



MEMORANDUM

TO: Ron Carlee, City Manager

FROM: Barry Gullet, Director, Charlotte Water

DATE: August 12, 2015

RE: Changes in Water Quality over Time

Summary

We monitor the drinking water quality through sampling and testing as required by the US Environmental Protection Agency (US EPA) and NC Department of Environment and Natural Resources (NC DENR). Based on the test results, our water is safe to drink and use. The running annual averages at each of the 12 locations comply with US EPA and NC DENR drinking water requirements so the drinking water meets the standard and there are no violations. The most recent round of quarterly samples analyzed this week found elevated Trihalomethane (THM) levels at 8 of the 12 locations. Customers at the sampling locations with individual test results greater than 0.08 ppm (parts per million) are being notified by hand delivered letters per North Carolina regulatory requirements. We are making operational changes to manage THMs and we are also considering systemic water treatment process changes to further reduce THM formation in the water.

Safe to Drink and Recent Trends

Water distributed to Charlotte Water customers complies with federal Safe Drinking Water Act requirements and is safe to use for drinking, cooking, bathing and swimming. However, there is a recent rising trend of THM levels that is concerning. Some individual process control samples and regulatory compliance samples collected this summer have had values in excess of 0.10 parts per million. Even though Mecklenburg County Health Department officials and NC DENR officials agree the water is safe to drink, we believe it is appropriate to take proactive and aggressive action to manage this trend.

Charlotte Water believes the increase in THM levels is attributable to several factors.

1. Higher concentrations of bromide in the Catawba River lakes are a significant factor in the increased THM formation. Bromide reacts with chlorine in drinking water to form several chemical compounds in the THM family, and the bromide based compounds are where the increase is most evident. Prior to 2013, bromide concentrations in the lakes were very low and did not contribute significantly to THM formation in drinking water.
2. Bromide in the Catawba River can come from a variety of sources. For example, in 2013 Duke Energy began adding calcium bromide to coal at the Marshall and Allen Plants on Lake Norman and Lake Wylie to enhance mercury removal to meet federal air quality regulations. According to Duke Energy, this resulted in the discharge of bromide into the lakes as a waste stream from

those two plants. The discharges from the Marshall Plant are impacting both Lake Norman and Mountain Island Lake, the water supply sources for Charlotte Water, as well as impacting Lake Wylie and possibly other downstream lakes that are the water supply sources for other utilities. Charlotte Water presented data to Duke Energy earlier this year illustrating the bromide impacts on drinking water. As a result, Duke Energy advised us it stopped using calcium bromide at their Catawba River plants in late May 2015. Duke Energy, Charlotte Water, and other water suppliers who may be affected are sharing data and communicating frequently about this issue. The City of York was also recently covered by the media for this issue.

3. Even though Duke Energy has stopped using bromide, the bromide concentration in the lakes remains elevated due in part to the drought conditions that limit the rate at which water passes through the lakes and the fact that bromide concentrations continue to work their way through Duke Energy's plants and are discharging into the lakes. It is not anticipated that Duke Energy will need to resume use of calcium bromide to comply with federal air quality regulations in the future. If they were, more work would be needed to determine and mitigate any potential impact this would have on the drinking water supply source.
4. Warmer water due to the hot summer weather increases the rate of chemical reactions forming THMs, so this issue is usually seen seasonally.

Actions Taken to Minimize the Formation of THMs in the Drinking Water System

Charlotte Water observed the rising trend in THMs over the past several testing cycles and determined through additional analysis that bromide was the primary cause. Since this realization, Charlotte Water has taken several actions to aggressively assure water quality standards are met. Actions taken by Charlotte Water include:

1. Reduced the age of the water reaching customers by decreasing the volume of water stored in elevated water tanks.
2. Reduced the age of the water reaching customers by strategically flushing water through fire hydrants and automated flushing valves. This very effective measure has been increased this summer due to the hotter than normal weather coupled with higher bromide concentrations in the lakes supplying our drinking water treatment plants.
3. Optimized existing treatment processes within the plants to minimize potential for THM formation as much as possible.

In addition, Charlotte Water began planning systemic changes to how it treats water to prepare for anticipated future reduction in the allowable THM standards and other anticipated regulatory changes by EPA. Based on what we know, we believe that systemic changes to the water treatment process are needed to ensure the long-term quality of the water. The new treatment process that we are

considering, a proven method used by many water systems, has several advantages over the current method including lowering the pH of the drinking water from approximately 8.9 to 7.5 which will reduce the formation of THMs by as much as 40%. Based on this summer's observations, Charlotte Water will take the most expeditious route to making these systemic changes.

Next Steps

Charlotte Water is taking additional proactive steps to assure our customers always have safe, reliable water including:

1. Minimize formation of THMs in the drinking water system through on-going optimized treatment and operation;
2. Continue frequent sampling and analysis of drinking water to confirm quality;
3. Communicate with customers about water quality test results;
4. Share information and communication strategies with other water utilities who draw water from the Catawba lakes;
5. Continue on-going communication with Duke Energy about its use of bromide, bromide concentrations in the lakes and any other Duke Energy operations that may impact drinking water;
6. Expedite evaluation and implementation of changes to the drinking water treatment process which could reduce THM formation and further protect the quality of the drinking water; and
7. Communicate with managers and elected officials regionally about water quality status and on-going actions by Charlotte Water.

Background on THM Formation

Charlotte's drinking water is in full compliance with all US EPA and North Carolina requirements and is safe to drink and use according to the Mecklenburg County Health Department, but changes in the chemical makeup of the water in Lake Norman and Mountain Island Lake (our sources of water) are resulting in drinking water treatment trends that need quick attention.

Drinking water is treated with chlorine to kill harmful bacteria so the water is safe to use for drinking, cooking, bathing and swimming. Chlorine is a strong chemical that kills bacteria but also reacts with other compounds, such as bromide, present in water to form chemicals referred to as "disinfection by-products." This group of disinfection by-products includes a family of chemicals called Trihalomethanes (THMs, also referred to as Total THMs or TTHMs). THM formation increases as water temperature rises and water age increases. The highest THM levels are generally found during the hottest summer months in the parts of the water distribution system that are the farthest distance from the treatment plants where the water has been in the pipes for the longest amount of time.

THMs are regulated by the North Carolina Department of Environment and Natural Resources (NC DENR) through rules prescribed by the US Environmental Protection Agency (US EPA) under the federal

Safe Drinking Water Act. According to public health officials, the regulations were established because laboratory animal testing indicates high consumption of THMs over an extended period of time (equivalent to 20 – 30 years in humans) seems to be associated with a higher risk of some types of liver and kidney cancers in those animals. However, continued research has shown inconclusive results. The International Agency on Cancer Research and the World Health Organization have concluded there is not enough evidence to prove that THMs pose a health risk to humans. Nonetheless, U.S. EPA has made THM regulations more stringent several times, most recently in 2012/2013.

US EPA and NC DENR rules are very specific as to how compliance with THM standards is determined. For Charlotte Water, compliance with THM regulations is determined by collecting and analyzing drinking water samples from 12 specific locations in the water distribution system four times per year. If the averages of the four most recent quarterly compliance samples at each location (referred to as Locational Running Annual Averages or LRAA) are below 0.080 parts per million (ppm)¹, the water is deemed to be in compliance with federal Safe Drinking Water Act requirements. Charlotte Water collects and analyzes additional samples from time to time to better understand and manage water quality.

Public communication requirements related to THM standards are stricter under North Carolina DENR's drinking water regulations than under those of the U.S. EPA. North Carolina requires the customer occupying a residence or business where any individual compliance sample collected exceeds a THM concentration of 0.080 ppm be notified of that test result even though a single test result is not a U.S. EPA rules violation or a NC DENR rules violation and does not present a health risk according to health officials.

The most recent round of quarterly samples analyzed this week from the 12 designated locations found THM levels ranging from 0.0625 ppm to 0.116 ppm. The running annual averages at each of the 12 locations range from 0.0533 ppm to 0.0789 ppm and comply with U.S. EPA and NC DENR drinking water requirements so the drinking water meets the standard and there are no violations. Customers at the sampling locations with individual test results greater than 0.080 ppm are being notified by hand delivered letters now per North Carolina regulatory requirements within 48 hours of the sample results.

We want to reiterate that our drinking water is in compliance with U.S. EPA Safe Drinking Water requirements and NC DENR drinking water requirements and is safe to use for drinking, cooking, bathing and swimming.

If you have any questions, please contact Barry Gullet, Charlotte Water Director at bgullet@charlottenc.gov.

¹ 0.080 parts per million (ppm) is 0.080 milligrams per liter which is equivalent to 0.080 pounds in 1,000,000 pounds of water or 1.28 ounces in 120,000 gallons of water