NEW YORK AMERICAN WATER ACTION PLAN FOR SERVICE AREA 1

NEW YORK AMERICAN WATER

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After years of a decline in customer compliants, New York American Water's Service Area 1, also known as the Lynbrook System, has been experiencing an increase in customer complaints about discolored water. In response, New York American Water undertook an engineering study to determine the cause and identify recommended actions that can be taken to improve the aesthetic quality of the drinking water in the system.

THE HISTORY

1970s: Customer complaints about discolored water numbered approximately 4,000 per year.

Introduction of sodium silicate water treatment and steady decline of customer complaints.

American Water acquired the Lynbrook service area in 1999.

New York American Water constructed a series of filtration plants to remove iron and manganese. **Customer complaints reached an all-time low.**

Twelve iron removal plants treat over 90 percent of the water distributed. Customer complaints ticked back up. **Why?**

BACKGROUND ON SERVICE AREA 1

PIPING

- 700 miles of piping. Over 400 miles are unlined cast iron pipe (UCIP).
- Most UCIP is 6-inch diameter and over half is more than 70 years old.

GROUNDWATER

- Generally low in pH (typically less than 6.0) and low in hardness (less than 50 mg/L as $CaCO_3$).
- Iron and manganese are elevated.

CUSTOMER COMPLAINTS

- New York American Water observed a steady decline in customer complaints, which reached a low of approximately 1,400 per year in 2014 and 2015. However, discolored water complaints began to increase in 2016, rising to about 1,800 in 2017 and reaching 2,172 in 2018.

STUDY APPROACH

TIMING

- Study was developed in October and November of 2018.
- Field data collection began in December 2018.
- Final water corrosion control study report delivered in May 2019.

OBJECTIVE

- Verify that the existing iron filtration plants are operating effectively to minimize the concentration of iron and manganese entering the distribution system.
- Assess the effectiveness of existing corrosion control practices, since it is common for customers served by UCIP mains to experience discolored water.

TESTING

1. **New York American Water's geographic information system (GIS) mapped the locations of customer complaints** to reveal potential patterns of discolored water incidents that could help identify the source or cause of the complaints.
2. **Corrosion coupon testing was conducted at four different well stations that represent the range of different treatment processes and chemistries** being deployed across Service Area 1.
3. **New York American Water's computerized hydraulic model of the distribution system was used to determine the areas of the system supplied by Plant 5 and Plant 7 at varying production rates,** as well as areas where mixing of water from the different plants occurs. Field measurement of dissolved oxygen was performed to verify the model results.
4. **Water quality test results from customer premises, treatment plant discharge points of entry (POEs), and distribution system samples sites were also reviewed to better understand** the overall water chemistry throughout the system.
5. **Lastly, a literature review was performed to locate published reports and other publications that could offer insights and guidance for both the approach to the study,** as well as the findings from other systems that have been able diagnose and reduce discolored water incidents.

CONCLUSION

Water quality sampling at the POEs and throughout the distribution system indicate that discolored water incidents are predominantly caused by disruption of existing corrosion scales in UCIP. The increase in discolored water incidents appears to be caused by periodic reductions in reduction-oxidation reaction (REDOX) levels that weaken tuberculation scales in parts of the distribution system that normally receive oxygenated water. Ineffective manganese removal at the two plants that utilize aeration may also be contributing to discolored water incidents.

STUDY RECOMMENDATIONS

A phased, two-prong approach is recommended to address the discolored water issues in Service Area 1 as rapidly and safely as possible:

1. **New York American Water will immediately seek authorization from the NCDOH to raise the target operating pH throughout the system to pH 9.0+/-0.3 and continue feeding sodium silicate for corrosion control.** New York American Water anticipates that this modification can be implemented at 6 to 9 facilities within 90 days after approval by the NCDOH. The Massachusetts Water Resource Authority (MWRA), which serves the City of Boston, has successfully used this strategy to improve corrosion control with water having similar characteristics as New York American Water's.

   Based on the results of the MWRA study, New York American Water expects that water quality will improve gradually over a period of six months following implementation.

CURRENT ACTION: New York American Water will operate the distribution system at a pH range of 8.5+/-0.3. Sodium silicate performs better at higher pH and, although the NCDOH will not allow us to operate at a pH at/or above 9.0, our water quality experts recommend operating as high as possible within the allowable range.

2. **Simultaneously, New York American Water will undertake a 9 to 12 month pilot study to assess if orthophosphate would achieve equivalent or better results as the pH 9.0/silicate approach.** If the results of the pilot study are favorable, New York American Water will seek NCDOH approval to convert to orthophosphate for corrosion control and reduce the target operating pH to 7.5+/-0.3. New York American Water anticipates this approach could be implemented within about 12 months following NCDOH approval because of the need to activate the phosphate feed systems simultaneously at all operating facilities to provide effective continuous control of lead and copper corrosion.

CURRENT ACTION: New York American Water will begin conducting a pipe loop study in July to test the effectiveness of the proposed new corrosion inhibitor, orthophosphate, and simultaneously develop construction plans to allow for treatment system conversion upon conclusion of the pipe loop study.