City of Wilmington

2014 Water Quality Report

Volume 13
Summer 2015

Water Works

A newsletter published by the City of Wilmington, Department of Public Works Water Division

To ensure that tap water is safe to drink, the Environmental Protection Agency (EPA) prescribes regulations which limit the amount of certain contaminants in public water systems.

The EPA requires the City of Wilmington, and all other water suppliers in the US, to report yearly on specific details about testing for a number of contaminants in our water. Chemical and biological monitoring provide the data that helps suppliers, such as the City of Wilmington, make key water quality management decisions to ensure freshness and purity.

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. To ensure that tap water is safe to drink, the EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration (FDA) regulates bottled water, which must provide the same protection to the public's health.

More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (**1-800-426-4791**).

(Full report continues on page 3)

Maintaining & Painting City Water Tanks is Important to Preserving Our Water Quality

There are nine elevated finished water storage tanks located throughout the City's distribution system. These tanks have storage capacities that range from 100,000 to over 2 million gallons of water. The City has been investing heavily in the tank infrastructure. The management and maintenance of these tanks helps to preserve distribution system water quality. One of the ways to accomplish this is to paint the tank.

Before painting can begin, the tanks are drained and inspected. Scaffolding is installed on the outside of the tank for workers. If needed, structural repairs are done on the tanks. The inside and outside are sandblasted or power washed depending on the condition of the tank. The surface is then patched, primed and painted. Each tank takes anywhere from 60 to 90 days for painting to be complete, depending on the size of the tank and the amount of repairs required. Once the painting is complete the tank must be properly disinfected, according to the standards set forth by the American Water Works Association, and refilled with water. After the disinfection process is completed, and before the tank is placed back in service, a bacteria sample is taken from the facility. Once this sample comes back negative, the tank may be placed back in service.

(Continued on page 8)

Jr. Water Works

Kids, be a junior microbiologist as we search for fresh water mussels along the Delaware River. Find out why mussels are important to water quality (see page 10).

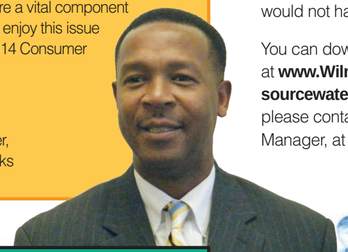
A Word from the Commissioner

The City of Wilmington continues its commitment of providing our consumers with clean and reliable drinking water today and for future generations. According to a poll commissioned by the Value of Water Coalition conducted in April 2015, 82 percent of Americans feel that it is important or extremely important to invest in strategies and programs that develop sustainable water supplies. The City shares in this priority, and continues its commitment of strategic investments to protect our water supply and distribution network. According to the Value of Water Coalition, each of us uses about 176 gallons of water every day, yet this vital resource is drastically undervalued. If drinking water and soda were to cost the same, water bills would skyrocket to more than 10,000 percent! The reality nationwide is that we need to invest in the aging water infrastructure, and the American Society of Civil Engineers estimates this amount is around $4.8 trillion over the next 20 years.

Few people realize what it takes to treat and deliver high quality drinking water. In this report you will read about how the City has been hard at work for you investing in our distribution system, treatment facilities and sampling programs, while providing additional value for an undervalued, yet vital, resource. Bringing clean water to our customers is a priority. Improvements to our treatment and storage facilities, and distribution network are a vital component to this mission. I hope you enjoy this issue of WaterWorks and our 2014 Consumer Confidence Report.

Best Wishes,

Jeff Starkey, Commissioner,
Department of Public Works

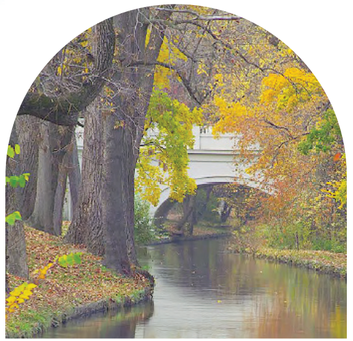


Source water...

The City of Wilmington developed the Source Water Protection Plan (SWP Plan) in order to better protect its water supply for future generations, reduce long term operating costs and carbon footprint, avoid future treatment requirements, improve planning and response to future spills and water quality events, and leverage upstream investments to protect its water supply.

Recognizing the efforts and input of the many dedicated stakeholders in the Brandywine Creek Watershed who have been involved with this SWP Plan is very important. The SWP Plan integrates a significant amount of information from their previous studies and plans. Without the involvement of these stakeholders and the benefit of their previous efforts, this plan would not have been possible.

You can download and read the SWP Plan at **www.WilmingtonDE.gov/government/sourcewater**. If you have any questions please contact Chris Oh, Water Quality Manager, at **(302) 573-5522.**



Contact Us

You can help us ensure the safety of our water supply by reporting any unusual or suspicious activity either on our waterways, near our reservoirs, water filtration plants, water towers or pumping stations.

To report an incident or general water quality concerns, call the City Call Center, **(302) 576-3878**.

If you have questions about this report, call the Water Quality Laboratory at **(302) 571-4158.**

Weekends or after 5 P.M. **(302) 571-4150**.

2014 Water Quality Report

How We Test Our Drinking Water

The Wilmington Water Division monitors for over 100 contaminants, including herbicides, pesticides, Cryptosporidia, Giardia and coliform bacteria. We collect samples from the Brandywine Creek, Hoopes Reservoir, Porter Reservoir, Cool Spring Reservoir, the filtration plants and at customers' taps in the distribution system.

Last year, over 30,000 water samples were drawn from the City's fresh water supply treatment plants and distribution system. Our laboratory performed over 70,000 water analyses on those samples. This data supports the conclusion that Wilmington's water system complies with all applicable EPA drinking water regulations.

During disinfection, certain byproducts form as a result of chemical reactions between chlorine and naturally occurring organic matter in water. These are carefully controlled to keep disinfection effective and byproduct levels low.

The state allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old. If this is the case, the sample year will be noted in the report. 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. The City of Wilmington 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 (**1-800-426-4791**), or at **www.epa.gov/safewater/lead**.

The Division of Public Health, in conjunction with the Department of Natural Resources and Environmental Control (DNREC), has conducted source water assessments for nearly all community water systems in the state. Contact the City at **(302) 573-5522** regarding the availability of the assessment and how you may obtain a copy. The assessment may also be viewed at this website: **www.delawaresourcewater.org**.

City of Wilmington
800 French St.
Wilmington, DE 19801

PWSID# DE0000663

June 1, 2015

Report Covers
Calendar Year 2014

Water System Contact –
Chris Oh,
Water Quality Manager
(302) 573-5522

Water Source:
Surface Water (Brandywine Creek & Hoopes Reservoir)

Protecting the Public from Disease

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.

Microbiological testing of water helps protect the public from waterborne diseases such as polio, diphtheria, typhoid and cholera. Chlorine is very effective at killing or disinfecting most of these organisms in drinking water. However, Cryptosporidium, a microbial pathogen found in surface waters throughout the US, is resistant to chlorine. Optimized water treatment, including filtration, provides an effective barrier against passage of Cryptosporidium into drinking water. One commonly used measure of this treatment effectiveness is turbidity removal. Turbidity is the cloudiness of the water that is caused by particles that are generally invisible to the naked eye. As shown in **Table 1** on **page 5**, the City continues to provide water that is well within State and Federal turbidity requirements.

The most commonly-used filtration methods, such as those used by Wilmington, cannot guarantee 100 percent removal. The City of Wilmington began monitoring for Cryptosporidium in source water for its two plants beginning in November of 2005. Based on research conducted on the removal of Cryptosporidium by common filtration methods, the level detected in the source water should have been removed by the filters at the City's treatment plant. Cryptosporidium has never been detected in the treated water supply.

Important Health Note for "At Risk" Populations

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, organ transplant recipients, people with HIV/AIDS or other immune system disorders, the elderly, and infants can be particularly vulnerable to infections. These people should seek advice from their health care providers. EPA/CDC guidelines on appropriate ways to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (**1-800-426-4791**).

Regulating Contaminants

Contaminants that may be present in source water include: microbial contaminants, such as viruses and bacteria; inorganic contaminants, such as salts and metals, which can be naturally occurring; pesticides and herbicides; organic chemical contaminant; and radioactive contaminants. In order to ensure that tap water is safe to drink, the EPA prescribes regulations which limit the amount of certain contaminants in drinking water provided by public water systems. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

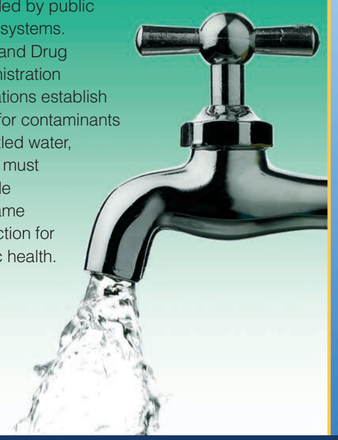


Table 1: Water Quality Results - Detected Primary[1] Parameters at ENTRY POINTS to Distribution System

				Brandywine Filter Plant			Porter Filter Plant			
Contaminant	**Units**	**MCLG[2]**	**MCL[3] or TT[4][5]**	**Range of Levels Detected**	**Highest Detected Level**	**Violation**	**Range of Levels Detected**	**Highest Detected Level**	**Violation**	**Likely Source of Contamination**
Microbiological Indicators - (2014 unless noted)										
Turbidity - Percentile	% of samples below 0.3	N/A	95% of monthly samples must be less than 0.3	100-100	100	No	100-100	100	No	Soil runoff
Turbidity - Values	NTU		No sample must ever exceed 1.0	0.01-0.02	0.02	No	0.03-0.09	0.09	No	Soil runoff
Inorganic Chemicals (Metals and Nutrients) - (2014 unless noted)										
Barium	ppm	2	2	0.0337-0.0348	0.0348	No	0.0337-0.0348	0.0348	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Nickel	ppb	N/A	100	1.5-1.5	1.5	No	1.7-1.7	1.7	No	Discharge from industrial sources; Erosion of natural deposits.
Arsenic	ppb	0	10	<0.5-<0.5	<0.5	No	<0.5-<0.5	<0.5	No	Mining runoff; Erosion of natural deposits; Emissions from glass & electronics processing; Wood preservatives & pesticides.
Chromium	ppb	100	100	0.9-1.0	1.0	No	0.9-1.0	1.0	No	Discharge from steel and pulp mills; Erosion of national deposits.
Fluoride	ppm	2	Delaware State MCL: 2 ppm[6]	0.08-1.10	1.10	No	0.16-1.50	1.50	No	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate	ppm	10	10	0.0-2.3	2.3	No	0.0-2.9	2.9	No	Runoff from fertilizer use; Leaching from septic tanks; sewage; Erosion of natural deposits.
Nitrite	ppm	1	1	0.0-1.3	1.3	No	0.0-1.9	1.9	No	Runoff from fertilizer use; Leaching from septic tanks; sewage; Erosion of natural deposits.
Disinfectants - (2014 unless noted)										
Chlorine	ppm	N/A	At least 0.3 residual entering Distribution System	0.52-2.54	2.54	No	1.33-2.66	2.66	No	Water additive used to control microbes
Disinfection Byproduct Precursors - (2014 unless noted)										
Total Organic Carbon	ppm	N/A		0.79-2.76	2.76	N/A	0.60-2.79	2.79	N/A	Naturally present in the environment. Total organic carbon (TOC) has no health effects. However, TOC provides a medium for the formation of disinfection byproducts.
Total Organic Carbon	% Removal (Raw to Treated)	N/A	Must exceed 35% (25% in certain instances)	35%-60%	60%	No	36%-68%	68%	No	
Total Organic Carbon	Compliance Ratio (rolling annual avg)	N/A	Ratio of Actual to Required Removal - must be greater than or equal to 1	1.0-1.7[7]	1.7 [8]	No	1.0-2.0[7]	2[8]	No	

Table 2: Water Quality Results - Detected Primary[1] Parameters in Distribution System

Contaminant	Units	MCLG[2]	MCL[3] or TT[4][5]	Range of Levels Detected	Highest Detected Level	Violation	Likely Source of Contamination
Microbiological Indicators							
Total Coliform	% of samples positive each month	0%	5.0%	0-4.3	4.3	No	Bacteria that are naturally present in the environment. Used as an indicator of the presence of other potentially harmful bacteria.
Disinfectants							
Chlorine	ppm	MRDLG = 4.0[10]	MRDL = 4.0[9]	0.1-1.9	1.9[11]	No	Water additive used to control microbes
Disinfection Byproducts							
Total Trihalomethanes	ppb	No goal for the total	80	4.0-74	80[12]	No	Byproduct of drinking water disinfection. Forms due to reaction of chlorine with total organic carbon. **Health effects:** Some people who drink water containing TTHMs in excess of the MCL over many years could experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.
Haloacetic Acids	ppb	No goal for the total	60	7.0-65	38[12]	No	Byproduct of drinking water disinfection. Forms due to reaction of chlorine with total organic carbon.

Table 3: Detection of Unregulated Contaminants

Chemical or Constituent	Units	Average	Range of Levels Detected	Likely Source of Contamination
Chromium 6+	ug/L	0.22	0.17-0.27	Naturally occurring from geological formations, also from manufacturing textile dyes, wood preservation, leather tanning & anti-corrosion coatings.
Chromium, Total	ug/L	0.30	0.23-0.38	Discharge from steel, pulp mills & chrome plating; Erosion of natural deposits. Allergic dermatitis may occur in sensitive individuals who use water containing chromium in excess of the MCL over many years.
Strontium	ug/L	127	110-140	Found in rocks & soil, and through the use of phosphate fertilizers
Vanadium	ug/L	0.39	0.39-0.39	Naturally occurring metal; Steel manufacture.
Molybdenum	ug/L	1.78	1.30-3.20	Naturally occurring element in ores & present in plants, animals & bacteria; Used as a chemical reagent in the form molybdenum trioxide.
Chlorate	ug/L	280	120-600	Agricultural defoliant or desiccant; Disinfection byproduct & used in the production of chlorine dioxide.

Potential Contaminants

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 occur naturally or result from urban stormwater 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 stormwater runoff and residential uses.

Organic Chemical Contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff and septic systems.

Radioactive Contaminants, which can occur naturally or as a result of oil and gas production and mining activities.

Table 4: Secondary Parameters and Other Parameters of Interest Detected in Water as it Enters Distribution System

			Brandywine Filter Plant			Porter Filter Plant			
Contaminant	Units	SMCL	Average	Lowest	Highest	Average	Lowest	Highest	Source
Conventional Physical and Chemical Parameters									
pH	units	6.5 - 8.5	7.3	6.9	7.8	7.2	6.7	8.1	Waters with pH = 7.0 are neutral
Alkalinity	ppm as $CaCO_3$	N/A	49	20	67	46	30	61	Measure of buffering capacity of water or ability to neutralize an acid
Hardness	ppm as $CaCO_3$	N/A	97	64	120	113	88	130	Naturally occurring; Measures Calcium and Magnesium.
Conductivity	mmhos/cm	N/A	342	149	600	394	204	685	General measure of mineral content
Sodium	ppm	N/A	25	25	25	24	24	24	Naturally occuring; Chemical additive to treat the water; Road salt application and run-off.
Sulfate	ppm	250	18.5	18.5	18.5	18.8	18.8	18.8	Naturally occuring; Can cause objectionable taste and odor in water.
Total Dissolved Solids (TDS)	ppm	500	180	180	180	186	186	186	Metals and salts naturally occurring in the soil; Organic matter.
Chloride	ppm	250	61	27	556	72	44	395	Naturally occurring; Chemical Additive to treat the water; Road salt application and run-off.
Metals									
Iron	ppb	300	20	20	20	18.3	0.0	110	Naturally occurring; Chemical Additive to treat the water; Corrosion of pipes; Can cause disoloration in water.
Manganese	ppb	50	25	18	39	10	4	18	Naturally occurring; Can cause discoloration and objectionable taste in water.
Zinc	ppm	5	0.07	0.04	0.10	0.08	0.0	0.6	Naturally occurring; Chemical Additive to treat the water.

Table 5: Lead and Copper

(based on 2014 sampling–testing is done every 3 years)

Contaminant	MCLG	Action Level (AL)[13]	90th Percentile	# Sites of AL	Units	Violation	Likely Source of Contamination
Copper	1.3	1.3	0.333	0	ppm	No	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.
Lead	0	15	4.02	3	ppb	No	Corrosion of household plumbing systems; Erosion of natural deposits.

Key to Tables

[1] Primary parameters are contaminants that are regulated by a maximum contaminant level (MCL), because above this level consumption may adversely affect the health of a consumer.

[2] MCLG - Maximum Contaminant Level Goal is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow no margin of safety.

[3] MCL - Maximum Contaminant Level is 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.

[4] TT - Treatment Technique refers to the required process intended to reduce the level of a contaminant in drinking water. EPA's surface water treatment rules require systems to (1) disinfect their water and (2) filter their water such that the specific contaminant levels cited are met. Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. Total organic carbon is regulated by a Treatment Technique that requires systems operate with enhanced coagulation or enhanced softening to meet specified percent removals.

[5] Unless otherwise indicated value given is a MCL.

[6] State limit is to not exceed 2.0 mg/L.

[7] Cited average is the lowest running annual average calculated from monthly samples in 2014

[8] Cited average is the highest running annual average calculated from quarterly samples in 2014.

[9] MRDL - Maximum Residual Disinfectant Level is 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.

[10] MRDLG - Maximum Residual Disinfectant Level Goal is the level of drinking water disinfectant below which there is no known or expected health risk. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

[11] Cited value is the lowest and/or highest average of a minimum of 100 routine samples per month.

[12] Cited value is the highest Locational Running Annual Average (LRAA). MCL is based on the LRAA, which is compiled to include data from previous quarters.

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

ppm: Milligrams per liter or parts per million - or one ounce in 7,350 gallons of water

ppb: Micrograms per liter or parts per billion - or one ounce in 7,350,000 gallons of water

ND: not detected

Maintaining & Painting City Water Tanks is Important to Preserving Our Water Quality

(Continued from cover)

In the spring of 2014, the Alapocas Tank, a 250,000 gallon legged elevated tank located along Route 202 on the Rock Manor Golf Course, was fully repainted. Welded steel tanks are painted inside and out to protect the steel from corrosion. Due to the lifespan of the paint, however, it needs to be blasted off and reapplied every 20-30 years. This tank also needed upgrades to the accessories, such as a new roof vent, overflow screen and all ladders replaced to meet Occupational Safety and Health Administration (OSHA) requirements. Extensive upgrades are normal on older tanks like this one, which was built in 1957, but the upgrades are a very small part of the overall project cost.This upkeep results in a tank that will last longer, function better, and be much safer for anyone climbing to the top of it.

In the fall of 2014, repainting of the Carr Road Tank began. This 100,000 gallon legged elevated tank, also built in 1957, was due to be fully blasted inside and out then repainted, in addition to upgrades to the accessories similar to the ones done on the Alapocas Tank. Cold weather this winter cut short the production work, with painting set to resume spring of 2015.

Rehabilitation work started on the 2.3 million gallon Foulk Road Standpipe, and is scheduled to be completed in spring 2015. The paint on the outside of this 114-foot high tank was in fairly good condition, so over coating was an option, with touch-up priming on rusted areas. Tanks can usually be overcoated once or twice, saving hundreds of thousands of dollars on a large tank like this, before they need to be blasted to bare steel then painted. The interior needs complete blasting and painting, and will receive a new coat of a 100 percent solids paint that the City has been using in all of their tanks the past few years. This paint provides better coverage over pitted areas, and dries almost immediately allowing the tank to be refilled with water faster.

Tank painting is one of the many ways Wilmington continues to work to supply our customers with the highest quality drinking water possible.

2014 Water Main Replacement

Cast iron water mains usually have a long service life, but due to different soil conditions, working pressure and other factors, they need to be periodically replaced, and sometimes increased in size to provide for a growing demand.

During 2014, the City of Wilmington Water Division replaced over 8,000 linear feet of small sized main with 8-inch ductile iron pipe. All related valves and valve boxes associated with the mains were replaced. There were 13 fire hydrants replaced and 203 service laterals renewed. These replacements will increase flow and improve water quality for the communities of Southbridge, Trolley Square, Liftwood, 14th Street, and Rodney Street and St. Francis Hospital area.

Similar work will continue to be performed in 2015 with affected customers being notified prior to the start of work. Water main replacement is one of many ways Wilmington continues to work to supply our customers with the highest quality drinking water possible.

FAQs

Many customers ask similar questions concerning the safety and drinkability of their tap water. Some of the most frequently asked questions are answered below. Always call the Call Center at **(302) 576-3878** or the Water Quality Lab at **(302) 571-4158** if you have further questions concerning the safety of the tap water.

Brown / Yellow Colored Water Issues

What is the color from?

Following treatment, all water introduced into the system is clean and clear, and the water lines are pressurized to a point which prevents any mud or dirt from being able to enter into the piping system. The filter plants also add the chemical zinc orthophosphate, which is a corrosion inhibitor, to help prevent corrosion of the water main pipes. However, on occasion the internal buildup of iron can be knocked off due to a disturbance to the water pipe. For example: main breaks, construction, heavy water usage, water temporarily being turned on and off, and flushing fire hydrants. (Reference Article: Water Quality – Questions & Answers. Henry County Water Authority. HCWSA, 2015.)

Are there regulations for rusty water concerning health?

The EPA does not consider rusty water a health risk. Although unsightly and a nuisance, iron is not regulated in drinking water for health reasons. The EPA has established National Secondary Drinking Water Regulations (NSDWRs) that set non-mandatory water quality standards for multiple contaminants. The EPA does not enforce these "secondary maximum contaminant levels," they are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations. These contaminants are not considered to present a risk to human health. (Reference Website: **http://water.epa.gov/drink/contaminants/secondary standards.cfm#three-a-two**)

What should I do when rusty water appears in my faucets?

Step 1: Call the Call Center at **(302) 576-3878** and they will assist you in diagnosing and resolving the water issue. Calling the Call Center is the only way the City knows there is an issue with the water. If laundry has been discolored continue to keep the laundry wet and ask the Call Center to deliver a packet of Rover (an iron reducing laundry detergent).

Step 2: Grab a sample of the rusty, COLD water in a white cup or bowl for comparison and set it aside.

Step 3: Go to the lowest sink in the house, set a timer for 15 minutes and run the COLD water only. Running the hot water can cause rusty water to fill the hot water tank, which will then require it to be drained.

Step 4: After 15 minutes, grab another sample in another white cup or bowl and compare the first with the second. If the water has lightened it is likely that the issue has been resolved. Continue to flush and keep an eye on the water color. If it has not lightened call the Call Center back for further instruction.

Hardness Levels

What does a measurement of hardness in water mean?

Water hardness is the measurement of naturally occurring calcium and magnesium in water. What is the hardness level of the City's water?

On average, the City's hardness levels were moderately hard in 2014

Hardness Levels Chart		City's Reporting for 2014	
1ppm - 60ppm	Soft Water	48ppm - 58ppm	Lowest
61ppm - 120ppm	Moderate Water	101ppm - 110ppm	Average
121ppm - 180ppm	Hard Water	126ppm - 130ppm	Highest

Dishwasher related conversions:

There is a conversion calculator online that can help with any conversions going from parts per million (ppm) to grains per gallon (gr/gal):

http://www.unitconversion.org/concentration-solution/grains-per-gallon-us-to-parts-per-million-ppm-conversion.html

Here are some conversion examples below:

3gr/gal = 51ppm	6gr/gal = 103ppm
4gr/gal = 69ppm	7gr/gal = 120ppm
5gr/gal = 86ppm	8gr/gal = 137ppm

Report It / Resolve It

To make a request or log a complaint, please visit **www.reportitresolveit.wilmingtonde.gov.** Click on the "start new request" button and then follow the steps to submit your request. To check the status of a submitted request, please click "find existing request" and provide the necessary information.

Jr. Water Works

Hey kids, ever think about being a scientist? There are lots of fields of science that study water and what's in it. You could become a marine biologist or a microbiologist, or a hydrologist and do all kinds of interesting work in the lab and out in nature.

Today we are going to study freshwater mussels living under the water along a riverbed. Scientists who study our water quality get to do some fun and crazy things, like counting the mussel population in our rivers. When the number of mussels increases, it can be an indicator that the water quality of that river is improving.

Are you up to the mussel counting challenge?

Can you find all of the mussels?

Test your skills as a scientist by counting all the mussels in the picture above, then check your answer at the bottom right. (Hint: you can find the mussels wherever you see a number 7.)

Above: Two mature freshwater mussels. They often have a bluish color which is exaggerated in the illustration to make them easier to find.

Mussel shells have age rings much like the rings of a tree.

Freshwater Mussel Fun Facts

- Common Delaware Freshwater Mussels can range in size between 1-6 inches. However, freshwater mussels as big as a foot long can be found in other parts of North America.
- Mussel shells are used for many things, including jewelry, buttons and "cultured pearls" (small pieces of the shell are used as the "seed").
- Mussels can live, dependent on the species, between 10 and 100 years! Because of their long life span, scientists can use mussels to help determine the health of a water body.
- Much like the rings in a tree trunk, lines on the shell can help determine the age of the mussel.
- Mussels are a natural filter for water, filtering as much as eight gallons of water a day. They remove particulates and bacteria and filter suspended particles out of the water.
- Did you know that mussels have feet? Well... they have a foot. While some mussels spend their entire life in one spot, others use a singular foot to move around.

Below: An X-ray image of a young freshwater mussel using its foot to move.

BONUS QUIZ:

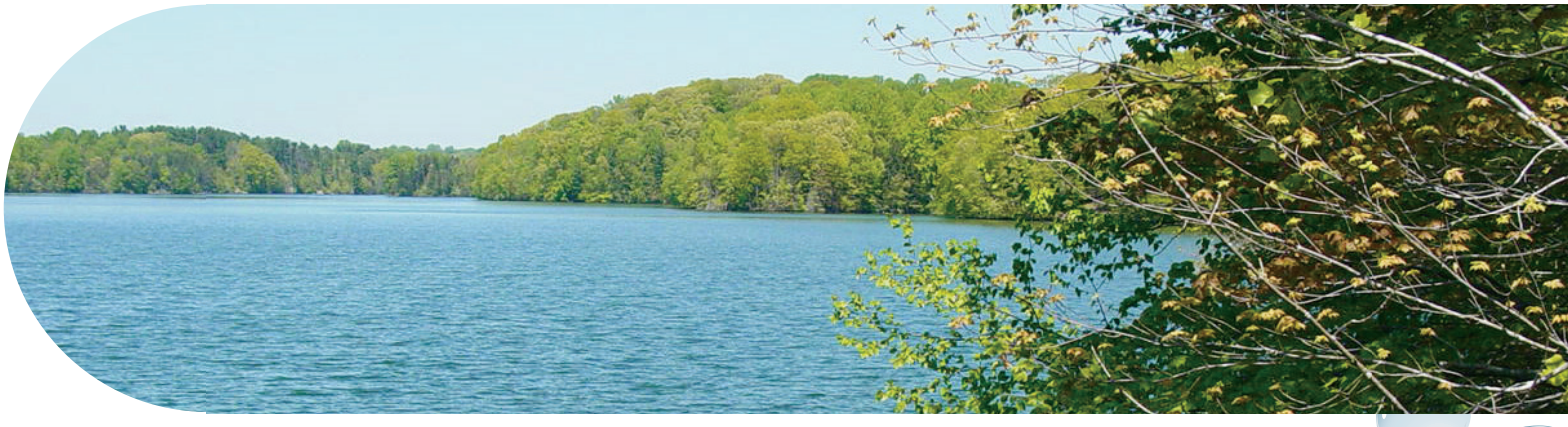
The picture shows numbers beside various common river-dwelling creatures. See how many you can correctly name. Match the numbers corresponding to each creature with their names below. Then check your answers at the bottom of the page.

____ *Snapping Turtle*
____ *American Eel*
____ *Catfish*
____ *Mussels*
____ *Painted Turtle*
____ *Striped Bass*
____ *Crawfish*

MUSSEL COUNT QUIZ SCORE:
There are 217 mussels pictured. If you said:

216-218 = Science Superhero, 214-220 = Mollusk Master, 212-222 = Lab Assistant. If you guessed less than 212 or greater than 222, keep practicing – you'll get better.

BONUS QUIZ ANSWERS:
***Snapping Turtle 3, American Eel 2, Catfish 5, Mussels 7, Painted Turtle 1, Striped Bass 4, Crawfish 6.** If you got 5 or more right, you are well on your way to becoming a real natural scientist!*



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