



Lead in Drinking Water in Southeastern Wisconsin

Environmental Justice Task Force Meeting

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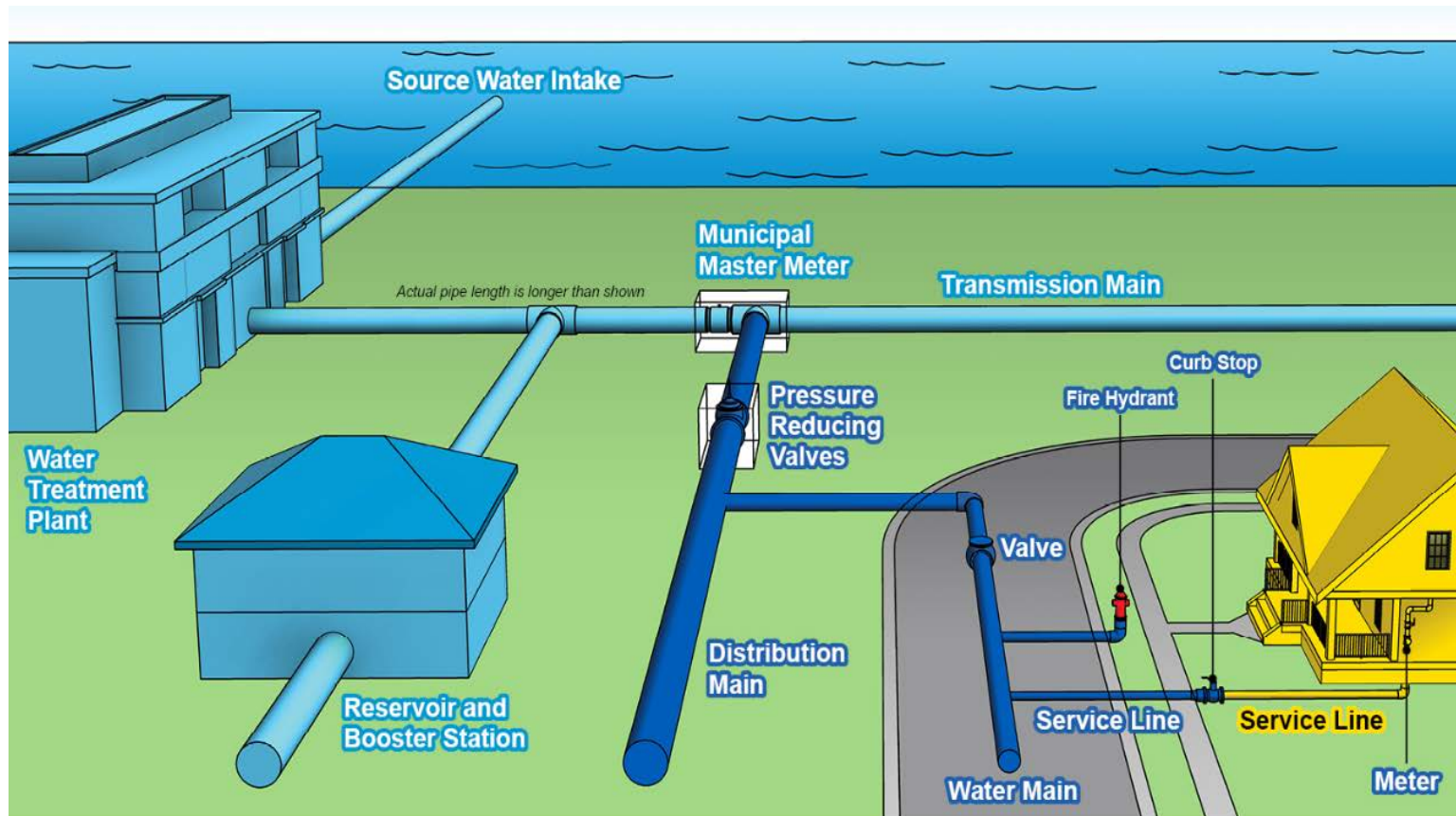


Outline

- Background
 - Water supply distribution systems
 - Federal rules regarding lead in water supply systems
- Health Effects of Lead
- Sources of Lead in Drinking Water
- How Lead is Released from Lead-containing Plumbing
- Addressing Lead in Drinking Water



Background: Water Supply Distribution Systems



Source: Great Lakes Water Commission



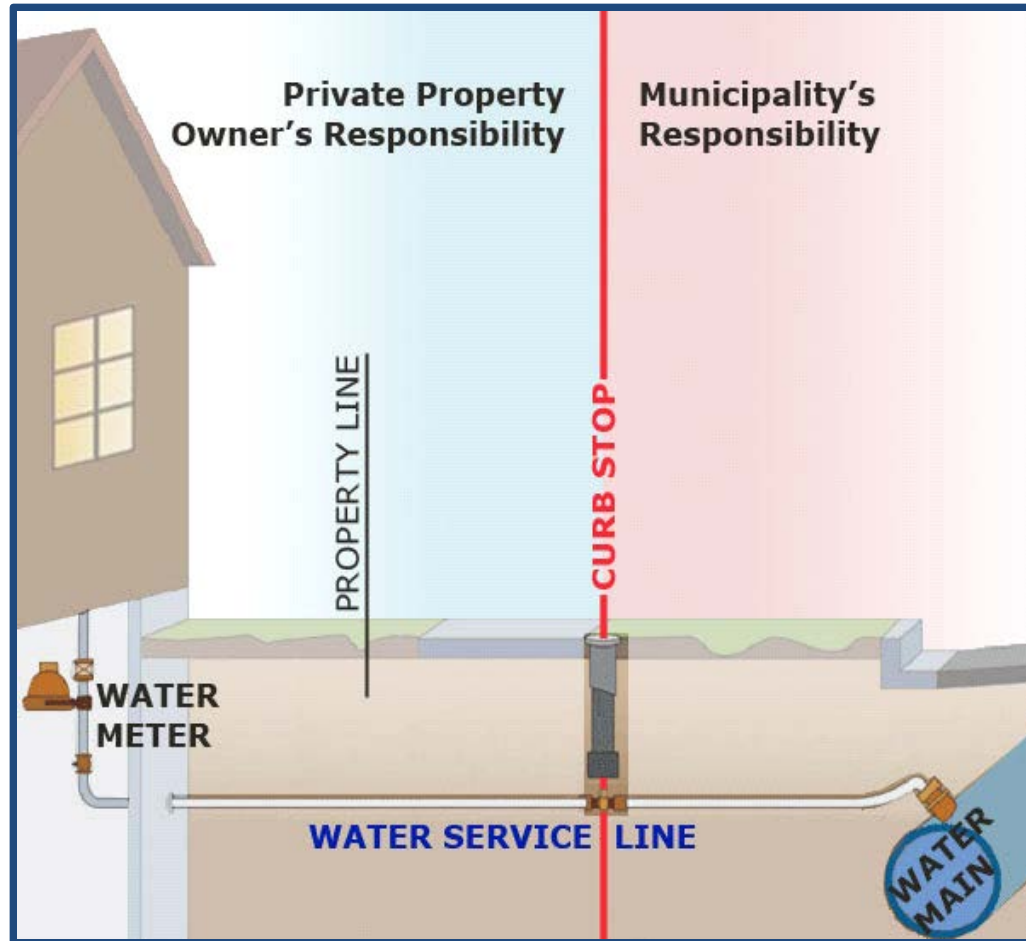
Background: Water Supply Distribution Systems

- Water treatment may include
 - Sedimentation to remove particles
 - Filtration to remove particles and some chemicals
 - Aeration to remove some chemicals
 - Chemical treatment to improve sedimentation and/or filtration or to adjust water chemistry
 - Disinfection to kill or inactivate disease-causing organisms
- All of these treatment techniques must be adjusted to work together throughout the distribution system



Background: Water Supply Distribution Systems

Water Service Lines



Source: Wisconsin Department of Natural Resources



Background: Federal Rules Regarding Lead

- Reduction of Lead in Drinking Water Act
 - Defines lead-free plumbing materials
 - Pipes, fittings, and fixtures with less than 0.25 percent lead are lead-free
 - › Prior to 2011 this was 8 percent
 - Solders and fluxes with less than 0.2 percent lead are lead-free
 - As of June 1986, prohibits the use of plumbing materials that are not lead-free in the installation or repair of any public water systems or in plumbing in buildings providing water for human consumption



Background: Federal Rules Regarding Lead

■ Lead and Copper Rule

- Requires public water supply systems to monitor lead and copper concentrations at the taps of customers who have lead service lines
- Requires public water supply systems to take action when 10 percent or more of samples exceed an action level of 0.015 milligrams per liter. Action may include:
 - Monitoring other drinking water quality parameters
 - Education programs
 - Monitoring source water
 - Treating source water
 - Installing and optimizing corrosion control
 - Replacing lead service lines



Health Effects of Lead

- The most sensitive tissues are the nervous system, cardiovascular system, blood, and kidneys
- Effects
 - Low levels → cognitive deficits
 - Intermediate levels → anemia, loss of coordination
 - High levels → brain damage, kidney damage, muscle weakness, paralysis, and death
- Children are more vulnerable to lead poisoning than adults
 - Absorb lead more efficiently
 - Nervous systems are still developing



Health Effects of Lead

- A blood concentration of 5 micrograms per deciliter ($\mu\text{g}/\text{dl}$) or more is considered indicative of lead poisoning
 - From 2011 to 2016, in the Southeastern Wisconsin Region, an annual average of 3,616 children under 6 years of age were reported to have blood stream lead concentrations greater than 5 $\mu\text{g}/\text{dl}$ (out of about 47,747 tested per year)
 - Highest numbers of children with lead poisoning were reported by health departments serving Cities of Milwaukee and Racine and Kenosha and Waukesha Counties
 - Highest percentages of children tested found to have lead poisoning were reported by health departments serving Cities of Milwaukee, Racine, and West Allis and Kenosha County



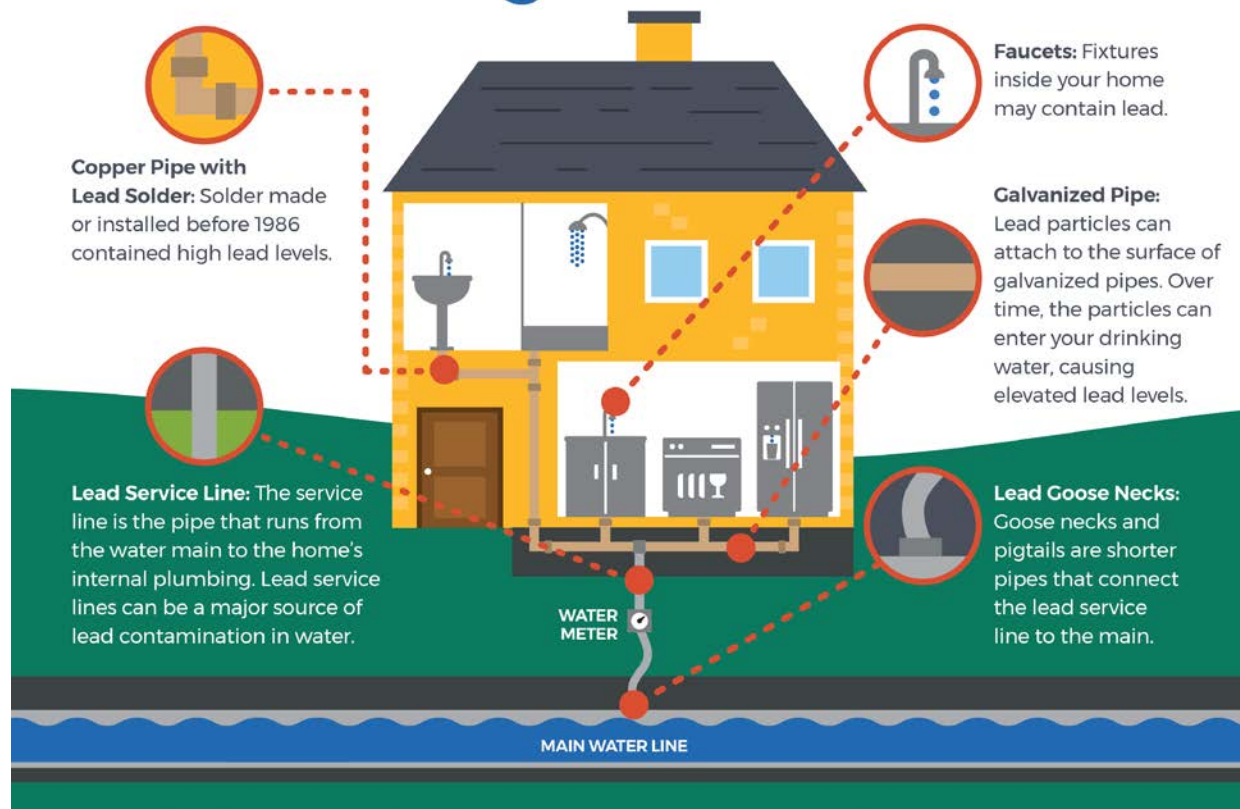
Sources of Lead in Drinking Water

- Water mains and water service lines serving older buildings, especially those built before about 1951
 - Example: City of Milwaukee
 - Required the use of lead water service lines until 1948
 - Banned the use of lead water service lines in 1962
 - The use of lead water service lines was banned nationally in 1986
- Other plumbing materials installed prior to 1986 may also contain lead
 - Interior plumbing lines
 - Fixtures
 - Solder and flux



Sources of Lead in Drinking Water

Sources of **LEAD** in Drinking Water



Source: U.S. Environmental Protection Agency



Sources of Lead in Drinking Water

- Wisconsin Department of Natural Resource (WDNR) estimates that there are at least 121,500 lead water service lines in the seven-county Southeastern Wisconsin Region
 - City of Milwaukee 70,000 – 75,000
 - City of Racine 12,900
 - City of Kenosha 9,080
 - City of Wauwatosa 8,660
 - City of West Allis 6,690
 - In 2017, several local water utilities reported to the Wisconsin Public Service Commission that they are assessing the number of lead service lines, if any, that are connected to their systems



Sources of Lead in Drinking Water

- Other sources of lead in the environment
 - Leaded gasoline
 - Use phased out beginning in 1976 and totally banned 1996
 - Leaded paint
 - Use banned in residential paint and other coatings 1976
 - Pesticides
 - Used prior to 1940
 - Cosmetics, ceramics, jewelry, candies, and other products
 - U.S. Environmental Protection Agency estimates that drinking water accounts for about 20 percent of exposure to lead



How Lead is Released from Lead-Containing Plumbing

■ Corrosion

- Electrochemical dissolution that releases lead in water mains, service lines, or interior plumbing into the water
- Corrosion can be promoted by:
 - Acidic water
 - High rates of water flow
 - High water temperatures
 - Presence of dissolved solids, dissolved gases, or suspended solids in water
 - Presence of certain microorganisms in water
 - Presence of free chlorine from disinfectants in water
 - Improper matching of plumbing materials made from different metals
 - Longer residence time of water in pipes



How Lead is Released from Lead-Containing Plumbing

■ Physical Disturbance of Pipes

- Can cause lead-containing scale to detach from pipe walls and enter the water
- Exposes previously covered pipe surfaces to water leading to corrosion
- Types of disturbance that can result in lead release include:
 - Road construction and maintenance
 - Construction and maintenance of underground infrastructure such as sewers and gas lines
 - Partial replacement of lead service lines



Addressing Lead in Drinking Water

- Distribution system methods
 - I. Implementing corrosion control treatment to discourage release of lead from pipes and other plumbing materials
 - Adjust acidity of the water to encourage formation and deposition of scale on pipe walls
 - Add corrosion inhibitors to form and deposit insoluble compounds on pipe walls
 - Reduce the availability of nutrients that can support the growth of microorganisms
 - Optimization of corrosion control requires minimizing concentrations of lead and copper at customer taps throughout the distribution system while not violating any drinking water standards



Addressing Lead in Drinking Water

■ Distribution system methods

2. Replace water service lines with lead-free materials

- Involves finding and replacing buried infrastructure
- Responsibility for service lines is shared between the utility and the property owner—best to replace both portions together
- Estimated cost of replacing privately-owned portion of the service line is \$2,000 to \$7,000
- 2017-2018, WDNR provided communities with \$27 million to fund lead water service line replacements on private property
- Using ratepayer dollars to provide financial assistance for private property service line replacement requires approval from the Wisconsin Public Service Commission
- If interior plumbing contains lead, it may not reduce lead concentrations at the tap below the action level of 0.015 milligrams per liter



Addressing Lead in Drinking Water

■ Methods within buildings

- Use only cold water tap for water for cooking, drinking, or making infant formula
- Flush plumbing by running the cold water tap for at least three minutes before using water for cooking, drinking, or formula
- Periodically remove, clean, and replace aerators and filters at water faucets
- Use a home filtration system
 - Should be certified under NSF/ANSI Standard 53 for removal of lead
 - Filters in these systems may need to be replaced periodically
 - 2016 City of Milwaukee distributed over 1,700 filters
 - City of Milwaukee, United Way, and A. O. Smith are providing residents of the Milwaukee area filters at discounted cost