SUEZ Water New York

2016 Water Quality Review

February 22, 2017

2016 REVIEW

The following is a review of instances of discoloration, odor and taste in the SUEZ Water New York (SWNY) distribution system in 2016. This review is provided in accordance with Case 16-W-0130 dated January 24, 2017. Findings of root cause of the issues are provided along with potential solutions.

Discoloration, taste and odor are guidelines by the United States Environmental Protection Agency (EPA) to assist water purveyors in managing aesthetic considerations for drinking water. These parameters are not considered by the EPA to present a risk to human health, and while the EPA does not require testing for these parameters by public water systems, the New York State Department of Public Health (NYSDOH) reserves the right to require monitoring on a case by case basis.

The EPA groups issues associated with these parameters into three categories:

- Aesthetic effects – undesirable tastes or odors
- Cosmetic effects – effects which do not damage the body but are still undesirable
- Technical effects – damage to water equipment or reduced effectiveness of treatment for other contaminants

Examples of root causes of aesthetic, cosmetic, and technical effects in water systems include:

- Normal system operation and maintenance
- Seasonal system demand changes and associated supply changes
- Hydraulic disturbances such as during operation of fire hydrants
- Raw water quality changes

A more detailed description of root causes is provided in the following sections.

This review provides a description of when, where and why issues with discoloration, taste and odor occurred. The steps taken or plans developed to mitigate these issues are also described. Issues determined to be caused by normal system operation and maintenance tend to be isolated in nature and are typically resolved in a few hours. These issues are not the focus of this review.

Discolored Water

Discolored water is typically caused by a disturbance in the distribution system that results in an increase in velocity or reversal of flow direction in water mains. Increased velocity or reversal of flow direction can cause sediment that settles in water mains during normal low velocity operation to become suspended in the water and discharged from customers' taps when using water. It can also cause naturally occurring minerals in the water to come out of solution. The following is a list of examples of activities or events that can cause increased velocity or reversal of flow in water mains:

- Fire Hydrant Use, including:
    - Normal system maintenance such as flushing

  - Emergency fire hydrant use
  - Unauthorized use of fire hydrants (theft of water)
- Seasonal changes in the dominant source of supply to an area
  - Start-up of a seasonal well or surface water treatment plant which typically occurs in the late spring or early summer
  - Shut down of a seasonal well or surface water treatment plant which typically occurs in early to mid-fall
- Extremely high system demand

Most customer issues with discolored water are isolated in nature, clear up in a matter of hours, and are resolved by flushing a cold water faucet at the lowest level of the house or the cold water in the bath tub until the water clears. In some cases, system flushing by SWNY personnel is required in the immediate area around isolated incidents. The results of samples collected during most isolated instances of discolored water typically conform to standards for the parameters that contribute to discolored water. The most common parameters that contribute to discoloration of water are iron and manganese.

Further investigation is warranted when discolored water events are not isolated. There were two such discolored water events in the North Rockland / Stony Point area in 2016. Customers experienced intermittent periods of discolored water from approximately April 23 – April 29 and from approximately May 9 – May 16. Investigations of these events concluded that they were triggered by a series of hydraulic disturbances. The disturbances were primarily caused and prolonged by the following events:

- April 23 – Fire department activity
- April 29 – Unauthorized hydrant use (sweeper)
- May 9 – Unauthorized hydrant use (paving project)
- May 10 – Fire department activity
- May 10 – 16 – Rosman Road tank drained and taken off line for painting (planned system operation and maintenance)

In addition to the above, the following were possible additional contributing factors leading up to the April and May discolored water events:

- April 11 –18 – Operational modifications were implemented to direct more supply from groundwater sources to the area to reduce the potential for disinfection byproduct (DBP) formation. This changed the direction of flow in some system mains.
- May 1 – Fire department activity
- May 2 – Fire department activity

SWNY performed a uni-directional flushing program to address these issues with discolored water. This program was conducted in the Stony Point area beginning on May 16. The events subsided at

the conclusion of this flushing program. Some customers experienced intermittent discolored water during flushing but it subsided after completion of flushing in the area.

Taste and Odor

The most common cause of complaints of taste and odor (T&O) in the SWNY system are related to chlorine used during the disinfection process or after a seasonal change in source water serving an area. SWNY utilizes water from both groundwater and surface water sources, and some areas receive exclusively groundwater or surface water year round. Complaints of T&O in these areas are uncommon as the water characteristics are consistent throughout the year. Some areas receive groundwater, surface water and/or a blend of groundwater and surface water throughout the year. System demand and seasonal conditions dictate whether portions of the systems in these areas will receive groundwater, surface water and/or a blend. Some customers in these areas are able to detect changes in taste, odor, and temperature during these transitional periods and will call the Company to express concern.

Source water quality conditions can also cause T&O concerns for customers. SWNY customers in the areas of Clarkstown and Orangetown who predominantly receive water from Lake DeForest, experienced this condition beginning in September of 2016. This issue was caused by geosmin, a naturally occurring compound that can be released in surface water as algae decays, which began forming in Lake DeForest in August. Geosmin is a common cause of T&O complaints in water systems supplied by surface water and is not toxic or harmful. However, it can cause an earthy, musty smell and taste which some customers find aesthetically unpleasing. Algae was prevalent in Lake DeForest in 2016, as conditions were favorable for algal growth due to the prolonged period of hot and dry weather during the summer months. While SWNY performs treatment on Lake DeForest to control algal growth in accordance with all applicable regulations, weather can have a significant impact on the efficiency of this treatment. This was the case in 2016.

The human sensory is extremely sensitive to geosmin, therefore, very small amounts of geosmin can be detected by most people. The typical threshold concentration for human detection of geosmin is between 15 – 30 nanograms per liter, and some people particularly sensitive to geosmin or with sensitive palates can detect geosmin concentrations as low as 5 - 10 nanograms per liter. To put this in perspective, most people would detect the smell of less than one (1) tablespoon of geosmin poured into the equivalent of two (2) Olympic-sized swimming pools.

Although geosmin began forming in Lake DeForest in August, concentrations did not increase above approximately 5 nanograms per liter until they spiked to 45 nanograms per liter on September 12. The concentration continued to increase until around October 11 when a peak concentration of 380 nanograms per liter was detected. The levels began to decline at this point and dropped below the human detection level in late December.

Geosmin presents the following challenges for water purveyors and customers:

- It is not possible to forecast when or how long taste and odor issues associated with geosmin will occur
- Conventional water treatment, such as the technologies at the Lake DeForest Water Treatment Plant, cannot remove geosmin
- Treatment technologies installed specifically for T&O removal, such as that caused by

geosmin, are not guaranteed to remove all T&O

- Home filtration systems, whether whole house, faucet mounted or pitchers, are not guaranteed to remove all T&O, such as that caused by geosmin

The 2016 geosmin event was the first to occur at Lake DeForest in approximately ten years. While the existing treatment process at the Lake DeForest Water Treatment Plant is not capable of removing T&O caused by geosmin, SWNY is in the early phases of pilot testing treatment technologies to improve various aspects of the plant, including T&O control.

Summary and Conclusions

SWNY will continue to work within the community to reduce the occurrence of events that can lead to discolored water. SWNY's coordination with the Rockland County Office of Fire and Emergency Services, The Water Utility Liaison Committee of the Rockland County Fire Chiefs Association and the volunteer fire fighting community has resulted in an improved ability to communicate with customers regarding instances of discolored water during emergency use of fire hydrants. SWNY appreciates the efforts of these groups and looks forward to continued coordination and improvement. Working with the local Police Chiefs, SWNY has also been able to increase the awareness in the community regarding unauthorized use of fire hydrants. This is also a key component of limiting the number of discolored water events.

The findings of the pilot testing at the Lake DeForest WTP will be used to develop the scope of work for permanent upgrades at the facility. In addition to T&O control, the testing will examine treatment processes to reduce the potential for DBP formation, increase effectiveness of turbidity removal, and address other water quality issues associated with algae.

Additionally, SWNY is in the process of hiring a Water Quality Supervisor who will have primary oversight of all water quality parameters and monitoring requirements. The person in this position will also be responsible for fielding escalated customer inquiries regarding water quality, and will also have a lead role in root cause determination and development of solutions for water quality issues. It is expected that the position will be filled in approximately one month.

Lastly, it is common for isolated discolored water incidents and T&O events to be determined to be attributable to internal plumbing or home treatment systems such as filtration systems and softeners. Customers with home treatment systems should consult with the manufacturers of their systems to ensure they are following all recommended maintenance practices so as to minimize the likelihood of T&O or other home based water quality issues. The American Water Works Association (AWWA) also provides examples of things that can impact water quality in a home's internal plumbing in a video entitled Maintaining High Water Quality: Faucets. The following is a link to this video: https://www.youtube.com/watch?v=shxYwKypyoU .