# Orr High School Water Mitigation Pilot Project

## Auto Flushing System Case Study for Lead Water Mitigation - Orr High School

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Robert Christlieb
Chicago Public Schools

## EXECUTIVE SUMMARY

In July of 2016, the Chicago Public Schools (CPS) kicked off their Water Quality Testing & Mitigation program in conjunction with City of Chicago Department of Water Management. CPS developed a comprehensive district wide testing and mitigation protocols that focuses on identifying the root causes of lead contamination in drinking water. Once the root cause was identified CPS would mitigate the problems to provide long term cost effective solutions.

The goal of this case study is to confirm the effectiveness of flushing in general and the *Noah Automated Flushing System* in particular, for maintaining water quality during high occupied periods and to develop best practices for timing and frequency of flushing to maintain non-detectable lead levels in the system, confirm flush timing and levels based upon follow up water quality testing to be completed by the Loyola Sustainability Lab, and to develop programmatic templates for application across the district and establish design criteria for future projects.

The overarching goal is to maintain non-detectable (<2 ppb) levels in all potable water sources while building is occupied and the system is operating.

## INTRODUCTION

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.

Although lead concentrations leaving a water treatment plant are generally low, corrosive water can result in lead leaching from lead pipes within a distribution system, lead solder used to connect pipe, or brass fixtures which may contain a small percentage of lead. The 1986 Amendments to the Safe Drinking Water Act (SDWA) required EPA to develop regulations to control for lead in drinking water. The Lead and Copper Rule (LCR), issued in 1991, is focused on controlling corrosion within the distribution system that delivers water to customers. The Rule requires that public water systems monitor a fixed number customer taps for lead. If more than ten percent of taps tested exceed 15 parts per billion (ppb), the system must undertake activities to control corrosively of water, increase monitoring, educate the public, and possibly replace lead service lines within the distribution system. Additional information on the LCR can be found at www.epa.gov/safewater/lead.

In 1989 and subsequent years, EPA released guidance and information to inform states and school systems how to test for and reduce the risk of lead exposure in school drinking water. EPA's guidance provides a protocol for testing water in schools and recommends that schools take action at fixtures where the lead concentration exceeds 20 ppb. This concentration differs from the 15 ppb action level that public water systems are required to follow. The 20 ppb action level is based on a smaller sample collection volume of 250 milliliters (ml) and is designed to pinpoint specific fountains and outlets that require attention. When testing fixtures, the levels of lead are expected in the initial flush of water that has been sitting in the pipes. The 15 ppb action level required for compliance with the LCR calls for a tap sample volume of 1000 ml (1 liter), and is designed to

identify system-wide problems. If a one liter sample was collected from a drinking water fountain in schools, the initial high concentrations might be diluted by the later part of the sample, which could show lower concentrations. The 20 ppb school level is not inconsistent and likely is more stringent because it reflects a more concentrated sample; 20 ppb in a 250 ml sample would correspond to about 12 ppb in a one liter sample.

## PROBLEM

Discolored water and high lead action levels at the start of day and during periods of low or no occupancy. Several fixtures tested above the action level during testing in the fall of 2016.

After recent experiences with the CPS Onahan Elementary School riser flushing project and non-draining plumbing, the design team began to rethink the approach. It was determined that riser flushing can work, but only if the drain works. Otherwise one experiences a high volume of water at a rapid rate, causing a waterfall. With the *Noah Automated Flushing System*, this risk is decreased due to the volume of water at any given location being limited to .5-1 gpm. Onahan also had some significant environmental cost associated with the system install. The project had to access the riser in the masonry wall, abate the ACM insulation and then make the pipe install. This added cost and complexity to the project. The advantage of flushing at the fountain versus the riser is that it significantly decreases the potential for environmental issues and eases the complexity of installation and thus cost.

## CASE

### AUTO FLUSHING SYSTEMS FOR LEAD WATER MITIGATION ORR HS

Name: Orr High School
Size: 260,474 sf
Students: 550+ total
Utilization for shared campus is 30%
Year Built: 1973

### USER GROUPS

Academy for Urban School Leadership (AUSL)
Orr Academy High School
Kipp One Charter
YMCA Day Care Facility

### PARTNERS

Chicago Public Schools
Chicago Department of Water Management
Loyola University - Institute of Environmental Sustainability
Illinois Department of Public Health
Environmental Defense Fund
Moen North America
Murphy & Jones Co.

RCS Water Quality Solutions
Noah Automated Flushing System

## THE PILOT

The Orr pilot is focused on flushing the potable drinking water systems, while trying various, timing methodology and locations for flushing. While Orr was originally designed to be a riser flushing demonstration project, after review, the cost comparison between riser flushing and the *Noah Automated Flushing System*, as well as the understanding the *Noah Automated Flushing System* ease of install, caused CPS to shift focus to the *Noah Automated Flushing System* as A solution with the Orr Pilot. Riser flushing installs cost about $3,000 – 3,500 per location plus any environmental abatement costs. *Noah Automated Flushing System* installs are running $1,200 $1,500 per location if power is nearby.

In addition to the seventeen Noah Automated Flushing System devices planned for installation, this pilot project includes one riser/branch flusher servicing the kitchen at the basement level. The intent is to pre-flush the horizontal supply from main water service located in the athletic building to the north which supplied via the city main. This will pre-flush the main bulk of the system's volume, reducing the flushing run time required for each Noah Automated Flushing System above to reach fresh water.

In addition to installing riser flushing and *Noah Automated Flushing System* at water fountains, the pilot also tested Moen 8500 self-flushing vanity fixtures in remote bathrooms to assist in the flow of remote non potable locations.

Cost is always a factor with any capital expenditure and as such, the goal is to maximize water quality in Orr while minimizing capital investment. While Orr is problematic building, the goal is to develop design and maintenance best practices in a cost effective manner that can be applied district wide. The Orr pilot bypasses mid-level drinking fountains and focus on the key end of run locations to maximize the impact of flushing. The *Noah Automated Flushing System* is being installed at the Top of the Riser (TOR) End of a Branch (EOB).

The pilot project is designed to use the school's hall lighting system as a facsimile for a Building Automation System (BAS). The *Noah Automated Flushing System*'s at Orr are tied to the building hallway lighting circuits. When the lights are turned on at the start of the day, the *Noah Automated Flushing System* runs it program.

Due to the observed water conditions and test results at Orr, the *Noah Automated Flushing System* will initially start with a flushing program of 20 mins at the start of the day ( when the lights are turned on), and 5 mins per hour thereafter while the lights are on. The goal is to reduce flushing timing to the minimum required to maintain exceptional water quality and Pb testing below 2 ppb throughout the potable water system (maintenance level) while minimizing water usage.

The Loyola Institute of Sustainability has partnered with CPS on developing numerous testing protocols (Orr WQ Tests) to be used over the next 6-9 months at Orr to test the effectiveness of

the auto flushing concept, and develop best practices for timing and design. CCA & the Loyola Institute of Sustainability are working together to providing testing and lab services for the pilot. .

## PROJECT SCHEDULE

Install Completed 7/21/2017
System Operational 8/1/2017
Testing & Monitoring 8/1 TO 12/31/2017

## ATTACHMENTS

Orr Test Results - DB Report

Orr WQ Pilot OTB Set

Pictures