



## TOWN OF CARLISLE WATER SUPPLY REGULATIONS Effective March 1, 2026

### PURPOSE

All premises intended for human habitation, occupancy, or use must be provided with an adequate supply of potable water.<sup>1</sup>

These regulations are intended to protect the public health and general welfare by ensuring that private wells in the Town of Carlisle are constructed, developed, maintained, used and decommissioned in a manner which will protect the supply and quality of the water derived from private wells. These regulations have been adopted because Carlisle has no municipal water supply, but rather all residences, business and government users rely exclusively on individual, on-site wells for drinking water and other uses.

### AUTHORITY

These regulations are adopted by the *Town of Carlisle* Board of Health, pursuant to its authority under Massachusetts General Laws, Chapter 111, section 31. These regulations supersede all previous Regulations for Private Wells adopted by the Board of Health.

These regulations are modeled after the MA DEP Private Well Guidelines, May 2024<sup>2</sup> which provide additional guidance for the construction of a private well.

### DEFINITIONS

Abandoned Water Well: A well that meets any of the following criteria; (1) construction was terminated prior to completion of the well, (2) the well owner has notified the local Board of Health that use of the well has been permanently discontinued, (3) the well has been out of service for at least three years, (4) the well is a potential hazard to public health or safety and the situation cannot be corrected, (5) the well is in such a state of disrepair that its continued use is impractical, or (6) the well has the potential for transmitting contaminants from the land surface into an aquifer or from one aquifer to another and the situation cannot be corrected.

Agent: Any person designated and authorized by the Board to implement, in whole or part, these regulations. To the extent provided by the Board, the agent shall have all the authority of the Board and shall be directly responsible to the Board and under its direction and control.

Alteration: Change the structural or hydraulic characteristics of a well including but

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<sup>1</sup> Uniform State Plumbing Code, 248 CMR 10.00 – Principle No. 1

<sup>2</sup> <https://www.mass.gov/doc/private-well-guidelines>

not limited to deepening, decommissioning, performing Well Yield Enhancement, or performing casing extension, replacement, perforation or repair.

Applicant: Any person who applies to construct a private well.

Aquifer: A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian Aquifer: An aquifer that is bound above and below by impermeable material or materials of distinctly lower permeability than the aquifer itself. The water in an aquifer confined in this manner will rise in a drilled hole or well casing above the point of initial penetration (above the bottom of the confining, or impermeable, layer overlying the aquifer).

Bentonite: A mixture of swelling clay minerals containing at least eighty-five percent of mineral montmorillonite (predominantly sodium montmorillonite) which meets the specifications of the most recent revision of API Standard 13A.

Bentonite Grout: A mixture of bentonite (API Standard 13A) and water in a ratio of not less than one pound of bentonite per gallon of water.

Board: The Board of Health of *Carlisle*, Massachusetts or its authorized agent.

Business of Well Drilling: Performing for commercial purposes, the activity of Drilling or Altering a Well.

Casing: Impervious durable pipe placed in a boring to prevent the walls from caving and to serve as a vertical conduit for water, other fluids, or gases in a well.

Certified Laboratory: A laboratory certified by the Department for the analysis of drinking water and required water quality analytes. Provisional certification is acceptable.

Certified Company: A person authorized by nontransferable Certification with the Department, under 310 CMR 46.00, to engage in the business of Well Drilling and Alteration, determining Well Yield and Pump Installation.

Certified Individual: An individual authorized by nontransferable Certification with the Department to Drill or Alter Wells, as specified in 310 CMR 46.03(3).

Concrete: A mixture consisting of Portland cement (ASTM Standard C150, type I or API Standard 10, Class A), sand, gravel, and water in a proportion of not more than five parts of sand plus gravel to one part cement, by volume, and not more than six gallons of water. One part cement, two parts sand, and three parts gravel are commonly used with up to six gallons of water.

Cross Connection      Any physical connection or arrangement between two otherwise separate

pipng systems, one of which contains potable water and the other water of unknown or questionable safety, whereby water may flow from one system to the other, the direction of flow depending on the pressure differential between the two systems.

Department: Massachusetts Department of Environmental Protection.

Drinking Water: Water used for human consumption.

Dwelling Unit - means a structure that is used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that is occupied for living purposes.<sup>3</sup>

- Single Dwelling Unit<sup>4</sup> - means a room or group of rooms used or intended for use by an individual, family, or household for living, sleeping, cooking, and eating, and other areas of which the occupant has exclusive use.
- Multi-Dwelling Unit- means more than one dwelling unit in a single building or several buildings on the same lot and includes condominiums and accessory apartments.

Forms: The following required forms are available at the Board of Health office: Well Construction Permit and Water Supply Certificate Application. (change our form names or form names here)

Geothermal Well: A well intended to supply a Ground Source Heat Pump system.

Install a Pump or Pump Installation: Install, replace, or alter a pump or any component thereof for a well.

Irrigation Well: A well used for the sole purpose of watering or irrigation. The well shall not be connected at any time to a dwelling or a building unless it meets the requirements of a Private Drinking Water Well and has the Board's written approval.

Hydrofracturing: A process whereby water is pumped under high pressure into a well to fracture the surrounding rock thereby increasing the well yield.

Neat Cement Grout: A mixture consisting of one bag (94 pounds) of Portland cement (ASTM Standard C 150, Type I or API Standard 10, Class A) to not more than six gallons of clean water. Bentonite (API Standard 13A), up to two percent by weight of cement, shall be added to reduce shrinkage. Other additives, as described in ASTM Standard C494, may be used to increase fluidity and/or control setting time.

Person: Any agency or political subdivision of the federal government or the commonwealth, any state, public or private corporation or authority, individual, trust, firm, joint stock company, partnership, association, or other entity, and any officer,

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<sup>3</sup> 780 CMR 9<sup>th</sup> Edition (State Building Code)

<sup>4</sup> 310 CMR 15.203(2): Title 5 provides design flows for Single-Family (one) and a Multi-Family (more than one) Residences

employee or agent of said person, and any group of said persons.

Private Drinking Water Well: Any Private Well that is used for the purpose of supplying water used for human consumption.

Private Water Supply: A system that provides water for human consumption, if such system has less than fifteen (15) service connections and either (1) serves less than twenty-five individuals or (2) serves an average of twenty-five (25) or more individuals for less than sixty (60) days of the year.

Private Well: Any hole or shaft drilled into the ground or inject or withdraw water, other fluids, or gasses, monitor soil gasses, monitor groundwater levels or water quality, transfer heat, or provide cathodic protection that is not regulated as a public water supply under 310 CMR 22.00.

The Board does not recommend the use of dug or shallow wells to supply water for human consumption because they are vulnerable to contamination, and fluctuations in the level of the water table may cause them to go dry.

Wells installed for non-human consumption purposes such as irrigation wells, geothermal wells and fire protection wells require a well construction permit and a well location plan.

Public Water System: A system for the provision to the public of piped water for human consumption, if such system has at least fifteen (15) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such a system and used primarily in connection with such systems, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public water system is either a “community water system” or a “non-community water system.”

Private Well Yield: The gallons per minute (gpm) of water that can flow or be withdrawn from a well, at a sustained rate after a minimum of 2 hours if the water level has stabilized (water level does not fluctuate more than 3 inches) for the last 30 minutes of the test.

Pumping (Aquifer) Test: A procedure used to determine the characteristics of a well and adjacent aquifer by installing and operating a pump.

Pump or Pump System: The mechanical equipment or devices used to remove water from a well. For a well with a pitless adapter, the pump system includes all piping and the pitless adapter. For a well with a submersible pump and without a pitless adapter, the pump system includes all piping up to the metering device, or if none, then up to the main control valve inside the foundation of the structure served by the well. For a well without a submersible pump and without a pitless adapter, the pump system includes all piping up to and including the wellhead. For installation or repair purposes, the pump or pump system includes all piping up to the metering device or, if none, then up to the main control valve inside the foundation of the structure served by the well.

Registered Well Driller: Any person registered with the Division of Water Supply of the Department of Conservation and Recreation Well Drillers Registration Program to dig or drill wells in the Commonwealth of Massachusetts.

Replace a Pump or Pump Replacement: Install a Pump of the same horsepower as the Pump that was last removed, install any component of a Pump with a component of the same size and capacity as the one that was last removed. Also, removal and replacement of a pump or any component thereof.

Sand Cement Grout: A mixture consisting of Portland cement (ASTM Standard C150, Type I or API Standard 10, Class A), sand, and water in the proportion of one part cement to three or four parts sand, by volume, and not more than six gallons of water per bag (94 pounds) of cement. Up to five percent, by weight of bentonite (API Standard 13A) shall be added to reduce shrinkage.

Static Water Level: The distance from established ground surface to the stabilized water level in a well which is neither being pumped nor under the influence of pumping.

Structure: A combination of materials assembled at a fixed location to give-support or shelter, such as a building, framework, retaining wall, fence, or the like.

Water Used for Human Consumption: Water that is used for drinking, bathing, showering, cooking, dishwashing, or maintaining oral hygiene.

Well: Any hole or shaft drilled into the ground to inject or withdraw water, other fluids, or gases, monitor soil gasses, monitor groundwater levels or water quality, transfer heat, or provide cathodic protection.

Wellhead: The above ground component or structure built over a well.

Well Yield Enhancement: A process to increase the production of water and yield by using water under pressure, or another substance the Department has approved for use in the process, to clean out existing fractures to allow water to flow into the well from other areas.

## **PERMITS AND REPORTS**

### **Registration of Drillers Requirement**

All wells, including non-potable wells such as irrigation, geothermal and monitoring wells, and all well drilling activities – such as installation, deepening, decommissioning, and hydrofracturing – must be performed by a Massachusetts Certified Well Driller in accordance with 310 CMR 46.00. A permit from the Board of Health is required prior to the installation or modification of a private well.

## **Building Permit Requirement**

Pursuant to MGL Chapter 40, Section 54, which governs the powers and duties of cities and towns, "no building permit shall be issued for the construction of a building which would necessitate the use of water therein, unless a supply of water is available" from either a public or a private water system. A Well Completion Report approved by the Board of Health which includes a satisfactory Water Quality Test is required for a Building Permit.

## **Well Construction Requirements**

### **New and/or Replacement Wells**

A well construction permit application shall be filed by the Certified Well Driller installing the well. Each permit application to construct a well shall include the following:

- 1) the property owner's name and address
- 2) the well driller's name and proof of valid Massachusetts certification
- 3) a plan with a specified scale, signed by a registered surveyor or engineer, showing the location of the proposed well in relation to existing or proposed above or below ground structures. Copies of existing plans on file with the Carlisle Board of Health are acceptable at the discretion of the Agent of the Carlisle Board of Health.
- 4) a description of prior and current land uses within two hundred (200) feet of the proposed well location, which represents a potential source of contamination, including but not limited to the following:
  - a) existing and proposed structures
  - b) subsurface sewage disposal systems
  - c) subsurface fuel storage tanks
  - d) public and private ways
  - e) utility rights-of-way
  - f) any other potential sources of pollution, such as hazardous waste sites, paddocks, barns and stables, or other areas dedicated to the raising of livestock.
  - g) location of abutter's wells within two hundred (200) feet of the proposed well location.
  - h) proof that the owner of any property abutting the applicant's property has been notified of the applicant's intention to install a well if less than 100' from the property line.
- 5) Permit Fee. See current Fee Schedule.

The permit shall be on site at all times that work is taking place. Each permit shall expire three years from the date of issuance unless revoked for cause or extended. Permits may be extended for one additional six (6) month period provided that a written explanation for the request is received by the Board prior to the expiration date.

The Board may choose to require additional information pertaining to the location such as waste sites, underground storage tanks, agricultural land uses, and/or utility rights-of-way that are within 500-1000 feet of the well site. Applicants are required to obtain plumbing and/or building permits as appropriate. Copies of the permits may be required at the option of the Board.

Well construction permits are transferable within one year of initial application and upon appropriate written notice from the new Certified Well Driller.

### DEP Well Completion Report

Within 30 days after completion of any well (productive or nonproductive), or after plugging of an abandoned well, a certified well driller shall submit to the Drinking Water Program, a DEP Well Completion Report electronically through the MassDEP electronic filing system with a copy to the local Board of Health. Well completion reports must be submitted for all activities covered under 310 CMR 46 including well drilling, decommissioning, Ground Source Heat Pump wells (“geothermal”), repairs, deepening, yield enhancement, pump installation and replacement.

A Well Completion Report shall include:

- 1) well address and the name and address of the owner of the well
- 2) the latitude and longitude in decimal degrees
- 3) work performed (e.g., new installation, repair, abandonment, etc.)
- 4) well type (e.g., domestic, irrigation, geothermal, etc.)
- 5) drilling method
- 6) drilling log describing the material penetrated, including:
  - a. well depth
  - b. depth to refusal or bedrock
  - c. bedrock type
- 7) date drilling completed
- 8) casing type, depths, thickness and diameter
- 9) protective well seal
- 10) well screen type, slot size, diameter and depths at which screen is set
- 11) description of filter pack and grouting materials used
- 12) method of plugging an abandoned well
- 13) pump test results including:
  - a. method
  - b. date and length of time (in hours and minutes) well was tested
  - c. drawdown and recovery
  - d. well yield
- 14) static water level
- 15) pump description, depth and installer
- 16) water bearing zones

### Water Supply Certificate

The issuance of a Water Supply Certificate (need to create) by the Board of Health certifies that a newly installed private well may be used as a drinking water supply and has sufficient capacity to meet peak demand flows. A Certificate is required prior to the issuance of a building permit for:

- 1) the construction of a new dwelling
- 2) the renovation, modification or conversion of an existing structure which results in an increase in septic capacity as defined in Title 5<sup>5</sup>

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<sup>5</sup> 310 CMR15.204 Increase in Design Flow to System: No person shall increase the actual or design flow to any cesspool or to any other system above the existing approved capacity, or change the type of establishment of a

- 3) the creation of a multi-dwelling unit on the same lot.

A DEP Well Completion Report is required for installing monitoring, irrigation or geothermal wells, but a Water Supply Certificate is not required.

The following shall be submitted to the Board of Health to obtain a Water Supply Certificate:

- 1) completed Well Construction Permit
- 2) a copy of the Well Completion Report as required by MassDEP Well Driller Program regulations (310 CMR 46.00)
- 3) a copy of the Pumping Test Report required of these regulations
- 4) a copy of the Water Quality Report required of these regulations.

Upon the receipt and review of the above documents, the Board (or its Agent) shall make a final decision on the application for a Water Supply Certificate. A final decision shall be in writing and shall comprise one of the following actions:

- 1) Issue a Water Supply Certificate.
- 2) Deny the applicant a Water Supply Certificate and specify the reasons for the denial.
- 3) Issue a conditional Water Supply Certificate with those conditions, which the Board deems necessary to ensure fitness, purity and quantity of the water, derived from that private well. These conditions may include, but not be limited to, requiring treatment and/or additional testing of the water.

### Geothermal Wells

Open Loop Geothermal Wells are not allowed for new or upgraded ground source heat pump (GSHP) systems. An Open Loop well serves as a supply well for a GSHP by withdrawing groundwater and discharging it back to an aquifer. Open loop wells introduce the potential for damaging an aquifer because there is no separation between process water and contaminants that may be introduced during operation, repair or maintenance of the GSHP. Because Carlisle has no municipal water supply, all residential, business and government users rely exclusively on on-site wells for drinking water and any contamination to an aquifer may have widespread impact on availability of potable water.

Closed Loop Geothermal Wells require a Board of Health permit. Geothermal wells developed as part of a closed loop ground-source heat pump system shall be developed and constructed in accordance with the most recent version of the Massachusetts Department of Environmental Protection *Guidelines for Ground Source Heat Pump Wells*<sup>6</sup>.

Irrigation Wells require a Board of Health permit. The Carlisle Board of Health (BOH) has established as its policy an allowed usage of 15% of the estimated average recharge (water replenishment for the property). This is designed to ensure that an adequate supply of clean,

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facility served by a cesspool, unless the cesspool or system is upgraded first. (fix footnote number)

<sup>6</sup> <https://www.mass.gov/doc/guidelines-for-ground-source-heat-pump-wells>

drinkable water will remain available, allowing for residential use, evaporation, transpiration, and runoff. This policy applies to all new or modified irrigation systems in the Town of Carlisle.

Irrigation wells shall be deep wells (bedrock; one-hundred-foot minimum deep well). Irrigation wells must be posted with a permanently fixed sign located at the pump outlet. The sign must be constructed of a sturdy weather resistant material, either plastic or non-corrosive metal, the sign must be at least 10 inches by 10 inches with legible writing, the sign must state: “ This well is permitted for irrigation use only, not for human consumption.” Conversion of a pre-existing water supply well to an irrigation well requires a notice to the Board of Health. A cross connection to the drinking water supply is not allowed.

Monitoring wells shall be constructed in accordance with the most recent version of *Standard References for Monitoring Wells*<sup>7</sup> available from the Mass. DEP.

### **GENERAL WELL DESIGN AND CONSTRUCTION**

#### Well Location and Use Requirements

In locating a well, the applicant shall identify all potential sources of contamination which exist or are proposed within two hundred (200) feet of the site. When possible, the well shall be located upgradient of all potential sources of contamination and shall be as far removed from potential sources of contamination as possible, given the layout of the premises.

Each private well shall be accessible for repair, maintenance, testing, and inspection. The well shall be completed in a water bearing formation that will produce the required quantity of water under normal operating conditions.

Each private well shall be located at a minimum of:

<b>Land Use</b>	<b>Setback in feet</b>
Property Line	25
Public/Private Roadway	25
Right of Way	15
Sewer line/septic tank*	50
Leaching Field or drywell*	100
Stable, barnyard, manure storage	100
Underground fuel storage or pesticide tank	250
Aboveground Petroleum storage tank	25
Surface water, wetlands**	25
100-year floodplain elevation	Above
Structure with a foundation	20

\* Setbacks required by Title 5.

\*\* Referral of well location to Conservation Commission for approval required if proposed within 100 feet of surface water regulated under the Wetlands Protection Act.

<sup>7</sup> <https://www.mass.gov/doc/standard-references-for-monitoring-wells-small-diameter-driven-well-supplement-0/download>

Irrigation Wells: 10 feet from property line; 25 feet from wetland; 50 feet from septic tank/pump chamber; 50 feet from soil absorption system; 20 feet from structure with foundation.

Geothermal Wells: 10 feet from property line; 25 feet from public or private way; 25 feet from wetlands; 50 feet from septic tank/pump chamber; 50 feet from soil absorption system; 20' from structure with foundation.

The centerline of a well, if extended vertically, shall clear any projection from an adjacent structure by at least 5 feet.

When possible, private water systems shall be located in areas above the 100-year floodplain. The Conservation Commission must review and approve any work in the Buffer Zone.

A suction line or well shall be located at a minimum of:

- 1) ten (10) feet from a building sewer constructed of durable corrosion resistant material with watertight joints, or fifty (50) feet from a building sewer constructed of any other type of pipe;
- 2) fifty (50) feet from a septic tank and/or pump chamber; one-hundred (100) feet from any subsurface sewage disposal areas less than 2000 GPD, and
- 3) one-hundred fifty (150) feet from systems 2000 GPD or greater.<sup>8</sup>

Setbacks must be maintained from already permitted but not constructed septic tanks, pump chamber, and/or leaching field on an adjacent property.

Water supply lines shall be installed at least ten (10) feet from and eighteen (18) inches above any sewer line. Whenever water supply lines must cross sewer lines, both pipes shall be constructed of class 150 pressure pipe and shall be pressure tested to assure water-tightness.

The Board reserves the right to impose minimum lateral distance requirements from other potential sources of contamination not listed above. All such special well location requirements shall be listed, in writing, as a condition of the well construction permit.

No private well, or its associated distribution system, shall be directly connected to either the distribution system of a public water supply system or any type of waste distribution.

Any work involving the connection of the private well to the distribution system of the residence must conform to the local plumbing code. All electrical connections between the well and the pump controls and all piping between the well and the storage and/or pressure tank in the house must be made by a pump installer or certified well driller, including the installation of the pump and appurtenance(s) in the well or house.

A physical connection is not permitted between a water supply, which satisfies the requirements of these regulations, and another water supply that does not meet the requirements of these regulations without prior approval of the Board.

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<sup>8</sup> 310 CMR 15.211 Distances (Title 5)

### Well Design and Construction Requirements

Consolidated wells are wells drilled in bedrock. They may be either artesian or non-artesian wells.

- 1) The following construction method is recommended for bedrock wells:
  - a. Extend an oversized drillhole a minimum of ten (10) feet into competent bedrock.
  - b. Install an unperforated, watertight protective casing with a drive shoe, a minimum of ten (10) feet into competent unfractured bedrock.
  - c. Seal the annular space between the casing and the drillhole with neat cement grout, sand cement grout, or bentonite grout applied from the bottom of the drillhole upward to a depth which will adequately prevent subsurface leakage or surface contamination.
  - d. After the grout has set, extend the drillhole into the water bearing zone.
- 2) All private wells shall be designed and constructed such that:
  - a. The materials used for the permanent construction are durable in the specific hydrogeologic environment that occurs at the well site.
  - b. No unsealed opening is being left around the well that could conduct surface water or contaminated groundwater vertically to the intake portion of the well or transfer water from one formation to another.
  - c. An artesian well is drilled through an impermeable stratum into an artesian aquifer. The water in the well will seek its own static water level based on the elevation of the recharge area. If a flowing artesian well is encountered, the wellhead should be capped or piped off to a discharge area. The discharge pipe should be air gapped so there is no direct connection between the discharge pipe, the receiving pipe, the receiving discharge area, or any potential source of contamination.
- 3) Permanent construction materials shall not leach or contribute toxic substances, taste, odors, or bacterial contamination to the water in the well.
  - a. The driller shall operate all equipment according to generally accepted standards in the industry and shall take appropriate precautions to prevent damage, injury or other loss to persons and property at the drilling site.
- 4) Well construction design shall ensure that surface water does not enter the well through the opening or by seepage through the ground surface. Construction site waste and materials shall be disposed of in such a way as to avoid contamination of the well, any surface water or the aquifer.
- 5) At all times during construction when the well is not being worked on, the top shall be securely covered by a temporary cap. The temporary cap shall protect the well from entry of airborne or surface contamination or water. It shall be

sufficiently secure to protect the well from vandalism. It shall be in place overnight during construction, during any lapse in construction, and between the completion of the well and installation of the permanent pumping system.

- 6) All water used for drilling, well development, or to mix a drilling fluid shall be obtained from a source, which will not result in contamination of the well or the water bearing zones penetrated by the well. Water from wetlands, swamps, ponds and other similar surface features shall not be used.
- 7) Water shall be conveyed in clear sanitary containers or water lines and shall be chlorinated to an initial concentration between 50 milligrams per liter (mg/L) and 100 mg/L. All drilling equipment, including pumps and down hole tools, shall be cleaned and disinfected prior to drilling each new well or test hole.
- 8) All drilling fluids shall be nontoxic. Drilling fluid additives shall be stored in clean containers and shall be free of material that may adversely affect the well, the aquifer, or the quality of the water to be pumped from the well. Surfactants shall be biodegradable. The use of biodegradable organic polymers shall, when possible, be avoided.
- 9) All wells, including those that have been hydrofractured, shall be developed in order to remove fine materials introduced into the pore spaces or fractures during construction. One or more of the following methods shall be used for development: over pumping, backwashing, surging, jetting, air-lift pumping.
- 10) The completed well shall be sufficiently straight so that there will be no interference with installation, alignment, operation or future removal of the permanent well pump.
- 11) The well driller shall take all reasonable precautions to prevent inadvertent cross contamination of a drinking water well via his tools and equipment. If the same rig or tools are moved from a monitoring well site to a potable well site, the driller shall be especially cognizant of the potential for contamination.

#### Well Casing

- 1) Private water supply wells shall be constructed using either steel or thermoplastic well casing. The casing shall be of adequate strength and durability to withstand anticipated formation and hydrostatic pressures, the forces imposed on it during installation, and the corrosive effects of the local hydrogeologic environment.
- 2) Steel casing shall be used with cable tool drilling or when the casing is installed in an open drill hole in which formation materials may suddenly collapse against the casing.
- 3) All casing used in the construction of private wells shall be free of pits, breaks, gouges, deep scratches and other defects. If previously used casing is installed, it shall be decontaminated and disinfected prior to installation.

- 4) Installation of water well casing shall be done in a manner that does not alter the shape, size, or strength of the casing and does not damage any of the joints or couplings connecting sections of the casing. A standard drive shoe shall be used when casing is installed. The drive shoe shall be either welded or threaded to the lower end of the string of casing and shall have a beveled metal cutting edge forged, cast, or fabricated for this specific purpose.
- 5) Upon completion of the installation procedure, the entire length of the casing above the intake shall be watertight.
- 6) Well casing shall not be cut off below the land surface unless a pitless adapter or a pitless unit is installed or an abandoned well is being permanently plugged. Well casing terminating above-grade shall extend at least twelve (12) inches above the predetermined ground surface at the wellhead except when the well is located in a floodplain. When a well is located in a floodplain, the well casing shall extend at least two (2) feet above the level of the highest recorded flood. The top of the well casing shall be reasonably smooth and level.

#### Steel Casing

- 1) Steel casing shall consist of schedule 40 pipe that complies with materials standards approved by the American Water Works Association.
- 2) Segments of steel casing shall be coupled by using threaded casing, coupling, or by welding the joint. Recessed or reamed and drifted couplings shall be used on threaded casing and no threads shall be left exposed once the joint is completed. When welded casing joints are used, they shall conform to the most recent revision of AWWA C206, "Standard for Field Welding of Steel Water Pipe." The weld shall be at least as thick as the wall thickness of the well casing and shall be fully penetrating. When completed, a welded casing joint shall have a tensile strength equal to or greater than that of the casing.

#### Thermoplastic Casing

- 1) Thermoplastic casing used in the construction of private water supply wells shall be capable of withstanding pressures equal to or greater than 200 pounds per square inch and shall conform to the most recent revision of ASTM Standard F480, "Specification for Thermoplastic Water Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR)." In addition, the casing and couplings shall meet the requirements of the most recent revision of National Sanitation Foundation Standard Number 14, entitled "Plastics Piping System Components and Related Materials." Materials complying with Standard Number 14 can be recognized by the marking "NSF-WC."
- 2) Thermoplastic casing shall be stored in such a manner as to prevent deformation,

sagging, or bending. Storage of thermoplastic casing and couplings in direct sunlight shall be avoided. Thermoplastic casing shall be installed only in an oversized drill hole and shall not be driven, pushed, or forced into a formation. Thermoplastic casing shall be joined by mechanical means only. When pulling back then-no plastic well casing to expose a well screen, the force applied shall not exceed the casing weight.

#### Well screen

A well screen is required for all drilled wells that are completed in unconsolidated formations. All well screens shall be of Grade 304 stainless steel. Wells completed in bedrock do not require a screen unless the bedrock formation is brittle in nature or has a potential for collapse. The well screen aperture openings, screen length, and diameter shall be selected so as not to limit the aquifer's water yielding characteristics while preventing access of soil particles that would detract from well efficiency and yield.

#### Grouting and sealing

- 1) Private wells drilled in bedrock shall be grouted from the ground surface or from the bottom of the pitless adaptor (if present) to fifteen (15) feet into competent bedrock. Neat cement grout, sand cement grout, or Bentonite grout shall be used. It shall have a permeability of at least  $1 \times 10^{-7}$  and be emplaced using standard grouting techniques as described in the MassDEP Private Well Guidelines, as amended.
- 2) All wells completed with the casing extending above grade shall have a surface seal designed to eliminate the possibility of surface water flowing down the annular space between the well casing and the surrounding backfilled materials. The surface seal shall extend to a depth below the local frost line.

#### Wellhead completion

- 1) All wells shall be equipped with a sanitary seal or watertight cap designed to prevent surface water and foreign matter from entering the well.
- 2) All wells except flowing artesian and dug wells shall be vented. The opening of the vent pipe shall be covered with a 24-mesh corrosion resistant screen and shall be large enough to prevent water from being drawn into the well through electrical conduits or leaks in the seal around the pump when the pump is turned on. The vent pipe shall terminate in a downward position at or above the top of the casing.
- 3) All connections to a well casing made below ground shall be protected by either a pitless adapter or a pitless unit that complies with the most recent revision of National Sanitation Foundation Standard Number 56, entitled "Pitless Well Adapters."

- 4) Above-grade connections into the top or side of a well casing shall be at least twelve inches above the established ground surface or two (2) feet above the level of the highest known flood, whichever is higher. Above-grade connections shall be sealed so that they are watertight.
- 5) The ground immediately surrounding the well casing shall be sloped downward and away from the well in all directions to eliminate the possibility of surface water ponding.

Disinfection (consolidate some of these items in this section – seems redundant)

- 1) Upon completion of well construction, the well driller shall disinfect the well. If a pump is to be installed immediately upon completion of the well, the pump installer shall disinfect the well and the pumping equipment after the pump has been installed.
- 2) If the pump is not installed upon completion of the well, the pump installer shall, upon installation, disinfect the well and the pumping equipment. The pump installer shall also disinfect the entire water supply system immediately after any maintenance or repair work is done on the pump.
- 3) When a well is disinfected, the initial chlorine concentration shall be 100 mg/L throughout the entire water column.
- 4) For newly constructed or altered wells in which the pump is not immediately installed, the chlorine concentration used to disinfect the well shall be 100 mg/L. Upon installation of the pump, the well, the pumping equipment, and the distribution system, if connected, shall be disinfected with a chlorine concentration of 100 mg/L.
- 5) The disinfectant solution shall remain undisturbed in the well for a minimum of two (2) hours. After all the chlorine has been flushed from the water supply system, a water sample shall be collected and submitted to a Massachusetts certified laboratory. For new wells, the sample shall be tested pursuant to Section VI of these regulations.
- 6) Only certified well drillers are authorized to physically alter or repair a well.
- 7) For wells that have undergone repair, a sample shall be tested for total coliform bacteria and any other parameters deemed appropriate by the Board, prior to being put back in use.

### WATER QUANTITY REQUIREMENTS

A properly constructed private water supply well must have sufficient capacity to provide for anticipated needs. In order to demonstrate the capacity of the well to provide the required volume of water, a pumping test shall be conducted for new construction, replacement wells and increase in Title 5 Design Flow in an existing dwelling or construction of or conversion to a multi-dwelling unit on the property. The applicant shall submit to the Board (or its Agent) for review and approval a Pumping Test Report prior to issuance of a Building Permit.

The Pumping Test Report shall include at a minimum:

- 1) name and address of the well owner
- 2) well location (latitude/longitude in decimal degrees)
- 3) date the pumping test was performed
- 4) depth at which the pump was set for the test
- 5) location of the discharge line
- 6) the static water level immediately before pumping commenced
- 7) the discharge rate and, if applicable, the time the discharge rate changed
- 8) pumping water levels and respective times after pumping commenced
- 9) the maximum drawdown during the test
- 10) the duration of the test, including both:
  - a. the pumping time, and
  - b. the recovery time during which measurements were taken
- 11) recovery water levels and respective times after cessation of pumping
- 12) reference point used for all measurements

The values in the table below give the required peak flow rates for a various number of bedrooms and bathrooms in a dwelling.

Number of bedrooms	Number of bathrooms				
	1	1.5	2	3	4
	Flow rate in gallons per minute (GPM)				
2	5	6	8		
3	7	8	9	10	12
4	8	9	10	12	13
5		11	12	13	15
6			13	15	17
6+	2 gpm additional per bedroom				

**Table 1: Peak flow rates (GPM) for homes based on number of bedrooms and bathrooms**

To determine if the well can provide sufficient water to meet the average household daily demand, the following methodology should be employed:

- a. Estimate Peak Demand in gallons required to meet peak demand period of 1 hour (60 minutes) using Table 1 based on number of bedrooms and bathrooms in the house

**(gpm x 60 minutes = gallons needed for peak demand)**

- b. Estimate volume of water the well can produce in peak demand period of 60 minutes, based on pumping test results

**(Well yield\* in gpm x 60 minutes = gallons produced)**

- c. Estimate the borehole water storage using information obtained from the Well Completion Report and Table 2. To determine the available water in feet, subtract the static water level from the Depth to the pump intake. Multiply the available water in feet times the gallons of water per foot for the well diameter to calculate the number of available gallons held in storage in the borehole (see Table 2 below.)

**(Total depth to pump intake – static water level) x gallons per foot of water = available water from borehole storage)**

Diameter of Well in Inches	Gallons of Water		Diameter of Well in Feet	Gallons of Water Per Foot of Water Depth
	Per Foot of Water Depth	Per 100 Feet of Water Depth		
1.5	0.092	9.2	2	23.5
2	0.163	16.3	3	52.9
3	0.367	36.7	4	94.0
4	0.653	65.3	5	146.9
5	1.020	102.0	6	211.5
6	1.469	146.9	7	287.9
8	2.611	261.1	8	376.0
10	4.080	408.0	9	475.9
12	5.876	587.6	10	587.6

**Table 2: Gallons of Water per Foot of Depth for Various Hole Diameters**

- d) Subtract gallons of water held in borehole storage and total amount the well is capable of producing in 60 minutes from the estimated peak demand to determine if the well is capable of meeting peak demand. If the difference between the two is zero or less, the well is capable of meeting peak demand. If the difference is greater than zero, then additional volume in the form of a storage tank will be required to meet

peak demand.

$$[(a) \text{ Estimated peak demand (gallons)} - (b) \text{ well yield (gallons)} + (c) \text{ borehole storage (gallons)}] = \text{estimated storage requirements}]$$

The pumping test may be performed at whatever rate is desired. Following the pumping test, the water level in the well must be shown to recover to within eighty-five (85) percent of the pre-pumped static water level within a twenty-four (24) hour period. *See Appendix A for Examples*

\*Well yield is the gallons per minute (GPM) of water that can flow or be withdrawn from a well, at a sustained rate after a minimum of 2 hours if the water level has stabilized (water level does not fluctuate more than 3 inches) for the last 30 minutes of the test.

### **Additional Testing Requirements for Multi-Dwelling Units**

Due to seasonal variations in groundwater recharge, pumping tests performed during times of seasonally high ground water may not accurately predict performance during times of reduced water availability. It is recommended that Pumping Tests be performed between June and October for determining if a well will satisfy water demands for Multi-Dwelling Units..

## **WATER QUALITY AND TESTING REQUIREMENTS**

This regulation requires that private drinking water wells meet all current Massachusetts' Primary and Secondary Drinking Water Standards and Guidelines adopted by the MassDEP Office of Research and Standards (ORS). In any case where a private drinking water well does not meet such Standards or Guidelines, it is the responsibility of the well owner to bring the system into compliance with treatment. As it deems necessary for the protection of public health, safety or welfare, the Board may take action, but not limited to, requiring the property owner to provide an alternative source of drinking water.

All water quality analyses should be conducted utilizing methods approved by the U. S. Environmental Protection Agency for analyzing drinking water and done by a MassDEP Certified Laboratory that is certified for the specific analysis required. All water quality analyses for the following categories shall be submitted to the Board of Health.

Newly Constructed Wells: After a private water supply has been completed and disinfected, a raw water sample shall be analyzed for all of the testing parameters in the Table below and submitted to the Board of Health prior to issuance of a building permit or use of the new well.

Transfer of Property: Prior to selling, conveying, or transferring title to real property, the owner shall have tested the raw water of every private drinking water well serving that property according to the Table below. For wells with a treatment system, a sample from a household tap must also be taken to ensure that the system is functioning properly.

Increase in Septic Design Flow Requirements: Prior to renovating or adding to a dwelling that will result in an increase in Design Flow in accordance with 310 CMR 15.204 (Title 5) or the creation of a multi-dwelling unit on the property, the owner shall have tested the raw water of every private drinking water well serving that property according to the Table below prior to the issuance of a building permit. For wells with a treatment system, a sample from a household tap must also be taken to ensure that the system is functioning properly.

<b>TESTING PARAMETERS</b>			
<b>Newly Constructed Wells</b>	<b>Property Transfer</b>	<b>Increase in Habitable Space</b>	<b>Test Valid For</b>
Coliform	Yes	Yes	12 months
Nitrate/Nitrite (total)	Yes	Yes	12 months
Lead	Yes	Yes	12 months
Hardness	Yes	Yes	12 months
Manganese	Yes	Yes	12 months
Copper	Yes	Yes	12 months
Fluoride	Yes	Yes	12 months
Sodium	Yes	Yes	12 months
Chloride	Yes	Yes	12 months
Iron	Yes	Yes	12 months
pH	Yes	Yes	12 months
Arsenic	Yes	Yes	12 months
PFAS 6 (20 ppt)	Yes	Yes	5 years
Gross Alpha*	Yes	Yes	5 years
Radon**	Yes	Yes	5 years

\*If the Gross Alpha screen detects radiation of 15 pCi/L or more, then the water must be analyzed for Uranium concentrations. If the Gross Alpha screen detects radiation of 5 pCi/L or more, then the water must be analyzed for Radium and Uranium concentrations.

\*\*If radon in the well water exceeds the action levels, then the air should be tested. Mitigation shall follow state guidelines.

In addition to the above requirements, for all property located in Residence District A, the Board of Health requires testing for Volatile Organic Compounds including Methyl Tertiary Butyl Ether (MTBE).

The owner of a rental property shall make results of all water quality tests available to all tenants of the property and the Board of Health. In cases where the well water does not meet the water quality standards outlined above, the Board of Health may require the

property owner to provide an alternative approved source of drinking water for the tenants.

In addition, the owner shall give copies of all available water quality test results of which he/she has knowledge (regardless of age of results) for the private well in question to any buyer and/or broker involved in the transfer. In the event that there is no buyer at the time the water is tested, a copy of all water test results must be given by the owner to the buyer before the property is put under agreement.

The Board reserves the right to require retesting of the above parameters, or testing for additional parameters when, in the opinion of the Board, it is necessary due to local conditions or for the protection of public health, safety, welfare and the environment. All costs and laboratory arrangements for the water testing are the responsibility of the applicant.

Following a receipt of the water quality test results, the well owner shall submit a Water Quality Analysis to the Board, which includes:

- 1) a copy of the certified laboratory's test results
- 2) the name and contact information of the individual who performed the sampling
- 3) where in the system the water sample was obtained

### **WELL MAINTENANCE**

All materials and construction practices used in the maintenance, or repair of any well should be the same as those required for the construction of a new well. All maintenance, repair, and reconstruction work to the well should be done only by a MassDEP certified well driller. Upon completion of any alteration of a well, or maintenance or repair work done on a well or its pumping equipment, the contractor should disinfect the well, the pumping equipment and the distribution system before the well is returned to service. Appropriate disinfection procedures are discussed in the section entitled "Disinfection".

- 1) The well owner should be responsible for;
- 2) maintaining the well in a sanitary condition
- 3) maintaining the well in a manner that prevents surface water or contaminants from entering the well
- 4) maintaining the well in a manner that conserves groundwater resources
- 5) maintaining the well so that it is accessible for rehabilitation and repairs
- 6) ensuring that an abandoned well is properly plugged

### **DECOMMISSIONING REQUIREMENTS**

Abandoned wells, test holes, and borings shall be decommissioned so as to prevent the well, including the annular space outside the casing, from being a channel allowing the vertical movement of water.

The owner of a private well shall decommission the well if any of the following criteria are met:

- 1) Construction of the well is terminated prior to completion of the well.
- 2) The well owner notifies the Board that the use of the well is to be permanently discontinued.
- 3) The well has been out of service for at least three (3) years.
- 4) The well is a potential hazard to public health or safety and the situation cannot be corrected.
- 5) The well is in such a state of disrepair that its continued use is impractical or unsafe.
- 6) The well has the potential for transmitting contaminants from the land surface into an aquifer or from one aquifer to another and the situation cannot be corrected.

The property owner shall ensure that all abandoned wells and test holes or borings associated with the well installation are properly plugged before work at the site is completed. Only certified well drillers may plug abandoned wells, test holes, and borings.

Abandoned overburden wells or borings shall be completely filled with a low permeability grout, which cures with a final permeability of less than  $1 \times 10^{-7}$  cm/sec. Wells shall be plugged with neat cement grout, sand cement grout, concrete, or bentonite grout.

Regardless of the type used, the grout used for plugging shall:

- 1) be sufficiently fluid so that it can be applied through a tremie pipe from the bottom of the well upward;
- 2) remain as a homogeneous fluid when applied to the subsurface rather than disaggregating by gravity into a two phase substance;
- 3) be resistant to chemical or physical deterioration; and,
- 4) not leach chemicals, either organic or inorganic, that will affect the quality of the groundwater where it is applied.

The plugging materials shall be introduced at the bottom of the well or boring and placed progressively upward to a level approximately four (4) feet below the ground surface. Sealing materials shall not be poured from the land surface into the well, borehole, or annular space being sealed.

The well driller shall install a surface seal after the well or boring has been plugged. Before the surface seal is placed, casing remaining in the hole shall be cut off. The remaining four (4) feet at the top of the well or boring shall then be filled with concrete. The top of the seal shall comprise a concrete slab above the top of the plugged well or boring. This concrete slab shall be at least six (6) inches thick and shall be at least two (2) feet greater in diameter than the well casing or borehole wall.

## ENFORCEMENT

The Board has authority to investigate suspected or known violations of these regulations and/or violations of any Water Supply Certificate conditions. The Board may take actions, as it deems appropriate, within its authority for the protection of public health, safety welfare, or the environment, and to enforce any of the provisions of this regulation.

If any investigation reveals a violation of these regulations or the Water Supply Certificate Conditions, the Board may order the private well owner to comply with the violated provision(s), and/or take other action within its authority as the Board deems appropriate.

Any Order the Board issues shall be in writing and served in the following manner:

- 1) personally, by any person authorized to serve civil process;
- 2) by any person authorized to serve civic process by leaving a copy of the Order at the property owner's address;
- 3) by sending the property owner a copy of the Order by registered or certified mail, return receipt requested; or,
- 4) by posting a copy of the Order in a conspicuous place on or about the premises and by advertising it for at least three (3) out of five (5) consecutive days in one or more newspapers of general circulation within the municipality where the private well is located, if the property owner's last and usual place of residence is unknown or outside the Commonwealth.

### Hearing

Any person to whom the Board issues an Order may request a hearing before the Board by filing with the Board within seven (7) days after the day the Order was served a written request for a hearing. Upon receipt of a hearing request, the Board shall set a time and place for the hearing and shall inform the well owner in writing. The hearing shall commence within thirty (30) days from the day on which the written request was made, unless a later time is agreed to in writing by the Board and the person requesting the hearing. At the hearing the person requesting the hearing shall be given an opportunity to be heard and show why the Order should be modified or withdrawn. After the close of the hearing, the Board shall issue a written decision to sustain, modify, or withdraw the Order and shall mail a copy of the decision, by certified mail, return receipt requested, to the person who requested the hearing. If the Board sustains or modifies the Order, it shall be carried out within the time period allotted in the original order or in the modification.

Every notice, order, or other record prepared by the Board in connection with the hearing shall be entered as a matter of public record in the office of the clerk of the city or town, or in the office of the Board.

If a request for a hearing is not filed with the Board within seven (7) days after the day an Order has been served or if after a hearing, the Order has been sustained in whole or

any part, each day's failure to comply with the order as issued or sustained shall constitute a separate violation.

### Appeal

Any person aggrieved by the final Order, Variance, Well Construction Permit, or Certificate of Water Supply determination of the Board may appeal to any court of competent jurisdiction as provided by the laws of the Commonwealth.

### Penalties

Any person who violates any provision of these regulations, or who fails to comply with any final Order of the Board, for which a penalty is not otherwise provided in any of the Massachusetts General Laws, shall upon conviction be fined not less than ten (10) nor more than five hundred (500) dollars. Each day's failure to comply with a final Order or any provision of this regulation shall constitute a separate violation.

### Variance

The Board may grant a variance to any provision of this regulation when, in its opinion, the enforcement would result in manifest injustice, and the applicant has demonstrated that the equivalent degree of protection will be provided without strict application of the particular provision(s) sought to be varied.

Every request for a variance shall be in writing and shall state the specific provision of this regulation from which variance is sought, the reasons for seeking the variance and proof of the notice required below. The request shall also contain the information to establish manifest injustice and equivalent degree of protection. At least ten (10) days prior to submission of the application to the Board, the applicant shall provide notice of their intent to the request a variance as follows: a) by certified mail, return receipt requested to all abutters of the property upon which the private well will be or is located and b) publication in a newspaper of general circulation in the town or city in which the private well will be or is located. The notice shall include at a minimum: the name and address of the applicant, a statement of the provision(s) of this regulation from which a variance is sought, and the reason for seeking the variance. Any grant or denial of a variance shall be in writing and shall contain a brief statement of the reasons for approving or denying the variance. A copy of each variance shall be conspicuously posted for thirty (30) days following its issuance and shall be available to the public at all reasonable hours in the Office of the Town Clerk or Office of the Board of Health. No work shall be done under any variance until thirty (30) days elapse from its issuance, unless the Board certifies in writing that an emergency exists.

The Board may issue a variance subject to such conditions as it deems necessary to public health, safety, welfare or the environment. Any such conditions shall be stated in writing in the Board's grant of the variance. The Board may revoke, modify or suspend, in whole or in part, a variance after the property owner has been notified in writing and is afforded

an opportunity to be heard, pursuant to these regulations.

Severability:

If any provision of these regulations or the application thereof is held to be invalid by a court of competent jurisdiction, the invalidity shall be limited to said provision(s) and the remainder of these regulations shall remain valid and effective. Any part of these regulations subsequently invalidated by a new state law or modification of an existing state law shall automatically be brought into conformity with the new or amended law and shall be deemed to be effective immediately, without recourse to a public hearing and the customary procedures for amendment or repeal of such regulation.

Effective Date

These regulations were adopted by vote of the Carlisle, Massachusetts Board of Health, at their regularly scheduled meeting held on \_\_\_\_\_, 2025 and are to be in full force and effect on and after \_\_\_\_\_, 2025. Before said date, these regulations shall be published and a copy placed on file in the Board of Health Offices and filed with the Department of Environmental Protection, Division of Wastewater Management in Boston. These regulations or any portions thereof may be amended, supplemented or repealed from time to time by the Board, as provided by law and applicable regulations.

Disclaimer

The issuance of a well permit shall not be construed as a guarantee or certification by the Board or its agents that the water system will function satisfactorily or that the water supply will be of sufficient quality or quantity for its intended use.

CARLISLE BOARD OF HEALTH

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Patrick Collins, Chairman

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Tony Mariano, Vice-Chairman

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Jennifer Wall, Clerk/Treasurer

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Dave Erickson, Member

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Will Proctor

Adopted: June 7, 1966  
Revised: February 17, 1987, effective April 1, 1987  
Revised: October 12, 1989, effective November 10, 1989  
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Revised: April 7, 2009, effective April 7, 2009  
Revised: January 15, 2019, effective January 15, 2019  
Revised: January 14, 2026, effective March 1, 2026

### APPENDIX A WATER QUANTITY REQUIRMENTS

To determine if the well can provide sufficient water to meet the average household daily demand, the following methodology should be employed:

- (a) Estimate Peak Demand in gallons required to meet peak demand period of 1 hour (60 minutes) using Table 1 based on number of bedrooms and bathrooms in the house.

**(gpm required x 60 minutes = gallons needed for peak demand)**

**TABLE 1**

Number of bedrooms	Number of bathrooms				
	1	1.5	2	3	4
	Flow rate in gallons per minute (GPM)				
2	5	6	8		
3	7	8	9	10	12
4	8	9	10	12	13
5		11	12	13	15
6			13	15	17
6+	2 gpm additional bedroom or bathroom				

- (b) Calculate the volume of water the well can produce in the peak demand period of 60 minutes based on the pumping test results.

**(Well yield in gpm x 60 minutes = gallons produced)**

- (c) Estimate the borehole water storage using information obtained from the Well Completion Report and Table 2. To determine the available water in feet subtract the depth to static water level from the depth to the pump intake. Multiply the available water in feet times the gallons of water per foot for the well diameter (see Table 2) to calculate the number of available gallons held in storage in the borehole.

**TABLE 2**

Diameter of Well in Inches	Gallons of Water		Diameter of Well in Feet	Gallons of Water Per Foot of Water Depth
	Per Foot of Water Depth	Per 100 Feet of Water Depth		
1.5	0.092	9.2	2	23.5
2	0.163	16.3	3	52.9
3	0.367	36.7	4	94.0
4	0.653	65.3	5	146.9
5	1.020	102.0	6	211.5
6	1.469	146.9	7	287.9
8	2.611	261.1	8	376.0
10	4.080	408.0	9	475.9
12	5.876	587.6	10	587.6

**(Total depth to pump intake – static water level) x gallons per foot of water = available water from borehole storage)**

- (d) Subtract gallons of water held in borehole storage (step c) and total amount the well is capable of producing in 60 minutes ( step b) from the estimated peak demand (step a) to determine if well is capable of meeting peak demand. If the difference between the two is zero or less, then the well will meet peak demand. If the difference is greater, then additional storage in the form of a storage tanks will be required.

***Estimated peak demand(a) (gallons) – (b)[well yield (gallons) + (c)borehole storage (gallons)] = estimated storage requirements]***

Example 1: The well completion report indicates that a 6 inch diameter domestic well was installed that has a pump intake set at a depth of 300 feet, with a measured static water level depth of 15 feet and an estimated well yield of 2 gpm.

a. For a 2 bedroom, 2 bathroom home, a peak demand rate of 8 gpm for one hour, or 480 gallons, is estimated from Table 3, are needed to meet the household peak demand (8 gpm X 60 min = 480 gallons)

b. The well report indicates that the well is only capable of producing 2 gpm or 120 gallons during the 1 hour period (2 gpm X 60 minutes = 120 gallons)

c. Borehole storage is calculated to be 419 gallons (300 foot depth to pump intake – 15 foot static level) X 1.469 gallons /feet of 6 inch diameter casing = 419 gallons)

d. 480 gallons needed to meet peak demand – 120 gallons (well yield over 1 hour) – 419 gallons (borehole storage) = **-59 gallons ( surplus)**.

*In this example, the well installation will not require any additional storage to meet the peak demand,, because the well yield plus the borehole storage provides a volume in excess of the peak demand requirements.*

Example 2: assuming same well completion information as example 1 (above)

a. For a 3 bedroom, 3 bathroom home, a peak demand rate of 10 gpm for one hour, or 600 gallons, is estimated from Table 3 are needed to meet the household peak demand (10 gpm X 60 minutes=600 gallons)

b. The well report indicates that the well is only capable of producing 2 gpm or 120 gallons during the 1 hour period ( 2 gpm X 60 minutes = 120 gallons)

c. Borehole storage is calculated to be 419 gallons (300 foot depth to pump intake – 15 foot static level) X 1.469 gallons/feet of 6 inch diameter casing = 418.67 gallons)

d. 600 gallons needed to meet peak demand – 120 gallons (well yield over 1 hour) – 419 gallons (borehole storage) = **+61 gallons (deficit)**.

*In this example the well installation does not meet the daily peak demand and an additional 61 gallons will be required daily.*

*In instances where the above methodology indicates that peak demand can be met by a combination of well yield and borehole storage, the well yield alone should also be able to refill the borehole storage volume over a 12-hour time period. Minimum well yields of between 0.5 gpm to 1.5 gpm would be needed to accomplish this for the 1-hour peak demand volumes calculated using the recommended peak flow rates provided in Table 3. These minimum well yields would be necessary in order to sufficiently replenish the borehole storage between peak demands events.*