DC Water Report on Pressure Loss & Boil Water Advisory

August 15, 2018

EXECUTIVE SUMMARY

On July 12, 2018, the District of Columbia Water and Sewer Authority experienced a pressure loss in its water distribution system in portions of the Northeast and Northwest quadrants (2nd High elevation). The loss of pressure caused large portions of the 2nd High Service Area to be serviced with low water pressure or no water at all.

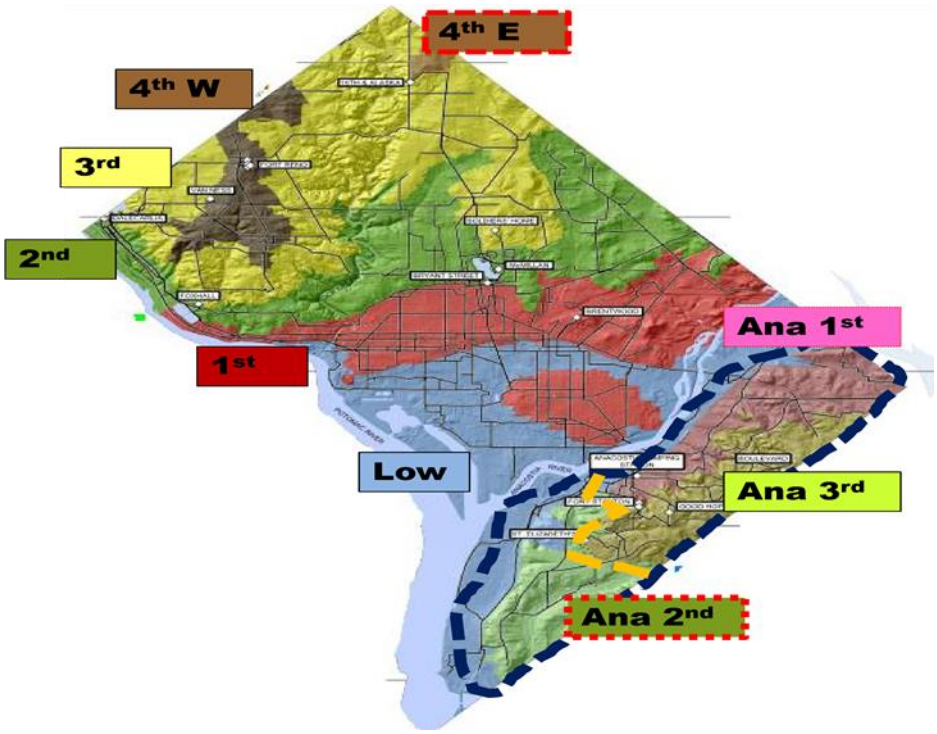
This unusual incident prompted DC Water leadership to issue an advisory in the early morning hours of July 13th for all users of water in 2nd High to boil any water intended for consumption until further notice. The next day, July 14, the impact zone was significantly narrowed after the initial water quality tests were completed. And on July 15, the entire boil water advisory was lifted for everyone.

Ultimately, there were no adverse effects to drinking the water, as all final tests of samples on the last day were negative for bacteria. Public attention then turned not just to the pressure drop but to the decision to issue the boil water advisory, and the timing and methods which were used to communicate that information. Besides exploring the cause of the pressure drop, this report reviews all the issues leading up to the advisory and considers the various channels used by DC Water to contact customers.

At the end of this report is a set of preliminary recommendations DC Water management is considering or already implementing, and a detailed overview of the entire incident.

WATER PRESSURE DROPS

At about 8:30 p.m. on July 12, 2018, Valve #71 was opened at the Bryant Street Pumping Station. Valve #71 separates the pressure zones of the 2nd High Service Area from lower elevations of the District (Low Service Area). The 2nd High Service area is shown in green on the map below, and Low Service is shown in blue.



The 2nd High Service Area on average maintains a discharge pressure level in its section of the system of around 95 pounds per square inch. By contrast, the Low Service Area maintains a discharge pressure level in its section of the system of around 21-22 PSI.

When Valve #71 was opened, the two systems rebalanced their pressure levels. Pressure levels in 2nd High dropped to around 40-45 PSI, while

pressure levels in Low Service increased to around 35-40 PSI. Customers served by 2nd High noticed a drop in pressure almost instantly.

The DC Water employee who opened Valve #71 has given inconsistent responses as to why he opened the valve. As a Utility System Operator, he was responsible for operating and overseeing the distribution system, which generally consists of monitoring and managing the distribution system's pumps, the tank levels, the flows and the pressure levels.

When there is maintenance and instrumentation work being performed at a pumping station, Utility System Operators will assist by executing various commands to isolate different pumping segments, as requested.

Utility Operators remotely operate the distribution pumping stations through a computer program known as the Supervisory Control and Data Acquisition system, or SCADA. At the Main Pumping Station, Utility Operators remotely monitor and operate various distribution pumping stations, including starting and stopping pumps and opening and closing valves at those stations.

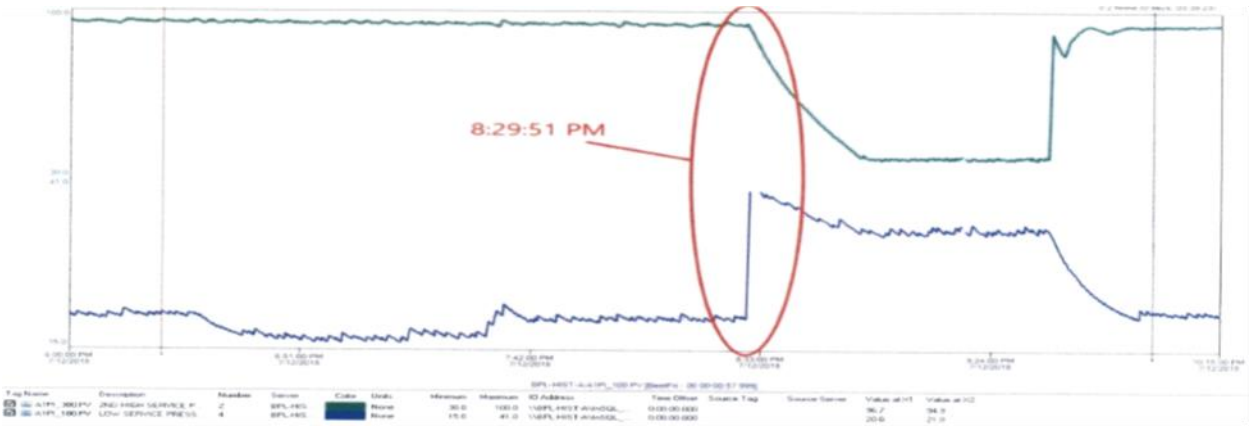
At the Bryant Street Pumping Station, when a pump is started or stopped the pump control cone valve ("pump valve") will automatically open or close after receiving a command in SCADA to start or stop the pump if the hydraulic loop is pressurized. The hydraulic loop, when pressurized, provides the hydraulic power that opens and closes valves in the pumping system.

At 8:30 p.m. when the valve opened, there were simultaneous alarms triggered in this SCADA system indicating high pressure for the Low Service Area. At 8:34 p.m. there were low pressure alarms triggered in SCADA for the 2nd High Service Area. These alarms register on the computer screen of the operators.

The valve remained open from 8:29 p.m. to 9:35 p.m. At 9:35 p.m. a command was issued to close Valve #71. Upon the closing of Valve #71, normal pressure levels were restored in both 2nd High and Low Service.

The impact was felt far from the pumping station.

From the Woodridge and Brookland communities on the eastern edge of the District, to Palisades and Georgetown in the far west, a pressure drop meant that customers who were showering, watering their lawns, running the tap, etc. suddenly experienced a drop in pressure. The graph below illustrates how rapidly pressure fell across the 2nd High Service Area, while simultaneously pressure rose in Low Service.



While it's impossible to say exactly how many people were impacted at what time, we know that it was likely more than 100,000. A total of 34,000 properties are served by 2nd High, though some customers on the western half of the District may not have noticed any drop in pressure at all. Customers include apartment buildings, hospitals and other facilities serving many individuals.

The call volume to DC Water's Emergency Command Center was extraordinarily high between 8:45 p.m. and 10:00 p.m., overwhelming the phone system and the two dispatchers on duty. In that timeframe, the Command Center received 483 calls. 47 were answered, but the other callers received a busy signal or gave up before speaking to a dispatcher. There was also an increase in online reports using the "Report a Problem" feature on DC Water's website.

Other DC Water staff were also receiving reports of low pressure. The General Foreman of Water Services received calls from two hospitals reporting they had no water pressure. There was a sharp uptick in social media activity related to DC Water as well.

In the hours after the valve was closed, DC Water employees worked to both sort out why the problem had occurred, but more importantly to determine the potential impact of the pressure loss on water quality in the distribution system.

The incident pivoted from being an issue of service interruption to one of public welfare protection.

BOIL WATER ADVISORY ISSUED

In any city, if there is a decrease in pressure in a distribution system, there is a possibility that microbial contaminants may seep into the distribution system.

Because of the loss of pressure in the 2nd High Service Area on July 12, DC Water staff began reviewing the implications for contamination immediately once service was restored for customers. The preliminary assessment conducted included modeling and pressure calculations, reviewing calls and online reports from customers, pinpointing any potentially related water main breaks, and examining SCADA data to understand the extend of the issue.

At 10:52 p.m., the Office of Emergency Management activated DC Water's Drinking Water Public Notification Plan and the Incident Management Team (IMT). The IMT includes trained staff from multiple departments across the Authority, and coordinates with District agencies and other outside partners.

Ultimately, the Boil Water Advisory was issued in the early hours of July 13, 2018 and remained in effect until the morning of July 15, 2018 when all water samples in the affected area came back negative in tests for bacteria.

Coordination with EPA

DC Water notified the U.S. Environmental Protection Agency about the pressure loss at 11:26 p.m. on July 12. In a subsequent call 24 minutes later, DC Water informed EPA that the decision had been made to issue a boil water advisory, although the area of impact had not yet been defined. DC Water continued to consult with EPA staff over the next three hours as the advisory was drafted, refined and finalized for distribution.

Defining the Impact Area

Once the decision was made to issue the boil water advisory, and DC Water's General Manager began informing other stakeholders, the staff at DC Water accessed pre-written templates prepared for drinking water notifications. These announcements are kept on standby for just such occasions. However, DC Water staff realized that the bigger challenge would be clearly defining and communicating the affected area so customers would know if they were impacted.

The process of defining the impacted area and generating a map for public distribution took several hours to complete. At the same time, staff worked to finalize the language in the boil water advisory. At this point, most customers were asleep and the goal of the team was to provide a clear set of guidance on the boil water alert by early the next morning when residents would be waking up and using water.

OUTREACH

DC Water utilized a wide range of tools to contact customers and others about the boil water advisory.

At 3:49 a.m., the advisory and map of the impacted area were distributed to the media and customers who had previously signed up for DC Water news alerts. At 4 a.m., the advisory was posted on the DC Water website, shared via social media (4:10 a.m.) and emailed to additional contacts.

At approximately 4:29 a.m., the District's Homeland Security and Emergency Management Agency (HSEMA) sent an alert to subscribers via the AlertDC system.

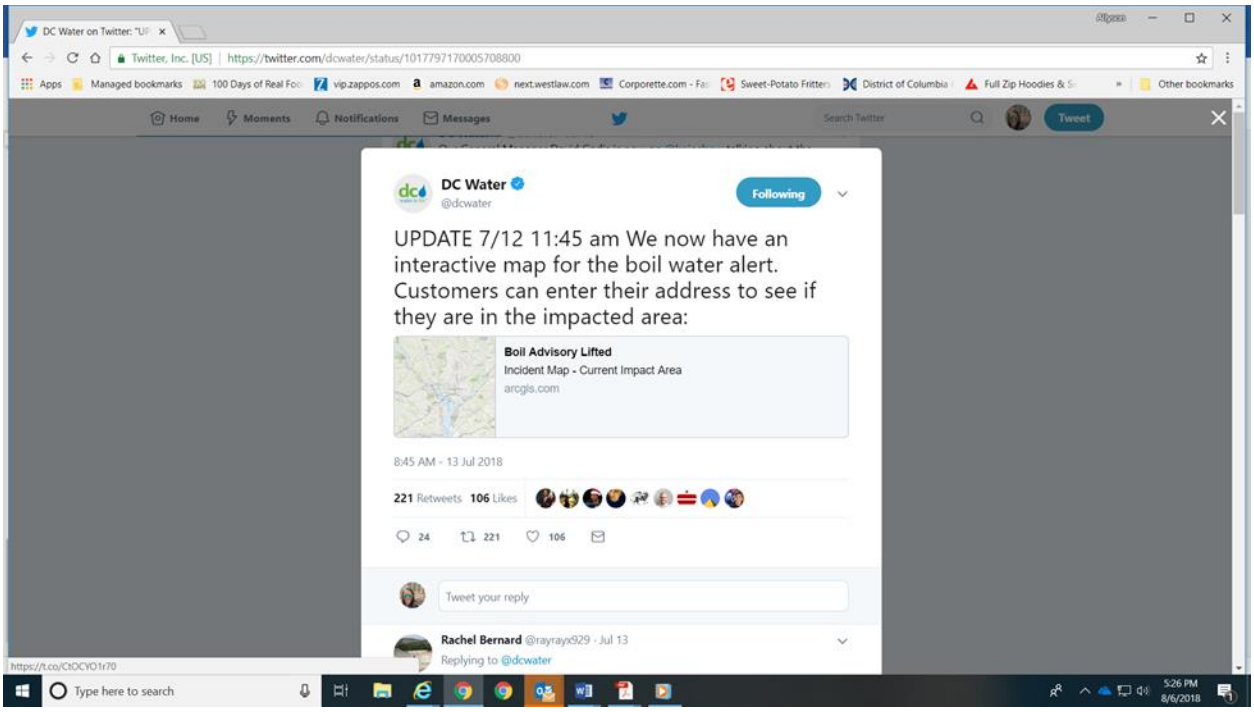
At 9:10 a.m., the District's Fire and Emergency Medical Service (FEMS) Department posted the boil water advisory on Nextdoor, a neighborhood communications platform with 69,400 subscribers in the city.

In previous drinking water notifications, DC Water has relied on direct communication to customers, and this case was no different. DC Water maintains a system that allows it to automatically call customers with pre-

recorded audio messages. On July 13, staff made the decision to start the automated robocalls at 6:00 a.m. A total of 26,000 robocalls were scheduled, although there were 34,000 separate addresses impacted by the boil water alert. The gap is a result of many customers have accounts with DC Water with no functioning telephone number associated with the account. Even under perfect circumstances, nearly a third of the impacted customers would not get a call.

A further complication came in the timing of the calls. The DC Water automated phone system had never attempted to contact so many customers at once. Since the system can only make a limited number of calls each hour, it was not effective at reaching everyone in a timely manner, and some customers reported they did not receive a call at all.

However, those calls were in addition to extensive social media, which experience has shown is often the fastest way to reach a large number of customers and supplement the messaging that was coming from other avenues. DC Water staff also sent emails to key stakeholders sharing the information and providing links for additional information.



And traditional media, in this city as well as others, is often a very efficient way to reach a large number of customers. That worked in this case too, as DC Water officials held press conferences each day of the event, streaming them live and giving real time updates to radio, TV and newspaper reporters – as well as bloggers and other social media consumers. There was extensive media coverage of the boil water advisory beginning early Friday morning (July 13) and throughout the event. Even so, some customers complained directly and in media reports that they did not receive notice of the boil water advisory in a timely manner.

The DC Water website (http://www.dcwater.com) was used to constantly update information about the advisory. However, it became overwhelmed after the advisory was issued on Friday, July 13, when page load times increased from just a few seconds to over one minute. The website was moved to a backup service provider to add capacity. This did not completely solve the issue, so a second server was installed which tripled capacity and improved performance but not until 1:00 p.m. DC Water had never experienced this website traffic volume before. The second server is now in place permanently.

WATER TESTING & ALL CLEAR

Testing of water samples was conducted on July 13 and into July 14 to ensure that no contamination had entered the water supply. Because of the nature of the testing, getting results takes a full 24 hours, so the process is by nature a slow one.

Samples collected at 13 different fire hydrants are delivered to Fort Reno for testing on July 13. Sampling results shows one positive result for total coliform from a hydrant located at 1732 Allison Street, NE. The other results showed no contamination. Based on the test results, the impacted area was narrowed and additional samples were collected and tested.

On Sunday, July 15, it was confirmed that all sampling results were negative from the second round of tests. The final lifting of the alert was issued at 8:26 a.m. though customers were still advised to run their water for a few minutes before drinking any of it. This update was distributed to the traditional press and others at 8:54 a.m.

PRELIMINARY RECOMMENDATIONS

The following measures are being implemented or considered to improve operations and communications.

1. **Valve Restrictions:** Operational controls at pumping station to prevent accidental release of pressure by requiring Water Distribution supervisor approval before a divider valve is opened.

2. **Safe Clearance Standard Operating Procedures:** The Department of Distribution and Conveyance System will clarify protocols and expectations for safe clearances and ensure that all operators and maintenance staff are trained on these changes within 30 days of the changes.

3. **Supervisory Control and Data Acquisition (SCADA):** The Department of Distribution and Conveyance Systems in partnership with the Department of Engineering and Technical Services is conducting a comprehensive review of SCADA alarm protocols. We expect to make changes in the near future that will improve alarm notifications.

4. **Technology improvements:** Information Technology Department has added a second server to reduce the chance of website being overwhelmed.

5. **Better mapping capability:** Information Technology is creating pre-loaded map templates that can be used for future alerts that show existing pressure zones.

6. **Better government coordination:** Water Quality Division will more frequently review Drinking Water Public Notification Plan internally and with EPA Region 3. The language for advisory templates will also be reviewed more frequently to minimize delays.

7. **Communication:** DC Water is reviewing possible technology enhancements to reach customers more quickly and convening discussions with DC Homeland Security and Emergency Management Agency (HSEMA) about both their Reverse 911 system or the Wireless Emergency Alerts (WEA) system for drinking water advisories.

8. **New customer outreach:** DC Water will identify a liaison officer to communicate with hospitals, schools, universities and other large customers in case of future emergencies.

9. **Call Center:** DC Water is reviewing options for adding additional customer service phone lines and staff to be able to handle future emergencies.