2019 Annual Drinking Water Quality Report
Charlotte Water

Water System Number: 01-60-010

We are pleased to present to you this year's Annual Drinking Water Quality Report. This report is a snapshot of last year's water quality. Included are details about your source(s) of water, what it contains, and how it compares to standards set by regulatory agencies. Our constant goal is to provide you with a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water treatment process and protect our water resources. We are committed to ensuring the quality of your drinking water. **If you have any questions about this report or concerning your water, please call 311 or 704-336-7600. We want our valued customers to be informed about their water utility. You can also find more information regarding water quality on our website**
https://charlottenc.gov/Water/WaterQuality/Pages/WaterQuality.aspx

What EPA Wants You to Know

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Charlotte Water is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at https://www.epa.gov/safewater/lead.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include

microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife; inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming; pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses; organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems; and radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

When You Turn on Your Tap, Consider the Source

Mountain Island Lake and Lake Norman supply our treatment plants with high quality water for your home, business or school. These surface waters are part of the Catawba River Basin, which provides water for more than 1.5 million people in our growing region. Charlotte Water operates three water treatment plants, and they collectively treat an average of 108 million gallons of water a day.

Our Treatment Process

Long before you step in the shower or turn on the tap, Charlotte Water employees have managed numerous processes to protect our drinking water and those who use it. First, we pump the water from Mountain Island Lake and Lake Norman to one of the three water treatment plants - Franklin, Dukes, or Vest. We add powdered activated carbon for taste and odor control followed by aluminum sulfate (alum) in the rapid mix phase to cause dirt particles to coagulate, which are then removed through settling. The water then flows through filters that trap even smaller particles. We add chlorine to prevent bacterial growth and fluoride to promote dental health. We also add lime to adjust the water's pH, which helps prevent pipe corrosion and the leaching of metals into the water. We then pump the water to homes, businesses and storage tanks through over 4,300 miles of water pipes. A schematic of our treatment process can be found at https://charlottenc.gov/Water/Education/Pages/Journey.aspx

Source Water Assessment Program (SWAP) Results

The North Carolina Department of Environmental Quality (DEQ) Public Water Supply (PWS) Section, Source Water Assessment Program (SWAP) conducted assessments for all drinking water sources across North Carolina. The purpose of the assessments was to determine the susceptibility of each drinking water source (well or surface water intake) to Potential Contaminant Sources (PCSs). The results of the assessment are available in SWAP Assessment Reports that include maps, background information and a relative susceptibility rating of Higher, Moderate or Lower.

The relative susceptibility rating of each source for Charlotte Water was determined by combining the contaminant rating (number and location of PCSs within the assessment area) and the inherent vulnerability rating (i.e., characteristics or existing conditions of the well or watershed and its delineated assessment area). The assessment findings are summarized in the table below:

Susceptibility of Sources to Potential Contaminant Sources (PCSs)

Source	Inherent Vulnerability Rating	Contaminant Rating	Susceptibility Rating	Date
Mt. Island Lake/Catawba River	Moderate	Moderate	Moderate	September 2017
Lake Norman	Higher	Higher	Higher	September 2017

Report Date: September 18, 2017

The complete SWAP Assessment report for Charlotte Water may be viewed on the Web at https://www.ncwater.org/?page=600. Note that because SWAP results and reports are periodically updated by the PWS Section, the results available on this web site may differ from the results that were available at the time this Consumer Confidence Report (CCR) was prepared. If you are unable to access your SWAP report on the web, you may mail a written request for a printed copy to: Source Water Assessment Program – Report Request, 1634 Mail Service Center, Raleigh, NC 27699-1634, or email requests to swap@ncdenr.gov. Please indicate your system name, number, and provide your name, mailing address and phone number. If you have any questions about the SWAP report please contact the Source Water Assessment staff by phone at 919-707-9098.

It is important to understand that a susceptibility rating of "higher" does not imply poor water quality, only the system's potential to become contaminated by PCSs in the assessment area.

Help Protect Your Source Water

Protection of drinking water is everyone's responsibility. Charlotte Water is partnering with Charlotte-Mecklenburg Storm Water Services to expand the scope of source water quality sampling in Lake Norman and Mountain Island Lake. Multiple locations from both source waters are now being monitored. You can help protect your community's drinking water source(s) in several ways: If you see or suspect potential water contaminations, water leaks, or sewage spills, please call **311 or 704-336-7600**. We will respond 24 hours-a-day, 365 days-a-year. Dispose of chemicals properly and take used motor oil to the four Mecklenburg County recycling centers. Put only toilet paper in the toilet. All other products should go in the trash including 'flushable' wipes.

Water Quality Data Tables of Detected Contaminants

We routinely monitor for over 150 contaminants in your drinking water according to Federal and State laws. The following tables list all the drinking water contaminants that we detected in the last round of sampling for each contaminant group. The presence of contaminants does not necessarily indicate that water poses a health risk. **Unless otherwise noted, the data presented in this table is from testing done January 1 through December 31, (2019).** The EPA and the State allow us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.

Important Drinking Water Definitions:

Action Level (AL) - The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Locational Running Annual Average (LRAA) – The average of sample analytical results for samples taken at a particular monitoring location during the previous four calendar quarters under the Stage 2 Disinfectants and Disinfection Byproducts Rule.

Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Maximum Residual Disinfection Level (MRDL) – The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfection Level Goal (MRDLG) – The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Nephelometric Turbidity Unit (NTU) - Nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Non-Detects (ND) - Laboratory analysis indicates that the contaminant is not present at the level of detection set for the particular methodology used.

Not-Applicable (N/A) – Information not applicable/not required for that particular water system or for that rule.

Parts per million (ppm) or Milligrams per liter (mg/L) - One part per million corresponds to one minute in two years or a single penny in $10,000.

Parts per billion (ppb) or Micrograms per liter (ug/L) - One part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.

Parts per trillion (ppt) or Nanograms per liter (nanograms/L) - One part per trillion corresponds to one minute in 2,000,000 years, or a single penny in $10,000,000,000.

Parts per quadrillion (ppq) or Picograms per liter (picograms/L) - One part per quadrillion corresponds to one minute in 2,000,000,000 years or one penny in $10,000,000,000,000.

Picocuries per liter (pCi/L) - Picocuries per liter is a measure of the radioactivity in water.

Running Annual Average (RAA) – The average of samples taken at all locations throughout the system.

Total Organic Carbon (TOC) - has no health effects, however, organics provide a medium for the formation of disinfection byproducts. The TOC compliance criterion applies only to treated water.

Treatment Technique (TT) **-** A required process intended to reduce the level of a contaminant in drinking water.

Tables of Detected Contaminants

Microbiological Contaminants in the Distribution System

Contaminant (units)	MCL Violation Y/N	Result	MCLG	MCL	Likely Source of Contamination
Total Coliform Bacteria (presence or absence)	N/A	<5% per month	N/A	TT*	Naturally present in the environment
E. coli** (presence or absence) Distribution System	**No**	0	0	Routine and repeat samples are total coliform-positive and either is E. coli-positive or system fails to take repeat samples following E. coli-positive routine sample or system fails to analyze total coliform-positive repeat sample for E. coli Note: If either an original routine sample and/or its repeat samples(s) are E. coli positive, a Tier 1 violation exists.	Human and animal fecal waste

* If a system collecting 40 or more samples per month finds greater than 5% of monthly samples are positive in one month, an assessment is required

**E.coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely- compromised immune systems.

Turbidity*

Nephelometric Turbidity Unit (NTU)	Year Sampled	Treatment Technique (TT) Violation Y/N	Water Treatment Plant (WTP)	Result NTU	MCLG	Treatment Technique (TT) Violation if:	Likely Source of Contamination
Highest Single Turbidity Measurement	2019	**No**	Franklin	0.27	N/A	Turbidity > 1.0 NTU	Soil runoff
			Dukes	0.23			
			Vest	0.09			
Lowest Monthly Percentage (%) of Samples Meeting Turbidity Limits	2019	**No**	Franklin	100%	N/A	Less than 95% of monthly turbidity measurements are ≤0.3 NTU	
			Dukes	100%			
			Vest	100%			

***** Turbidity (NTU) is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system. The turbidity rule requires that 95% or more of the monthly samples must be less than or equal to 0.3 NTU.

Inorganic Contaminants

Contaminant	Year Sampled	MCL Violation Y/N	Water Treatment Plant (WTP)	Result (highest)	Range Low - High	MCLG	Likely source of contamination
Fluoride (ppm)	2019	No	Franklin	0.92	0.54 - 0.92	4	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
			Dukes	0.78	0.60 - 0.78		
			Vest*	0.78	0.32 – 0.78		

*Fluoride system upgrades account for low readings at Vest WTP.

Lead and Copper Contaminants

Contaminant (units)	Year Sampled	Result	Number of sites found above the AL	MCLG	AL	Likely Source of Contamination
Copper (ppm) (90^{th} percentile)	2019	None detected at 90^{th} percentile	0	1.3	AL=1.3	Corrosion of household plumbing systems; erosion of natural deposits
Lead (ppb) (90^{th} percentile)	2019	None detected at 90^{th} percentile	1	0	AL=15	Corrosion of household plumbing systems; erosion of natural deposits

Total Organic Carbon (TOC)

Contaminant (units)	Year Sampled	TT Violation Y/N	Water Treatment Plant (WTP)	Result (RAA Removal Ratio)	Range Monthly Removal Ratio Low – High	MCLG	TT	Likely Source of Contamination	Compliance Method (Step 1 or ACC#__)
Total Organic Carbon (removal ratio) (TOC)-TREATED (ppm)	2019	No	Franklin	1.26	0.95 - 1.43	Compliance Method ACC#2 Treated Water <2.00 ppm and Removal Ratio >1.00	TT	Naturally present in the environment	ACC#2
			Dukes	1.20	1.01 – 1.50				
			Vest	1.30	1.10 – 1.43				

Disinfectant Residuals Summary

Contaminant (units)	Year Sampled	MRDL Violation Y/N	Water Treatment Plant (WTP)	Highest Running Annual Average (RAA)	Range Low - High	MRDLG	MRDL	Likely Source of Contamination
Chlorine (ppm)	2019	No	Franklin	1.33	0.95 – 1.82	4	4.0	Water additive used to control microbes
			Dukes	1.35	1.08 – 1.80			
			Vest	1.30	1.09 – 1.60			
			Distribution System	1.08	0.49 – 1.65			

Other Disinfection Byproducts Contaminants

Contaminant (units)	Year Sampled	MCL/MRDL Violation Y/N	Water Treatment Plant (WTP)	Result	Range Low - High	MCLG	MCL	Likely Source of Contamination
Chlorite* (ppm)	2016	No	Dukes	0.100	0.063 - 0.137	0.8	1.0	By-product of drinking water chlorination
			Distribution System	0.014	ND – 0.048			

*Charlotte Water conducted a commissioning study for the startup of a chlorine dioxide generation system at the Dukes plant over a 2-day period in April 2016 (4/5 & 4/6). The application of chlorine dioxide as a pre-oxidant enhances water quality by reducing disinfection byproducts (DBP), and functions as an oxidizing agent to counter soluble manganese and iron concentrations in untreated, raw water along with providing bacteriological inactivation. The purpose of the commissioning study was to generate chlorine dioxide, apply the chlorine dioxide in the water treatment process, and evaluate performance. Chlorine Dioxide was not fed at any time during 2019; therefore, chlorite was not required to be monitored.

Stage 2 Disinfection Byproduct Compliance - Based upon Locational Running Annual Average (highest LRAA)

Disinfection Byproduct	Year Sampled	MCL Violation Y/N	Result (highest LRAA)	Range Low High	MCLG	MCL	Likely Source of Contamination
TTHM (ppb)	2019	No	51.2	20.3 – 67.6	N/A	80	Byproduct of drinking water disinfection
HAA5 (ppb)	2019	No	22.0	12.9 – 24.5	N/A	60	Byproduct of drinking water disinfection

For TTHM: Some people who drink water containing Total Trihalomethanes above the MCL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.
For HAA5: Some people who drink water containing Haloacetic Acids above the MCL over many years may have an increased risk of getting cancer.

Other Miscellaneous Water Characteristics Contaminants* – At Entry Point to Distribution System

Contaminant (units)	Sample Date	Result (average)	Range Low High	Secondary MCL
Alkalinity (ppm)	2019	16	15 - 18	N/A
Aluminum (ppb)	2019	33	30 – 38	50-200 ppb
Calcium Hardness as CaCO3 (ppm)	2019	22	20 – 22	N/A
Chloride (ppm)	2019	6.4	5.8 – 7.4	250 ppm
Conductivity (umhos/cm)	2019	84	78 – 91	N/A
Hardness, Total as CaCO3 (ppm)	2019	28	27 – 30	N/A
Iron, Total (ppb)	2019	23	10 - 31	300
Magnesium (ppm)	2019	1.6	1.4 – 2.0	N/A
Manganese (ppb)	2019	4	1 - 6	50
pH	2019	8.55	7.57 – 9.19	6.5 – 8.5**
Silica (ppm)	2019	9.2	8.5 – 11.0	N/A
Sodium (ppm)	2019	3.0	2.8 – 3.3	N/A
Sulfate (ppm)	2019	8.4	8.0 – 9.0	250 ppm
Total Dissolved Solids (TDS) (ppm)	2019	56	41 – 64	500 ppm

* The PWS Section requires monitoring for other misc. contaminants, some for which the EPA has set national secondary drinking water standards (SMCLs) because they may cause cosmetic effects or aesthetic effects (such as taste, odor, and/or color) in drinking water. The contaminants with SMCLs normally do not have any health effects and normally do not affect the safety of your water.
** The PWS Section has established a pH range of 7.0 – 9.2 for Charlotte Water in order to ensure optimal corrosion control treatment.

Cryptosporidium

Charlotte Water monitors quarterly for Cryptosporidium and Giardia. There were **zero detects** for 2019.

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes *Cryptosporidium*, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water and/or finished water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of *Cryptosporidium* may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people, infants and small children, and the elderly are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. *Cryptosporidium* must be ingested to cause disease, and it may be spread through means other than drinking water.

Unregulated Contaminants Monitoring Rule (UCMR) 4* – Required by EPA

Contaminant (units)	Year Sampled	Sample Location	Result (Highest)	Range Low High
Bromide (ppb)	2018	Raw Water	40.8	23.2 – 40.8
Total Organic Carbon (ppm)	2018	Raw Water	1.87	1.62 – 1.87
Manganese (ppb)	2018	Entry Point to Distribution System	121.0	0.59 – 121.0
Bromochloroacetic Acid (ppb)	2018	Distribution System	4.93	2.53 – 4.93
Bromodichloroacetic Acid (ppb)	2018	Distribution System	3.31	1.42 – 3.31
Chlorodibromoacetic Acid (ppb)	2018	Distribution System	1.34	0.35 – 1.34

* Unregulated contaminants are those for which EPA has not established drinking water standards. The purpose of unregulated contaminant monitoring rule is to assist EPA in determining the occurrence of unregulated contaminants in drinking water and whether future regulations are warranted.

Additional Monitoring of Other Contaminants

In addition to participating in the EPA's Unregulated Contaminant Monitoring Rule, Charlotte Water has been working with an outside certified laboratory to analyze drinking water samples for over 740 unregulated contaminants. Five rounds of additional, non-required sampling were conducted between September 2018 and October 2019.

The first two testing rounds were full rounds of over 740 contaminants. During the next three testing rounds, only groups of contaminants that had one or more of those contaminants detected were tested. The finished water at Franklin and Lee Dukes Water Treatment plants was tested. **These tables reflect results only when a contaminant is detected.** A full list of all the non-detected contaminants can be found on our website at charlottewater.org.

For those contaminants that we did detect, we will continue to monitor them for any changes in concentration.

The following tables show the results for trace detects of contaminants with current MCL's (Table 1) and contaminants that are not currently regulated (Table 2). Please note that the detects are extremely small, measured in parts per billion (ppb) and even some in parts per trillion (ppt).

Table 1 – Regulated Contaminants:

The following contaminants are currently regulated by the EPA and therefore, have MCLs. However, current EPA approved analytical methods for the contaminants listed below, do not have detection levels as low as those offered by our outside lab. Therefore, these contaminants are considered non-detected by EPA and do not show up on our regular annual reports.

Contaminant (units)	Result (Highest)	MCL	EPA Health Advisory (DWEL)
2,4-D (ppt)	11	70,000	200,000
Atrazine (ppt)	25	3,000	700,000
Chromium (ppb)	0.2	100	100
Manganese (ppb)	12	50*	1,600
Simazine (ppt)	5.6	4,000	700,000

Definitions from EPA 2018 Edition of the Drinking Water Standards and Health Advisories Tables:
MCL: Maximum Contaminant Level
Health Advisory (HA): An estimate of acceptable drinking water levels for a chemical substance based on health effects information; an HA is not a legally enforceable Federal standard, but serves as technical guidance to assist Federal, State, and local officials.
DWEL: Drinking Water Equivalent Level. A DWEL is a drinking water lifetime exposure level, assuming 100% exposure from that medium, at which adverse, noncarcinogenic health effects would not be expected to occur.
***** Secondary DW Regulation: Non-enforceable guidelines. Contaminants may cause aesthetic effects in DW.

Table 2 - Contaminants Not Regulated by EPA:

Contaminant (units)	Result (Highest)	EPA Health Advisory (DWEL used unless otherwise noted)
1,1,1-Trichloro-2-propanone (ppb)	1.2	
1,1-Dichloro-2-propanone (ppb)	0.8	
Acesulfame-K (ppt)	82	
Acetaldehyde (ppb)	11	
Boron (ppb)	36	7,000 [1]
Bromochloroacetonitrile (ppb)	0.9	
Chromium, Hexavalent (ppb)	0.21	
Deet (ppt)	14	
Desethylatrazine (DEA) (ppt)	8.5	
Diaminochlorotriazine (DACT) (ppt)	35	
Dibromoacetonitrile (ppb)	0.9	
Dichloroacetonitrile (ppb)	1.2	
Iohexal (ppt)	14	
Lincomycin (ppt)	10	
Metformin (ppt)	7.7	
Metolachlor (ppt)	6.8	350,0000 [1]
N-Nitrosodimethylamine (NDMA) (ppt)	2.5	70 [2]
Perchlorate (ppb)	0.10	25 [3]
Perfluorohexanoic acid (PFHxA) (ppt)	2.4	
Perfluorooctanesulfonic acid (PFOS) (ppt)	2.2	70 [4]
Perfluoropentanoic acid (PFPeA) (ppt)	2.4	
Quinoline (ppt)	13	
Strontium (ppb)	30	20,000 [1]
Sucralose (ppt)	550	
Tris(2-chloroethyl) phosphate (ppt)	12	
Vanadium (ppb)	0.67	

Definitions from EPA 2018 Edition of the Drinking Water Standards and Health Advisories Tables:
Health Advisory (HA): An estimate of acceptable drinking water levels for a chemical substance based on health effects information; an HA is not a legally enforceable Federal standard, but serves as technical guidance to assist Federal, State, and local officials.

1 DWEL: Drinking Water Equivalent Level. A DWEL is a drinking water lifetime exposure level, assuming 100% exposure from that medium, at which adverse, noncarcinogenic health effects would not be expected to occur

2 Cancer Group: A qualitative weight-of-evidence judgment as to the likelihood that a chemical may be a carcinogen for humans. Sufficient evidence in animals and inadequate or no evidence in humans.

3 Subchronic value for pregnant women.

4 Lifetime HA: The concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure, incorporating a drinking water RSC factor of contaminant-specific data or a default of 20% of total exposure from all sources. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 liters of water per day. For Lifetime HAs developed for drinking water contaminants before the Lifetime HA policy change to develop Lifetime HAs for all drinking water contaminants regardless of carcinogenicity status in this DWSHA update, the Lifetime HA for Group C carcinogens, as indicated by the 1986 Cancer Guidelines, includes an uncertainty adjustment factor of 10 for possible carcinogenicity.