Water Filtration and Conditioning Guide

WELL WATER CONNECTION, INC.

Water Well Design & Project Management

WELL WATER CONNECTION, INC.
Water Well Design & Project Management

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PO Box 158 * Tewksbury, MA 01876 * Tel: 978-640-6900 * Fax: 978-640-6901 * www.WellWaterConnection.com

WELL WATER CONNECTION, INC.
Water Well Design & Project Management

Company Profile

Thank you for your interest in ***Well Water Connection, Inc.*** and for allowing me to introduce myself and my company to you. After receiving a civil engineering degree from the University of Massachusetts in 1990, I worked on the Central Artery Project for Stone & Webster's Geotechnical Engineering Division in Boston. There I supervised geotechnical site investigations and drilling operations, monitored well installations and performed bedrock and soil testing, both in the field and in the laboratory. As the geotechnical work on the "Big Dig" was completed, I was laid off, so in 1995, I started working for a small local artesian water well drilling company. Over the next six years as the sales manager and then general manager of that company, I became directly responsible for sales, design, coordination and supervision of the installation of over 600 residential and commercial artesian well and pump systems.

During that time, I listened to many questions, concerns and complaints from home owners, property owners, property managers, landscapers and irrigation contractors about the limited information and services provided by most well drilling companies.

After six successful years with that company , I began to search for a company that could provide all types of water wells (not just artesian), but also the pumps, filtration systems and the planning, permitting, design and maintenance services that I knew by now were necessary for quality well installations and the key to long-term satisfied customers. I quickly learned that that type of company did not yet exist.

In 2002, I started ***Well Water Connection, Inc.***, a truly full-service, water well design and project management company that provides well-managed, custom-designed irrigation wells, pumping systems, filtration and related services that dovetail seamlessly with our customers' irrigation systems and landscape plans. We are a company whose capabilities and menu of services is not limited by our drillers' experience or by the type of equipment we own. With a civil engineering degree and geotechnical engineering background , and professional affiliations with competent, highly knowledgeable, fully licensed and insured water well drillers and related professionals, we are able to handle large projects while still providing personal one on one attention to the smallest details. We realize the importance of good communication with our customers, whether they are big or small, and meeting the technical concerns and practical expectations of the other engineers, designers and contractors working on the project.

In 2011, we moved our office to a new facility, opened our Water Filtration Division and hired additional service and administrative staff. In addition, we made an arrangement with a local retail store, **Quality Pump & Supply**, to offer professional grade water pump and filtration products at a discounted price for our customers. As we continue to grow and develop, we strive to provide our customers with the best service, but know the decision to hire a contractor can be challenging. At ***Well Water Connection, Inc.,*** one of our goals is to provide our customers with enough information to make well-informed decisions. Please do not hesitate to contact our office if you have any questions, need more information, references, or would like a free, no-obligation written estimate for your water well related project.

We are proud to offer you our expertise and eager for you to experience our level of service. Thank you again for allowing me to introduce my company to you. We look forward to working with you.

John Larsen
Owner

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WELL WATER CONNECTION, INC.
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Project Management & Technical Services

Our *Project Management Division* will assist you in the implementation of your ground water well project. . .

- Cost Estimating
- Estimate Procurement
- Site Study and Selection
- Permitting
- Water Well Design
- Estimate Analysis & Comparisons
- Specifications Design
- Water Analysis
- Pump System Design

- Feasibility Analysis
- Site Assessment
- Investigation Services
- Filtration Design
- Fracture Trace Analysis
- System Evaluation
- Pump Test Analysis
- VLF Geophysical Surveys

…while our *Technical Services Division* utilizes our own pump installation and service equipment, experienced crew and network of fully qualified and licensed water well and related professionals to get the job done right, on time and within budget.

- Artesian Wells
- Point Wells
- Gravel Wells
- Geothermal Systems
- Booster Pump Systems
- Pump System Diagnostics
- Pump Removal & Installations
- Water Sampling & Testing
- Zone-Fracturing
- Constant Pressure Systems
- Filtration Systems
- Hydro-fracturing

- Site Prep and Preservation
- Trenching
- Test Work
- Down Hole Video Inspections
- Pump Repair & Maintenance
- Locating Existing Wells
- Stain Removal Services
- Stain Prevention Systems
- Pump Testing
- Debris Removal and Containment
- Whole House Water Systems

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Residential Testimonials

"John is always courteous and professional and cares about customer satisfaction. A pleasure to do business with." **Jim Barry, Tewksbury, MA**

"We recently installed an irrigation well at our home in Randolph. After considering several companies, I selected Well Water Connection primarily because I was confident, after talking with John Larsen, that he and his company were competent, responsible and honest. John, Nancy and Mike thoroughly justified my confidence. The work was performed when and as promised and they were always responsive and pleasant to deal with. While actual well production is, of course, not predictable, we got a well with about three times the production that our contract called for, on time, at a fair price and within budget. I couldn't have asked for more."

Laurence Johnson, Randolph, MA

"John has been nothing but the best for us." **Chet and Joy MacAskill, Saugus, MA**

"WWC provided a complete turnkey solution -- coordinated the drilling, plumbing, electrical, and landscaping; also the town permit in advance and the water dept certification upon completion. John also kept my neighbors informed about the project, and kept their disruption to a minimum. The Foxboro Water Dept was pleased, my neighbors were pleased, and I was pleased (because he even came in under budget!)."

Arthur Barrett, Foxboro, MA

"John, great job and support. Give Henry some treats!" **Ralph Poirier, Reading, MA**

"John and Nancy were thorough, responsive and professional during all stages of our well project. John worked with us to customize our project over a period of time in a way that allowed us to move through the planning and installation stages comfortably and with confidence. We ended up with a terrific product for a fair price."

Lou DiFronzo, N. Reading, MA

"John has taken care of us since day one and doing a great job and going out of his way to take care of us. Thanx John!" **Chris Dowd, Weymouth, MA**

"We were building a house and were looking to install a well and John was recommended to us by one of our neighbors. I had already contacted a couple of other companies, but after meeting with John it was obvious he was the person we could trust. He took the time to provide us with all the answers to our questions so we could make an intelligent decision. He coordinated the entire installation from permits to the drilling, electrical, and plumbing. It has been two years and the system has worked great!!! I cannot say enough about our experience with Well Water Connection and we recommend them very highly." **Bob Bernard, Braintree, MA**

"Great job - we have been very happy!" **Bob and Betty Joyce, Franklin, MA**

"Three years ago I had a well drilled in my yard. The workings of the well were above ground, visible and ugly. Last Fall I saw a sign for Well Water Connection on the front lawn of a house. I called and got in-touch with John from Well Water Connection to see if there was anything that could be done with my well. John took a look at my well and came up with a plan that eliminated the unsightly well top. He redesigned the well head and now it is out of sight. John also set me up with a system that eliminates the staining of iron heavy water. Great service is what Well Water Connection is all about. I highly recommend them." **Joe Salvucci, Tewksbury, MA**

"I am satisfied with all your services, sales representative, installation team and office and service staff."

Mario Delvecchio, Braintree, MA

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Commercial Testimonials

PROPERTY MANAGERS

"My experience with Well Water Connection has been great. They have always been reliable, dependable and their work is top-notch. John has always been extremely honest in his recommendations and advice. It is clear that Well Water Connection strives to earn client respect by delivering on what they promise."

Paul Schmitt, Barkan Management, Job: Knollsbrook Condominium, Stoughton, MA

"When we built our building in 2000, we hired a pump company to install a well to supply the water for our irrigation needs. It was a considerable investment. But, unfortunately, the system never performed as advertised. Finally, someone suggested I contact John Larsen of Well Water Connection, Inc. John immediately diagnosed the problem and suggested a cost effective repair. I'm happy to say the system has been running great for the past two years. Thank you Well Water Connection!"

Peter Crocker, PGA Realty, Wilmington, MA

"I was very happy with the results of Well Water Connection. They showed up when they were supposed to and got the job done. I had a serious iron stain problem and John took care of it like he said he would. I also had a water treatment system installed that works well too."

Roger Calarese, Calarese Properties, Job: Digital Federal Credit Union, Franklin, MA

DEVELOPERS

"A.W Perry, Inc. is a real developer based in Boston and the South Shore. We recently built a new building on a 36 acre site in Hingham. Well Water Connection was recommended to us and we brought them in to oversee the drilling of our irrigation wells. This area isn't noted for productive wells and we wanted to limit our exposure. John Larsen did a nice job developing a detailed set of specifications and a scope of work for the well drillers to follow. John coordinated the entire process from permitting through to the start-up and testing of the wells. I can highly recommend John and Well Water Connection."

Steve Leggett, Operations Manager, A. W. Perry, Inc., Jobs: Blue Cross Blue Shield & EMD Serono, Inc, Hingham, MA

PARKS AND RECREATION

"The Belmont Soccer Association offered to donate three water wells to the town of Belmont for three different athletic fields. The athletic fields would require significant quantities of water and we were concerned about where the wells should be drilled. After significant due diligence, we chose Well Water Connection. Well Water Connection suggested doing initial testing rather than just drilling holes and hoping for the best. This included using Very Low Frequency testing (VLF) to help identify the optimum drilling locations. John and Nancy worked seamlessly & collaboratively with the various town departments that contributed to the project to provide a complete solution. I would highly recommend Well Water Connection!"

Jim Fitzgerald, Board Member, Belmont Soccer Association, Jobs: PQ Field, Town Field, Grove St. Field, Belmont, MA

"Thanks for a job well done!!"

Denis Fraine, Town Administrator, Job: Blackstone Field, Bellingham, MA

LANDSCAPE AND IRRIGATION CONTRACTORS

"I have been using Well Water Connections to take care of any well issues that my custromers have had for several years now. The knowledge and professionalism that John provides has been an invaluable asset to both me and my customers."

Paul Catanzano, Molloy Landscaping, Milton, MA, Jobs: South Shore and Eastern MA

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Service Plans and Lifetime Warranties

A properly designed and installed *Water Well System* consists of several separate *systems* each made up of many different *components*, or *parts*. Each part is crucial and must work properly and in unison so that the entire system provides a clean, reliable and consistent source of water.

Shallow Well Jet Pump System & Tank System

Artesian Well Submersible Pump System & Mechanical Constant Pressure System

Artesian Well Submersible Pump System, Tank System & Water Treatment System

Artesian Well Submersible Pump System, VFD Drive System, Tank System & Water Filtration System

THE PROBLEM:

Every Water Well System is made up of parts from different manufacturers. Even if installed by a professional, most manufacturers will only warranty their parts for up to one year from the date of installation.

The manufacturer <u>will not</u> cover the labor costs that it will take to fix or replace that part. This could cost hundreds or even thousands of dollars in repairs and replacement parts if you have a problem, even within the first few years!

THE SOLUTION:

Well Water Connection, Inc. offers *Annual Service Plans* and *Lifetime Warranties* that include *Parts* <u>AND</u> *Labor*!

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Common Water Problems

Probable Cause	General Effect	Probable Remedy
Hardness (Calcium & Magnesium)	Scale in pipes and water heaters; causes "soap curd" on fixtures, tile, dishes and laundry; low sudsing characteristics	Removal by ion exchange softener.
Iron /Manganese	Causes discolored water; red, brown, orange or black stains on fixtures, appliances and laundry; dark scale in pipes and water heaters.	Low level (2 ppm) removal by ion exchange softener when hardness is also present; best removed by oxidizing iron filter; aeration and/or chlorination followed by filtration in some cases.
Iron/Manganese/ Sulfur (Bacteria)	Same general effects as above plus slimy deposits that form in pumps, pipes, softeners and toilet tanks.	Low level removal possible by oxidizing iron filter; best removed by chlorination followed by filtration.
Hydrogen Sulfide Gas	Foul rotten-egg odor; corrosion to plumbing; tarnishes silver and stains fixtures and laundry; ruins the taste of foods and beverages.	Best removed by aeration, scrubbing and filtration; also removed by oxidizing filters or chlorination followed by filtration.
Turbidity	Suspend matter in water; examples include mud, clay, silt and sand; can ruin seats, seals and moving parts in appliances.	Removal by backwashing sediment filters; extra fine treatment utilizing sediment cartridge elements.
Acid Water (low pH)	Corrosive water attacks piping and other metals, red and/or green staining of fixtures and laundry.	Best corrected by neutralizing filters or soda ash feeding.
Taste/Odor/Color (organic matter)	Makes water unpalatable; can cause staining.	Depending on the nature of contaminant, aeration followed by filtration; carbon filtration; chlorination followed by filtration.
Tannins/Humic Acid	Can impart an "iced-tea" color to water; causes light staining; can affect the taste of foods and beverages.	Removal by special ion exchange or oxidizing agents and filtration.
Coliform Bacteria	Can cause serious disease and intestinal disorders.	Chlorination and filtration is most widely practiced; iodination, ozonation and ultraviolet treatment are used to a lesser degree.
Organic Halides (e.g. Herbicides & Pesticides)	Can cause serious disease and/or poisoning.	Most are readily removed by absorption with carbon filters; some can also be removed by hydrolysis and oxidation.
Nitrates/Chlorides & Sulphates	Can cause health-related problems if quantities are high.	Removal by special ion exchange, deionization process or reverse osmosis.
Sodium Salts	Imparts an alkaline or soda taste to water.	Removal by deionization process or reverse osmosis; distillation can be used.

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Iron Removal Filters

Types of Iron In Water

Ferrous Iron – Iron that you **can't see** in water, but you can taste it and smell it. This type of iron is in "solution" in the water. Although it can't be seen while wet, when it dries it will have a staining effect outside the home on irrigated landscapes and inside on household fixtures, like sinks and toilets and on laundry.

Ferric Iron – Iron that you **can see** in water. This may come in the form of just cloudiness, or it may come in a way that makes the water have a reddish tint. This type of iron is in "suspension" in water, and can cause stuck sprinkler valves and clogged sprinkler heads.

How to Remove Ferric Iron in Water

Mechanical Filtration – By running water through a sand, and/or sediment filter, most times you can catch and trap the floating iron that is in suspension. No chemical reaction takes place for removal in this case. The filter physically "traps" the iron, and gets rid of it by periodically backwashing filter media and/or replacing the filter cartridge.

How to Remove Ferrous Iron in Water

1. **Oxidation-** Oxidation is the process of adding oxygen to the water in order to transform the iron molecules in the water from the ferrous iron (clear-water iron that you can't see) into the ferric form (the form you can see in suspension), so that the filter can then mechanically trap it.

2. **Ion Exchange-** This process takes any ferrous iron molecules that exist in solution in the water, and exchanges them with soft sodium ions in a water softener. The softener regenerates when salt water brine is brought into contact with the resin in the mineral tank. The exchange process is then reversed, with the iron molecules, releasing themselves off of the resin beads. This process is an actual chemical reaction that goes back and forth, exchanging one way during normal running service, and back the other way during regeneration.

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Water Softeners

Causes of Hard Water

Hard water is usually defined as water that contains a high concentration of calcium and magnesium ions. Measurements of hardness are given in terms of the calcium carbonate equivalent, that is an expression of the concentration of hardness ions in water in terms of their equivalent value of calcium carbonate. Water is considered to be hard if it has a hardness of 100 mg/L or more as calcium carbonate.

Bathtub Rings

Scaling in Pipes

Advantages of Soft Water

1. Soft water washing makes clothes cleaner, last longer and feel softer. Hair and skin will be less dry, feel smoother and have more luster. Dishes and glassware will rinse sparkling clean and clear.
2. Having soft water saves you money. When your water is soft, you use 1/2 to 2/3 less soap and fewer cleaning products. Your budget will automatically reflect the savings.
3. Your plumbing will last longer. Hard water can cause a build up of scale from mineral deposits. Over time, pipes can clog, water flow can diminish, and water pressure can be reduced. This doesn't happen with soft water. Soft water is low in mineral content and therefore doesn't leave stains and deposits in and on the pipes and fixtures.
4. Your hot water heater will last longer. Scale and lime build-up created by minerals will not take place if your water is soft. This adds life to your hot water heater. Also, if you don't have deposits in your hot water heater, it will cost approximately 20% less to heat the water that your family does use. At the end of the year, these savings can really add up.
5. Most water-using appliances will remain stain and streak free, last longer. Whether it's your coffee pot, your humidifier, or your hot tub, soft water inhibits a build-up of minerals and adds life to these products.

Water Softening Systems

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Acid Neutralizers

How Does an Acid Neutralizer Work?

An acid neutralizer is a tank that holds a natural calcium and magnesium based treatment media. The low pH water (aggressive water) passes through the tank and slowly consumes the neutralizing media. As the media dissolves, it increases the alkalinity (raising the pH) and increases the hardness of the water. The media is sacrificial and needs to be checked at least once per year.

How Does an Acid Neutralizer Benefit My Home and Family?

Acid water (water of pH equal to or less than 6.9) is corrosive to your plumbing and water-using appliances. An acid neutralizer uses a natural calcium and magnesium media to stop the corrosive tendency of the water. Once the pH is neutral or basic (water of pH equal to or greater than 7.0) it stops corroding your plumbing fixtures, water using appliances and piping system.

Pipe Corrosion Inside Plumbing

Visible Effects of Pipe Corrosion

Neutralizing Filters Correct The Problems

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Arsenic

What Is Arsenic?

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. Non-cancer effects can include thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness. Arsenic has been linked to cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate.

Like most heavy elements, Arsenic occurs in more than one valence state, specifically as AsIII (Arsenic +3) AsV(Arsenic +5). The ratio of As III to As V will vary widely, depending upon both the specific location and as a function of the pH and oxidation potential of that environment. Arsenic III is far more toxic than Arsenic V and more difficult to remove from the water.

Should I Have My Water Tested for Arsenic?

EPA regulates public water systems; it does not have the authority to regulate private drinking water wells. Approximately 15 percent of Americans rely on their own private drinking water supplies, and these supplies are not subject to EPA standards, although some state and local governments do set rules to protect users of these wells. Unlike public drinking water systems serving many people, they do not have experts regularly checking the water's source and its quality before it is sent to the tap. These households must take special precautions to ensure the protection and maintenance of their drinking water supplies. If you own your own, individual well, you are responsible for testing it.

Contact your Well Water Connection, Inc. representative to arrange testing. You can also call the Safe Drinking Water Hotline at 800-426-4791 and ask for the state certification officer who can give you the names of labs in your area that can do the testing.

Removing Arsenic from Well Water

The removal of Arsenic from water can be complicated, but can be achieved with proven technologies. Typically, Arsenic III (if it exists) is converted to Arsenic V, which is easier to remove with existing water treatment technologies. The exact technology or combination of technologies is determined by the specific analysis of your source water. Reverse osmosis, Ion exchange, coagulation, and oxidation are some technologies used to achieve the desired arsenic removal. An analysis of your water analysis by an Well Water Connection, Inc. professional will determine the appropriate method for an effective system.

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Radon

Is There Radon In My Water?

Not all drinking water contains radon. If your drinking water comes from a surface water source, such as a river, lake or reservoir, most radon that might be in the water will be released into the air before reaching your water supplier or home. Radon is only a concern if your drinking water comes from underground , such as a well that pumps water from an aquifer, though not all water from underground sources contains radon.

Water Testing For Radon

When getting your water tested for radon, make sure the proper procedures are followed in getting a sample as improper sample pulls and lack of quick turnaround time to the lab for testing can render your test results invalid and unreliable. Make sure that a Certified State Laboratory is utilized for testing the sample. Speak to your Well Water Connection, Inc. treatment professional about getting a good water sample.

Removing Radon from Well Water

If testing your private well shows that you have high levels of radon in your drinking water and you are concerned about it, there are some things you can do to improve the water. The most effective treatment you can apply is to remove radon from the water right before it enters your home. This is called point-of-entry treatment. There are two (2) types of point-of-entry devices that remove radon from water:

- Aeration devices (which bubble air through the water and exhaust the radon gas to outside the home)
- Granulated activated carbon (GAC) filters (which use activated carbon to remove the radon)

Aeration System

An Aeration system would be installed on the main water supply just after the well tank. An Aeration system consists of fiberglass or plastic tank in which water is depressurized and agitated. The best systems will use a combination of spraying the water and agitation in the tank to achieve higher reduction rates. As the water is sprayed and agitated the radon gas is released from the water and then escapes or is blown through a vent, which will terminate outside the house where it mixes with outside air and quickly reaches normal background levels. The vent should be extended above the roof if there is any chance of the radon gas reentering the home and potentially exposing the occupants to high levels of radon. Since no radon is stored in the unit there is very little opportunity for radiation to be given off by the unit itself and there are no disposal concerns.

Proper design, installation (particularly plumbing) and maintenance are critical to the long-term reliability and effectiveness of these systems.

Granular Activated Carbon (GAC)

A GAC system would also be installed on the main water supply just after the well tank. A GAC system consists of a large fiberglass tank containing a bed of granular activated carbon (GAC) that can hold onto the radon much like a sponge holds water. GAC filters tend to cost less initially than aeration devices, however, because radioactivity collects on the filter that could require special disposal methods, this method of radon removal is not recommended by Well Water Connection, Inc.

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Reverse Osmosis

Drink to Your Health

Water quality is a persistent problem for New England residents and can be especially frustrating when the quality varies from street to street and season to season. A reverse osmosis water filtration system can correct most common water quality problems. Drinking water purification systems can be installed as point of entry systems or point of use, under sink systems. Whether you currently have town-supplied or private well water, a reverse osmosis water filtration system can vastly improve the quality of your drinking water.

Municipal Water Supply

City and town water departments are monitored by the U.S. EPA (Environmental Protection Agency) and required to test and provide safe drinking water to its customers. The quality levels, in terms of aesthetics and mineral content, vary from town to town. While municipal supplies are general y safe, there are limitation as to what your town can do to provide you with the level of water quality that you personally desire. Quality can also vary substantially from season to season, which is why many customers with municipal water supply opt for reverse osmosis water treatment, at least for drinking water.

Private Well Water

Homeowners with private well water are their own water utility. We highly recommend that you get an annual comprehensive water quality test from a state certified water laboratory. Additionally, because of the uncertainty associated with well water due to rain and changing ground water, we recommend a reverse osmosis water filtration system for customers with well water. Utilizing reverse osmosis (RO) technology for drinking water is a viable option for purifying well water and a safeguard against many potential contaminants.

How a Reverse Osmosis Water Filtration System Works

Reverse osmosis water treatment intentionally forces unpurified source water against a synthetic membrane using line water pressure. The pores of a RO membrane are approx. .0005 micron in size, which is smaller than a bacteria or virus (a typical virus ranges from .02 to .4 micron in size). Only molecules of water dissolve and diffuse through the unique membrane material, forming pure water on the other side of the membrane. This purified water is held in the storage tank where the system is installed.

Point of Use or Remotely Located Point of Use

The reverse osmosis water treatment system can be installed either under the kitchen sink (point of use) or in a remote location like a basement. A remotely located reverse osmosis water purification system will have a line running up to the kitchen sink that feeds a separate faucet. A line can also be run to the refrigerator, feeding purified water to the ice maker, and/or automatic water dispenser.

Residential Point of Use

Whole House Systems

Bottleless Coolers

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Ultraviolet Water Purification

What Does an Ultraviolet System Do?

Ultraviolet (UV) water purification lamps produce UV-C or "germicidal UV", radiation of much greater intensity than sunlight. Almost all of a UV lamp's output is concentrated in the 254 nanometers (nm) region in order to take full advantage of the germicidal properties of this wavelength. Most ultraviolet purification systems are combined with various forms of filtration, as UV light is only capable of killing microorganisms such as bacteria, viruses, molds, algae, yeast , and oocysts like cryptosporidium and giardia. UV light generally has no impact on chlorine, VOCs, heavy metals, and other chemical contaminants. Nevertheless, it is probably the most cost effective and efficient technology available to homeowners to eliminate a wide range of biological contaminants from their water supply.

UV water treatment offers many advantages over other forms of water treatment for microbiological contaminants. Most importantly, it does not introduce any chemicals to the water, it produces no bi-products, and it does not alter the taste, pH, or other properties of the water. Accordingly, in addition to producing safe drinking water, it is not harmful to your plumbing and septic system. Further, it is easy and cost-effective to install and maintain without any special training.

How it Works

Ultraviolet purification uses a UV light source (lamp) which is enclosed in a protective transparent sleeve (usually quartz). The lamp is mounted such that water passing through a flow chamber is exposed to the UV-C light rays. When harmful microbes are exposed to UV rays, their nucleic acid absorbs the UV energy, which then scrambles the DNA structure of the organism. The UV treatment is an excellent choice to eliminate biological contamination from most home drinking water, whether your home is on a municipal water system or untreated private system (well, lake water, etc.). Its sole purpose is to kill harmful biological contaminants, and therefore should always be combined with other forms of filtration (GAC/carbon block, KDF, or reverse osmosis.

Ultraviolet Purification Systems

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Whole House Water Systems

Whole House Water Systems are custom designed, built and installed by us to meet your particular needs.

Whole House Variable Drive Constant Pressure System with stainless steel tank components and NEMA 4 controller mounted on board
(Tewksbury, MA)

Mechanical Valve Constant Pressure System (CPS) in basement with port for possible future whole house use
(North Reading, MA)

Whole House Water Systems are available in all sizes and configurations.

Whole House Well casing and cap ("well head") 18" above grade
(Sudbury, MA)

Traditional Whole House System with large storage tank in basement
(Hingham, MA)

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Sediment Filters

Sediment Filters are an important part of any well. For *irrigation only* wells, they help protect the pump and irrigation system. For *whole house* water systems, filters help protect the pump, the heating system and the household appliances.

Clear View sediment filter with "Manual" flush valve for irrigation well
(Wayland, MA)

Clear View sediment filter including "Automatic" flush valve for irrigation well
(Canton, MA)

Pump Screen installed over submersible pump to limit intake of sediment from irrigation well
(Wilmington, MA)

Submersible pump sand separator for sediment isolation and removal from pump intake
(Hingham, MA)

1 micron bag filter for removal of fine sand and silt from irrigation well
(Hopkinton, MA)

Cartridge Filter to remove sediment from well in whole house water system
(Stoughton, MA)

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Iron Stain Prevention Systems

Heavy iron stains on sidewalk at commercial property before removal
(Wilmington, MA)

Some irrigation systems that are run off of well water can produce stains on stone walls, driveways, concrete sidewalks and even on plants, shrubs and trees. The most common cause of staining is from abnormally high levels of iron that are naturally present in some wells. The first step in determining the cause of any staining is by testing the well water. Once the chemical properties of the water has been determined, we can begin to look at the best way of handling it.

Sometimes the long term solution is to install an iron stain prevention system. However, it is important to note that iron stain prevention systems will not remove any *existing stains*. Any pre-existing stains will require our grass and plant friendly ***stain removal services***.

Stain prevention system with 30 gal tank under landscape rock at commercial condominium
(Hingham, MA)

Large "Aeration System" for removal of iron in basement of residence
(North Reading, MA)

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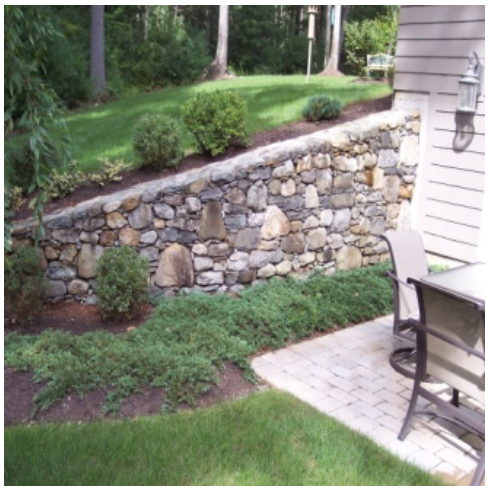
Iron Stain Removal Services

BEFORE

AFTER



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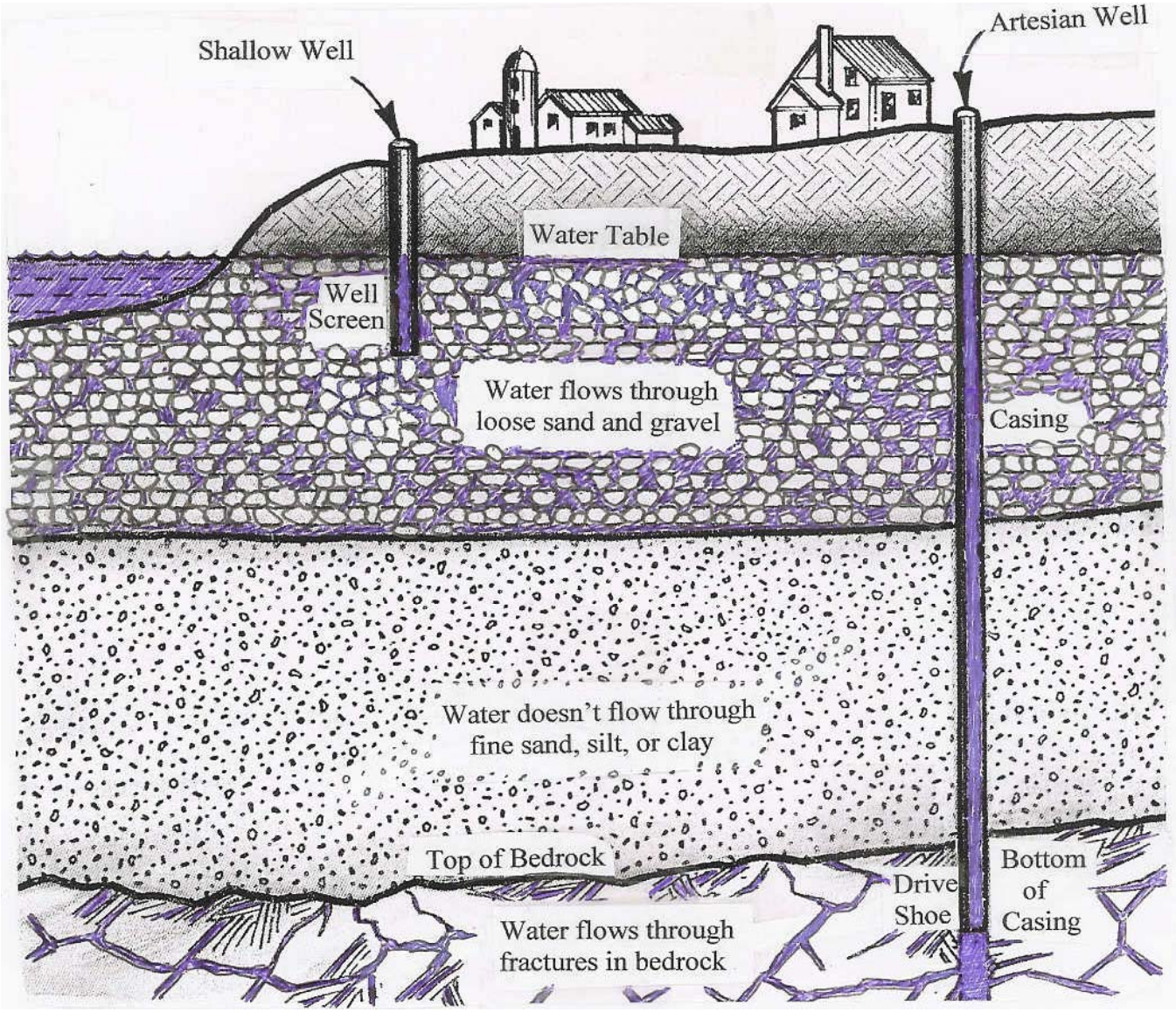
Bedrock "Artesian" vs. Shallow Wells



Shallow Wells rely on water that travels through spaces in loose sands and gravels. Because they are not very deep, they may be fitted with either surface mounted or submersible pumps and motors. Installation methods include driving a well point, wash and drive methods, or by auger. With this type of well, the depth to the water table and the type of soil encountered will determine how much water, if any, can be pumped from the ground.

Artesian Wells are generally deeper and fitted with submersible pumps and motors. With this type of well, a drilling rig is used to bore a hole through the soil and rocks and into solid bedrock that exists beneath your property. Steel casing and drive-shoe are then installed into the surface of the bedrock to provide a watertight seal and prevent soil, rocks and dirty water from entering the borehole. Drilling into the bedrock resumes without casing until the borehole intersects with fractures that exist naturally in the bedrock. This factor determines how much water, if any, can be pumped from the ground.

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How Artesian Wells Work

To understand how bedrock wells work, imagine you have 2 - 5 gallon buckets and 2 large rocks. In each bucket, you place one of the rocks. One rock is solid, with no cracks or fractures in it. The other rock has several fractures running through it. Each bucket is then filled to the top with water. Imagine if we drilled a small hole a couple inches into the top of each rock. Imagine we then insert a straw through the water, into each boulder to the bottom of each hole we drilled, and created a watertight seal between the inside of the rock and the outside of the straw.

Would we be able to draw up any water through the straw from the rocks? Obviously, the rock with no cracks in it would have no water in it, right? In the other bucket, the rock with the fractures running through it would contain water, but only in its cracks. But because the straw seals off cracks as it passes through each one, no water would be able to flow into the straw from a crack. Any water that moves through these cracks will flow around the straw, not into it. If we were able forced the straw down deeper through the middle to near the bottom of this same rock, no water could be drawn from the rock. That is unless the tip of the inserted end of the straw somehow ended up on a crack and the chances of that are remote. So how do we get water from the rocks? The solid rock, because it has no cracks will never allow water to flow freely through it. The other rock, however has plenty of cracks and therefore allows water to flow through it. We just need to get at it.

Now imagine if we left the straw in place just a couple inches in the fractured rock. Then we took a slightly narrower, but much longer drill bit and inserted it inside the straw down to the rock below. Then we started drilling. Because the rock is hard, the hole drilled through it will stay open as the drill bit travels through. As the drill bit eventually passes small cracks in the fractured rock, water would begin to flow into the drilled hole. If we pulled out the drill bit and watched, what would happen? We would see water flowing from the cracks that were intersected by the drill bit. The flowing water would begin to fill up the drilled hole.

The water level in the drilled hole would continue to rise, past the bottom tip of the straw and up to the same level as the water in the bucket. This occurs because the water in the submerged rock is under *hydrostatic pressure.* Hydrostatic pressure (psi) is created by the weight of the water above the fracture and is the force that pushes the water through the fracture into the drilled hole and up to the same level as the water surrounding the rock. Anyone who has been more than a few feet below the surface of water has felt it.

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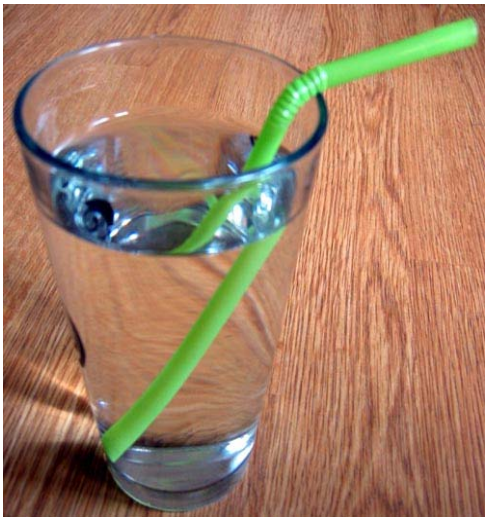
Recovery Rate in Artesian Wells



Recovery rate is a measurement in gallons per minute (gpm) of how quickly the well re-fills itself after being pumped down from its "normal" (static) level. A way to see it is to place one end of a clear straw into a glass of water while holding a fingertip firmly onto the other end so that no air can escape. Now push the straw deeper into the glass. As you do this you may feel a slight increase in pressure on your fingertip. As you continue to push the straw deeper to the bottom of the glass, as long as you keep your fingertip firmly on the other end, the pressure against your fingertip will increase as water tries to rush up the straw, but is held down by the air being compressed inside the straw. As soon as you take your fingertip off the end and the air pressure is released, you will see the water flow up the straw.

Intuitively, we know that it will stop when it reaches the same level (static level) as the water on the outside of the straw. However, if you watched carefully, you will notice that the level of the water in the straw does not rise at the same rate.

You can see the water rush up the straw quickly as you first remove your finger, then slow down as the water rises inside the straw and approaches the level of the water inside the glass. *The flow rate visibly decreases as the straw fills up with water.* This is due to the increasing weight of the water *inside* the straw as it rises. As more water flows in, the weight of the water inside the straw increases and is pushing down on the water that's flowing *into* the straw. This is why the rate of flow slows down as the straw fills up with water. When the water level in the straw reaches the same level as the water outside the straw (state of equilibrium) the water stops flowing. This type of water flow, to a lever higher than its original source is called *artesian*. Since the flow of water from most bedrock wells behaves in precisely this same manner, the term *artesian well* has become synonymous with bedrock wells.

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Submersible Pump Systems

Submersible Pump Systems may be operated ***"tankless"*** or ***"pressurized"***. A tankless system utilizes a pump start relay, float switch or other control device wired to your irrigation system, to turn on and off your pump. A pressurized system utilizes a pressurized tank and switch that turns the pump on and off based on the pressure in the system.

- **3"-6" Professional Grade submersible pumps and motors**
- **Pressure regulating valves**
- **Single or double jacketed electric cable**
- **Poly, PVC or galvanized drop pipe**
- **Torque arrestors, cable guides, pitless adapter**
- **Watertight and vented 4"-8" well caps and seals**
- **Bleed-back/winterizing valves and hose bibs**
- **Flow inducer and pump intake sediment screens**
- **Optional five (5) year or *Lifetime Warranties***
- **Annual Service Contracts & Preventative Maintenance Plans**

Submersible pump & motor size needed to run average residential sprinkler system at 10-12 gallons per minute (gpm) & 40-60 psi at various well recovery depths

Well Depth	10 gpm Recovery Depth	HP Pump System
50'	5' – 45'	1/3 hp – 1/2 hp
100'	50' – 80'	1/2 hp – 3/4 hp
200'	100' – 180'	3/4 hp – 1 hp
300'	200' – 280'	1 hp – 1 1/2 hp
400'	300' – 380'	1 1/2 hp
500'	400' – 480'	1 1/2 hp – 2 hp

The final pump design (make, model, motor size & rating) recommended will be based on many variables, including but not limited to the depth and yield of the well, distance to the power source, the existing or proposed irrigation design and personal preferences you may have.

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How Point Wells and Gravel Wells Work

This simple demonstration helps explain how groundwater flows through different soil types and can be used to help understand the cause of localized flooding, wet basements, and even how shallow wells work.

To understand how groundwater flows from the ground and into point wells and gravel well (shallow wells), imagine you have a 5 gallon bucket. Now, imagine you fill it a third of the way with clay. Next, fill it another third of the way with silty, fine (like the beach) sand. Lastly, fill the bucket to the top with gravel and coarse sand. Now we have a bucket with three distinct layers of different soil types. Now attempt to fill the bucket with water by repeatedly dumping cupfuls of water into it. As you can imagine, the water will easily flow through the first layer of soil (the coarse sand and gravel). The water, when it reaches the second layer (the fine sand) will slow down, maybe even create a temporary puddle on the top of its layer that will disappear gradually as the water continues to seep downward.

When the water reaches the top of the last layer (the clay) it will stop flowing down and just sit there and on top of the clay. Eventually, some of the water will be absorbed by the clay while the rest sits on top. As we continue to dump water into the bucket, its level rises above the clay layer, slowly filling the layer of fine sand with water and pushing the air out at the same time. This process speeds up through the top layer of coarse sand and gravel until the bucket is full of only water and soil, as the air spaces between the grains of soil has been pushed out and replaced with water. Each layer of soil is now *saturated.*

Attempting to install a point well or gravel well is like putting a long straw into each layer of soil and trying to suck the water out. Intuitively, you can imagine how it can be done easily in a saturated layer of coarse sand and gravel.

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Shallow Well Jet Pump Systems

Our Shallow Well Jet Pump Systems utilize a pressurized tank and switch that turns the pump on and off automatically whenever you need water. In addition to feeding water to an underground irrigation system, an attached hose spigot will allow you to use the well water for hand watering flowers/gardens, washing cars, filling a pool and hosing off driveways, decks, lawn furniture, etc.

A typical Shallow Well Jet Pump System includes:

- Professional Grade Pump
- Pressure Tank
- Check Valve
- Pressure Gauge
- Isolation Valve for Irrigation
- Hose Spigot
- 110v or 220v Electrical Plug
- Quick Winterizing Disconnects
- Misc. Brass Fittings
- Artificial Rock Cover (optional)
- Sediment Filter (optional)

Shallow Well Pump Performance Ratings (Goulds)

HP/Model	1/2 HP – J5S					1/2 HP – J5SH						3/4 HP – J10S					1 HP – J10S					1 1/2 HP – J15S				
Nozzle	AN017					AN019						AN018					AN018					AN022				
Venturi	AD3332					AD3328						AD3336					AD3339					AD3342				
	Discharge Pressure - PSI					Discharge Pressure – PSI						Discharge Pressure – PSI					Discharge Pressure – PSI					Discharge Pressure - PSI				
Total Suction Lift (feet)	20	30	40	50	Max. Shut off (PSI)	20	30	40	50	60	Max. Shut off (PSI)	30	40	50	60	Max. Shut off (PSI)	30	40	50	60	Max. Shut off (PSI)	30	40	50	60	Max. Shut off (PSI)
	Gallons Per Minute					Gallons Per Minute						Gallons Per Minute					Gallons Per Minute					Gallons Per Minute				
5	17.5	16.5	10.2	5.0	63	11.5	11.3	11.0	7.7	4.8	83	21.3	18.3	12.5	6.6	70	24.8	24.4	16.6	9.9	74	26.6	26.3	25.0	15.6	80
10	15.7	14.4	9.2	4.3	61	10.3	10.0	9.6	7.0	4.2	81	18.8	17.3	11.3	5.0	68	22.9	22.2	15.8	8.6	72	24.7	24.3	22.6	13.9	77
15	13.7	12.5	8.0	3.6	59	8.8	8.6	8.3	6.3	3.7	79	16.4	15.5	9.6	3.7	66	19.8	19.5	13.8	6.9	70	21.6	21.5	20.4	12.9	75
20	11.5	10.4	7.1	2.3	57	7.0	7.0	6.8	5.8	3.2	76	13.6	13.2	8.3	2.0	63	16.6	16.6	12.2	5.6	67	18.1	18.0	17.6	12.0	73
25	8.7	8.6	6.2	1.3	54	5.3	5.2	5.2	5.0	2.8	73	10.0	9.9	6.4	1.0	59	12.5	12.4	10.4	3.6	65	14.0	14.0	14.0	10.1	71

The final pump design (make, model, motor size & rating) recommended will be based on many variables, including but not limited to the depth and yield of the well, distance to the power source, the existing or proposed irrigation design and personal preferences you may have.

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Zonefracturing


Constant Pressure Systems


Filtration Systems


Hydrofracturing

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