroom faucets, janitor's sinks). Unusual sources of drinking water, such as locker room showerheads and other non-drinking water taps used to fill water jugs should also be included when testing for lead (EPA, 2013).

Refer to your PWS's annual water quality report for more information.

- Discuss remediation options, as it is important to be prepared to remediate any identified problems.

Identify an Action Level

The EPA's recommended lead action level for schools served by a PWS is 20 ppb (µg/L) using a 250-mL first draw sample. Many school districts with voluntary programs have chosen to set more stringent action levels including the LAUSD (15 ppb), LWC (10 ppb) and Seattle Public Schools (10 ppb) than the recommended action level.

Decide Where to Sample

When developing a program to test for lead in drinking water it is important to take the following steps:

- Determine if any drinking water fountains were previously identified as having lead components or lead lined tanks under the LCCA. Appendix E: Water Cooler Summary in EPA's "3Ts for Reducing Lead in Drinking Water in Schools" includes a full list of prohibited fixtures. Any drinking fountain on this list at a facility should be removed from service immediately (EPA, 2006d).
- Identify potential sample locations. The EPA recommends that sample sites include:
    - "Drinking fountains;
    - Kitchen sinks;
    - Classroom combination sinks and drinking fountains;
    - Home economics room sinks;
    - Teachers lounges sinks;
    - Nurses' office sinks;
    - Sinks in special education classrooms; and

- Any other sink used for consumption (e.g., sink near a coffeemaker)" (Grummon et al., 2014).

- Prioritize sample locations. Follow this general criteria:
  - High priority: taps used by children under the age of 6 years or pregnant women (e.g., drinking fountains, nurses' office sinks, classrooms used for early childhood education, kitchen sinks, teachers' lounges).
  - Medium priority: other taps regularly used to obtain water for drinking or cooking (e.g., home economic sinks, classroom sinks).
  - Low priority: all other taps that could be used to obtain water for drinking but are not typically used for that purpose (e.g., bathroom faucets, utility sinks) (Minnesota Department of Health, 2014).

TIP: Ideally, schools should test all water outlets used for cooking or drinking. This may not be feasible at all schools due to cost concerns. If the budget does not allow for all taps to be tested in the first year, it is suggested that all high priority taps be tested the first year, the medium priority the second and the low priority the third. The fourth year could be used as a "make up" year if needed (Minnesota Department of Health, 2014).

- Determine how many locations will be sampled. Although sampling every single outlet would be ideal, budget constraints may limit the number of sampling locations. The EPA's "Lead and Copper Rule: A Quick Reference Guide for Schools and Child Care Facilities that are Regulated Under the Safe Drinking Water Act" specifies the number of sampling locations relative to the school's student population for schools and child care facilities with their own well and considered a public water system (EPA, 2005b).
- Finalize sampling locations.
- Create a sampling schedule.
- Select who will take samples and identify training needs.

- Choose a certified laboratory to analyze samples. More information about certified laboratories in each state is available at EPA's "State Certification Officers for Drinking Water Laboratories" webpage. Keep in mind that your PWS may have a certified laboratory and may be willing to analyze samples for free or at a reduced price. When selecting a laboratory, consider the following:
    - "How much will the testing cost? Are discounts available (e.g., to schools, to non-profit organizations, for bulk orders)?
    - Will the laboratory collect the samples for you, or will you or a staff member need to collect them?
    - How long does it take for testing to be completed?" (Grummon et al., 2014)

In the long term, schools and ECE facility administrators should determine if sampling would be repeated in the future, either at the same locations or at different locations throughout the facility. As mentioned previously, lead levels can vary from tap to tap and in some cases, year to year.

Section 7: Take Lead Samples

The following section details basic steps for taking lead samples at school and childcare facilities and includes tips for consistent and efficient sampling and testing.

When to Sample

Staff should take samples after a period of eight to 18 hours of no facility water use, which is adequate time for water to stagnate in the plumbing (EPA, 2006d). It is best to take samples first thing in the morning before children arrive or start using the water. Unless specifically directed to do so, do not collect samples in the morning after vacations, weekends or holidays because the water will have remained stagnant for too long and would not represent the water used for drinking during the week.

Sample Types

Different types of samples can be taken and each type of sample can yield different information.

First Draw Samples

The EPA recommends that schools collect a 250 milliliter (mL) first draw (e.g., before any water use) sample from water fountains and other outlets[3] (EPA, 2006d). The sample size was designed to collect the water that has stagnated in

[3] It is important to note that the lead testing protocol used by PWSs is aimed at identifying system-wide problems rather than problems at outlets in individual buildings. Moreover, the protocols for sample size and sampling procedures are different. Under the LCR for public water systems, a lead action level of 15 parts per billion (ppb) is established for 1 liter samples taken at high-risk residences. If more than 10 percent of the samples at residences exceeds 15 ppb, system-wide corrosion control treatment may be necessary. The 15 ppb action level for public water systems is therefore a trigger for treatment rather than a notification of health-based or exposure level concerns (EPA, *Laws and Regulations Website – Online Resource*).

the fixture overnight to pinpoint specific fountains and faucets that require remediation. For some sampling programs, samples are split into two 125 mL samples to further pinpoint where the lead is coming from (Paul Makoski, Environmental Health Manager and Jim LeFevre, Environmental Health Educator; telephone interview: March 12, 2015). A first draw sample will likely include all the water that has been stagnating in the plumbing of a fixture (e.g., faucet, unrefrigerated fountain). Results from this type of sampling approach help to pinpoint specific fountains and outlets that require remediation.

Flush Samples

To capture water that could be stagnating in contact with lead soldering or pipes throughout the building, take an additional 250 mL sample after a first draw sample. Collect this "flush sample" after the water has run for a pre-determined amount of time, usually 30 seconds. Results from this sampling approach will determine the lead content in the water in plumbing behind the walls (EPA, 2006d).

Lead Service Line Samples

If a plumbing profile and/or school records indicate any building has a lead service line, take an additional lead service line sample by sampling the cold water tap closest to the service connection and let the water run while feeling the temperature of the water. The water temperature may change as the water from the service connection enters the building, so collect a 250 mL sample immediately after a temperature change is detected (EPA, 2006d). Before taking the sample, calculate the expected flushing time (by using distance of pipe, pipe diameter and flushing rate) needed to ensure that the temperature change indicates water from the lead service line rather than water that has been influenced by heating and cooling ducts.

Sample Collection Procedures

- Post signs throughout the facility at least the night before sampling to remind staff that water sampling will be conducted, especially if all water sources cannot be used, not just the taps scheduled to be sampled. Whenever possible, alert staff well in advance once a sampling date is confirmed.
- Verify that no water use has occurred at the taps or fountains that are scheduled for sampling. Ensure that water has been stagnating in the pipes for eight to 18 hours, unless otherwise instructed. As noted in Section 6, prioritize tap sampling based on use and other factors.
- Use 250 mL sample bottles provided by the laboratory and keep the containers sealed until collecting a sample.
- Assign a unique number to each sample collected. Write down the number on the sample bottle and on recordkeeping forms.

  Also record the following information:
  - Type of sample taken (e.g., initial first draw, 30-second flush);
  - Date and time of collection;
  - Name of the sample collector;
  - Location of the sample site; and
  - Name of the fixture manufacturer and model number, if known.
- Fill out labels using a permanent marker and affix them to the bottle. This reduces the chances that the ink will run if the bottle gets wet.

TIP: Start a small (e.g., pencil-sized) steady flow of water from the outlet or other sample location when sampling. Sudden changes in flow could stir up sediments or cause sloughing of pipe films that would not be characteristic of typical water use patterns (EPA, 2006).

- Do not remove aerators (unless otherwise instructed).[4]
- Set up a timer if capturing additional samples (e.g., 30-second flush sample).
- Do not rinse the sample containers before filling.
- Collect a 250-mL first draw sample from each sample location, taking care not to spill any water.
- Take additional flush or lead service line samples if needed.
- Fill out any additional information on the recordkeeping form immediately following the collection of all samples at a location.
- Verify that the samples will be sent to the laboratory and properly preserved within the designated holding time.
- Prepare the samples for pickup.

TIP: When collecting samples, follow the instructions provided by the laboratory for handling sample containers to ensure accurate results and follow any preservation guidelines. Most laboratories will provide shipping containers and ice packs if necessary. Keep a copy of any forms when providing samples to the laboratory (EPA, 2006).

Sampling approaches, instructions and tips are also available from the following resources:

- How to Collect a Drinking Water Sample for Lead and Copper Testing (MassDEP, 2005).
- Testing for Lead in School Drinking Water Systems flyer succinctly describes a two-step sampling process (Washington State DOH, 2006).

[4] Collection of first draw samples without aerators is only permissible if your school has a documented routine maintenance program for removing, cleaning, and replacing aerators on drinking water outlets. If your school does not have an aerator maintenance program in place, removing, cleaning and replacing the aerators prior to sampling for diagnostic purposes will provide sampling results that may not represent the water that the children and staff are routinely drinking from the outlet (EPA, 2006). Refer to the EPA's "Drinking Water Best Management Practices: For Schools and Child Care Facilities Served by Municipal Water Systems" for detailed aerator cleaning procedures.

- Water Works: A Guide for Improving Water Access and Consumption in Schools to Improve Health and Support Learning – see "Test for and Remediate Lead in Drinking Water" – (Grummon et al., 2014).
- How to Collect an Initial (First Draw) Sample –includes instructions for taking an initial and follow-up first draw sample, as well as a flush sample – (EPA, 2005c).
- 3Ts for Reducing Lead in Drinking Water in Schools ☐ see Exhibit 4.2-4.10 for general and specific sampling procedures for different types of outlet (e.g., water faucet, water fountains, service connections) – (EPA, 2006d).
- Assisting Schools and Childcare Facilities in Addressing Lead in Drinking Water – see Appendix G: Example Sampling Protocol and Appendix H: Example Recordkeeping Form – (AWWA, 2005).
- Schock, M. R.; Lemieux, F. G. Challenges in addressing variability of lead in domestic plumbing. Water Science & Technology: Water Supply 2010, 10 (5), 792-798.
- Schock, M. R.; Lytle, D. A. Internal Corrosion and Deposition Control; In Water Quality and Treatment: A Handbook of Community Water Supplies; Sixth ed.; McGraw-Hill, Inc.: New York, 2011.

Sample Analysis Costs

A list of certified laboratories for lead testing should be available from the state drinking water agency or local water provider. On average, laboratory analysis costs range from $20 to $100 per sample. Here are additional examples of sample analysis costs from across the country:

- As part of the development of the Water Works: A Guide to Improving Access to and Consumption of Water in Schools to Improve Health and Support Learning report, the

TIP: It is best to have your water samples analyzed for "total lead" rather than "dissolved lead." Many laboratories will recommend the dissolved lead test because it is cheaper, but this test does not analyze for particulate lead, which can only be measured using the "total lead" test (Pennsylvania State University, *Lead in Drinking Water – Online Resource*).

authors contacted all EPA-certified laboratories in five San Francisco Bay Area counties (Alameda, Marin, San Francisco, San Mateo and Sonoma). Analysis costs ranged from $15 to $55 per sample depending on the technique. A table of the results can be found in the Supplemental Materials section of the report (Grummon et al., 2014).

- The Massachusetts Water Resources Authority (MWRA) "Laboratories Certified for Lead Analysis in Drinking Water" website provides an online list of certified testing laboratories. Analysis costs range from $15 to $50 per sample depending on the laboratory.
- The Washington State DOH's "Lead in Drinking Water" website includes estimates certified labs in Washington can perform lead analysis for $20 to $40 per test.
- Massachusetts-based Stoughton Public Schools' staff collect samples and an outside lab analyzes them. Most recently, the lab analyzed 83 samples at a cost of approximately $20 per sample (Joel Harding, Director of Maintenance and Operations; personal interview, Nov. 21, 2014).

In addition, it is important to factor in any shipping costs to get the samples to the laboratory as part of the program budget.

Interpreting Sample Results

When the laboratory returns test results, the concentrations of lead in your water samples will be reported in metric form such as mg/L or □g/L, or they will be reported as a concentration such as parts per million (ppm) or ppb, respectively (EPA, 2013a). Remember that mg/L in drinking water is equivalent to ppm and □g/L is equivalent to ppb.

Did You Know?

One ppm is roughly equivalent to one drop of substance in a full bathtub. One ppb is about one drop of a substance in a swimming pool (Alaska Department of Conservation, June 2009).

If any sample results come back above 20 □g/L (ppb) of the school action level, take the following steps:

- Immediately take any fixture out of service where a lead exceedance occurred;
- Inform staff and students by placing a sign and/or disconnecting the fixture entirely; and
- Conduct follow-up sampling at all outlets with high lead levels.

Follow-up sampling will help determine the appropriate remediation measures to take. Follow-up sampling procedures should mirror initial sampling procedures. he school may determine that additional samples are needed, especially if only first draw samples were taken during the initial round of sampling.

A comparison of initial and follow-up samples will help to assess where lead may be getting into the drinking water. Based on the comparison of the initial and follow-up samples taken at the same location, staff can determine what general types of remediation may be necessary. Remediation options for fixtures are described in the next section.

Case Study: The U.S. Department of Defense (DOD) operates 181 accredited schools. Although there is no federal law or DOD policy requiring schools or childcare facilities to test for lead unless they are a PWS, the U.S. Navy has made testing and sampling for lead a top priority. This comes in response to lead being found in the water at day care sites at the Norfolk Naval Station and at Fort Story. The identified priority areas include primary and secondary schools, child development centers, Navy operated 24/7 group homes and youth centers. As of February 2014, Navy installations implemented a three-step sampling and testing program at all priority areas. The Navy's Environmental Program will provide project funding for sampling, remediation and retesting (Department of the Navy, 2014).

Section 8: Choose Remediation Options

School and ECE facility administrators should consider what remediation options (i.e., fixes) are best suited for a particular facility. Remediation costs vary depending on the options chosen. Schools and ECE facilities should consider approaching other partners such as water suppliers, federal or state government agencies and/or private funders who may have programs, resources or grants to help address remediation. Potential remediation options should be discussed as part of program development and before sampling takes place.

When determining the appropriate remediation option, note that each type of option has its own benefits and considerations. Most importantly, ensure that chosen remediation options will remove lead from the water. Some key questions to consider when choosing to remediate a water delivery option include:

- How much does the option cost to purchase, install, use and maintain?
- What are the installation and plumbing requirements?
- Will the option be installed outdoors or indoors?
- How long will the option last?
- How reliable is the option? Could it be taken out of service accidentally?
- Does the option require electricity?
- Does the option require frequent cleaning or maintenance?
- Is it important the option provide chilled water?
- Will this option require students to use a cup or reusable bottle to get water?
- What type of option do students and staff prefer?
- How much staff time will be involved to implement the practice?
- Will school staff need any specialized training? (Grummon et al., 2014)

Case Study: Stoughton Public Schools in Massachusetts has a remediation plan with multiple options available if elevated levels of lead are found in school facilities. Potential actions include posting warning signs, telling custodians to flush affected outlets, replacing the fountains, running plastic pipe to water fountains from water mains, adding electronic valves to flush the pipes periodically and specifying lead-free solder for all new construction. A flexible testing and remediation program allows school officials to adapt their plans in response to changes that were made over time to the school's internal water distribution systems and as plumbing materials were upgraded (Joel Harding, Director of Maintenance and Operations; telephone interview: Nov. 21, 2014).

Take Fixtures Out of Service or Restrict Use

As discussed in the previous section, schools and ECE facilities should take a fixture out of service immediately if sample results are higher than the established action level. There are multiple ways to take a fixture or fountain out of service, or restrict use:

- Remove or turn the fixture off completely.
- Put up signs that clearly indicate that water is unsafe to drink.
- Display notices at bathroom sinks that water should not be consumed.
- Post age-appropriate warning signs and display pictures if small children use the facility.

Facility staff may also need to provide alternative sources of water if no safe taps are available.

Case Study: Seattle Public Schools use different remediation methods depending on the circumstances. Options include:

- Replacing water fountain parts;
- Installing new end-of-use plastic-lined flexible connectors;
- Disabling the fountain if other accessible fountains are available nearby;
- Installing granulated media point-of-use filters;
- Partially or entirely replacing building piping; and
- Providing bottled water.

A filtration system is usually installed if water from a fountain has a lead concentration over 10 ppb. In some cases at a school where multiple fixtures are above the threshold, an investigation is conducted to determine whether it is more cost effective to schedule a capital project to completely replace school water lines. The school provides water dispensers when fixtures are replaced or taken out of service. Older schools generally have filters on fountains, but at newer schools, it usually is not necessary. Filter replacement varies between schools – at some fixtures it is every two weeks, while for others it may only be once per year (Shelly Kerby and Richard Staudt, Risk Management; telephone interview: Nov. 20, 2014 and Boyd, 2009).

Case Study: The "MassDEP Lead & Copper in Schools Maintenance Checklist" asks schoolsif they have water coolers and whether they have checked their coolers against the EPA's list of banned water coolers in Appendix E of the 3Ts Toolkit. If a school or childcare center has a banned cooler, administrators are required to remove and/or replace it. Disconnection was previously an option, but it was found that in the case of two schools, coolers had been disconnected and then accidently reconnected several years later by someone who did not know why they had been disconnected (Ken Pelletier, Lead in Drinking Water Contact; telephone interview: March 12, 2015).

Develop a Flushing Plan

A flushing program is designed to replace the stagnant water that may have been in contact with lead-containing plumbing fixtures overnight or over the weekend. As discussed previously, the more time water is exposed to lead pipes or solder, the higher the lead levels may be. Make sure to take flush samples from the affected fixtures before determining that a flushing program is a good option for a school or ECE facility. If lead levels do not drop below the action level after flushing or rise back above the action level soon after flushing, a flushing program may not be appropriate.

Flushing should be done at the start of each day, before any water is used for drinking or cooking, or after long periods of non-use (e.g., after weekends, school breaks). Much of the information collected while developing a facility plumbing profile can be used to help develop a flushing plan (e.g., location of all water outlets).

TIP: Flushing times vary depending on each individual building and the flushing of refrigerated water fountains can take as long as 15 minutes. In addition, keep in mind that if a facility has more than one wing, there may be more than one tap located far from the water service line (EPA, 2006).

The AWWA recommends the following basic flushing program guidelines:

- Locate the tap/outlet farthest from the service line on each wing and floor;
- Open the tap/outlet and let the water run for 10 minutes (for precise results, calculate the volume of the plumbing and flow rate)[5] ;
- Open all valves at all drinking water fountains without refrigeration units, as well as kitchen faucets and let the water run for one minute (AWWA, 2005).

[5] Contact your PWS or a licensed plumbing professional to determine the recommended flushing time for your facility based on the facility's layout and piping if you are unsure how long you should flush taps.

Additional flushing plan resources are available from the following:

- The EPA's "Drinking Water Best Management Practices: For Schools and Child Care Facilities Served by Municipal Water Systems" provides an alternate example of a flushing plan (EPA, 2013a).
- The MassDEP created an example flushing documentation form (MassDEP, 2005).
- The LAUSD's "Daily Flushing Requirements for Drinking Fountains and Faucets" includes a "Monthly Drinking Water Flushing Log" (LAUSD, 2009).

Flushing Programs – Benefits/Considerations

Benefits:

- Possibly the quickest and easiest solution to removing high lead levels, especially when contamination is localized in a small area or in a small building
- Does not require installation or maintenance of water treatment equipment
- Does not require complex instructions

Considerations:

- Staff and time commitment – depending on the number of fixtures that have to be flushed daily, this may involve multiple staff
- Difficult to ensure that staff consistently follow instructions and maintain accurate records
- Managing a hazard in place – this approach involves leaving the problem in place, while relying on responsible parties to take care of the issue
- Depending on how corrosive the water is, flushing may need to be done more frequently than daily
- Flushing may be considered a waste of water (EPA, 2006)

Case Study: The sampling and analysis of non-refrigerated LAUSD water fountains showed that the lead levels dropped on a majority of affected fountains after a 30-second flush. The school district implemented a flushing program and developed guidance stating, "All fixtures and fountains that may be used for consumption of water or used for food preparation shall be flushed for a minimum of 30 seconds prior to the first use of the day as outlined below. Those responsible for flushing fixtures shall note on the daily log if the fixture is inoperative, the water is discolored or has an odor after completion of flushing."

This program tasks the local district superintendent with ensuring that all site administrators comply with this policy, provide proper training for those responsible for flushing and establish schedules that allow for flushing to be completed prior to the first use of the day. The site administrator shall ensure that flushing of fixtures occurs every day prior to first use and the flushing log is completed. The site administrator certifies compliance with the policy on a monthly basis.

The site administrators at most schools divide the flushing responsibilities among staff so that one person is not overwhelmed – usually divided between custodians (outside and hallways), kitchen staff (kitchen) and teachers (classroom sinks/fountains). A challenge has been ensuring that all outlets are flushed consistently for 30 seconds at the start of the day and that this information is properly recorded (LAUSD "Daily Flushing Requirements for Drinking Fountains and Faucets" (LAUSD, 2009) and Jennifer Flores, Environmental Health Supervisor; telephone interview: Feb. 10, 2015).

Install Automatic Flushers

Some schools have installed automatic flushing mechanisms. This involves the installation of a time-operated valve that is set to automatically flush the main pipes of the school at a specific time in the morning. This option will only work on lead sources

along the main feed lines to the outlets, and additional flushing would have to be done at each tap to ensure that there is no lead buildup from valves, faucets, etc. While this option has worked for some school districts, similar units installed at Boston Public Schools were expensive to maintain and often broke, leading to the abandonment of the program (Jeff Lane, Environmental Division Chief; telephone interview: Jan. 29, 2015).

Case Study: Stoughton Public Schools installed automatic flushing valves directly from the service line in many schools that flush prior to each school day (4:30-5 a.m.) (Joel Harding, Director of Maintenance and Operations; telephone interview: Nov. 21, 2014).

Automatic Flushers – Benefits/Considerations

Benefits:

- No reliance on staff to complete the flushing
- Long lasting if lead levels do not rise above the action level between flushing intervals
- Minimal maintenance

Considerations:

- Upfront costs are greater
- Requires professional installation
- Flushing may be considered a waste of water (EPA, 2006)

Install Point-Of-Use Filtration Systems

Point-of-use (POU) filtration can be an effective way to reduce lead in drinking water. A POU device is a filtration system installed directly on a drinking water outlet or housed within a fixture. Advice when using POU filtration devices includes:

- Use only independent third party-certified devices for the removal of lead. If there are other contaminants of concern, determine if one filter can effectively remove the other contaminants or use several filters in succession.
- Work with maintenance or facilities departments to choose and install a filter or treatment device certified to remove the specific contaminants.
- Properly maintain POU treatment devices. Refer to the manufacturer's instructions for maintenance procedures.
- Complete follow-up testing to make sure that the installed POU filtration is reducing lead in drinking water to below the action level (EPA, 2013a).

The following resources describe POU filtration options in further detail:

- The EPA examined multiple POU options as part of its "Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems" report (EPA, 2006a).
- The Water Works: A Guide to Improving Access to and Consumption of Water in Schools to Improve Health and Support Learning report includes examples of point of use machines as part of the supplemental materials (Grummon et al., 2014).
- Appendix 3 of the CDC's "Increasing Access to Drinking Water in Schools" provides examples of prices and considerations for water dispensers in schools (CDC, 2014b).
- The WQA's "Lead Fact Sheet" describes POU treatment methods (WQA, 2013). School and ECE facility administrators can also visit the WQA website to find certified water treatment products.

POU Filtration – Benefits/Considerations

Benefits:

- Volume discounts may be available if buying POU filtration devices in bulk
- A POU system can be installed directly into the water line at an affected fixture
- Minimal maintenance and cleaning is usually required

Considerations:

- Units may require professional installation
- Units will require periodic filter replacement
- Students may need a cup/bottle to obtain water from the fountain or dispenser
- Some POU options are standalone units that require electricity (EPA, 2006)

Case Study: Point-of-use filtration units need to be installed in schools and community places in central California as part of the California Agua4All pilot program. Some schools also need specialized filters for arsenic, which can increase the cost significantly. The Agua4All consortium has worked with California's only approved vendor for this filter size to obtain discounted retail prices on filtration units and replacement filters. (Sarah Buck, RCAC Rural Development Specialist and Shen Huang, CWC Technical Analyst; telephone interview: Jan. 9, 2015).

Case Study: The LAUSD installed POU filtration at all early education centers (2-5 years old) in the district. All fixtures were replaced with stainless steel assemblies and follow-up sampling was conducted to verify that lead levels had dropped. The LAUSD spent $10 million installing the filters. There were two types of filters used (1,500 gallon for classroom water fountains and 6,000 gallon for multiple water fountain assemblies). The filters automatically shut off water flow when the filter capacity has been reached. The plant manager requests a service call and the plumbing department changes the filter. This project has been extended to approximately 700 elementary schools (Jennifer Flores, Environmental Health Supervisor; telephone interview: Feb. 10, 2015).

Replacing Fixtures, Pipes and Fittings or Reconfigure Plumbing

If a particular location exceeds the lead action level, and is localized, the source of lead can be replaced. This may include removing and replacing a drinking water fountain. However, if lead components are found throughout the system, it may be complicated and expensive to remove all lead sources. According to the LAUSD, trying to trace a problem and replace plumbing may be extremely expensive and may not always solve the problem (Jennifer Flores, Environmental Health Supervisor; telephone interview: Feb. 10, 2015). If it is financially feasible, school or ECE facility administrators may want to contact a professional engineer or other individual with experience in remediation or scientific research to help investigate a widespread lead issue.

The Reduction in Lead in Drinking Water Act now requires piping components and related materials to meet new "lead free" requirements for any alterations made to the existing plumbing system. Therefore, replacing pipes and fittings or reconfiguring plumbing may be the best option if the school is already undergoing a renovation. This option was used by the Seattle Public Schools and described in a case study in Section 4. A licensed plumber should implement all modifications to the plumbing system.

Replacing Fixtures, Pipes and Fittings or Reconfiguring Plumbing – Benefits/Considerations

Benefit:

- Removes the hazard completely
- Potentially eliminates monitoring and treatment
- Eliminates staff time needed to implement other remediation programs

Considerations:

- Difficult to identify all sources of lead
- Difficult to trace the problem
- Expensive

Provide Bottled Water

Some school districts have opted to shut down all water fountains in their schools and provide bottled water to students instead. This has been the chosen option for some school districts due to the high cost of replacing multiple fountains at each school and the potential cost of replacing pipes and other plumbing infrastructure.

Case Study: After a 1988 testing effort at Boston Public Schools, all schools that had outlets with high lead levels switched to bottled water; this was approximately 80 percent of all schools. In 1990, the MWRA started adding a corrosion inhibitor to the water, which decreased the amount of lead leaching into the water. The school district is currently conducting wholesale retesting of water taps across the district, with the intention of resuming regular water use at approximately two schools per year. A testing protocol has been proposed and may be accepted in the future (Jeff Lane, Environmental Division Chief; telephone interview: Jan. 29, 2015).

Bottled Water – Benefits/Considerations

Benefit:

- Depending on the situation, it may be cheaper than replacing leaded fixtures and fountains
- For bottled water, for which lead pipes aren't used in production, the Food and Drug Administration (FDA) has set the lead limit at 5 ppb (FDA, *Bottled Water Everywhere: Keeping It Safe – Online Resource*)

Considerations:

- High costs
- Less environmentally sustainable (e.g., disposable bottles)

Case Study: In November 2007, the Baltimore City Public School System decided to make a system-wide shift to bottled drinking water after testing results revealed that several water fountains that had passed previous tests for lead and returned to use had subsequently failed. After the city and state health department worked collaboratively to collect samples and conduct testing at 84 fountains from 10 randomly selected schools, 10 fountains had levels above the cutoff level of 20 ppb and those fountains were immediately shut off. A school system financial review showed that the cost of providing bottled drinking water for the entire school system was expected to be approximately $675,000 per year. This was chosen as a cheaper option than continuing to test and trying to remediate the problem, because the school system was already paying a similar amount to provide bottled water for schools without adequate numbers of working fountains and for staff and consultants to oversee, sample and analyze test results (City of Baltimore, 2007).

Section 9: Communicate with the Public

A lead sampling program should include a communications plan in addition to a testing program. A communications plan should describe how to inform school employees, students, parents and the community about ongoing, up-to-date information regarding sampling and remediation efforts.

Remember that if a school or ECE facility meets the definition of a PWS, the LCR identifies specific notification requirements. More information is available in the EPA's "Lead and Copper Rule: A Quick Reference Guide for Schools and Child Care Facilities" (EPA, 2005b).

Deliver Information Effectively

The EPA's "3Ts for Reducing Lead in Drinking Water in Schools" document contains recommendations for effective communication:

- Take the initiative in providing information to the community (it is important to do so before the media does it for you). When public health risks are involved, especially with respect to children, vague or incorrect information can be worse than no information at all.
- Be a good and reliable source of information. That is, provide honest, accurate and comprehensive information in every necessary area.
- Always speak with one voice (e.g., designate points of contact – preferably one person – to respond to parents and the media). Anticipate likely questions from members of the local community, including civic organizations and the media, and prepare answers. Each member of the community may have a different concern or viewpoint on the subject of lead testing.
- Be positive, proactive and forthcoming when working with the media. Communication efforts are likely to be less complex if a good working relationship is established.

- Keep members of the school community up-to-date on important events and as the lead testing program unfolds (EPA, 2006d).

As part of developing a communications plan, school management should:

- Assign a designated person to be the contact for the lead control program.
- Notify affected individuals about the purpose of the testing as well as the results. School employees, students and parents should be informed and involved in the overall process through meetings, open houses, public notices.
- Identify and share specific activities they are pursuing to correct any lead problems. Local health officials can assist in understanding potential health risks, technical assistance and communication strategies (EPA, 2006d).

The communication methods chosen need to be relevant for each situation and/or protocol. Make sure to provide sampling results to the public with any information needed as a basis for interpreting and understanding the significance of those results. All materials should be culturally and linguistically appropriate.

Use these seven basic public notification methods alone or in combination to communicate lead-in-drinking-water issues and the meaning of sampling program results:

- Press Release: A press release distributed to local media can potentially inform a broad range of the public of lead in drinking water issues and the results of your sampling program. It is important for the release inform readers about how to obtain the sampling results and other lead in drinking water information, and, perhaps, include the phone number of an informed and available facility official.
- Letters/Fliers: Letters or fliers represent the most direct and effective method of communicating lead in drinking water activities to parents/guardians and other members of your school or building community. The letters and fliers should be mailed directly.

- Mailbox Stuffers: Mailbox stuffers are a direct and effective method of communicating lead in drinking water activities to school employees. Stuffers would contain much the same information as that contained in a press release or letter/flyer.
- Staff/School Newsletter: A notice contained in a newsletter is another option for directly and effectively communicating information about the lead program to employees, parents and students.
- Presentations: Presenting the information at facility-related meetings is another effective means of communication. Relevant events for schools include meetings of parent-teacher organizations, faculty and the school board.
- Email and Websites: Electronic communications are a convenient communication method for both staff and parents. Websites can be updated frequently to quickly convey new information. Email provides a quick, easy method for parents to ask questions, but responses must be timely to be effective (EPA, 2006d).
- Social Media: Keeping the public updated on the progress of the lead testing and remediation program can be accomplished by providing updates through established social media accounts (e.g., Facebook, Twitter).

Provide Information Prior to Starting a Program

Be proactive and tell parents and staff about your voluntary lead testing program. This will demonstrate a commitment to protecting the health of students and staff, and build confidence in a school or ECE facility administrators' ability to provide a safe and healthy environment, whether or not elevated lead levels are found at the facility.

It is important to make sure the lead testing process is transparent. Provide guidance about the procedures to the public. One recommendation is to post the information on a school or ECE facility's website, if applicable. Public communication should include the following information:

- Details about the nature of your drinking water lead control program;
- Information on the public health effects and risks posed by lead in drinking water and the significance of lead in drinking water versus other sources such as food, air, dust and soil;
- The availability of general lead in drinking water information resources;
- How and where individuals may seek blood-lead level testing if they are concerned;
- Recommend consultation with a physician if further assistance is needed;
- How families can increase their awareness of exposure in their home and elsewhere; and
- Information about state certified laboratories to test home water for lead and other contaminants (EPA, 2006d).

Here are letter template resources school administrators can customize to share information about lead in drinking water with the community:

- The EPA's "3Ts for Reducing Lead in Drinking Water in Schools," - specifically Exhibits 6.1-6.3, includes sample public notice letters, press releases and newsletter articles (EPA, 2006d).
- The AWWA's "Assisting Schools and Childcare Facilities in Addressing Lead in Drinking Water," includes several versions of "Questions and Answers – Lead in Drinking Water" literature (AWWA, 2005).
- The EPA developed a "Lead Exposure: the Risks and Remedies" frequently asked questions document (EPA, 2005d).

Provide Sampling Results

Schools should inform the public about the results of water testing. If testing results demonstrate poor water quality, information should be provided to indicate what steps the school is taking to remediate the problem. A school should also make copies of the

water testing results available to the public, either by keeping copies in the school administrative offices and/or by posting results online (EPA, 2006d).

The following are letter template resources that a school or ECE facility could use to provide sampling results:

- The MassDEP's Lead in School Drinking Water Program Overview includes "Attachment D: Sample Letter for Parents In the Event a School Has Elevated Lead Levels" (MassDEP, 2005).
- The EPA's 3Ts for Reducing Lead in Drinking Water in Schools guidance includes a "Parent and Caregiver Letter" template (EPA, 2005e) and a "Public Address" template (EPA, 2005f).

Here are examples of school district water quality sampling programs and their public reporting systems:

- The District of Columbia Department of the Environment, Water Sampling Results for District Schools webpage links to water quality testing results dating back to 2009 and describes actions taken when water quality issues were found. http://ddoe.dc.gov/publication/water-sampling-results-district-schools
- The Seattle Public Schools, Drinking Water Quality Program webpage contains water quality annual reports, links to the district water quality policy and frequently asked questions. http://seattleschools.org/district/departments/risk_management/environmental_health_issues/drinking_water_quality_program/

- The LAUSD, Office of Environmental Health and Safety, School Drinking Water Testing Results webpage contains links to water quality testing results by school building and links to the district's daily flushing policy. An individual can search this publicly available information by school. http://www.lausd-oehs.org/drinkingwater_listschools.asp

Case Study: "An integral part of Stoughton, MA Public School's testing program includes making the effort to establish a working rapport with students, parents, school officials, and other stakeholders through consistent communication and transparency. After every testing session, the district communicates test results to all stakeholders, what the results were, if any remediation steps were taken, and recommends that people check their own homes for lead. If anyone has questions, they are welcome to contact the facilities department to obtain more information about the testing. The testing program has not received any negative responses from stakeholders, which is mainly due to these communication procedures. 'Parents will be unhappy,' explained Mr. Harding [Director of Maintenance and Operations], 'if they hear that testing is going on but don't know why it is taking place or the results of the tests; but keeping them well informed and abreast of the testing program prevents a public outcry and a risky public relations situation from arising.' He also stressed the importance of keeping the superintendent, school staff, faculty, town engineers, the Public Works Department and local health officials aware of the plan so that they would also be able to respond to inquiries and concerns from the public. In May 2007, Stoughton Schools was a recipient of the MassDEP STAR-L Award (Systems Taking Action to Reduce Lead Award). The MassDEP gives the STAR-L Award to both the school and the local drinking water utility to recognize the excellent work they have done together to establish this testing program, inform the public, and protect the health of the school's occupants." (EPA, Case Study: Stoughton Public Schools, Stoughton, Massachusetts).

Section 10: Recommendations

School and ECE facilitiy administrators need to know if the drinking water that they provide to children contains high levels of lead. A tailored sampling and analysis program is vital to determine if there is a problem, and proper planning allows staff to address high lead levels in drinking water before children are harmed. Ensuring that children are not exposed to lead in drinking water depends on policies that support lead sampling, analysis and remediation programs at the national, state, district and individual facility levels. The following are general recommendations for schools and ECE facilities to ensure access to lead-free drinking water.

- Make the decision to begin a proactive sampling and testing program. Many of the individuals interviewed as part of the development of this document noted the importance of starting a lead testing and analysis program before the potential discovery of high lead levels by an outside source, such as the news media. Use the requirement to provide free, potable water as part of the Healthy, Hunger-Free Kids Act as an incentive to start a program.
- Develop comprehensive facility infrastructure inventories of drinking fountains, bottle-fillers and other tap water delivery options in all school buildings and conduct periodic follow-up assessments to ensure that building plumbing meets the latest standards.
- Institute and oversee a uniform, routine water quality testing protocol across all facilities if there is more than one.
- Develop a transparent communication plan for the public, explaining the details of the lead testing and remediation program.

- Identify a team of facility and community stakeholders, who can provide insight, support and funding for a lead testing and remediation program.
- Train school maintenance and custodial staff to assist with sampling and implementing remediation best practices (e.g., an aerator cleaning program). Ensure schools have access to training documents for future staff trainings.
- After implementing a sampling program, review the program at a set schedule to determine how implemented changes are improving the quality of the drinking water.
- Conduct annual maintenance planning. Drinking fountains should be included in annual maintenance plans to make sure that schools are in compliance with minimum requirements for fountains under the applicable plumbing code and that all fountains are kept in good working condition.
- Look for cost savings opportunities as a sampling and testing program is implemented (e.g., rely on facility staff to take samples). Most of the schools interviewed as part of the development of the report have seen their annual sampling, testing and analysis costs decrease over the life of their programs. In most cases, the number of samples containing high lead levels has dropped following the implementation of mitigation measures.
- Include lead in drinking water remediation objectives in capital improvement plans to build, renovate or repair school infrastructure.
- Address drinking water in school wellness policies. Empower students, teachers and parents to become partners in ensuring the safety of their facility's drinking water. This ensures that the implemented lead testing and remediation program will become part of regular operating procedures.

The following are recommendations at the state level:

- State drinking water programs should continue to promote lead testing in schools and provide funding opportunities.
- States should institute a uniform, routine water quality testing program at all schools and ECE facilities.

The following are recommendations at the national level:

- Coordinate with state drinking water agencies to request updates on the policies provided in the "Controlling Lead in Drinking Water for Schools and Day Care Facilities: A Summary of State Programs" report (EPA, 2004b). Best practices can be identified and applied across the country.
- Using the best available research on adverse health effects from lead in drinking water, determine if recommended lead action levels need to be revised.
- Determine how to address the mandate that free, potable water for consumption be available at any school or ECE facility affected by the provisions of the Healthy, Hunger-Free Kids Act. Specifically address the fact that at the same time that free, potable water is mandated, no federal regulations require schools or ECE facilities served by a PWS to test for lead in drinking water.

Acronym List

Acronym	Term
ANSI	American National Standards Institute
AWWA	American Water Works Association
BLL	Blood lead level
CCR	Consumer Confidence Report
CDC	United States Centers for Disease Control and Prevention
DEP	Department of Environmental Protection
DOH	Department of Health
ECE	Early Childhood Education
EPA	United States Environmental Protection Agency
IQ	Intelligence quotient
LAUSD	Los Angeles Unified School District
LCCA	Lead Contamination and Control Act (1988)
LCR	Lead and Copper Rule (1991)
LWC	Louisville Water Company
MDH	Minnesota Department of Health
mg/L	milligrams per liter
mL	milliliter
NTNCWS	Non-transient, non-community water systems
POU	Point-of-use
ppb	parts per billion
ppm	parts per million
PTA	Parent Teacher Association
PUME	Padres Unidos, Mejores Escuelas (Parents United for Better Schools)
PWS	Public water system
SDWA	Safe Drinking Water Act (1974 with later amendments)
SDWIS	Safe Drinking Water Information System
µg/L	micrograms per liter
µg/dL	micrograms per deciliter

Glossary

Acidic: The condition of water that contains a sufficient amount of acidic substances to lower the pH below 7.0.

Action level: The level of lead or copper which, if exceeded in more than 10 percent of sites, triggers treatment or other requirements that a PWS must follow.

Aerator: A part of the faucet assembly that introduces air into the water flow that makes it feel as if a larger water flow is coming out of the tap. The use of aerators is a common water conservation practice. Screens are not intended to remove contaminants in the water, but may trap sediment or debris as water passes through the faucet. Lead bearing sediment may end up in drinking water from physical corrosion of leaded solder and can build up in the aerator over time.

Alkalinity: The capacity of water to neutralize acids. This capacity is caused by the water's content of carbonate, bicarbonate, hydroxide and occasionally borate, silicate and phosphate. Alkalinity is expressed in mg/L of equivalent calcium carbonate. Alkalinity is not the same as pH because water does not have to be strongly basic (high pH) to have a high alkalinity. Alkalinity is a measure of how much acid can be added to a liquid without causing a significant change in pH.

Contaminant: Anything found in water (e.g., minerals) which may be harmful to human health.

Corrosion: The gradual decomposition or destruction of a material.

Flux: A chemical agent often used in soldering.

Leach: the process by which lead from a plumbing component or pipe enters drinking water through corrosion.

Monitoring program: PWS testing that must be performed at regularly scheduled intervals to detect and measure contaminants.

pH: A measurement of how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic and a pH greater than 7 is basic.

Point-of-use device: A treatment device applied to a single tap to reduce contaminants in drinking water at that tap.

Public water aystem: A publicly or privately owned drinking water provider that serves at least 15 service connections or 25 persons. A PWS will have a network of pipes, pumps and storage and treatment facilities designed to deliver water to homes, schools, businesses and other users.

Remediation: Removal of contaminants from drinking water to protect human health.

Samples: The water that is analyzed for the presence of EPA-regulated drinking water contaminants.

Service Line: The pipe that connects the water main to the building.

Soft water: Water having a low concentration of polyvalent cations, such as calcium and magnesium ions. According to U.S. Geological Survey guidelines, soft water is water having a hardness (concentration of polyvalent cations) of 60 mg/L or less.

Solder: A metallic compound used to seal the joints between pipes.

Water cooler: A device that chills water and includes a tank that holds the chilled water. These devices usually dispense water without treatment or filtering.

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