MEMORANDUM

LEGISLATIVE REFERENCE BUREAU

WWW.MILWAUKEE.GOV/LRB

To: Ald. Jim Bohl

From: Aaron Cadle – Legislative Fiscal Analyst

Date: September 13, 2016

Subject: Sources of Lead in Drinking Water

Introduction

The Legislative Reference Bureau located reports authored by the U.S. Environmental Protection Agency (EPA), the Centers for Disease Control and 4 states (Wisconsin, Connecticut, Pennsylvania and Massachusetts) discussing the issue of lead in drinking water. This memo summarizes the views presented on sources of lead in drinking water, and related issues concerning lead in drinking water.

Sources of Lead in Drinking Water

The EPA estimates 10-20% of human lead consumption comes from drinking water. The Wisconsin Department of Natural Resources (DNR) asserts food is the greatest single source of lead for the average adult. Lead contamination of food typically occurs from lead in the air, or lead in food containers, particularly lead-soldered food containers.

The primary sources for lead in drinking water are lead service lines connecting residencies to utility mains, lead pipes used for interior plumbing inside residencies, lead solder (usually a 50/50, tin/lead compound) and fluxes used to join copper or galvanized steel piping used for interior plumbing, and brass or chrome-plated brass faucet fixtures. Lead leaches into drinking water when motionless water is in direct contact with the source of lead for long periods; the longer the period, the more lead will dissolve into the water.

The Massachusetts Water Resources Authority claims that in extreme cases, older faucets can contribute up to 1/3 of the lead in water that has been sitting in the pipes for several hours, with the remainder coming from lead solder joints in copper pipes or lead service lines.

While there is broad agreement these are the sources of lead in drinking water, the percentage of overall lead contamination at the

consumer's tap attributable to each source is addressed nowhere other than the Massachusetts Water Resources Authority report. To quote a DNR brochure, "The concentration of lead in drinking water can vary greatly, depending on the corrosivity of the water, the type and age of the plumbing materials used in the house and the length of time that the water stands in the pipes."

In general, water acidity acts to corrode pipes and fixtures to leach lead, while high levels of mineral content in water tends to coat pipes with a protective layer that inhibits lead leaching. Water combining high levels of acidity and low mineral content (soft water) corrodes most readily to cause greater amounts of lead to leach into drinking water. Hot water exacerbates lead leaching.

Milwaukee water is treated with phosphate (phosphoric acid), as mandated by the EPA, to reduce its natural corrosiveness. With this additive, Milwaukee water is described, according the Milwaukee Water Works, as not aggressive (not corrosive) and mildly scaling (pipe and fixture coating), reducing the chances of lead leaching.

U.S. Environmental Protection Agency's "Lead Free" Regulation

The EPA's 1986 Safe Drinking Water Act mandated that all solder and fluxes used to join copper pipe, interior plumbing for water consumption, and brass or chrome-plated brass faucet fixtures be "lead free," which the agency defined as containing not more than 8% lead. In 2014, the "lead free" standard was tightened by the agency to 0.25% lead.

The Massachusetts Water Resources Authority notes some manufacturers produce plastic faucets, while others are substituting other metals for the lead in the brass, inserting copper tubes inside the brass faucets, or applying special coatings on the inside of the faucets to meet EPA's "lead free" requirements.

U.S. Environmental Protection Agency Water Utility Regulation

In 1991, the EPA enacted the Lead and Copper Rule to regulate the levels of lead and copper in water distributed by public water utilities. Utilities are required to sample and monitor copper and lead concentrations in water at the tap of customers most likely to be affected by these contaminants. If 10% of customer water samples contain more than 15 parts per billion of lead, or 1.3 parts per million

of copper, the utility is ordered to take remedial action, which could include:

- Optimizing the utility's corrosion control treatment program (as the Milwaukee Water Works was ordered when it failed to meet lead-concentration standards).
- Educating the public about lead in drinking water and actions consumers can take to reduce their exposure to lead.
- Replacing the portions of lead service lines under the utility's control.

In Milwaukee, lead concentration levels for 90% of first-draw water samples (before "running" the water) taken at home taps of 50 sample customers most likely to be affected by lead contamination in 2014 were at or below 8.2 parts per billion, well below the EPA's 15 parts per billion threshold. Copper concentrations similarly sampled were at 0.038 parts per million versus EPA's 1.3 parts per million standard.

Method to Reduce Lead in Drinking Water at the Tap

The reports reviewed agree, that to avoid lead exposure, consumers should never drink or cook with hot water. They also agree the most effective method to reduce lead in drinking water passing through lead service lines or lead found in the piping, solder or faucet fixtures of interior plumbing is to flush water sitting in the pipes for extended periods before consuming. The flush time needed and method used, however, varies.

For residencies served by lead free service lines suspected of having interior lead plumbing, the DNR recommends flushing each tap that has gone unused for 6 or more hours until the water runs cold, usually 2-3 minutes. Residencies supplied by lead service lines should allow the flush water to run an additional 15 seconds after it cools.

According to the DNR, studies by the DNR have shown this flushing technique can reduce lead levels from hundreds of parts per billion to fewer than 3 parts per billion (the current detection limit at the State Laboratory of Hygiene).

The Centers for Disease Control recommend running the kitchen tap (or other principal tap used for water consumption) 1-2 minutes if the service line is known to be lead-free. If water is supplied by a lead service line, the shower or bathtub should first be run for 5 minutes or more, then the kitchen tap run for an additional 1-2 minutes before

drinking or cooking with water that has been sitting for 6 or more hours.

The states of Connecticut and Pennsylvania estimate flushing for 15-30 seconds should be sufficient to render tap water noticeably colder and rid the pipes of lead contamination. Massachusetts reckons a minute will be needed.