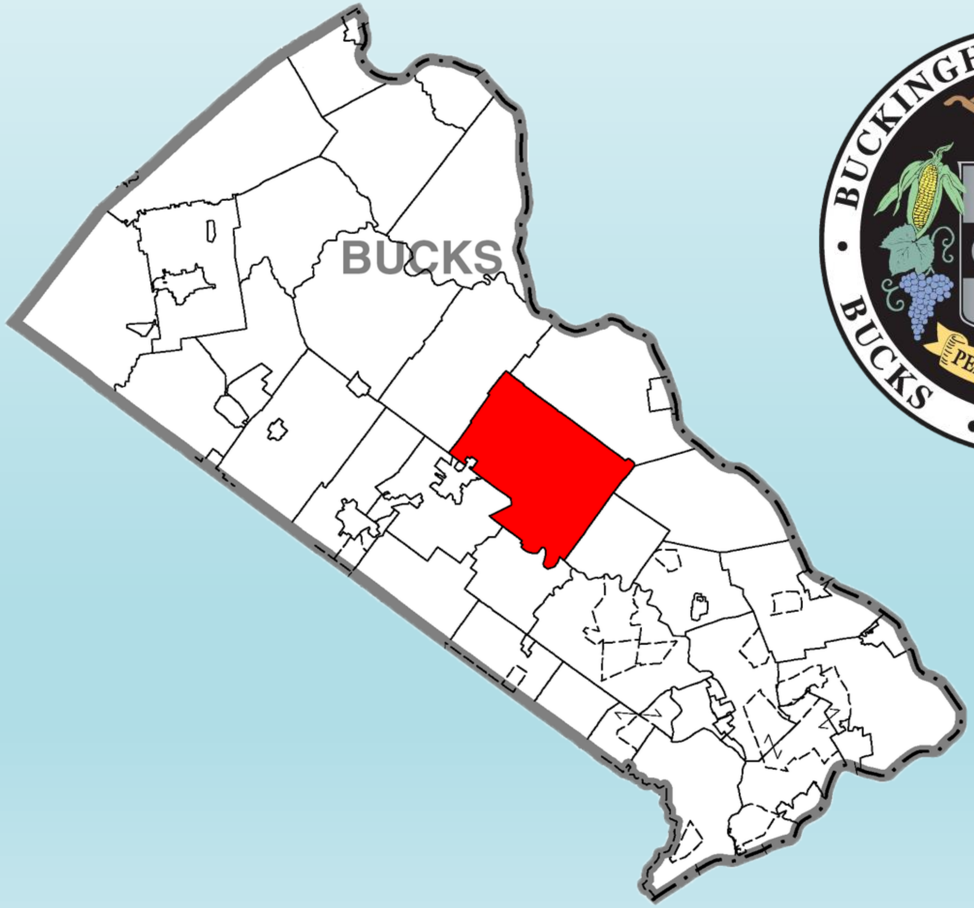
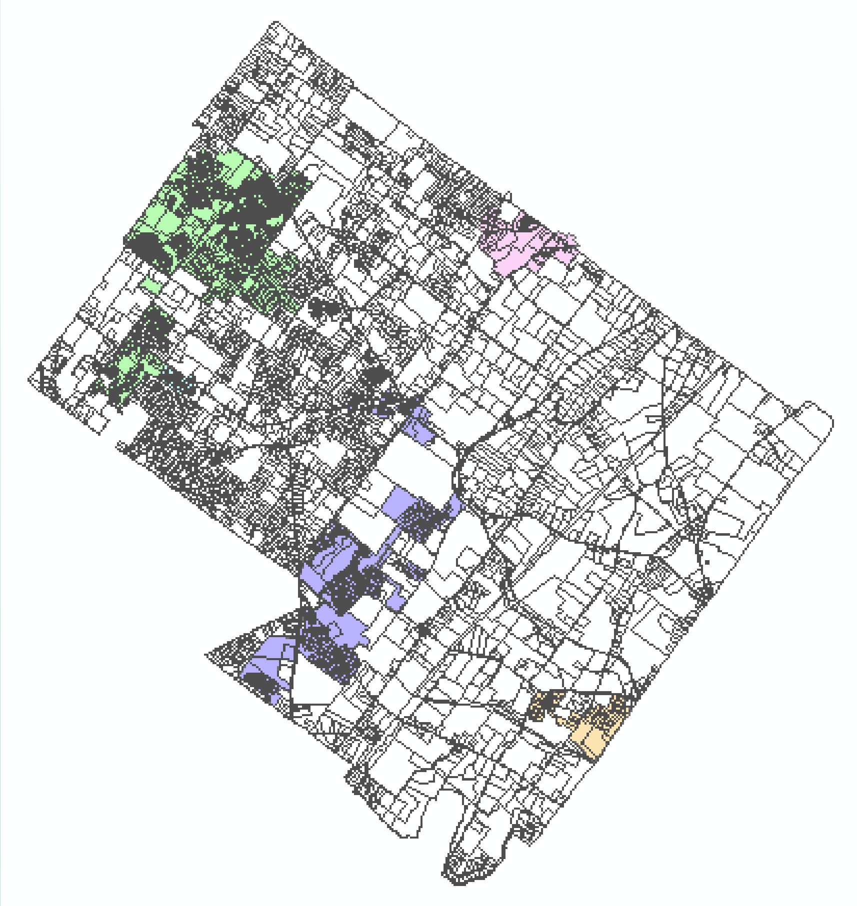
BUCKINGHAM TOWNSHIP
Public Water Systems



BUCKINGHAM TOWNSHIP PUBLIC WATER SYSTEMS



Currently, Buckingham Township provides water to over 8,600 people via over 3,600 connections, serving Buckingham Township with a withdraw of over 0.55 million gallon per day from the following systems:

Cold Spring Water System

Four Production Wells

Furlong Water System

Eight Production Wells

Fieldstone Water System

Two Production Wells

Mill Creek Water System

Two Production Wells

Fenton’s Corner Water System

Two Production Wells

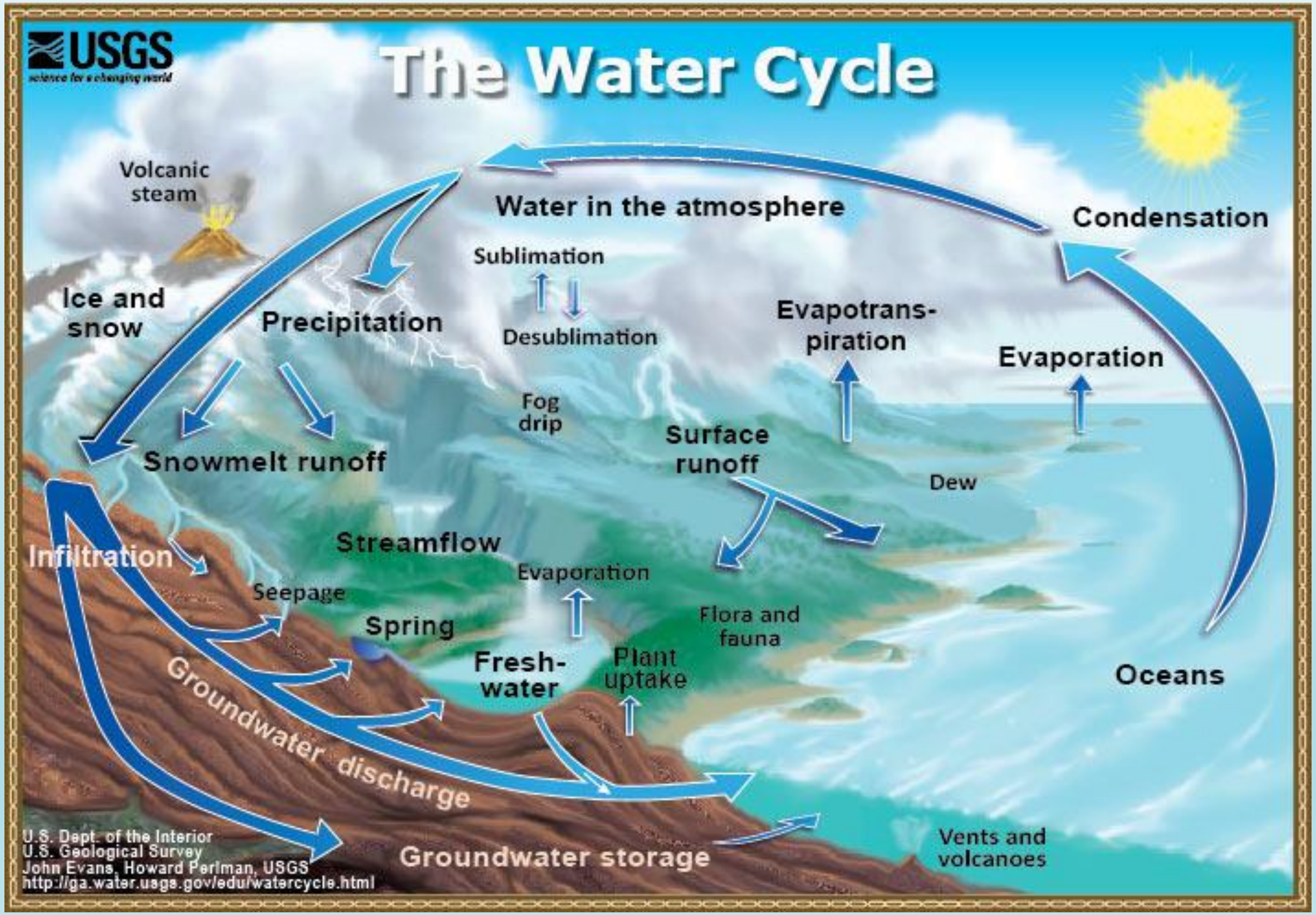
WATER IS ESSENTIAL FOR GOOD HEALTH. OUR BODIES NEED WATER.

Water is vital for all body functions. For example, water helps:

- regulate body temperature
- carry nutrients and oxygen to cells
- aid digestion and remove waste from the body
- protect the body by providing a cushioning layer around the eyes, brain, and other sensitive structures

Lack of water can lead to dehydration. Severe dehydration is a medical emergency.

THE WATER CYCLE

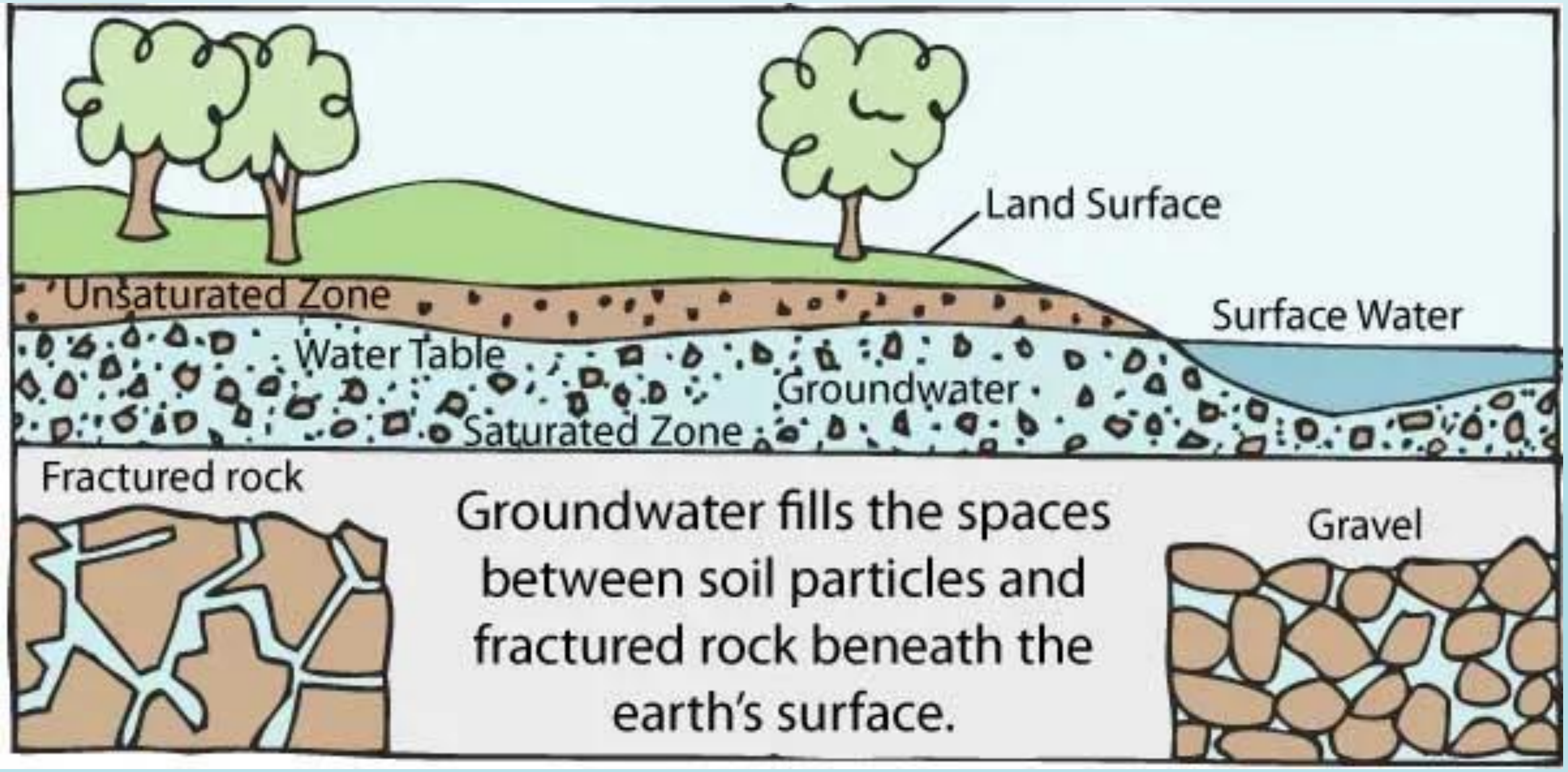


IMPORTANCE OF THE WATER CYCLE

The importance of the water cycle can be understood through its crucial role in sustaining life and the environment. Some of the points are:

- It ensures a continuous supply of freshwater.
- It provides water for plants and animals, thus supporting the ecosystem.
- The movement of water through the different phases of the water cycle influences the weather pattern.
- It constantly replenishes and redistributes water throughout nature.
- It ensures that water is available for agriculture.

GROUND WATER



GROUND WATER

Groundwater is the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand, and rocks called aquifers.

How much do we depend on groundwater?

- Groundwater supplies drinking water for 51% of the total U.S. population and 99% of the rural population.
- Groundwater helps grow our food. 64% of groundwater is used for irrigation to grow crops.
- Groundwater is an important component in many industrial processes.
- Groundwater is a source of recharge for lakes, rivers, and wetlands.

PUBLIC WELLS VS. PRIVATE WELLS

It is important to know the source of your drinking water. The first question should be: does my water come from a Public Water Supply (City Water) or a Private Water System (Well Water or Spring that "You" control)? The United States Environmental Protection Agency (USEPA) has established drinking water standards for public water supplies. However, Private Systems are not regulated by the EPA and most states.

A public water supply is defined as "a system which provides water to the public for human consumption and which has at least 15 service connections or regularly services an average of at least 25 individuals daily at least 60 days out of the year". If your source is not a public water supply, you are on a private system. Most public water supplies may also be known as "City Water", because they are typically managed by an Association, Authority, Water Company, Utility, or other entity.

SITING A PUBLIC WELL

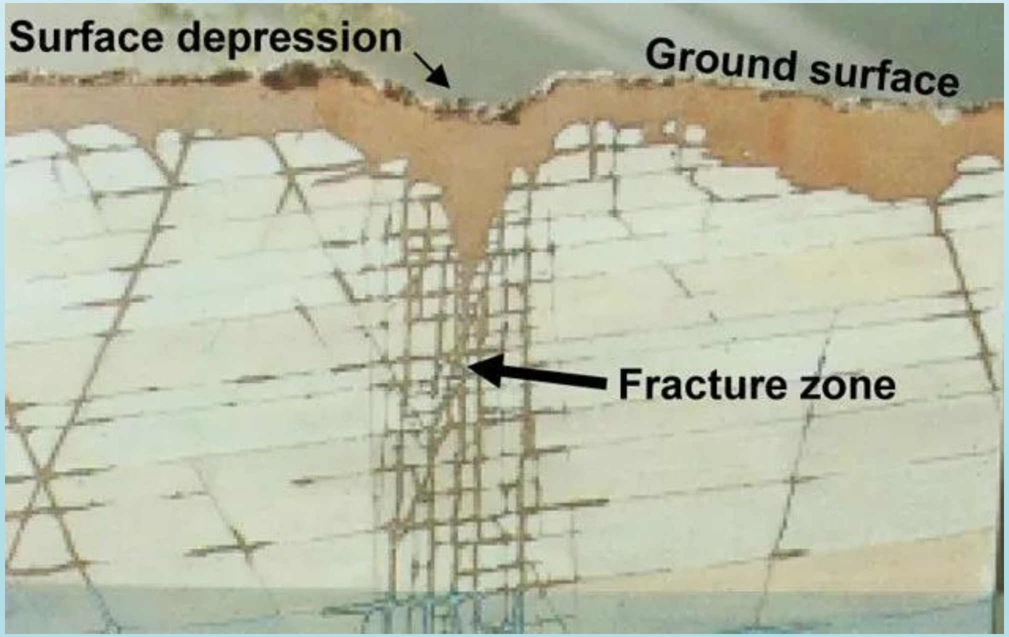
Prior to drilling, the site of a public water system well must be approved in writing by the PADEP. The Department shall require the supplier of water to submit a well site evaluation report that takes into account the proposed size, depth, and location of the well. The evaluation may include, but is not limited to the following types of information:

- An evaluation of the quality of anticipated ground water.
- Identification of the known aquifers
- An estimate of hydrologic and geologic properties of each aquifer and confining layers.
- Description of potential sources of contamination within a quarter mile of the well site.

SITING A PUBLIC WELL

Groundwater exploration is not a hit or miss (or random) proposition.

Scientific methods have been developed for locating wells where they will penetrate into zones of fractured rock buried beneath the soil surface. Wells located on a fractured rock zone will produce much larger quantities of water than wells drilled into zones where the rock is not fractured.



SITING A PUBLIC WELL

The Fracture Trace Method

Fracture trace mapping has been successfully used throughout Pennsylvania to locate wells that yield millions of gallons of water per day on a sustained basis.

(at right): An aerial photograph showing crosshairs where fracture intersections occur.

STEPS IN DRILLING A PUBLIC WELL

Location

Each well shall be staked by the design engineer or licensed professional geologist prior to drilling, be located a minimum of fifty (50) feet from the nearest property line, be located a minimum of fifty (50) feet from any potential source of contamination, and be no closer to specified sources of contamination than set forth in PADEP regulation. In vulnerable settings, the Department may require engineering or hydrologic analysis to determine if the required setback distance is adequate to prevent contamination.

DRILLING THE WELL

STEPS IN DRILLING A PUBLIC WELL

Permits and Regulations

Necessary permits are obtained, and local regulations are followed. Some counties have special requirements for drilling and well casing depth. The permit issued before drilling will always list special conditions and requirements. Both PADEP and Bucks county will issue a drilling permit.

Drilling

The well is drilled using the appropriate method for the site's geology and desired depth. A small bore hole (usually 6") is drilled at first to determine the geology and potential water.

Geological data shall be collected at each pronounced change in formation and shall be recorded in the driller's log. Supplemental data includes, but is not limited to, accurate geographical location such as latitude and longitude or GIS coordinates, and other information on accurate records of drillhole diameters and depths, assembled order of size and length of casing, screens and liners, grouting depths, formations penetrated, and water levels.

STEPS IN DRILLING A PUBLIC WELL

Well Development

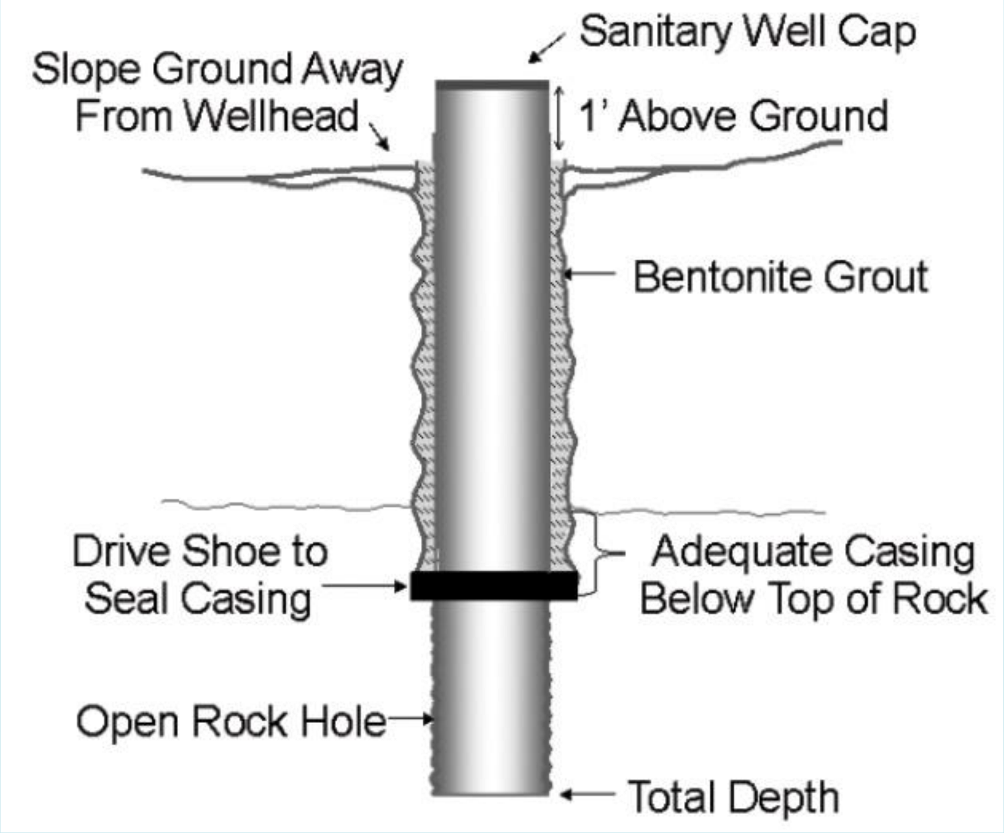
The well is developed to improve water quality and flow. This step helps to ensure the well's long-term performance, efficiency, and water quality. Proper well development can also prolong the well's lifespan and reduce the need for maintenance or repairs.

Enlarging the borehole - After the test well is determined to be adequate for the required quantity of water, the bore hole is reamed out (enlarged). This is required to aid in the quantity of water and to fit the larger well pumps required for public use.

Casing and Grouting - The well is lined with a casing to prevent collapse. The annular space around the casing and the hole drilled then needs to be filled with a grout to protect the well and prevent contamination.

STEPS IN DRILLING A PUBLIC WELL

Completed well borehole



AQUIFER TESTING

After the well drilling is completed, the public water supplier and their professional geologist execute the aquifer test. A complete aquifer test consists of four individual components (listed below). Successful completion of each component ensures that the Hydrogeologic Report submitted with the permit application package will include data needed to evaluate the proposed source.

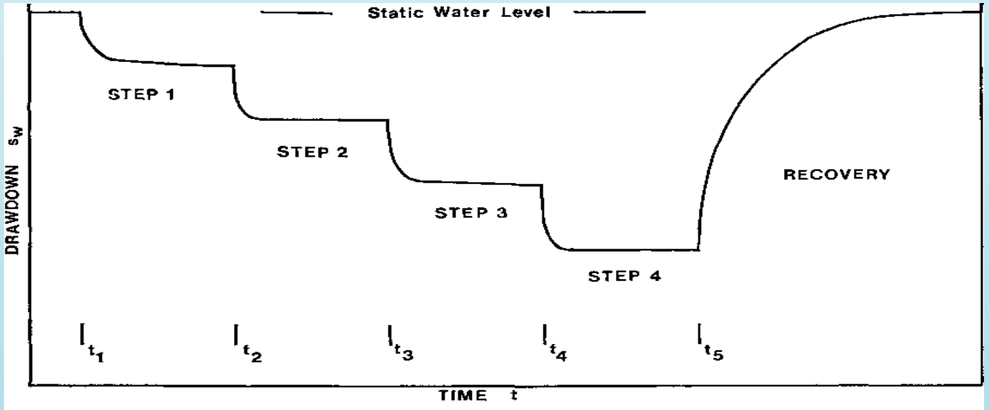
- Step test
- Background test
- Constant-rate aquifer test and water-quality sampling (new source sampling)
- Recovery test

AQUIFER TESTING

Aquifer testing accomplishes two goals. First, it estimates what are known as the aquifer's "hydraulic properties." These properties include, for example, the aquifer's transmissivity, or rate of flow, and how much water can be produced. Second, it assesses the chemical quality of the groundwater in an aquifer zone.

AQUIFER TESTING – STEP TEST

A step-drawdown test is a single-well test that is frequently conducted after well development to determine well efficiency and correctly size the production pump. Pumping rates are constant during steps which are of sufficient duration, about 1–4 hours, for water levels to change minimally at the end of each step. Successively greater discharge rates are pumped during subsequent steps, where three to five discharge rates typically are tested. Water levels are measured prior to pumping, during each step, and during recovery so that drawdowns can be estimated.



STEP	DISCHARGE RATE	TIME
1	Q_1	$t_2 - t_1$
2	Q_2	$t_3 - t_2$
3	Q_3	$t_4 - t_3$
4	Q_4	$t_5 - t_4$

AQUIFER TESTING – BACKGROUND TEST

As part of the aquifer test, local public and private wells should also consider potential impacts from groundwater withdrawal on other water resources. To assure compliance with the Clean Streams Law (CSL), adjacent water resources need to be monitored during aquifer testing. As a starting point, water resources located within the estimated area of diversion should be established as monitoring points.

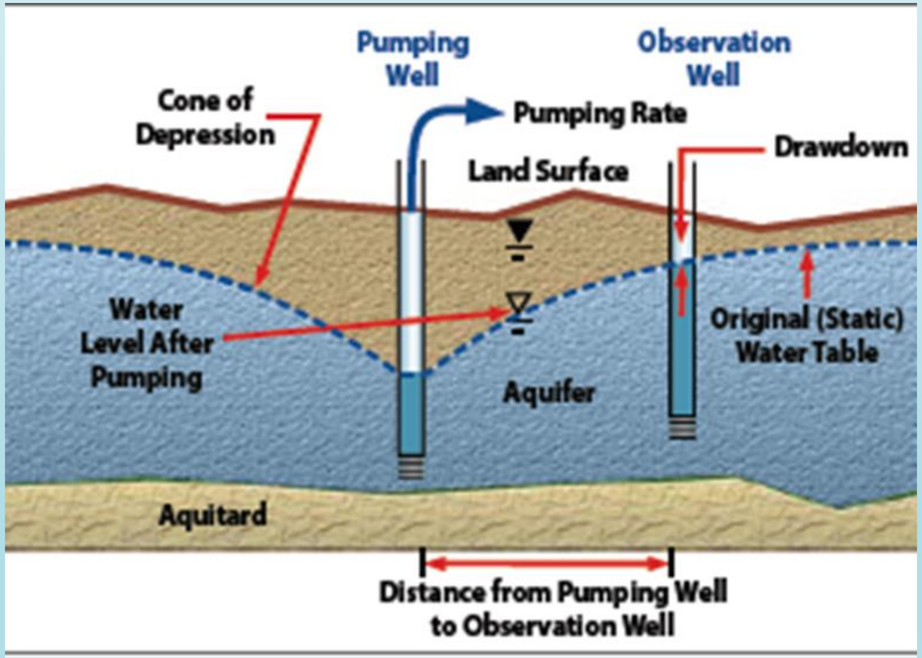
A monitoring network of public and private wells is set up to measure the effect of pumping the production well. These wells are located at increasing distances from the production well so that distance-drawdown data can be provided. A typical spacing utilizing a minimum of three observation wells would be approximately 100, 400, and 1,000 feet from the production well.

AQUIFER TESTING – 72-HOUR PUMP TEST

Constant-rate aquifer test and water-quality sampling (new source sampling)

Pump Test – A pumping test consists of pumping groundwater from a well, usually at a constant rate, and measuring the change in water level (drawdown) in the pumping well and any nearby wells (observation wells) or surface water bodies during and after pumping.

Pumping tests can last from hours to days or even weeks, depending on the purpose of the pumping test, but traditional pumping tests typically last for 72 hours.



AQUIFER TESTING – WATER QUALITY MONITORING

Water Quality Monitoring during the Pump Test

During the 72-hour pump test, water quality from the production well is monitored. Temperature, pH, conductivity, and turbidity data should be collected at 2-hour intervals and recorded in the field with a calibrated water quality instrument.

Groundwater Sampling

At the conclusion of the pump test, before the pump is turned off, groundwater samples should be collected from all production wells for chemical analysis. Laboratory analysis of groundwater samples should include all chemical constituents listed on the next slide.

AQUIFER TESTING – WATER QUALITY MONITORING

VOLATILE ORGANIC CHEMICALS (VOCs):		
BENZENE CARBON TETRACHLORIDE o-DICHLOROBENZENE para-DICHLOROBENZENE 1,2-DICHLOROETHANE 1,1-DICHLOROETHYLENE cis-1,2-DICHLOROETHYLENE	trans-1,2-DICHLOROETHYLENE DICHLOROMETHANE 1,2-DICHLOROPROPANE ETHYLBENZENE MONOCHLOROBENZENE STYRENE TETRACHLOROETHYLENE	TOLUENE 1,2,4-TRICHLOROBENZENE 1,1,1-TRICHLOROETHANE 1,1,2-TRICHLOROETHANE TRICHLOROETHYLENE VINYL CHLORIDE (See NOTE) XYLENES (Total)
NOTE: Monitoring for vinyl chloride is only required when one or more of the following two-carbon compounds are detected: trichloroethylene, tetrachloroethylene, trans-1,2-dichloroethylene, cis-1,2-dichloroethylene, 1,2-dichloroethane, 1,1-dichloroethylene, 1,1,1-trichloroethane.		

SYNTHETIC ORGANIC CHEMICALS (SOCs):		
ALACHLOR ATRAZINE BENZO(A)PYRENE CARBOFURAN CHLORDANE DALAPON DI(2-ETHYLHEXYL) ADIPATE DI(2-ETHYLHEXYL) PHTHALATE DIBROMOCHLOROPROPANE (DBCP) DINOSEB	DIQUAT ENDOTHALL ETHYLENE DIBROMIDE (EDB) ENDRIN GLYPHOSATE HEPTACHLOR HEPTACHLOR EPOXIDE HEXACHLOROBENZENE HEXACHLOROCYCLOPENTADIENE LINDANE	METHOXYCHLOR OXAMYL (VYDATE) PCBs[1] PENTACHLOROPHENOL PICLORAM SIMAZINE TOXAPHENE 2, 3, 7, 8-TCDD (DIOXIN)[1] 2, 4-D 2, 4, 5-TP (SILVEX)
1. Monitoring for PCBs and/or dioxin is required when there is a contamination source within 1,000 feet of the new groundwater source. Provide details of the assessment in Public Water Supply Module 3A, Part U to support a finding of no sources of contamination.		

INORGANIC CHEMICALS (IOCs):		
ANTIMONY ARSENIC ASBESTOS (See NOTE) BARIUM BERYLLIUM CADMIUM	CHROMIUM COPPER CYANIDE (as free cyanide) FLUORIDE LEAD MERCURY	NICKEL NITRATE (as Nitrogen) NITRITE (as Nitrogen) SELENIUM THALLIUM
NOTE: Monitoring for asbestos is required when DEP has reason to believe the source is vulnerable to contamination.		

RADIONUCLIDES:	
GROSS ALPHA	GROSS BETA (See NOTE)
RADIUM-226, RADIUM-228	URANIUM
NOTE: If the Gross Beta exceeds 50 pCi/L, analyze the same or equivalent sample to identify the major radioactive constituents present.	

MICROBIOLOGICAL CONTAMINANTS:	
TOTAL COLIFORMS CONCENTRATION	Three (3) separate samples obtained at 15-minute intervals immediately prior to the conclusion of the constant rate aquifer test. For each Total Coliform positive sample, analyze the same or equivalent sample for *E. coli* concentration.

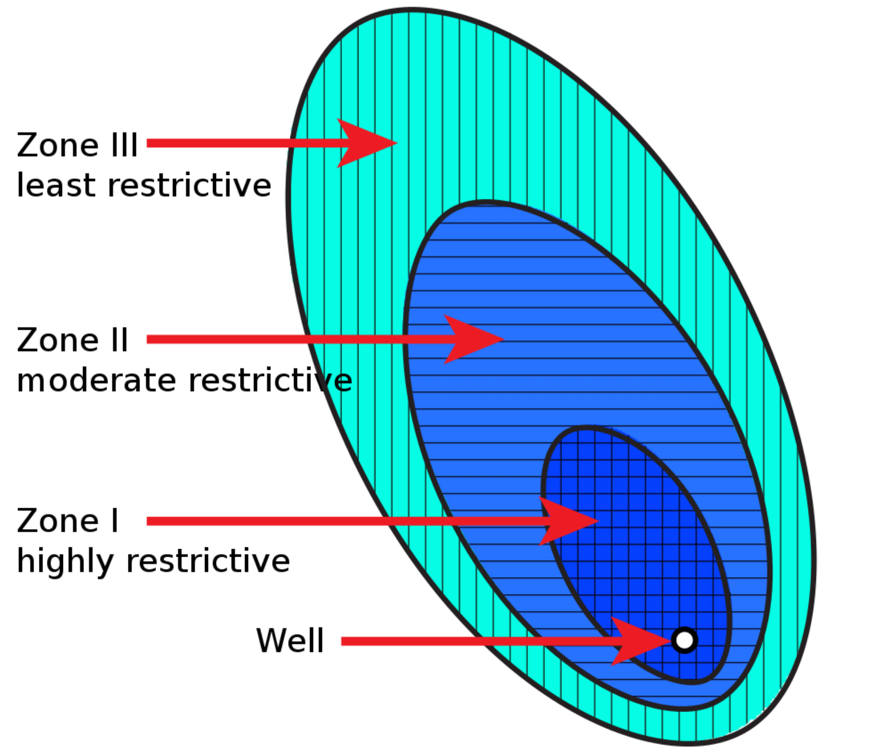
SECONDARY CONTAMINANTS AND OTHERS:		
ALKALINITY ALUMINUM CHLORIDE COLOR FOAMING AGENTS	HARDNESS IRON MANGANESE pH (See NOTE) SILVER	SULFATE TEMPERATURE (See NOTE) TOTAL DISSOLVED SOLIDS TOTAL ORGANIC CARBON TURBIDITY (NTU) ZINC
NOTE: Temperature and pH measurements may be obtained in the field with a calibrated water quality meter within 15 minutes of sample collection.		
MICROSCOPIC PARTICULATE ANALYSIS (MPA)	The project applicant should coordinate with appropriate DEP regional staff regarding MPA sampling. Sampling should be conducted by the DEP or the project applicant for new groundwater sources which fall within the criteria of the *Guidance for Surface Water Identification Protocol*, DEP ID: 383-3500-106, available on DEP's website at www.dep.state.pa.us .	

AQUIFER TESTING – RECOVERY TEST

When the pump is shut down after a pumping test, the water levels inside the pumping and observation wells (at a distance from the pumping well) begin to rise. This rise in water level is known as recovery drawdown. Recovery-test measurements allow the Transmissivity and Storativity of the aquifer to be calculated, thereby providing an independent check on the results of the pumping test.

Recovery drawdown data can be more reliable than drawdown data because the recovery occurs at a constant rate, whereas constant discharge pumping is often difficult to achieve in the field. Recovery drawdown data can be collected from both the pumping and observation wells.

WELLHEAD PROTECTION AREA



Theoretical wellhead protection zones

WELLHEAD PROTECTION AREA

The Wellhead Protection Program in the 1986 amendments to the Safe Drinking Water Act requires states to protect underground sources of drinking water from contaminants that may adversely affect human health.

This wellhead protection area is defined as the surface and subsurface area surrounding a water well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach the well.

Buckingham Township established a Source Water Plan defining the approach the Township uses to ensure the quality of the drinking water in Buckingham Township. This plan establishes the zone requirements for each production well.

WELL HEAD PROTECTIONS ZONES IN BUCKINGHAM TOWNSHIP

Source Water Protection Zone I

Zone I is the smallest of the three zones and is also the most stringent from a protection standpoint. Zone I is a circle around the well with a radius between 100 and 400 feet. The management goal for Zone I is maintaining it in a natural state, under control of the water supplier, with no potential sources of contamination.

Source Water Protection Zone II

The land that contributes groundwater to a pumping well or flowing spring is referred to as the capture zone, or the zone of diversion. Zone II is the surface representation of the capture zone. This area is delineated by a volume of water in an aquifer contributing to a well or spring. The Zone II delineations represent the volume of water entering the sources in a 10-year time of travel.

Source Water Protection Zone III

Zone III, or the zone of contribution, is the portion of the watershed that can contribute water to the capture zone. Zone III occupies an area of 18.8 square miles.

WATER QUALITY ISSUES AND TREATMENT

Contaminants That Can Affect Drinking Water

The following contaminants can affect drinking water treatment plant operations or human health. While all contaminants can pose a challenge to drinking water utilities, the following contaminants present common and complex challenges.

- Nutrients
- Pathogens
- Turbidity and TSS
- Metals and minerals
- Contaminants of Emerging Concern

OVERVIEW OF WATER TREATMENT

Purpose of water treatment – to provide safe drinking water that does not contain objectionable taste, odor, or color; to provide adequate quantities of water for domestic, commercial, industrial, and fire protection needs.

All water produced by public water systems must be drinking water quality, even though only about 1% of water produced is used for drinking and cooking.

Since Buckingham public water system is supplied by groundwater, the treatment is much less involved than surface water treatment. Groundwater has fewer impurities. Most of the treatment, if required, is done by filtration, but the addition of chemicals to reduce corrosion is required in some of the systems.

WATER QUALITY ISSUES AND TREATMENT - NUTRIENTS

Nutrients, specifically nitrogen and phosphorus, are chemicals that are essential for plant growth. We add nutrients when we fertilize our gardens and fields, and in the same way, adding nutrients to water fertilizes water-dwelling plants. Nutrients usually occur at very low concentrations relative to plant demands. Nutrient levels change throughout the year as growing plants take up the nutrients and dying plants release them back into the water.

Nitrates are odorless, colorless, and tasteless so it is important to test feed and drinking water to determine levels of nitrate. High concentrations of nitrate in drinking water can cause methemoglobinemia (also known as blue baby syndrome). Concentrations greater than 10 parts per million can be harmful to young babies, and should be avoided by nursing mothers.

Maximum concentration of Nitrate in drinking water: 10 mg/L

WATER QUALITY ISSUES AND TREATMENT - NUTRIENTS

Nitrogen Sources

Fertilizers - Because plants require nitrogen, farmers often add nitrogen in the form of fertilizers. Sometimes, the nitrate leaches into groundwater systems. Fertilizers can also be washed into surface waters and increase aquatic plant productivity, depleting oxygen and causing eutrophication.

Livestock manure - Fecal matter contains nitrogen, so when livestock manure washes into surface water (among other pollutant problems), the excess nitrogen can cause eutrophication.

Malfunctioning septic systems - Similar to livestock manure, when a septic system leaches into the ground, the bacteria and nutrients can get into ground water systems and surface water systems.

WATER QUALITY ISSUES AND TREATMENT - PATHOGENS

Pathogens

Of the many infectious microorganisms found in the environment, bacteria (such as Shigella, Escherichia coli, Vibrio, and Salmonella), viruses (such as Norwalk virus and rotaviruses), and protozoans (such as Entamoeba, Giardia, and Cryptosporidium) may be found in water.

These microorganisms can cause symptoms such as nausea, vomiting, diarrhea, and stomach cramps. In healthy adults, these illnesses are usually mild and do not last long. In infants, children, the elderly, and persons with weakened immune systems, these illnesses can be more severe.

Disinfection

Buckingham public water systems treatment method for disinfection is chlorine.

WATER QUALITY ISSUES AND TREATMENT - PATHOGENS

Fecal Coliform

Buckingham Township is required by law to routinely test drinking water for contaminants, including total coliform bacteria. Although most types of coliform bacteria are not infectious, many are present in fecal matter (which is the source of most waterborne infectious microorganisms). If coliform bacteria are found, further testing is required to determine if the coliform bacteria are of fecal origin (fecal coliform). If these tests determine that the water contains these microorganisms, the Township is required to notify the public (TV, radio, newspapers, mailings) and take immediate corrective action. In some situations, a “boil water” notice may be given to the public with specific instructions

WATER QUALITY ISSUES AND TREATMENT – TURBIDITY & TSS

Turbidity and Water

Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms.

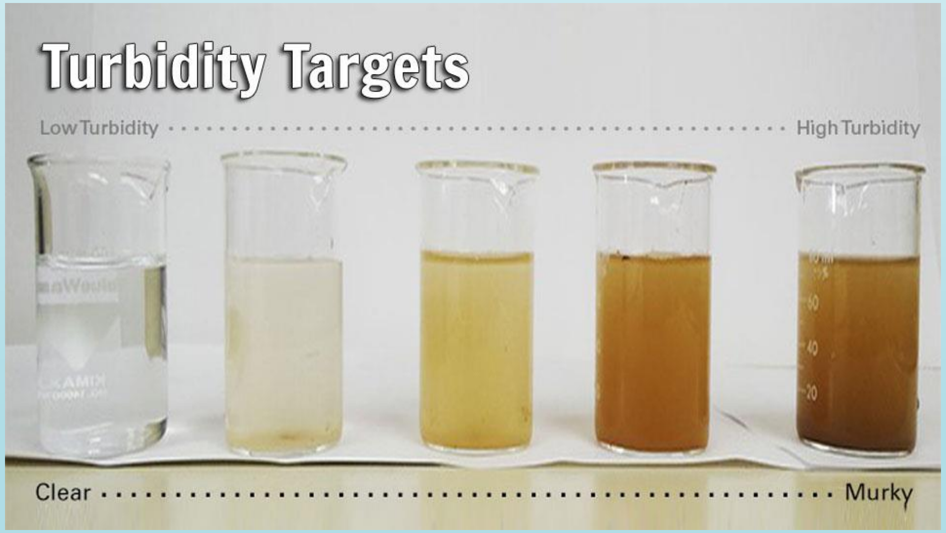
Turbidity and Water Quality

High concentrations of particulate matter affect light penetration and ecological productivity, recreational values, and habitat quality, and cause lakes to fill in faster. In streams, increased sedimentation and siltation can occur, which can result in harm to habitat areas for fish and other aquatic life. Particles also provide attachment places for other pollutants, notably metals and bacteria. For this reason, turbidity readings can be used as an indicator of potential pollution in a water body.

WATER QUALITY ISSUES AND TREATMENT – TURBIDITY & TSS

Turbidity and human health

Excessive turbidity, or cloudiness, in drinking water is aesthetically unappealing, and may also represent a health concern. Turbidity can provide food and shelter for pathogens. If not removed, the causes of high turbidity can promote regrowth of pathogens in the water, leading to waterborne disease outbreaks, which have caused significant cases of intestinal sickness throughout the United States and the world. Although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa.



WATER QUALITY ISSUES AND TREATMENT – TURBIDITY & TSS

TSS (Total Suspended Solids)

Total solids are dissolved solids plus suspended and settleable solids in water. In water, dissolved solids consist of calcium, chlorides, nitrate, phosphorus, iron, sulfur, and other ions particles that will pass through a filter with pores of around 2 microns (0.002 cm) in size. Suspended solids include silt and clay particles, plankton, algae, fine organic debris, and other particulate matter.

A high concentration of total solids will make drinking water unpalatable and might have an adverse effect on people who are not used to drinking such water. Levels of total solids that are too high or too low can also reduce the efficiency of wastewater treatment plants, as well as the operation of industrial processes that use raw water.

Sources of total solids include industrial discharges, sewage, fertilizers, road runoff, and soil erosion. Total solids are measured in milligrams per liter (mg/L).

WATER QUALITY ISSUES AND TREATMENT – METALS & MINERALS

Minerals are naturally-occurring inorganic compounds that are essential for maintaining the overall health and well-being of living organisms. These compounds can be found in many different forms, including rocks, soils, and, most importantly, water. Having minerals in water is generally considered to be a good thing, as they provide a variety of health benefits when consumed in appropriate amounts. Minerals are essential for the basic functions of the human body to take place. They help to control bone growth, regulate fluids, normalize nerve and muscle functions, keep up metabolism, grow connective tissues, and so much more.

WATER QUALITY ISSUES AND TREATMENT – METALS & MINERALS

Minerals found in drinking water - Helpful

There are several common minerals that are considered to be beneficial when found in water, including:

Calcium: Calcium is an essential mineral that plays a vital role in the development and maintenance of strong bones and teeth. It also helps to regulate muscle function and blood clotting.

Magnesium: Magnesium is another important mineral that is essential for maintaining healthy bones and teeth. It also helps to regulate blood sugar levels, blood pressure, and muscle and nerve function.

Potassium: Potassium is an essential mineral that helps to regulate fluid balance in the body, as well as maintaining healthy blood pressure and heart function.

Sodium: Sodium is a mineral that helps to regulate fluid balance and blood pressure in the body. It is also essential for proper nerve and muscle function.

Chloride: Chloride is a mineral that helps to maintain the body's acid-base balance and plays a role in the digestion of food.

Fluoride: Fluoride is a mineral that helps to prevent tooth decay and promote healthy teeth and bones.

WATER QUALITY ISSUES AND TREATMENT – METALS & MINERALS

Minerals found in drinking water – Harmful

Arsenic: Arsenic is a naturally occurring mineral that can be found in water, soil, and air. Long-term exposure to arsenic can lead to cancer, skin lesions, and other health problems.

Lead: Lead is a toxic mineral that can be found in water, soil, and air. Long-term exposure to lead can lead to developmental problems in children, as well as kidney damage, high blood pressure, and other health problems in adults.

Mercury: Mercury is a toxic mineral that can be found in water, soil, and air. Long-term exposure to mercury can lead to neurological damage, including tremors, memory loss, and numbness in the hands and feet.

WATER QUALITY ISSUES AND TREATMENT – LEAD & COPPER

Lead and copper are naturally occurring metals that have often been used in indoor plumbing. Pipes and plumbing may contain lead, copper, or their alloys, such as brass. Some solder used at copper pipe joints may also contain lead. Water, particularly corrosive water, can dissolve small amounts of these metals into drinking water. The potential for leaching increases the longer the water is in contact with plumbing components.

WATER QUALITY ISSUES AND TREATMENT – LEAD & COPPER

On June 7, 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule. The treatment technique for the rule requires systems to monitor drinking water at customer taps. Because lead and copper in drinking water is mainly due to the corrosion of service lines and household plumbing, tap water samples are collected at kitchen or bathroom taps of residences and other buildings.

If lead concentrations exceed an action level of 15 parts per billion (ppb) or copper concentrations exceed an action level of 1.3 parts per million (ppm) in more than 10 percent of customer taps sampled, the system must undertake additional actions such as corrosion control treatment (CCR).

EPA published the Lead and Copper Rule Revisions (LCRR) in January 2021, which requires all community and non-transient noncommunity water systems to submit a service line inventory to DEP by October 16, 2024.

WATER QUALITY ISSUES AND TREATMENT – LEAD & COPPER

Steps to Reduce Lead in Residential Drinking Water

Flush pipes before drinking. The more time water has been sitting in a home's pipes, the more lead it may contain. The most important time to flush is after long periods of non-use, such as first thing in the morning, after work, or upon returning from vacation.

Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead.

Utilize household water-use activities — showering, washing clothes, flushing the toilet, or running the dishwasher — for flushing pipes and allowing water from the distribution system to enter household pipes.

Do not boil water to remove lead. Boiling water will not reduce lead in drinking water.

Purchase replacement plumbing products that have been tested and certified to "lead-free" standards.

WATER QUALITY ISSUES AND TREATMENT – LEAD & COPPER

Steps to Reduce Copper in Residential Drinking Water

Flush pipes before drinking. The more time water has been sitting in a home's pipes, the more copper it may contain. The most important time to flush is after long periods of non-use, such as first thing in the morning, after work, or upon returning from vacation.

Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of copper.

Utilize household water-use activities — showering, washing clothes, flushing the toilet, or running the dishwasher—for flushing pipes and allowing water from the distribution system to enter household pipes.

Do not boil water to remove copper. Boiling water will not reduce copper in drinking water.

Be mindful of copper exposure in newer homes with copper pipes, as they may be more likely to have a problem. Over time, a coating forms on the inside of the pipes and can insulate the water from the copper in the pipes. In newer homes, this coating has not yet had a chance to develop.

WATER QUALITY ISSUES AND TREATMENT – LEAD & COPPER

Lead and Copper Sampling

Lead and copper enter drinking water from the corrosion of lead- and copper-containing plumbing materials including home interior plumbing and water service lines. Water systems are required to collect tap samples within their water distribution systems. These regulations establish action levels for lead and copper based on a 90th percentile level of tap water samples. An exceedance of one or both action levels trigger additional actions by the water supply.

Unlike other contaminant monitoring, the samples for lead and copper testing must come from regularly used cold water taps inside your homes. So we encourage you to assist in our sampling program.

WATER QUALITY ISSUES AND TREATMENT - ARSENIC

Arsenic in Drinking Water

Arsenic is a semi-metal element in the periodic table. It is odorless and tasteless. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. The health effects of Arsenic exposure can be severe, and include stomach pain, nausea, diarrhea and vomiting; thickening and discoloration of the skin; numbness in hands and feet; partial paralysis; and blindness. Prolonged exposure or exposure to large doses can be fatal. Arsenic has also been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver, and prostate.

The Environmental Protection Agency (EPA) has established a Maximum Contaminant Level (MCL) for arsenic in drinking water at 10 ppb (parts per billion/micrograms per liter, µg/L).

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Currently, two of the systems in Buckingham contain arsenic in the raw water produced that is slightly above the 10 mg/l action level required by PADEP, and therefore require treatment. Due to the nature of our production wells, it was determined that absorption (filters) would be the best technique for removal. The township uses Bayoxide E33 filter material which has been developed specifically for the removal of arsenic and other ions from potable water. It is applied in a simple passive, continuous, pump-and-treat system for selective removal treatment of contaminated water. Due to its particularly high surface area and adsorption capacity, it selectively and safely adsorbs arsenic below the level of 10 µg/L. Prior to the filter having reached its adsorption capacity, the well is taken off line, the material is replaced, and the spent resin is disposed of in a landfill.

WATER QUALITY ISSUES AND TREATMENT – IRON & MANGANESE

Both iron and manganese are readily apparent in drinking water supplies. Both impart a strong metallic taste to the water and both cause staining. Water coming from wells high in iron and/or manganese may appear colorless initially but orange-brown (iron) or black (manganese) stains or particles quickly appear as the water is exposed to oxygen.

Iron and manganese are not health concerns in drinking water. Instead, they both have secondary or recommended drinking water standards because they cause aesthetic problems that make the water undesirable to use in the home and a bitter metallic taste that can make the water unpleasant to drink for both humans and farm animals.

WATER QUALITY ISSUES AND TREATMENT – IRON & MANGANESE

Iron and manganese can be effectively removed from water using a number of treatment processes depending on both the form and concentration of the metals. Since iron and manganese are aesthetic problems that affect all potential uses of the water, they must be removed from all water entering the system.

Currently the Fenton’s Corner water system has high iron and manganese. Granular activated carbon (GAC) filters were chosen for the removal process. GAC is prepared using charcoal, a porous form of carbon made from hardwood, as the material has been identified, investigated, and found capable of achieving a substantial amount of iron and manganese removal.

WATER QUALITY ISSUES AND TREATMENT – CONTAMINANTS OF EMERGING CONCERN OR FOREVER CHEMICALS

Emerging contaminants, or contaminants of emerging concern, can refer to many different kinds of chemicals, including medicines, personal care or household cleaning products, and lawn care and agricultural products, among others. These chemicals make it into our Nation's lakes and rivers and have a detrimental affect on fish and other aquatic species. That have also been shown to bioaccumulate up the food web - putting even non-aquatic species at risk when they eat contaminated fish.

Contaminants of emerging concern enter the environment every day. To understand where these chemicals come from, we just need to think about our modern lifestyle. People use chemical-based products each day. These chemicals remain in wastewater and beyond because treatment plants weren't designed to take out these chemicals. Similarly, industrial processes that have their own treatment processes don't remove all these chemicals, either. Eventually, they end up in the Nation's lakes and rivers. These chemicals are getting into the environment and we're concerned about the effects they might be having on organisms, including humans. After all, different contaminants have been detected in drinking water supplies and their risk to our health is still uncertain.

WATER QUALITY ISSUES AND TREATMENT – PFOS & PFOA

Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic (PFOS) acid are part of a group of chemicals commonly referred to as perfluoroalkyl substances (PFASs) or perfluorinated compounds (PFCs). PFOA and PFOS are man-made chemicals that, up until 2000, had been widely used in the manufacturing of many industrial and consumer products such as paper and cardboard food packaging, insecticides, electronics, stain repellants, paints, plumbing tape, firefighting foam, and non-stick cooking surfaces.

Currently Pennsylvania has set an MCL of 14 parts per trillion (ppt) for PFOA and an MCL of 18 ppt for PFOS. The rule also specifies requirements to ensure compliance with the MCLs, including monitoring and reporting, analytical requirements and approved treatment technologies.

Buckingham has one well that is slightly over the limit of 14 ppt for PFOA and we are in the permitting stage of treatment for this well.

PARTING THOUGHTS

You can help protect our groundwater by doing the simple things outlined below.

Limit your use of chemicals, fertilizers, pesticides, and other hazardous products. While planting your garden and/or landscaping next spring, always follow label directions. Use the least toxic product or method available for lawn, garden, and household pest and weed control. Also, minimize the use of de-icers.

Recycle leftover hazardous products. Never pour these chemicals onto the ground or into storm drains since they can contaminate the water supply. Examples of hazardous products include used motor oil, used antifreeze, batteries, paint, electronics, and insecticides.

Plug abandoned wells on your property. Abandoned wells can provide a direct channel for surface contaminants to reach groundwater supplies without first being filtered by the soil. Abandoned wells can also be a safety hazard for small children and animals.

If you have a septic system, make sure it is inspected and serviced every three years. Avoid pouring down the drain or toilet products that will harm your septic system such as diapers, coffee grounds, or hazardous chemicals.

Conserve water. Wellhead protection is meant to protect both the quality and quantity of water. Do your part by shutting off the water while brushing your teeth, replacing old appliances with new, more efficient models, installing low-flow toilets and shower heads, and fixing leaky faucets.

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