H_2Ops

GO WITH THE FLOW: THE SURFACE WATER ISSUE **MAY 2016**

LEAD THE NEW FOUR-LETTER WORD IN DRINKING WATER

Recent media reports about lead in Flint, Mich., drinking water have shaken the ground across the nation.

The good news in Washington is that lead service lines – one of the main culprits contributing to lead in drinking water – are rare here. Lead solder and older brass water fixtures are more likely to leach lead if water is corrosive. However, water is not a primary source of lead exposure. It ranks far behind lead-based paint, dust and contaminated soil.

It's important to note that the School Rule, which provides for lead and copper testing in water fixtures, remains frozen because the Legislature did not provide funding for testing in the 2017-19 state budget.

If a school in your area decides to test anyway, they should know the proper procedures for lead testing and the importance of communicating before testing begins, then following up with the results. Two publications will help guide schools that choose to test for lead:

331-261 Testing for Lead in School Drinking Water Systems (DOH)

3Ts for Reducing Lead in Drinking Water in Schools (U.S. EPA)

Both publications are online at doh.wa.gov/drinkingwater.

THE WATER PUZZLER (BASED ON A TRUE STORY)

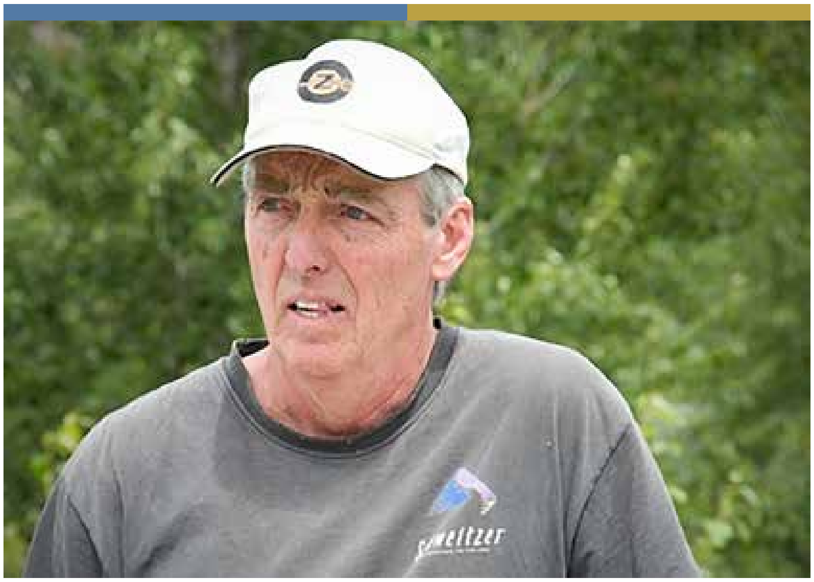
BY NANCY FEAGIN, SURFACE WATER PROGRAM ENGINEERING SPECIALIST

Steve and Nancy visit a small surface water treatment plant with an online chlorine analyzer, specifically the HACH CL17.

The instrument display shows a free chlorine residual at the distribution entry point of 0.40 mg/L. The daily plant log shows the grab sample from the distribution system earlier that morning was 0.70 mg/L. Steve and Nancy collect a sample from the entry point and measure the free residual with a Pocket Colorimeter II and obtain 0.82 mg/L.

The online instrument reagents are not expired and have been replaced in the last two weeks.

What was the problem? To find out, go to www.doh.wa.gov/puzzler!



HIGH 5: STAN ADAMS, CITY OF LEAVENWORTH

BY STEPHEN BAKER, WATER TREATMENT OPERATIONS ADVISOR

Stan Adams didn't start his career in water treatment. In fact, his service with the City of Leavenworth began at the back end of a garbage truck. He began working at the water treatment plant at Icicle Creek in 1992, while also working in wastewater. He became the sole operator in 1994.

At that time, the city wasn't sure its existing plant could ever adequately serve the community with safe and reliable water. Due to operational limitations, the plant produced drinking water only about 200 days that year. In fact, for much of the previous 25 years, extended periods of marginally filtered water quality severely limited the city's drinking water production.

In 1989, when the Surface Water Treatment Rule went into effect, the plant violated the new turbidity standards so often that it lost its filtration credit. There was talk in the city about replacing the facility and concern about the cost.

When the city hired Stan, it also hired an expert contractor. Their task was to evaluate the water system and identify specific improvements in operations, maintenance and administration to help ensure water quality met regulatory requirements.

Working with the contractor, Stan analyzed virtually every aspect of the Icicle Creek plant. He tested process limitations at extremes of flow and temperature while completing numerous jar tests to identify and maintain effective coagulation. Together they made major improvements in plant operation and performance, with relatively minor, low-cost modifications to the physical plant.

Over the ensuing years, under Stan's watchful eye, the plant nearly continuously demonstrated a high level of optimized filtered water turbidity performance. It also operates an additional 100 days a year—while providing water quality rivaling the best in the state.

Stan is one of our finest operators. For 20 years, he delivered safe, reliable drinking water to Leavenworth's residents and visitors. He retired in February. We were fortunate to work with him for so many years. We hope he enjoys his "next life" in fine woodworking.

STARTING UP A SEASONAL SURFACE WATER SYSTEM

BY NATHAN IKEHARA, ENVIRONMENTAL ENGINEER

It's time to take out the toys and tools that spent the winter in storage, and start getting them ready for the long days of summer. For some water systems, this includes a surface water source. And, just like a boat or RV, executing a well-planned start-up program can help you avoid problems later. To ensure your system is safe and reliable, your seasonal start-up plan should cover five elements:

Pre-Season Survey

- Walk through your entire system, from source to tap, noting any needed repairs.
- Complete the repairs you noted and any offline cleaning or maintenance needed.

Source Start-Up

- At initial start-up, consider the water nonpotable. Notify on-site personnel that the water is unsafe until further notice.
- Verify that all equipment functions properly and complete any needed maintenance.

Treatment System Start-Up

- This essential step varies by technology. You should verify, calibrate, and maintain chemical-feed components, pumps, gauges, and other equipment.
- Inventory and order supplies.
- If applicable, check your backwash discharge site and remove solids.

Distribution System Start-Up

- Because contaminants could enter your distribution system during the off-season, your start-up should include distribution disinfection and flushing.

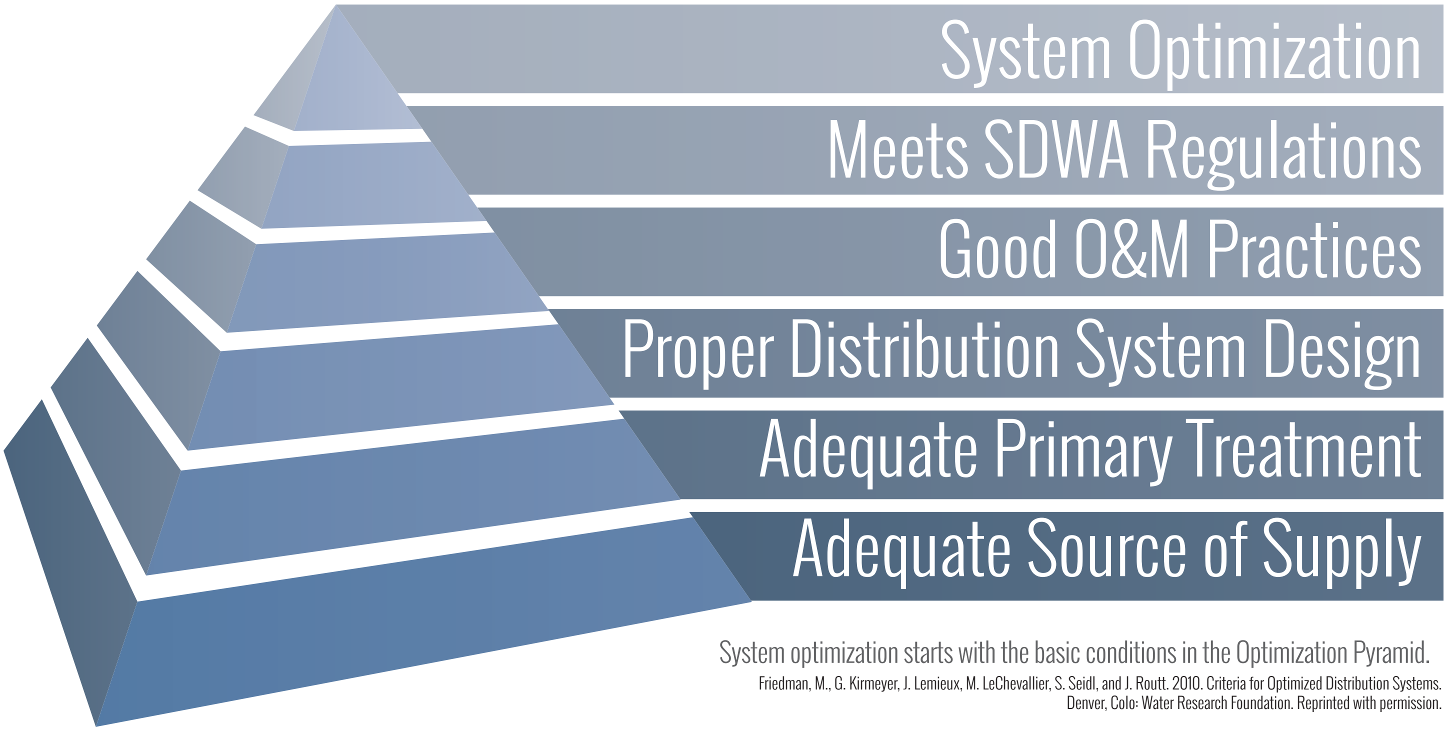
Water Quality Monitoring

- Before sampling, make sure the distribution system disinfection residual is at normal operating level.
- The Revised Total Coliform Rule has separate requirements for seasonal systems that depressurize. If your system depressurizes while offline, complete a *Seasonal Water System Start-Up Certification Form** (331-560).
- Take coliform samples early enough to bring your system online on schedule.
- Take other samples that may be due, such as nitrate.
- If your samples come back satisfactory, your system is ready to go! If not, contact us.

*Get start-up and shutdown publications, forms, and checklists online at http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/TNCWaterSystems/StartupandShutdownAssistance

DISTRIBUTION SYSTEM OPTIMIZATION

BY BILL BERNIER, CROSS-CONNECTION CONTROL AND DISTRIBUTION ADVISOR



System optimization starts with the basic conditions in the Optimization Pyramid.
Friedman, M., G. Kirmeyer, J. Lemieux, M. LeChevallier, S. Seidl, and J. Routt. 2010. Criteria for Optimized Distribution Systems. Denver, Colo: Water Research Foundation. Reprinted with permission.

Most drinking water systems invest a lot of time and money making sure high quality water enters the distribution system. Distribution system optimization ensures that the same high quality water flows from the customer's tap.

An optimized distribution system:

- Increases public health protection by getting the most out of what you have.
- Provides a compliance "insurance" policy by setting goals beyond regulated levels, creating a buffer between your operating parameters and an out-of-compliance condition.
- Takes a proactive approach to balance existing regulations through a holistic look at distribution systems.

Distribution system optimization touches each of the following integrity aspects and maximizes public health protection through better use of existing facilities.

- **Water quality integrity:** Disinfection residuals; disinfection by-products; biofilm management; corrosion control; emergency preparedness; and complaint tracking.
- **Hydraulic integrity:** Flushing or pigging programs; water age management; hydraulic modeling; design planning, representative sampling plans; and pumping and pressure management.
- **Physical integrity:** Cross-connection control; hydrant and valve maintenance; tank, tower and standpipe maintenance; main breaks; and quality control of new construction.

The primary approach for distribution system optimization is to ensure water quality is better than the minimum compliance levels. Here are some examples from the Water Research Foundation's 2010 Criteria for Optimized Distribution Systems:

Water quality integrity as a function of chlorine residual:

- Chlorine residual in 95 percent of time-stepped measurements:
  - Free Chlorine ≥ 0.20 milligrams per liter (mg/L) and ≤ 4.00 mg/L
  - Total Chlorine ≥ 0.50 mg/L and ≤ 4.00 mg/L
- Chlorine residual should not be undetectable for two consecutive time steps (weeks or months) at the same site.

Hydraulic integrity as a function of system pressure:

- Above 0 pounds per square inch (psi) during emergencies such as main breaks and power outages
- Above 20 psi under maximum day demand and fire flow conditions
- Above 35 psi and less than 100 psi under normal conditions
- Within ±10 psi of average pressure more than 95 percent of the time

Physical integrity as a function of water main breaks:

- No more than 15 reported breaks and leaks per 100 miles of water piping per year.

Optimization goals and activities vary depending on a water system's need and resources. You will need to track additional information to ensure your distribution system is working well, and protecting your customers' health.

IMPROVING THE EFFECTIVENESS OF ARSENIC TREATMENT

BY SAM PERRY, WATER TREATMENT ENGINEERING SPECIALIST

© Stefanie Ortanderl

Arsenic is well known as a poison in high doses. Even at concentrations naturally present in some drinking water supplies, it is associated with an increased risk of cancer, heart disease and diabetes. To take on this problem, in 2001 the U.S. Environmental Protection Agency finalized the Arsenic Rule, lowering the maximum contaminant level from 50 parts per billion (ppb) to 10 ppb. As a result, roughly 100 public water systems in Washington State needed to address sources with arsenic. Many of these water systems installed treatment to reduce their customers' exposure to arsenic.

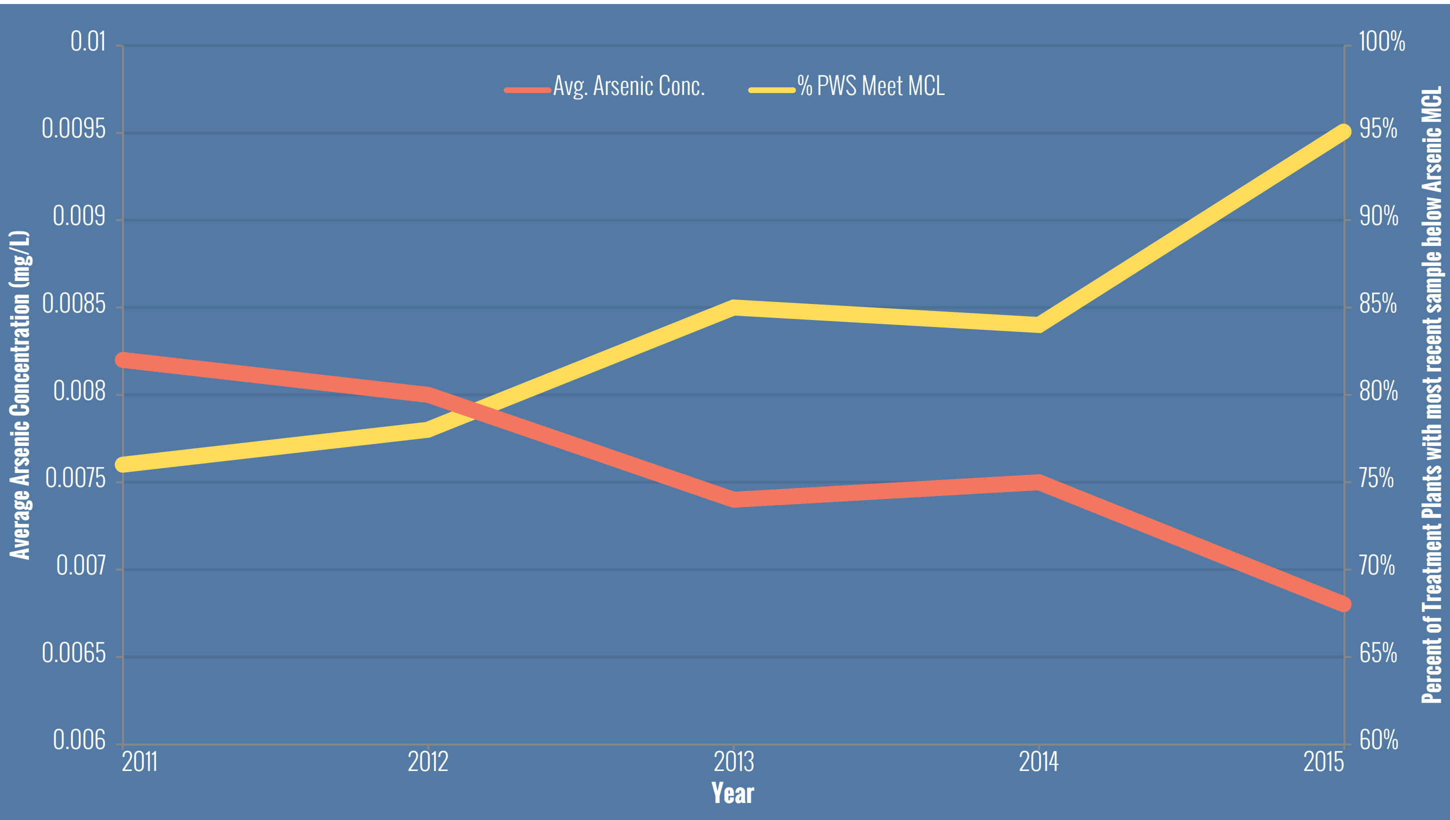
A number of systems struggled to get their treatment systems to work well after constructing them. So we used some of the basic approaches in the Area-Wide Optimization Program to make the most of their investments in public health. These approaches included closely tracking the effectiveness of treatment facilities that remove arsenic from their groundwater supplies. When we wrote our Strategic Plan in 2012, 76 percent of the treatment facilities covered by the Arsenic Rule were removing arsenic to less than 10 ppb. By the end of 2015, 95 percent of water systems were successfully removing arsenic to this standard (See figure below).

Chinook Estates in Pierce County, which is managed by the Valley Water District, had its share of treatment challenges. When their new treatment facility started up late in 2013, the treatment process did not remove arsenic as expected based on their pilot test results. Water district staff made several adjustments and in the end, they hired an engineer to troubleshoot the treatment facility. After extensive field testing, the engineer determined that a small dose of a cationic polymer used with the existing treatment process would make the process work well. Since the operators made this adjustment early in 2015, the treated water arsenic results have been between 4 and 8 ppb.

While using cationic polymer to improve the effectiveness of arsenic treatment is novel, at least in Washington State, water systems can make many treatment process adjustments to improve their existing facilities, such as:

- Adjusting the oxidant dose and oxidant contact time.
- Increasing the coagulant dose.
- Lowering the filtration rate.

Most water systems can make these changes on their own. In some cases, systems will require a licensed engineer to help with more substantial changes in the treatment process. The treatment facilities installed in these communities represent a significant investment. Therefore, it makes sense to refine the operations of arsenic treatment facilities and make the most of these investments to protect public health.



CONGRATULATIONS, TOP PERFORMERS!

Our Treatment Optimization Program has reached another milestone! Fifteen years ago, we started tracking and recognizing surface water systems using conventional or direct filtration that consistently perform above regulatory standards and provide better public health protection.

This year four of the systems pictured (Pasco, Skagit County PUD, Lake Whatcom, and Arlington) reached the 15-year mark; they've been optimized since the beginning!

We award bronze, silver, and gold certificates to systems the first time they meet the turbidity goals for 3, 5, and 10 consecutive years, respectively. This year, one system earned a gold award, three systems earned silver awards and three earned bronze awards. For a full list of TOP performers, visit our website at doh.wa.gov/TOP. Congratulations!

Gold Award

City of Kelso (2006-2015)

Silver Award

City of Bellingham (2011-2015)

Eastsound Water Users Association (2011-2015)

City of Lynden (2011-2015)

Bronze Award

Friday Harbor (2013-2015)

Olympic View Water & Sewer District (2013-2015)

City of Snohomish (2013-2015)

Pictured winners, left to right and top to bottom:

City of Pasco: *Tom Holmes, Lead Distribution Operator; Bill Maxwell, Water Plant Operator; Fred Vanecek, Chief Water Plant Operator; Derek Wiitala, Public Works Division Manager; Jeff Johnson, ODW; Mike Stephens, Water Plant Operator; and Scott Mallery, ODW*

Skagit County PUD: *Jamie LeBlanc and Derek Pell (ODW)*

Lake Whatcom Water & Sewer District: *Bob James (ODW) and Kevin Cook*

City of Arlington: *William Cochinella, Bob James (ODW), and Dallas Speed*

City of Kelso: *Jason Cook, Paul Reebs, and Monte Salte*

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STILL WATERS RUN DEEP

Surface water sources such as lakes, rivers, and shallow aquifers, are open to the environment and vulnerable to contamination from human and animal waste and other pollution. To protect public health, water systems that use surface water sources must comply with extensive federal and state requirements.

In Washington, 130 water systems use surface water sources to provide drinking water to their customers. All use disinfection to protect public health, and all but five also use filtration.

These systems must achieve 3-log removal or inactivation of Giardia and 4-log removal or inactivation of viruses. They must determine the daily level of inactivation achieved. Filtered water systems must use a combination of filtration and disinfection to achieve these standards, while unfiltered systems do so using disinfection alone.

There are 60 rapid-rate filtration systems in the state, which rely on chemical pretreatment to achieve removal of microbial contaminants. Our Treatment Optimization Program helps them achieve increased public health protection.