

North Shore Water Commission Lead and Copper Control in the Distribution System

Eric Kiefer

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North Shore Water Commission Background

The North Shore Water Commission (Commission) is a municipal entity that is responsible for supplying potable drinking water to its member utilities (Members) and wholesale customer. The Commission was formed in 1957 and is owned in joint by the Village of Fox Point, City of Glendale, and Village of Whitefish Bay. In 1999, the Commission and its Members entered into an agreement to provide water to specific areas within the Village of Bayside; the owner of that water utility is currently the City of Mequon.

Treatment Overview

The source water used by the Commission and other local water utilities is Lake Michigan, the fifth largest lake in the world. The treatment process starts at the intake which is approximately 4,000 feet offshore from the Commission's pumping station located in Whitefish Bay, Wisconsin. Lake water enters the intake through 3 inverted cones that are protected with bar screens and a mussel control system; this system uses a polymer-based product that acts as both a molluscicide and as a coagulant.

Water travelling through the intake passes a traveling screen upon arriving at the shore. Gravity forces the water to fill a large shorewell that has 4 raw water pumps submersed in it. Lake water is pumped from this station to the Bender treatment plant which is nearly a mile away in Glendale. Raw water is conveyed from station to station via transmission main.

Upon arriving at the Bender treatment plant, aluminum sulfate (alum) and coagulant-aid polymer are added to promote settling of solids. Chemicals are given time to react with the raw water in the next stage of treatment. During this phase of treatment, water travels very slowly through a system of 5 rectangular basins that provide a location for particulate matter to accumulate while the pre-treated water is directed to the rapid sand filters.

Eight rapid sand filters remove remaining particulate matter and clean water is stored in a clearwell below the filters. There are 3 pumps which force the filtered water through the fully redundant ultraviolet (UV) disinfection system which inactivates pathogens such as cryptosporidium. Before going into the UV reactors, fluoride is added to prevent tooth decay.

After the UV reactors, sodium hypochlorite (a form of chlorine) is used to disinfect any remaining pathogens. Underground piping directs the water to our 4 below-grade clearwells (historically they have been referred to as "reservoirs") that provide approximately 7 million gallons of

storage capacity. While in the clearwells, water continues to react with chlorine so that proper disinfection is achieved. Water is drawn out of the clearwells from 5 high service pumps. Underground piping directs the water to a chemical feed vault that allows for the addition of ammonium hydroxide (also referred to as aqua ammonia) and phosphate. The ammonium hydroxide converts the chlorine to another disinfectant, chloramine, that is used by neighboring communities and is often perceived to be better-tasting than free chlorine. Phosphate is added to reduce lead and copper leaching within premise plumbing.

The high service pumps deliver potable water to its Members through metering pits located on the grounds of the Bender facility. There are several interconnections between Members that the NSWC monitors; however, the bulk of the water stays within each member's system after initial delivery.

Lead and Copper Background

The Commission and its Members are regulated by the Wisconsin Department of Natural Resources (WDNR) and the United State Environmental Protection Agency (USEPA) to ensure potable water meets or exceeds all state and federal requirements. While each Member is responsible for operating and maintaining its own water utility, the Commission is primarily responsible for supplying each member and wholesale water customer with potable water that meets all applicable water quality standards.

Lead and copper are two of the many contaminants that are monitored by the Commission. Years of monitoring suggests that copper is not a contaminant of concern in our water system--levels found are significantly below the action level. Recent lead levels are also below the action level and are considered to be safe according to WDNR and USEPA regulations.

- In 2015, the 90th percentile copper level was found to be at 48 parts per billion (ppb) and the highest level detected was 110 ppb. The USEPA action level for copper is 1300 ppb.
- In 2015, the 90th percentile lead level was found to be at 9.2 ppb and the highest level detected was 15 ppb. The USEPA action level for lead is 15 ppb.

The action level is used to trigger additional action by the water utilities. If the 90th percentile level exceeds the action level, corrective action would have been required. Since the results were acceptable, no additional action was taken.

Lead is not a contaminant commonly detected in Lake Michigan and is not added to the water during the treatment process. Rather, it is introduced into drinking water when lead-bearing plumbing fixtures and pipes release lead through natural processes. The Commission and its Members are aware that lead pipes called "services" were installed before lead was considered to be a contaminant. These services connect the municipal water main to individual homes. The portion of the service which spans from the water main to the shut-off valve (also known as curb

stop) is owned by the water utility. The portion of the service that spans from the shut-off valve to the customer meter is typically owned by the homeowner.

The Commission and its Members are also aware that lead is used in the manufacturing of brass and solder. Plumbing fixtures installed and owned by homeowners may contain lead.

Lead and Copper Treatment

The Commission is able to reduce the amount of lead and copper release from these plumbing fixtures and pipes by adding a product that consists of phosphate compounds. The addition of phosphate has been determined by the USEPA and WNDR to be the best available treatment process for controlling lead and copper in the distribution system.

Our treatment process is designed to form a chemical scale on pipes that reduces the amount of lead and copper which can leach from plumbing fixtures and pipes.

The effectiveness of this treatment is evaluated each time WNDR requires the Commission to perform lead and copper monitoring. As this time, monitoring results indicate that our treatment process is effective.

Research

The Commission is currently engaged in a research project (Project #4586) managed by the Water Research Foundation. This purpose of this project is to determine if clean and biologically stable water distribution systems can optimize lead and copper corrosion control. While the results of this project have not been finalized, preliminary results indicate that it may be possible to further reduce lead and copper levels in the distribution system by flushing and maintaining appropriate chlorine levels throughout the water system.

After this research project concludes, recommendations may be made to member utilities for implementing specific water utility practices that could reduce lead and copper release.

Questions

Please direct any questions regarding lead and copper control to Eric Kiefer, Plant Manager. He may be contacted via email at EKiefer@northshorewc.com or by phone at (414) 963-0160.