

7 Del. Admin. C., § 7301

Regulations Governing the Construction and Use of Wells

Proposed June 1, 2011

1.0 General Provisions

1.1 Statutory Authority

The Department of Natural Resources and Environmental Control(Department) establishes and adopts the following Regulations pursuant to the authority granted by §6010(a) of the Delaware Environmental Protection Act, 7 Del. C., Chapter 60.

1.2 Scope and Applicability

- 1.2.1 Minimum requirements are hereby prescribed governing the location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment as well as certain requirements for the protection of potable water supply wells. These Regulations supersede all other well construction Regulations.
- 1.2.2 No person shall conduct any activity contrary to the provisions of these Regulations. All such activities which are contracted for shall be carried out only by those persons having a valid license pursuant to the provisions of the "Regulations for Licensing Water Well Contractors, Pump Installer Contractors, Well Drillers, Well Drivers and Pump Installers."
- 1.2.3 These Regulations apply to well construction activities from the initial penetration or excavation of the ground through development, equipment installation, disinfection and abandonment. Set up of construction equipment before actual penetration or excavation is not considered part of construction.
- 1.2.4 The installation of any well, as defined in Section 2.61 of these Regulations, shall receive the prior approval of the Department in the form of a well permit.
- 1.2.5 If any part of these Regulations or the application of any part thereof is held invalid or unconstitutional, the application of such part to other persons or circumstances and the remainder of these Regulations shall not be affected thereby and shall be deemed valid and effective.
- 1.2.6 The Department shall have the right to require that the well_permit and permit conditions be recorded with the Recorder of Deeds office in the county where the well is located.
- 1.2.7 These Regulations shall be liberally construed for the protection and conservation of the water resources of the State, to protect public health.
- 1.2.8 The Department shall have the right to enter at reasonable times upon any private or public property for the purpose of inspecting and investigating conditions relative to the enforcement of these Regulations; upon given verbal notice and after presenting official identification to the owner, occupant, custodian, or agent of the property.

1.3 Enforcement and Penalties

The provisions of these Regulations shall be enforced by the Department as provided in 7 Del. C., Chapter 60. Such enforcement may include revocation of any permit for cause. The failure of the Department to enforce any of the provisions of this Regulation shall not constitute a waiver by the Department of any such provisions.

2.0 DEFINITIONS

The following words or phrases, when used in these Regulations, shall have the meaning ascribed to them in this Section unless the text clearly indicates otherwise:

Absorption Facility: A system of open jointed or perforated piping, alternative distribution units or other seepage systems for receiving the flow from septic tanks or other seepage systems for receiving the flow from septic tanks or other treatment facilities.

Abandoned Well: A well that is not being used for its intended purpose, or less than the expected frequency as determined by the Department.

Agricultural Well: A non-potable well used for watering livestock, aquaculture, or watering household yards and gardens, or for other purposes related to farming but not for irrigating lands or crops.

Annular Space (Annulus): The space between a bore hole and well casing or between concentric well casings.

Applicant: The owner(s) of the property seeking a well permit, or their legally authorized agent.

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

Aquifer Interconnection: A condition that exists when a well that is screened or gravel packed across multiple aquifers.

Aquifer Test: A test conducted by influencing and observing changes in hydraulic head in an aquifer.

Beneficial Use: Any use of water which is necessary to the applicant, reasonably non-wasteful, reasonably non-damaging to other users, and in the best interest of the public.

Community Water System: A public water system which serves at least fifteen (15) service connections used by year-round residents or regularly serves at least twenty-five (25) year-round residents.

Confined Aquifer: A saturated layer of permeable geologic material bounded above and below by confining layers, and in which water pressures are greater than atmospheric.

Confining Layer: A stratum of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

Consolidated: Geologic material that is firm and rigid due to the interlocking or cementation of its mineral components or both.

Construction Well: A non-potable temporary well used solely to supply water for well construction.

Contaminant: Any substance, either man-made or natural, which degrades water quality to such a degree it is rendered unusable or harmful to public health and safety, or to the environment.

Contamination: The presence of a contaminant in the environment.

Department: The Department of Natural Resources and Environmental Control (DNREC).

Dewatering System: Mechanical equipment used to remove ground water from an excavation for construction purposes. Equipment consists of a pump, intake piping and intakes (wells, well points, sumps, or excavations).

Dewatering Well: A well used to remove ground water for construction of footings, sewer lines, building foundations, elevator shafts, etc.

Disinfection: The inactivation of pathogenic organisms in water by chemical oxidants, ozone, ultra violet light or similar treatments.

Disposal Area: The entire area used for the absorption facility.

Domestic Well: A well that may serve no more than three dwellings and is used for potable non-public water supply purposes and which may be used for non-potable purposes, excluding heat pump supply.

Drawdown: The extent of lowering of the static water level in a well and of the water table or potentiometric surface adjacent to a well, resulting from the discharge of water from a well.

Drilled Well: A well that is constructed using auger, rotary and/or percussion tools that cut, fracture or abrade.

Drive Shoe: A device fastened to the bottom of a length of casing to aid in driving the well casing.

Driven Well: A well that is constructed by means of pushing or hammering a casing and screen and including direct push methods and which does not create an annular space.

Dug Well: A well that is constructed by the use of picks, and/or shovels, or an excavator.

Fire Protection Well: A non-potable well used for emergency purposes only and not connected to a public water supply distribution system.

Geophysical Log: A record of various properties of the formation, borehole, or well obtained by electrical, mechanical, electromagnetic, and other devices.

Gravel Pack: Processed gravel or coarse sand placed in the annular space surrounding the well screen to limit the entrance of particulates.

Ground Water: Any water naturally found under the surface of the earth.

Grout: Material which is capable of providing a seal in an annular space of a well, or for sealing.

Grout (v): To emplace grout in an annular space of a well.

Heat Pump: A device that transports thermal energy from one environment to another, and in either direction.

Heat Pump Closed Loop Well: A borehole containing a vertical pressurized circuit of pipe below grade, utilizing ground water for heat transfer.

Heat Pump Recharge Well: A non-potable well used to inject ground- water source heat-pump effluent back into the aquifer from which it was withdrawn.

Heat Pump Supply Well: A well used to withdraw ground water for thermal exchange in a heat pump, and which may be used for potable supply.

Industrial Well: A non-potable well which is used in the processing, washing, packaging, or manufacturing of a product excluding food and beverages.

Injection Well: A well used to emplace fluid into the subsurface as regulated in the "Regulations Governing Underground Injection Control."

Irrigation Well: A non-potable well which is used for watering land or crops other than household lawns and gardens

Jetted Well: A well constructed using a high velocity stream of water.

Miscellaneous Well: A non-potable well used for beneficial purposes but not included in any other well categories defined herein.

Monitor Well: A non-potable well used primarily for collecting ground water samples.

Multiple Screens: The use of more than one screen, or a continuous screen, in well construction, connecting multiple water-bearing zones within a single aquifer.

Observation Well: A non-pumping, non-potable well used for measuring ground water levels or potentiometric surface.

Person: Any individual, firm, association, organization, partnership, business trust, corporation, company, contractor, supplier, installer, user, or owner, or any Federal, State or local governmental agency or public district or any officer or employee thereof.

Piezometer: An alternative word for an observation well.

Pitless Well Adapter: A device designed for attachment to one or more openings through a well casing, provided with a pitless well cap, and so constructed as to prevent the entry of contamination into the well. The adapter is used to conduct water to or from the well, protect the water from freezing temperatures and provide access to the internal components of the well.

Pitless Well Unit: A pre-assembled device which extends the upper end of a well casing to above grade, provided with a pitless well cap, and so constructed as to prevent the entry of contamination into the well. The unit is used to conduct water to or from the well, protect the water from freezing temperatures and provide access to the internal components of the well.

Pitless Well Cap: A device that encloses the upper termination of the well casing above a pitless well adapter or unit and provides for connections for electrical power lines and a screened well vent.

Plugged Well: A well which has been permanently decommissioned with sealing materials approved by the Department.

Potable Water: Any water which is in compliance with all the primary health related drinking water standards specified in the Delaware Regulations Governing Public Drinking Water Systems and the US EPA Safe Drinking Water Act, and is acceptable for human consumption.

Potential Source of Contamination: Anything that may introduce a contaminant that could cause a violation of applicable water standards.

Examples may include, but are not limited to, underground storage tanks for petroleum products, wastewater disposal areas, landfills, confined animal feed lot operations, and storm water detention basins.

Pressure Grouting: The emplacement of grout materials under positive pressure via a conductor (tremie) pipe.

Public Water Supply: Any water which is subject to the drinking water standards specified in the Delaware Regulations Governing Public Drinking Water Systems and the US EPA Safe Drinking Water Act.

Public Well: A well which is used to supply water to more than three dwelling units, employees, in the preparation or manufacturing of food or beverages, or to the public at large.

Pump Installer: Any person holding an appropriate license issued by the State of Delaware to act in responsible charge of all on-site work in the installation, modification, and repair of water pumps and related equipment.

Pump Installer Contractor: Any person licensed by the State of Delaware to engage in the business of contracting for the installation, modification, and repair of water well pumps and related equipment.

Pump Pit: An underground enclosure which contains pumping equipment external to the well, and may also contain the well and other water system components.

Recovery Well: A well used to withdraw contaminated ground water.

Regulations: Delaware Regulations Governing the Construction and Use of Wells.

Sealing: Removal of pumping equipment, if applicable, and emplacing impermeable material (grout) in the entire length of a well so as to make it permanently decommissioned .

Secretary: The Secretary of the Department of Natural Resources and Environmental Control or the Secretary's authorized designee.

Septic Tank: A receptacle which receives the discharge of wastewater from a structure or part thereof and is designed and constructed so as to permit settling of solids from the liquid, digestion of the organic matter by detention, and discharge of the liquid portion into an absorption facility.

Service Connection: A water line from a public water supply system to a dwelling or building.

SIRB – The Department's Site Investigation and Restoration Branch.

Soil Boring: A bore hole for the purpose of determining the physical and/or chemical characteristics of soil and/or sediments.

Source of Contamination: Anything that is known to have introduced a contaminant that has caused a violation of applicable water standards. Examples may include but are not limited to underground storage tanks for petroleum products, wastewater disposal areas, landfills, confined animal feed lot operations, and storm water detention basins.

Static Water Level: The position assumed by water in a well not under the influence of pumping.

Suction Line: A pipe which conveys water from a well by a pump creating negative pressure.

Suction Lysimeter: A device for collecting groundwater from pore spaces in the unsaturated zone.

Test Well: A temporary well installed to ascertain the lithology and water transmission properties of an aquifer or geologic materials and which may be used to determine water quality and which can only be reclassified to an observation well.

Unconfined Aquifer: An aquifer in which a relatively impermeable layer does not exist between the water table and the ground surface, and in which the water surface is at atmospheric pressure.

Unconsolidated: Sediment that is not cemented.

Unrecorded Well: A well for which Department has no record.

Water Well Contractor: Any person licensed by the State of Delaware to engage in the business of contracting for the construction and repair of wells, and the installation and repair of well pumps and related equipment..

Well: Any excavation which intersects the water table, and is installed for the purpose of obtaining geologic or hydrologic information and for locating, testing, measuring, extracting, and/or recharging water and other fluids, and where the depth is greater than the width. Such excavations may have been drilled, augered, cored, bored, driven, dug, jetted, or otherwise constructed. This definition does not include excavations for utility poles, construction pilings, building foundations, fence posts, test pits, or horizontal heat pump systems that are constructed above the water table.

Well Casing: closed -wall pipe used to provide access to a water-bearing unit.

Well Development: Cyclic or intermittent pumping, surging, or both, either mechanically or by using water or air under pressure.

Well Driller/Well Driver: Any person licensed by the State of Delaware to act in responsible charge of all on-site work relating to the construction, development, testing, alteration repair, of wells. and the installation, modification, and repair of well pumps and related equipment.

Well Pit: An underground enclosure that contains a well head that is capped below grade.

Well Point: A shallow well that is typically used in series with a manifold and pumped together by suction to dewater an excavation.

Well Screen: An open-wall pipe used as a sediment filter allowing entrance or exit of sub-surface fluids.

Wick Drain: A prefabricated strip which is inserted into the ground for draining pore water and consolidating compressible soils or sediments.

3.0 General Permitting Requirements And Procedures

3.1 Permit Required

3.1.1 A well or suction lysimeter may not be constructed until the Department has issued a well permit and a call-in authorization number unless otherwise authorized under Section 3.11 of these Regulations. A well permit is not required for the construction of hand-augered soil borings.

3.1.2 A permit is required for the use of all wells.

3.2 Well Repair

A well permit is not required for repair or rehabilitation, provided the physical dimensions of the well are not changed except as provided by Section 8.A. A change in physical dimensions, or exceedence of original capacity shall require an application for a well permit as set forth in the remainder of this Section.

3.3 License Required

The construction, repair, modification, or abandonment of wells shall be performed by or under the direct on-site supervision of a well driller. The installation of well pumps and pumping equipment shall be performed by or under the direct on-site supervision of a pump installer, plumber or well driller. Except as permitted by 7 Del. C., §6023, the above referenced persons shall be licensed under the requirements of the "Regulations for Licensing Water Well Contractors, Pump Installer Contractors, Well Drillers, Well Drivers, and Pump Installers."

3.4 Permit Preparers

All well permit applications (applications) shall be prepared and signed by a Delaware licensed well driller.

3.5 Permit Application Procedures

3.5.1 All applications shall be made on forms or in format provided by the Department.

3.5.2. All applications shall be legible and complete. An illegible or incomplete application shall be returned to the preparer with a statement of the reason for rejection.

3.5.3 All applications shall be signed by the proper applicant or their duly authorized agent. Evidence of property ownership shall be submitted in the form of a zoning verification, settlement agreement, tax assessor's record, or an easement agreement showing the applicant's authority to construct shall be submitted with the application.

3.5.4 All applications shall be accompanied by an application fee and an advertisement fee as applicable.

- 3.5.5 Wells shall only be used for the purpose designated on the permit.
- 3.5.6 The Department shall not consider the issuance of a permit for a potable water supply well on a undeveloped property until the wastewater disposal system permit for the property has been issued, or central sewer service is available to the property.
- 3.5.7 A zoning verification for the property on which the well is to be constructed shall accompany the application. For wells which will be constructed in areas where no tax map numbers are assigned, proof of the applicant's authority to construct shall be submitted with the application.

3.6 Dewatering System Application Procedures

- 3.6.1 Applications for dewatering systems shall be submitted on special forms supplied by the Department.
- 3.6.2 Applications for dewatering systems shall include:
 - 3.6.2.1 Duration of project.
 - 3.6.2.2 Location of water discharge.
 - 3.6.2.3 Project location map and site map showing well, well point, or excavation layout noting the estimated number of wells, well points, or sumps for the project.
 - 3.6.2.4 Maximum daily quantity of water to be pumped in gallons, and peak rate in gallons per minute.
 - 3.6.2.5 Applications for well points may be submitted on a single form provided that all well points are located on a single tax parcel and are identical in construction. For deep dewatering wells and sumps, separate applications are required for each facility.
- 3.6.3 Permits are valid for the duration of the project as described in the application. The operation of the dewatering system authorized by the permit shall cease prior to the expiration date of the permit.
- 3.6.4 The Department may require additional information concerning the operation prior to issuance of any dewatering permit.
- 3.6.5 Withdrawals from dewatering systems are subject to the requirements of Section 3.10(K) of these Regulations.
- 3.6.6 Water quality tests may be required as part of the application, at the discretion of the Department, where the Department has reason to believe that ground water contamination may exist in or near the proposed construction site.
- 3.6.7 The owner of the dewatering system may be required to analyze the extent of potential impact to other permitted water users and submit the findings to the Department.

- 3.6.8 The owner of the dewatering system may be required to provide reasonable assurance that the operation will not cause erosion at the point of discharge or introduce turbidity into the receiving water body.
- 3.7 Injection Well Application Procedures
- 3.7.1 Applications shall show the total number, diameter, and spacing of injection wells for the entire system on each application. A separate application is required for each well. The Department may require additional plans or drawings showing the overall operation of the injection system.
 - 3.7.2 For injection wells requiring a permit from the Underground Injection Control (UIC) program, the well construction permit will not be issued until the UIC permit is issued.
 - 3.7.3 For Class V injection wells authorized by rule under the Regulations Governing Underground Injection Control, §122.23 (d), the application must identify the category of Class V well proposed and the regulatory citation authorizing the construction without a UIC permit.
- 3.8 Closed Loop Heat Pump Well Application Procedures
- 3.8.1 Applications shall show the total number, diameter, and spacing of vertical loops for one system on one application form. The Department may require an additional site plan showing all closed loop locations for commercial-scale projects.
 - 3.8.2 One application fee shall be assessed for each application form submitted.
- 3.9 Monitor and Observation Well and Piezometer Application Procedures
- 3.9.1 Applications for monitor and observation wells, and piezometers shall be submitted on special forms provided by the Department.
 - 3.9.2 Applications for a maximum of ten (10) monitor or observation wells or piezometers may be submitted on a single form, or an unlimited number may be submitted electronically, provided
 - 3.9.2.1 all wells are proposed with identical construction, and
 - 3.9.2.2 all wells are located on the same tax map parcel number and associated with one project, and
 - 3.9.2.3 all wells are screened in the same aquifer.
 - 3.9.3 Monitor well, Observation well and Piezometer applications shall be accompanied by the appropriate fee if applicable. Monitor well applications require one fee per application.
- 3.10 Application Procedures to Continue to Use an Existing Well
- 3.10.1 A Permit to Continue use is required when the Department has determined that no well permit exists.
 - 3.10.2 Applications for permits to use existing wells shall contain information similar to that required in an application for a well permit.
 - 3.10.3 Existing wells for which a use permit application is submitted must meet the requirements contained in these Regulations. for the applicable well classification.

- 3.10.4 The Department may impose special use conditions which may include but are not limited to the conditions contained in the original well permit.
- 3.11 Application Procedures to Reclassify Wells or Continue to Use Wells.
 - 3.11.1 Upon receipt of a complete application and the appropriate fee, the Department may consider approving a request to change an existing well from one classification to another, such as in the changing of a domestic to an agricultural well.
 - 3.11.2 Wells shall only be used for their permitted use.
 - 3.11.3 The use of the well may only be changed by a Department- approved reclassification.
 - 3.11.4 Wells proposed for reclassification or continued use must meet the requirements contained in these Regulations for the proposed use.
 - 3.11.5 Test wells may only be reclassified to observation wells.
 - 3.11.6 The Department may impose special conditions on the reclassified well which may include but are not limited to the conditions contained in the original well permit.
- 3.12 Permit Issuance Procedures
 - 3.12.1 Advertising Requirements
 - 3.12.1.1 Any permit application, or combination of applications located on the same tax parcel, where the total estimated withdrawal is greater than fifty thousand (50,000) gallons per day, shall be advertised in newspapers of local and statewide circulation with a comment period of fifteen (15) days before issuance of the well permit(s). Fire protection wells are exempt from this requirement.
 - 3.12.1.2 If the well permit has expired, or the requested usage rate, (in excess of fifty thousand gallon per day)well construction or source aquifer have materially changed, a new application will be required with re-advertisement.
 - 3.12.1.3 Under extraordinary circumstances, the Department has the discretion to issue the permit prior to the expiration of the above comment period on a case-by- case basis. In such cases the owner is proceeding at their own risk with the permit still subject to public hearing requirements.
 - 3.12.2 The Department, shall take into account the hydrogeology, effect on water levels, sources of contamination, water quality, population density, water use, and other factors as may be relevant in the area of the proposed well to protect the water resources of the State
 - 3.12.3 The Department may place special conditions on the well permit such as, but not limited to, double casing, specialized grouting, water use or depth restrictions, advance notification prior to construction, and special material requirements, to protect the water resources of the State.
 - 3.12.4 Where public water supply is legally and reasonably available to the Department shall deny an application for a permit for a potable water well. A public water supply is deemed legally and reasonably available when both of the following apply:

- 3.12.4.1 Certificate of Public Convenience and Necessity has been granted to a water utility for the site.
- 3.12.4.2 A public water distribution line is located within two hundred (200) feet of the structure to be served.
- 3.12.5 A public water supply system shall not be deemed reasonably available if physical features make the connection prohibitive. The Department shall not deny a permit for a non-potable well due to the availability of public water supply.
- 3.12.6 When a proposed potable water well, is to be located within the jurisdiction or service area of a municipality serving public water, the applicant shall submit a written statement of approval from said municipality with the permit application. This requirement also applies for heat pump, miscellaneous, and agricultural wells.
- 3.12.7 The Department may specify, permit conditions, including but not limited to, geophysical logging, water-quality sampling, and formation sampling.
- 3.12.8 The Department may require aquifer tests as a condition of any well permit. These tests may require the construction and use of one or more observation or monitor wells. Aquifer test shall be conducted in accordance with published aquifer test procedures.
- 3.12.9 An application which is denied shall be returned to the applicant accompanied by an explanation.
- 3.12.10 All wells shall be used for their intended purpose and withdrawn water shall be put to beneficial use. If a well is not used for its intended purpose, the Department may declare it abandoned and order it decommissioned.
- 3.12.11 All wells and dewatering facilities are subject to 7 Del. C., §6031 and §6037, which set forth responsibilities as it concerns remedying the depletion, or water-quality degradation of any existing use of water caused as a result of any operation authorized under the permit.

3.13 Emergency Well

- 3.13.1 An emergency is deemed to exist when a well is replacing a failed well and when the Department determines that the lack of water poses an immediate danger to the health or welfare of a person, or when the Department has determined that other exceptional circumstances exist.
- 3.13.2 A permit number may be given verbally during business hours for the installation of an emergency well and will require call-in authorization to validate the permit. Within seventy-two (72) hours after the verbal issuance of a permit number, the applicant shall submit an application, completion report, and a report indicating the replaced well has been sealed.
- 3.13.3 For an emergency when State offices are closed, a well may be constructed provided that the Department is notified on the first working day following such action. Within seventy-two (72) hours after the verbal issuance of a permit number the applicant shall submit an application, completion report, and a report indicating the replaced well has been sealed.
- 3.13.4 All emergency wells constructed shall be constructed in conformance with these Regulations.

3.13.5 Any well constructed under emergency circumstances, will not have been reviewed pursuant to Section 3.10 (B) and is constructed at the owner's risk. Said review may result in the well being decommissioned (sealed) and relocated.

3.14 Relocation During Construction

If it is necessary to relocate an incomplete or newly constructed well to obtain sufficient yield, potable water, overcome a construction problem, to meet a distance requirement or, in the case of monitor wells, to adjust to newly discovered field conditions, the well driller may relocate the well construction site under authority of the original permit provided that:

3.14.1 The new location meets the siting requirements of these Regulations.

3.14.2 The new location is on the same tax parcel number listed on the permit.

3.14.3 The unsuccessful well, cased or uncased, shall be sealed in accordance with the requirements of Section 9 of these Regulations concurrent with or prior the construction of the relocated well.

3.14.4 A new permit application is required if the drill rig is removed from the site prior to construction of the relocated well.

3.14.5 Monitor, observation, recovery wells or soil borings shall not be relocated beyond the boundary of the site plan accompanying the permit application(s).

3.14.6 The well location must be clearly shown on the completion report.

3.14.7 The application has not undergone a hydrological review by the Department.

3.15 Relocation Prior to Approval

If it is necessary to relocate a well, as a result of the Department's review, the applicant may elect to:

3.15.1 Submit a new application showing the revised location, or

3.15.2 Reauthorize by initialing the revised location on the original application.

3.16 Cancellation of Permits

The Department shall have the right to cancel (void) any permit for a well that has not yet been constructed.

3.17 Permit Duration

A permit shall be valid for a period of one (1) year from the date of issuance by the Department, except as noted in Section 3.06(B) of these Regulations.

3.18 Permit Extension

A permit extension request may be approved by the Department not to exceed two (2) years from the date of issuance on a case by case basis.

3.19 Approval for Use

- 3.19.1 Well permits are issued for construction and use, except as noted in Section 3.19.2 and 3.19.3 of these Regulations.
- 3.19.2 Any permit, or combination of permits , located on the same tax parcel, where the total estimated yield or use is greater than fifty-thousand (50,000) gallons per day are not authorized for use. Prior to putting the well(s) into service, the owner shall apply for a Water Allocation Permit as set forth in the "Regulations Governing the Allocation of Water." Fire protection wells are exempt from this requirement.
- 3.19.3 Approval for use shall be obtained from the Division of Public Health for all and public wells prior to their use.
- 3.19.4 The Department may consider approving a request to change an existing well from one classification to another, such as changing a test well to an observation well.

4.0 Responsibilities Of Parties

4.1 Water Well Contractor and Well Driller Responsibilities

- 4.1.1 The water well contractor and well driller are responsible for construction of the well in accordance with the conditions of the permit and applicable laws and Regulations.
- 4.1.2 The well driller is required to have a copy of the signed well permit with authorization number on site. In the case of emergency replacement wells approved verbally during office hours, well driller is required to have the permit number and authorization number on site. In the case of emergency replacement wells constructed when state offices are closed, neither permit nor permit and authorization numbers are required. A well driller shall be present to conduct or supervise the well construction.
- 4.1.3 The well driller is responsible for attaching the identification tag supplied by the Department prior to demobilizing.
- 4.1.4 Upon completion of the well, the water well contractor shall submit to the Department a legible well completion report and formation log as set forth in Section 7 of these Regulations.

4.2 Property Owner's Responsibilities

- 4.2.1 The property owner is responsible for maintaining the well in accordance with these Regulations and in compliance with all applicable permit conditions including but not limited to maintenance of the upper terminus and identification tag.
- 4.2.2 The property owner is responsible for having any damage to the well repaired by a well driller.
- 4.2.3 It is the responsibility of the property owner to have a failed or abandoned well properly sealed by a well driller in accordance with Section 11.0. The well must be sealed within fifteen (15) days of construction of a replacement well. If the well is not sealed at the end of this period the Department may have the well sealed at the well owner's expense. A replaced well may be retained if the Department approves reclassification or continued use of the well in accordance with Section 3.19.4.

4.2.4 If a contractor other than the signatory of the application will construct the well, the applicant shall return the permit and identification tag so the Department can transfer them to the new contractor.

4.2.5 At the time of property transfer, the property owner is responsible for providing a copy of the well permit including the permit conditions, to the subsequent property owner and for notifying the Department of the transfer.

4.3 Pump Installer Contractor Responsibilities

The pump installer contractor, or their licensed employee, is responsible for the installation, repair, or replacement of pumps so as to maintain the well in accordance with the conditions of the permit and applicable laws and Regulations.

5.0 Well Construction Standards

5.1 Siting Criteria

5.1.1 All soil borings and wells, except for monitor, recovery, dewatering, and observation wells, shall satisfy these requirements for minimum horizontal separation.

5.1.1.1 Ten (10) feet from a property line (except as required in Section 4.01(J) of these Regulations) to allow access to the well without encroaching on adjoining properties. Wells may be constructed less than ten (10) feet from a property line if prior approval is granted by the Department for the purpose of maximizing other horizontal separation distances as required by this Section.

5.1.1.2 On any parcel, within fifty (50) feet of, an Agricultural Lands Preservation District, (District as defined in Title 3, Del. C., Chapter 9), all wells shall be located a minimum of fifty (50) feet from any boundary of the District. Parcels recorded prior to April 6, 1997 are exempt. The Department recommends that all wells be placed the maximum distance possible from lands on which federally regulated chemicals have been applied.

5.1.1.3 Not within any dedicated State of Delaware right-of-way unless written permission is obtained from the right-of-way holder and is submitted for review with the application.

5.1.1.4 One hundred (100) feet from identifiable, potential or existing sources of contamination, except that public water wells shall have a minimum separation of one hundred fifty (150) feet. Exceptions to this requirement for all wells other than public are addressed in 4.01(A)(5)(6)(7).

5.1.1.5 Fifty (50) feet from identifiable potential or existing sources of contamination for Heat pump recharge and heat pump closed loop wells, as stated in Sections 5.04(B) and 5.05(A) of these Regulations.

5.1.1.6 Fifty (50) feet from approved septic tanks, diversion valves or boxes, dosing chambers, holding tanks and grease trap.

- 5.1.1.7 Fifty (50) feet from any underground sewer line. The isolation distance may be decreased to no less than ten (10) feet or when the well is double-cased and is constructed into a confined aquifer.
- 5.1.2 When any well, with the exception of public wells, cannot be located at the required isolation distance from identifiable potential or existing sources of contamination the following shall apply:
- 5.1.2.1 The isolation distance shall be maximized and no less than fifty (50) feet, provided the well is screened in a confined aquifer and pressure grouted from at least ten (10) feet into the confining layer directly above the source aquifer to ground surface, as described in Section 4.07(K)(3) of these Regulations. Where the confining layer is less than ten (10) feet in thickness, the well shall be pressure grouted entirely through the confining layer.
- 5.1.3 A well may not be constructed within or under any building other than a structure constructed specifically for the housing of the well and related equipment, unless otherwise approved in writing by the Department. Such structures shall be identified on the exterior with the permit number of the well contained therein.
- 5.1.4 Water supply lines from wells shall be at least ten (10) feet from all identifiable potential or existing sources of contamination. However, if high water table conditions may submerge a suction pipe during any portion of the year, the suction pipe shall be at least fifty (50) feet from all identifiable potential or existing sources of contamination unless the suction line is double cased from the well to the pump.
- 5.1.5 Public wells shall not be sited less than one hundred fifty (150) feet from identifiable potential or existing sources of contamination, unless a variance is granted by the Department.
- 5.1.6 All wells shall be located so as to be accessible for cleaning, treatment, repair, testing, inspection, and any other such work as may be necessary.
- 5.1.7 All wells shall be protected from surface water run-off and flooding, as stated in Section 4.10 of these Regulations.
- 5.1.8 The Department may require special location and depth requirements for a proposed water supply well to minimize its exposure to identifiable potential or existing sources of contamination or interference with other water supply wells. The submission of drawdown data and capture zone analyses may also be required to justify the location and depth of the well.
- 5.1.9 Wells subject to flooding, as defined in Section 5.02(A) of these Regulations, are subject to the additional siting requirements contained in Section 5.02(B) of these Regulations.
- 5.1.1. All public wells within a housing development, recorded on or after April 6, 1997, shall be located at least one hundred fifty (150) feet from the property lines of the housing development.

5.2 Water Quality Protection During Well Construction

- 5.2.1 During construction the well and all aquifers shall be protected against contamination.

- 5.2.2 Whenever construction stops before completion, the open annular space or open bore hole shall be covered and protected from surface water drainage. The well casing shall be capped in accordance with the requirements of Section 4.10(D) of these Regulations.
- 5.2.3 Whenever contamination is detected during drilling, and the contamination was not anticipated by the Department and addressed in the permit conditions, the well driller shall cease work and notify the Department before continuation of drilling.
- 5.2.4 In the event that contaminants are encountered during drilling, the well driller shall decontaminate the drilling equipment and prevent the transfer of contaminants into uncontaminated aquifers or from the site.

5.3 Water for Well Construction

- 5.3.1 Water from sources other than those listed in Section 4.03(B) shall not be used for well construction.
- 5.3.2 The order of preference in selecting a water source for construction purposes is:
 - 5.3.2.1 A public water supply system meeting the requirements of the "Delaware Regulations Governing Public Drinking Water Systems."
 - 5.3.2.2 Any other potable water supply.
 - 5.3.2.3 Other non-potable water supply wells that can be used are irrigation, fire fighting, or well construction.
- 5.3.3 Water used for well construction shall be disinfected as follows:
 - 5.3.3.1 Water from a potable source shall be maintained with a free chlorine residual of two (2) milligrams per liter (mg/L).
 - 5.3.3.2 Water from a non-potable well shall be disinfected with one pound of calcium hypochlorite per one thousand (1000) gallons of water. At least thirty (30) minutes contact time shall lapse between addition of the disinfectant and use of the water. Sodium hypochlorite in the form of laundry bleach (5.25 percent available chlorine), may be used in lieu of calcium hypochlorite. One and seven tenths (1.7) gallons of laundry bleach is equivalent to one (1) pound of dry calcium hypochlorite.
- 5.3.4 All water used for well construction shall be treated with soda ash (sodium carbonate (Na_2CO_3)) to achieve a minimum pH of 8.
- 5.3.5 Temporary Wells for Construction Water
 - 5.3.5.1 The Department may issue a permit for a temporary well to supply construction water for a new well installation. The application for a temporary well should be submitted in conjunction with the application for a new well.
 - 5.3.5.2 All temporary wells shall be sealed in accordance with Section 10 of the Regulations, prior to the demobilization of the drill rig.

5.4 Drilling Fluids

- 5.4.1 Drilling fluids shall consist of water- or air-based fluids containing only additives manufactured for drilling.
 - 5.4.2 Lost circulation during drilling: If rapid loss of drilling fluid occurs, clean fill material such as sand, gravel, crushed stone, or drilling fluid additives manufactured for lost circulation may be used in the zone or zones in which the loss is occurring.
 - 5.4.3 The Department may set drilling fluid specifications for fluid viscosity and specific gravity. The Department may require a report of drilling fluid characteristics to be submitted with the Completion Report.
 - 5.4.4 Use of polymers is permitted to increase viscosity and filtration control in drilling fluids.
- 5.5 Well Casing
- 5.5.1 Casing shall be strong enough to resist the forces imposed on it during and after installation, following applicable specifications established by the American Petroleum Institute, American National Standards Institute, and The American Society for Testing and Materials.
 - 5.5.2 Casing shall not cause the delivered water to be toxic or violate state or federal drinking water standards, following the specifications established by National Sanitation Foundation.
 - 5.5.3 Casing other than thermoplastic or steel shall only be used with the written approval of the Department.
 - 5.5.4 Thermoplastic casing shall be a minimum of Schedule 40 unless otherwise approved by the Department.
 - 5.5.5 For wells with a diameter greater than six (6) inches it is the responsibility of the water well contractor to take into account conditions that may require heavier weight well casing (e.g. installation depth, etc.)
 - 5.5.6 Steel casing shall be used in wells constructed in crystalline rocks.
 - 5.5.7 Steel casing shall be a minimum of Schedule 40 unless otherwise approved by the Department.
 - 5.5.8 The Department may require that casing used for water supply wells be at least four (4) inches in diameter. The Department may require that casing used for public supply wells be at least six (6) inches in diameter.
 - 5.5.9 Well Casing Lengths
 - 5.5.9.1 Casing shall be no less than a total length of twenty (20) feet. Monitor, observation, recovery, wick drains, dewatering, and large-diameter bored wells are excluded from this requirement. Required casing heights above ground surface are specified in Section 4.10 of these Regulations.
 - 5.5.9.2 Wells (except, monitor, observation, dewatering and recovery) located on parcels less than one-half acre in size and on which an on-site wastewater disposal system is or will be utilized, shall be cased to a minimum depth of forty-two (42) feet.

5.5.9.3 Wells completed in a confined aquifer, shall be cased to the top of or into that aquifer.

5.5.10 Other Well Casing Requirements

5.5.10.1 Joints for all well casing shall be water tight and joined in accordance with the manufacturer's recommendations. Joints for steel well casing may be electrically welded or threaded. Joints for thermoplastic well casing may be solvent welded or threaded.

5.5.10.2 Casing shall not be cut off below ground except:

5.5.10.2.1 to install a pitless unit or pitless adapter, or

5.5.10.2.2 to install a standard plumbing "Tee", or

5.5.10.2.3 to install an outer casing to terminate just below a pitless adapter or standard plumbing "Tee" connection, which is on the inner casing, or

5.5.10.2.4 for sealing purposes.

5.5.10.3 Where steel casing is required, the casing shall be equipped with a drive shoe which shall be firmly seated by driving it into the rock prior to continuation of drilling or grouting.

5.6 Well Screens

5.6.1 All wells which obtain water from unconsolidated aquifers shall be equipped with a well screen that will limit the entrance of sediments.

5.6.2 Wells finished in consolidated aquifers are not required to be screened.

5.6.3 Well screens shall have sufficient structural strength appropriate for the installation.

5.6.4 The screen should be sized to permit a maximum entrance velocity of 0.5 feet per second.

5.6.5 Only commercially manufactured well screens shall be used in the construction of a well, unless otherwise approved by the Department.

5.6.6 Lead packers and lead swedges are prohibited.

5.6.7 The bottom of screened wells shall be closed.

5.6.8 Screening of multiple aquifers, as identified by the Department, is prohibited.

5.7 Gravel-Packed Wells

5.7.1 Gravel shall be free of foreign matter.

5.7.2 Bulk-gravel shall be stored out of direct contact with the ground and covered.

- 5.7.3 Gravel may be emplaced by pouring down the annulus, or by a tremie pipe. The Department may require installation of the gravel by tremie pipe.
- 5.7.4 Placement of gravel to interconnect multiple aquifers, as identified by the Department is prohibited.
- 5.7.5 Gravel shall not extend more than five (5) feet above the top of the screen in single-cased wells
- 5.7.6 Gravel may be used to fill the annulus of geothermal closed loop wells in the Piedmont from the bottom of the borehole to the bottom of the overburden.

5.8 Well Grouting

- 5.8.1 All wells shall be grouted unless specifically exempted in Section 4.07(F) or otherwise approved by the Department.
- 5.8.2 The annulus shall be a minimum of one and one half (1.5) inches wide (diameter of bore hole = outside diameter of casing plus three (3) inches).
- 5.8.3 All wells should be grouted as soon as possible, but shall be grouted within twenty four (24) hours, after the casing has been set.
- 5.8.4 Wells in unconfined aquifers may be grouted by pouring granular, chipped, or pelletized bentonite into the annulus but no deeper than than forty (40) feet, otherwise the annulus shall be sealed by pressure grouting.
- 5.8.5 Wells in confined aquifers shall be pressure grouted ten (10) feet into the confining layer directly above the source aquifer. Where the confining layer is less than ten (10) feet in thickness, the well shall be pressure grouted through the entire confining layer.
- 5.8.6 Geothermal closed loops wells are required to be pressure grouted from the bottom of the bore hole to ground surface.
- 5.8.7 Wells with casing depths of twenty (20) feet or less, are not required to be grouted.
- 5.8.8 The use of native formation material (i.e., drill cuttings) between the gravel pack and the required grout depth is prohibited.
- 5.8.9. The water well contractor may be required to notify the Department in advance of grouting. If the Department has scheduled a grouting inspection, the driller is not permitted to proceed with grouting before Department personnel arrives.
- 5.8.10 Cement grout shall be allowed to cure for a minimum of twenty-four (24) hours before well construction activity, including development, can be resumed.
- 5.8.11 The Department has the right to require special conditions pertaining to the grouting of any well. These requirements shall be specified on the well permit.
- 5.8.12 Grout
 - 5.8.12.1 Cement grout may be - neat Portland or quick setting ("hi-early") cement in a ratio of no more than six (6) gallons of water per ninety-four (94) pound sack of cement, unless another mixture is approved by the Department. A

sodium- based bentonite may be added to the cement grout in an amount not to exceed five (5) pounds per ninety-four (94) pound sack of cement.

5.8.12.2 Bentonite – grout is a sodium- based bentonite mixture with a ratio of not less than one and one-half (1.5) pounds of bentonite per gallon of water. Bentonite clay without additives shall not be used where it comes in contact with ground waters with a pH below five (5.0) or having a total dissolved solids content greater than one thousand (1,000) milligrams per liter (mg/L) without Department approval.

5.8.12.3 Use of polymers is permitted to retard hydration of bentonite.

5.8.12.4 Thermally Enhanced Grout

5.8.12.5 If rapid loss of grout material occurs during emplacement, clean fill material such as sand, gravel, crushed stone, or cement additives manufactured for lost circulation may be used in the zone in which the loss is occurring.

5.8.13 Standards for Grouting

5.8.13.1 Grouting shall be performed to provide a water-tight seal to prevent fluid migration in the annulus.

5.8.13.2 All wells shall be grouted to a depth of at least eighteen (18) feet, except those wells specifically exempted in Section 4.07(G). The Department may require grouting to a greater depth. All wells constructed on a parcel less than one-half acre in size and which is or will utilize an on-site wastewater disposal system shall be grouted to a minimum depth of forty (40) feet.

5.8.13.3 Wells installed with a minimum casing depth of one hundred (100) feet, as provided for in Section 4.01(C) of these Regulations, shall be grouted to a minimum depth of one hundred (100) feet.

5.8.13.4 If the annulus cannot be grouted in accordance with these Regulations, the well shall be sealed in accordance with Section 9 of these Regulations.

5.8.13.5 The final depth to top of grout shall be above the base of the discharge line.

5.8.13.6 Monitor and observation wells may be required to be grouted in accordance with special conditions as stipulated on the permit.

5.9 Well Development

5.9.1 Development shall be performed and additives are removed from the well until formation cuttings, mud, drilling fluids

5.9.2 All potable wells shall be developed such that the water meets the following requirements:

5.9.2.1 Contains less than one (1) milligram of sand or larger particles per liter of water (particles with a diameter larger than 0.0625 millimeters).

5.9.2.2 Have a turbidity of less than ten (10) NTU (Nephelometric Turbidity Units), except when the turbidity is due to the oxidation of naturally occurring dissolved iron or manganese.

5.10 Pitless Well Adapters, Pitless Well Units, and Plumbing "Tees"

- 5.10.1 Pitless well adapter or pitless well unit shall be installed on all wells having submersible pump or a deep well ejector jet pump.
 - a
- 5.10.2 For suction lift systems where the well casing is used as a suction line and for heat pump recharge wells, a standard plumbing "Tee" connector and extension pipe with cap may be used in place of a pitless well adapter or pitless well unit, providing the extension meets the requirements of Section 4.10 of these Regulations.
- 5.10.3 All pitless well adapters or pitless well units shall be of a type approved by the National Sanitation Foundation, the Water Systems Council, or the Department.
- 5.10.4 Connections of the pitless well adapter, pitless well unit, or plumbing "Tee" to the well casing and lateral connections of piping shall be watertight.
- 5.10.5 A pitless well adapter, pitless well unit or plumbing "Tee" shall be installed in conformance with depth of water service piping requirements referenced in Section 3.22 of these Regulations.

5.11 Well Caps and Well Heads

- 5.11.1 The wellhead, or pitless well unit for domestic and agricultural wells, shall not terminate less than eight (8) inches above the finished ground surface or pump house floor unless otherwise approved by the Department.
- 5.11.2 The well head for permanent monitor and observation wells, except as provided by Section in 4.10(C), shall not terminate less than twenty-four (24) inches above the finished ground surface. The casing shall be protected from entry by contaminants, vandalism, accidental damage, etc. The applicable protection device is required as follows:
 - 5.11.2.1 For steel casing – a locking well cap.
 - 5.11.2.2 For PVC casing – a concentric, steel protective casing firmly set in concrete with a locking well cap.
- 5.11.3 Temporary monitor and observation wells require a locking well cap, but do not require a protective steel casing.
- 5.11.4 Upon approval by the Department, monitor and observation wells may be terminated below finished ground surface.
- 5.11.5 The Department may require additional protective devices such as bollards in high traffic areas.
- 5.11.6 Upon approval by the Department, potable wells may be terminated below finished ground surface. The design of the enclosure must be included with the application, or submitted prior to modification of an existing well.

- 5.11.7 All other well heads or all other well heads, or pitless well units with the exception of monitor, observation and closed loop heat pump wells shall terminate not less than twelve (12) inches above the finished ground surface. Wells constructed in coastal or flood prone areas as defined in Section 5.02(A), shall be completed in accordance with Section 5.02(C) of these Regulations.
- 5.11.8 All wells shall be securely covered except during construction and testing. Caps shall be locking or removable only with tools. If a cap cannot be used, an alternative method for securely covering the well shall be employed.
- 5.11.9 Well pits, pump pits and buried well seals, are prohibited.
- 5.11.10 Any time an existing well is identified not meeting the requirements of this Section, the well head shall be brought into compliance with the requirements of this Section, unless otherwise approved by the Department.

5.12 Water Level Access Ports and Tubes

- 5.12.1 All wells with a pumping capacity greater than fifty thousand (50,000) gallons per day shall be constructed with a port and access tube.
- 5.12.2 All public wells which supply a community water system and all industrial wells shall have a capped access port and tube. A transducer may be installed in addition to the port and tube.
- 5.12.3 If the pump motor is not installed directly over the well, the access port shall be located directly on top of the well.
- 5.12.4 If the pump motor is installed directly over the well, an access port pipe shall be installed through the pump base or outside the well casing at some accessible point below the base of the pump.
- 5.12.5 The access port and tube shall have a minimum inside diameter of three quarter (0.75) inch.
- 5.12.6 The access port shall be constructed to prevent the entrance of water, dust, insects, or other foreign material, and permit ready access for water level measurements.
- 5.12.7 Air line gauges are not acceptable water level measurement devices.

5.13 Meters, Pumping Equipment, and Vents

- 5.13.1 All wells with a design capacity greater than fifty thousand (50,000) gallons per day shall be permanently equipped with a meter(s) capable of acquiring instantaneous flow rate and totalized flow measurements accurate to within plus/minus five percent (+/- 5%) of actual flow rate, unless otherwise approved by the Department. Flow rate indicators may consist of any combination of test dials and direct reading indicators. Elapsed timers are not acceptable flow metering devices except as noted in Section 4.12(B) of these Regulations.
- 5.13.2 All public and industrial wells shall be permanently equipped with a meter capable of acquiring instantaneous flow rate and totalized flow measurements accurate to

within plus or minus five percent (+/- 5%) of actual flow rate, unless otherwise approved by the Department.

- 5.13.3 A backflow prevention device shall be installed in a pumping system where the pumping equipment is used to convey wastewater, fertilizers, chemicals, or provide fire protection and where the pumping equipment is also connected to a water well.
- 5.13.4 Water systems which withdraw water from more than one aquifer shall install a backflow prevention device on each well to prevent the introduction of water that is not native to the source aquifer.
- 5.13.5 The proposed withdrawal rate shall be consistent with the pump capacity and well design and the intended use of the well.
- 5.13.6 Well vents shall be screened and positioned to prevent the entrance of surface water, insects, or other foreign material.
- 5.13.7 Upon completion of installation of the pump, the driller or pump installer shall disinfect the well and pump in accordance with Section 6 of these Regulations.

5.14 Water Service Piping

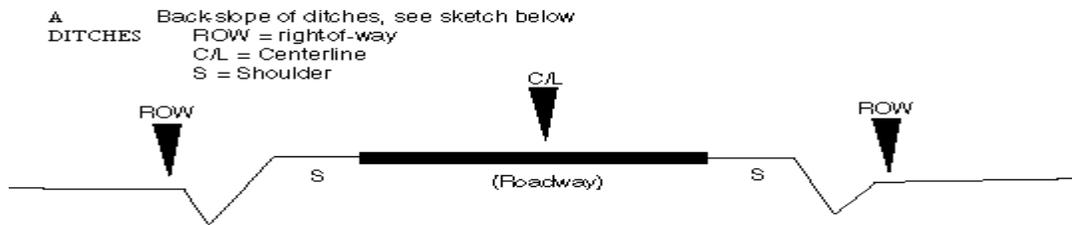
Water service piping from the well to the structure(s) shall be installed in accordance with the requirements of the "State of Delaware Regulations Governing a Detailed Plumbing Code", administered by the Department of Health and Social Services, Division of Public Health.

6.0 Special Construction Requirements

6.1 Monitor, Observation and Piezometer

- 6.1.1 Well construction materials and methods must be compatible with the monitoring program objectives.
- 6.1.2 Wells must be constructed to allow for characterization of geologic materials and sampling. Wells that are used as part of a specific environmental program may have special requirements.
- 6.1.3 Wells located within a Delaware Department of Transportation (DelDOT) right-of-way must be enclosed in a curb box, flush mounted with the ground surface with a six-inch wide cement apron around the perimeter of the curb box. No well shall be placed on highway travel lanes, on auxiliary travel lanes or on roadway shoulders. The well owner is responsible for having these wells abandoned upon notification from either the Department or DelDOT.
- 6.1.4 Applications for wells in these areas must have the words "Zone of Interest" clearly marked on the application. The following indicators identify Zones of Interest:

6.1.4.1 Ditches:



6.1.4.2 Telephone poles and DeIDOT fence lines.

6.1.4.3 Two (2) feet from the roadside edge of sidewalks.

6.1.4.4 Highway signs

- 6.1.5 PVC screens for monitoring hydrocarbons must have a slot width no less than .020 inches. Screens for all other applications must have a slot width no less than .010 inches.
- 6.1.6 Disinfection - Monitor wells shall not be disinfected without prior written approval from the Department.
- 6.1.7 Decontamination - In the event that contaminants are encountered during the drilling process, the water well contractor shall decontaminate the drilling rig and related apparatus to prevent the transfer of contaminants from the site following procedures provided by the SIRB.
- 6.1.8 Contaminant Disposal - Contaminated fluids and drill cuttings derived from drilling or pumping monitor wells shall be disposed of by the water well contractor following procedures provided by the SIRB.
- 6.1.9 Well Head Elevations - The elevations of the tops of monitor and observation well casings, excluding the caps, should be established with reference to mean sea level datum or a common datum, as appropriate, to determine the direction of ground water flow and relate ground water elevations to other available elevation points. The surface used for this measurement must be permanently marked.

6.2 Flood-Zone Well Construction

- 6.2.1 Special construction standards as set forth in this section are for wells in areas prone to wave action or flooding. These coastal areas are shown on Flood Insurance Rate Maps published by the Federal Emergency Management Agency and are designated as "A" or "V" zones.
- 6.2.2 Wells constructed on waterfront properties shall be constructed on the landward side of the property, unless otherwise approved by the Department.

6.2.3 Well construction beyond the Department's coastal building restriction line is prohibited.

6.2.4 Wells shall be finished at least two (2) feet above ground surface.

6.3 Public and Industrial Well Construction

6.3.1 The well owner shall be responsible for posting the Department well identification number on the exterior of the well house.

6.3.2 The boreholes of all public wells must be logged by a qualified geophysical logging operator. The suite of logs shall include a natural gamma log and any other log needed to identify the lithologic contacts intersected by the borehole.

6.4 Heat Pump Recharge Well Construction

6.4.1 All water obtained from wells for the operation of a heat pump system shall be injected into the aquifer from which it came. A waiver from this requirement may be considered where the requirements of Sections 5.04(D) and (E) of these Regulations have been met and the aquifer will not accept the water from the supply well.

6.4.2 No heat pump recharge well may be constructed within fifty (50) feet of any identifiable potential or existing source of contamination.

6.4.3 Other than thermal alteration, only natural ground water shall be recharged to the aquifer.

6.4.4 The diameter and screen length of all heat pump recharge wells shall be equal to or greater than the diameter and screen length of the heat pump supply well, unless otherwise approved by the Department.

6.4.5 Where a heat pump recharge well meets the requirements of 5.04(D) and all other requirements of these Regulations, and the receiving aquifer will not readily accept the return flow, another well will be required of the owner.

6.5 Heat Pump Closed Loop Well Construction

6.5.1 No heat pump closed loop well installed in an unconfined aquifer shall be constructed within fifty (50) feet of any identifiable potential or existing source of contamination.

6.5.2 No heat pump closed loop well installed in a confined aquifer shall be constructed within one-hundred (100) feet of any identifiable potential or existing source of contamination

6.5.3 The solution contained in the heat pump closed loop well piping system shall not contain any characteristic hazardous substances with the exception of ethanol-based antifreeze solutions designed for such systems. The use of non-toxic antifreeze solutions based on propylene glycol is recommended.

6.5.4 Closed loop heat pump well piping systems are not required to terminate above the finished ground surface. Prior to being connected to a manifold, the ends of the loop shall be temporarily sealed by fusion or capping. The use of tape is prohibited.

- 6.5.5 All buried pipe shall be marked with underground warning tape at a depth of twenty-four (24) inches.
- 6.5.6 Pressure testing of the closed loop heat pump system network shall be conducted prior to putting the system into operation.

6.6 Miscellaneous Well Construction

- 6.6.1 Miscellaneous wells will be subject to construction conditions as determined by the Department.

7.0 Well Disinfection

7.1 General Requirements

- 7.1.1 Disinfection of all newly constructed or repaired wells, in accordance with Section 6.02 s required, except as noted in Section 6.01(F) and (G) of these Regulations.
- 7.1.2 After any repair or maintenance to the well, pumping equipment or piping, or other system components, those components shall be disinfected. For domestic wells, the entire plumbing system shall be disinfected.
- 7.1.3 Bacteriological sampling and testing after the repair or maintenance of wells is required.
- 7.1.4 Calcium hypochlorite shall be used for disinfection unless otherwise approved by the Department.
- 7.1.5 Continuous disinfection directly into a well is prohibited.
- 7.1.6 No monitor well shall be disinfected without prior written approval of the Department.
- 7.1.7 No dewatering wells need be disinfected unless specifically required as a condition of the permit.
- 7.1.8 The Department shall have the right to require special disinfection procedures.

7.2 Disinfection Procedure

- 7.2.1 The following procedures shall be followed when disinfecting wells, unless otherwise approved by the Department
- 7.2.2 Calcium hypochlorite sufficient for a dosage of at least one hundred (100) milligrams per liter (mg/L) free available chlorine shall be emplaced into the well screen.
- 7.2.3 After the pump has been installed, the chlorine solution shall be fed through the entire supply line to waste until chlorine is detected. If the concentration is less than one hundred (100 milligrams per liter (mg/L), more calcium hypochlorite shall be added to the well until that concentration is reached.
- 7.2.4 The inside of the well above the static water level shall be disinfected with the chlorine solution to for thirty (30) minutes. If granular disinfectants were used prior

to closing the well the interior metal surfaces of the well casing above the static water level should be inspected, and any fragments should be rinsed.

- 7.2.5 If the well is connected to a public distribution system, the chlorinated water shall be pumped to the permanent disinfection unit, if present, or to the end of the water main where it is isolated from the remainder of the distribution system and can be blown off. Coordinate with the Office of Drinking Water (ODW).
- 7.2.6 If the well is connected to a residential system, the chlorinated water shall be pumped until chlorine is detected at each tap, unless otherwise approved by the Department.
- 7.2.7 A minimum of twenty-four (24) hours of contact time is required, but not to exceed forty-eight (48) hours.
- 7.2.8 If the free chlorine residual is less than five (5) milligrams per liter (mg/L) after twenty four (24) hours the above procedure shall be repeated. When the free chlorine residual is at least five (5) milligrams per liter (mg/L) after twenty four (24) hours, the well and distribution system shall be pumped to waste.
- 7.2.9 Should the well fail to be disinfected as determined by the Department, the Department may require other measures such as re-disinfection, repair, or sealing.
- 7.2.10 The amount of calcium hypochlorite needed to produce a dosage of one hundred (100) milligrams per liter (mg/L) free available chlorine per one hundred (100) feet of water column is given in the following table:

Calcium Hypochlorite Needed to Dose 100 Feet of Casing Water at 100 mg/L

Casing Diameter (Inches)	Volume/100 Feet (Gallons)	* Calcium Hypochlorite (Weight)
2	16.3	1/2 oz.
4	65.3	2 oz.
6	146.9	4 oz.
8	261.1	6 oz.
10	408.0	8 oz.
12	587.5	12 oz.
16	1,044.5	20 oz.
20	1,632.0	2 lb.
24	2,350.1	3 lb.

**65 percent available chlorine*

7.2.11 Notes

- 7.2.11.1 Read the calcium hypochlorite label carefully and follow all safety and storage instructions. Calcium hypochlorite should always be added to water. Never add water to calcium hypochlorite.
- 7.2.11.2 **The use of Calcium Hypochlorite warrants strict adherence to all applicable measures and utilization of proper protective equipment. The Department assumes no liability attendant to the handling, use and storage of Calcium Hypochlorite.**

8.0 Well Completion Reports

8.1 General Requirements

- 8.1.1 A well completion report and formation log shall be submitted to the Department in a format provided by the Department, not later than fifteen (15) days after the construction of any well, except as required in Section 3.11(C) of these Regulations.
- 8.1.2 Each completion report shall be signed by the well driller in direct on-site supervision of the well construction.
- 8.1.3 Failure to submit well completion reports as required by this Section shall result in the denial of additional well permits.
- 8.1.4 The completion report shall include the results of all testing required in the permit.
- 8.1.5 If geophysical logs were generated, the completion report shall include two (2) copies of each log.
- 8.1.6 An illegible or incomplete completion report will be returned to the preparer.
- 8.1.7 If the well location is different from that proposed on the application, it must be noted on the completion report..
- 8.1.8 For wells constructed in unconsolidated sand and gravel aquifers, the formation log shall include notation of the sediment type, grain size color, texture, accessory minerals, thickness and depth of individual layers or lenses, and all other distinctive features.
- 8.1.9 For wells constructed in crystalline rock, the formation log shall include the rock type (schist, gneiss, marble etc.) color hardness, texture, veining, and all other distinctive features, including depth, interval and estimation of flow rate of all water-bearing zones as encountered during drilling.

9.0 Domestic Well Water Quality Testing

9.1 General Requirements

- 9.1.1 Sections 9.2, and 9.4 shall be effective as of the effective date of these regulations.
- 9.1.2 Section 8.3 shall become effective one (1) year after the effective date of these regulations.
- 9.1.3 Section 8.5 shall become effective on January 1, 2015.
- 9.1.4 Sampling shall be performed by an Approved Sample Tester (AST) certified by the Delaware Division of Public Health.
- 9.1.5 Testing shall be performed by an accredited laboratory certified for drinking water analyses by the Delaware Division of Public Health.
- 9.1.6 Test results shall be provided by the well owner to the Divisions of Public Health and Water Resources within 15 days of receipt.
- 9.1.7 If testing is in conjunction with the transfer of a property the results shall be disclosed as a condition of sale.
- 9.1.8 The Department does not guarantee or otherwise certify the suitability of the water quality, and the well owner, or parties to a property transaction, shall be responsible for any treatment that may be necessary to attain a desired quality, unless otherwise determined by the Department.

9.2 New and Replacement Domestic Wells

- 9.2.1 Prior to use of the well for domestic water supply, the water quality shall be sampled and tested for the following parameters:
- 9.2.2 Alkalinity, Chloride, Hardness, pH, Iron, Nitrate, Nitrite, Sodium, Sulfate, Total Coliform (plus E coli (fecal) indicator).

9.3 Existing Domestic Wells

- 9.3.1 Prior to transfer of ownership of the well in conjunction with a property transaction, the water quality shall be sampled and tested for the following parameters:
- 9.3.2 Alkalinity, Chloride, Hardness, pH, Iron, Nitrate, Nitrite, Sodium, Sulfate, Total Coliform plus E coli (fecal) indicator.

9.4 Domestic Wells Installed in the Piney Point or Rancocas Aquifers

- 9.4.1 Wells installed (screened) in the Piney Point or Rancocas aquifers shall be sampled and tested for the following parameters for new installations, or existing installations prior to transfer of ownership of the well in conjunction with a property transaction:
- 9.4.2 Alkalinity, Chloride, Hardness, pH, Iron, Nitrate, Nitrite, Sodium, Sulfate, Total Coliform plus E coli (fecal) indicator, Arsenic, Fluoride.

9.5 Extended Testing

- 9.5.1 In addition to the requirements listed in this section wells shall be sampled and tested for Volatile Organic Compounds (VOCs)

and MTBE
reported

in accordance with EPA method 524a or equivalent, and
similarly.

9.6 The Department may require, after reasonable notice, that any well may be inspected, sampled, and tested, whether permitted or unpermitted, in order to protect public health and the environment.

10.0 Well And Pump Repair

- direct
- 10.1 All repair of the internal components of a well, shall be performed by, or under supervision of, a Delaware-licensed well driller, except for repair of pumps, which may also be performed by a Delaware-licensed, pump installer or plumber, except as provided in Section 10.2.
 - 10.2 A person owning or leasing land on which there is an agricultural, or irrigation well may perform their own pump repair on those wells.
 - 10.3 The repair of any well shall not modify the original construction specifications, except relining well screens is permitted.
 - 10.4 Repair of any well having a buried well head shall include the extension of the casing above ground as specified in Section 5.11 of these Regulations, unless otherwise approved by the Department.
 - 10.5 The repair of any industrial, public, or irrigation well shall include the installation of a water level access port and tube as required in Section 5.12 of these Regulations, if applicable.
 - 10.6 Well relining or changing capacity of the pump requires the submission of a new completion report.

11.0 Well Sealing

11.1 General Requirements

- 11.1.1 The objective of the requirements described in this Section is to seal the well thus preventing it from serving as a conduit. An unsealed or improperly sealed well can enable contaminants to enter groundwater or migrate between different aquifers.
- 11.1.2 All wells to be sealed shall be sealed only by a well driller.
- 11.1.3 Within fifteen (15) days of sealing of a well the water well contractor shall submit a well abandonment report to the Department, in a format provided by the Department. The report shall be completed and signed by the well driller supervising the site work.
- 11.1.4 The Department may require any well owner to have a well sealed if the Department determines that any of the following conditions apply:
 - 11.1.4.1 the well has been abandoned or has no beneficial use,

- 11.1.4.2 interference with the withdrawals of other water users unless compensation for such injury is provided satisfactory to the Department
- 11.1.4.3 the well is causing or is a potential source of contamination to waters of the state,
- 11.1.4.4 the well is producing water that is contaminated,
- 11.1.4.5 the operation of the well causes significant
- 11.1.4.6 the well is causing significant impacts to surface waters,
- 11.1.4.7 the well is deemed a potential safety hazard to the lives and welfare of humans or animals,
- 11.1.4.8 the well is not constructed in accordance with the permit conditions or these Regulations.
- 11.1.4.9 The well was installed illegally
- 11.1.5 A well screened in several aquifers or formations shall be sealed by pressure grouting inside the well from the bottom of the well to the top using a tremie pipe.
- 11.1.6 The Department may require or approve special sealing procedures.
- 11.1.7 The Department may require notification of the date of sealing.
- 11.1.8. All wells for which a replacement well permit has been issued and which are accessible shall be sealed within fifteen (15) days of completion of the replacement well unless specific written approval for retaining the replaced well is granted by the Department.
- 11.1.9 Wells that are unsuitable for their intended use shall be sealed or converted to another classification in accordance with Section 3.21 of these Regulations.
- 11.1.10 A well shall not be considered sealed if only the supply line is sealed.
- 11.2 Sealing and Fill Materials
 - 11.2.1. Only concrete, Portland cement, sodium-based bentonite clay, or combinations of these materials, or other materials approved by the Department shall be used to seal a well
 - 11.2.2 Only drill cuttings, clay, silt, sand, gravel, and crusher run are considered acceptable fill material and may only be used in accordance with Section 10.03 of these Regulations.
 - 11.2.3 Portland cement grout and sodium-based bentonite clay grout shall meet the requirements of Section 4.07(J)(1) and (2) of these Regulations.
- 11.3 Sealing Procedures

- 11.3.1 Prior to sealing, the well driller shall determine the condition of the well, its construction, and obstructions that may interfere with sealing. Obstructions shall be removed including re-drilling if necessary.
- 11.3.2 For well casings protruding above grade, and the casing is not to be removed, it shall be cut off at or below grade.
- 11.3.3 The Department may require that the well casing be ripped, perforated, or removed entirely to assure that any previously un-grouted annular space or voids are filled with sealing materials.
- 11.3.4 All wells shall be sealed with the appropriate sealing materials by pressure grouting through a tremie pipe from the bottom of the well upward to the ground surface, except as noted in Sections 9.03 (F), (G), and (H), or unless otherwise approved by the Department.
- 11.3.5 When Portland cement or concrete is used as a sealing material, it shall be emplaced in one continuous operation until grout returns to the surface.
- 11.3.6 A dug well larger than twenty-four (24) inches in diameter shall be filled and sealed by placing fill material in the well to a level approximately five (5) feet below land surface, and emplacing a plug of sealing material above the fill. The top foot of the well may be covered with fill material.
- 11.3.7 For wells penetrating fractured or cavernous rock, coarse fill materials may be used to fill the cavernous portions of the well. The well shall be sealed from bottom of the well to the cavernous zone, and from the top of the cavernous zone to land surface.
- 11.3.8. Dewatering wells and shallow monitoring or observation wells or piezometers less than twenty four (24) feet deep and two (2) inches or less in diameter shall have the entire casing removed unless otherwise approved by the Department. After removal of the casing, the wells may be abandoned with fill materials.

12.0 Well Identification Tag

- 12.1 Upon completion of the well and before leaving the site, the well driller, or pump installer shall be responsible for fastening the well identification tag. The tag shall be permanently fastened to the well casing above finished grade by means of a one half (1/2) or three-eighths (3/8) inch stainless steel band or other device or method approved by the Department. Tags for flush-mount installations shall be permanently fastened to the lid of the vault.
- 12.2 Tags for well permits issued via fax or under emergency circumstances shall be fastened to the well casing within five (5) working days of the well driller's receipt of the tag.
- 12.3 Well tags shall be returned to the Department within thirty (30) days of cancellation or expiration of an unused permit, or the sealing of a tagged well.

13.0 Waivers

- 13.1 The Department may grant waivers from any provision of these regulations that do not involve protection of the health and welfare of the public, or the environment. This process will apply only to the following, and no other:
 - 13.1.1 Property line setbacks
 - 13.1.2 Agricultural isolation distances
 - 13.1.3 Vertical closed loop heat pump isolation distances except for systems installed into confined aquifers
- 13.2 A separate application shall be made to the Department for each individual well permit desired. Each waiver application shall consist of:
 - 13.2.1 A complete well permit application;
 - 13.2.2 A separate scaled plot plan of the area depicting distances from all potential or existing sources of contamination as defined in Section 2.0 of these Regulations, within a one hundred fifty (150) foot radius of all proposed public and industrial wells, and within a one hundred (100) foot radius of all other proposed wells. The plot plan shall also include all buildings and property lines, and all other physically limiting barriers such as overhead power lines;
 - 13.2.3 The appropriate well permit application fee, if applicable;
 - 13.2.4 The property owner's signature on a written request which specifies the Section(s) of these Regulations for which the waiver is requested.

14.0 Variances

Applications for variances to any section of these Regulations except those which concern a source of water for three or fewer families shall be advertised in newspapers of local and statewide circulation with a comment period of fifteen (15) days. A public hearing will be held if a meritorious request is received within the fifteen (15) day period. A public hearing request shall be deemed meritorious if it exhibits a familiarity with the application and a reasonable statement of the variance's probable impact.

14.1 Applicable Delaware Law

No variance may be granted unless the Secretary, hearing officer or the Environmental Appeals Board finds that the following have been satisfied pursuant to the requirements of 7 Del. C., §6011.

- 14.1.1 Good faith efforts have been made to comply with the requirements of 7 Del. C., Chapter 60.
- 14.1.2 The applicant is unable to comply with the requirements of 7 Del. C., Chapter 60 and these Regulations because the necessary technology or other alternative methods are not or have not been available for a sufficient period of time or the financial cost of compliance by using available technology is disproportionately high with respect to the benefits which continued operation would bestow on the lives, health, safety and welfare of the occupants of this State and the effects of the variance would not substantially and adversely affect the policy and purposes of this chapter;

14.1.3. Any available alternative is being or will be used to reduce the impact of the granting of the subject variance on the lives, safety, or welfare of the occupants of this State; and

14.1.4. The continuing operation of the proposed well is necessary to national security or to the lives, health, safety or welfare of the occupants of this State.

14.2 Application Procedures

A separate application shall be made to the Department for each individual well permit desired. Each variance application shall consist of:

14.2.1 A complete well permit application;

14.2.2 A separate scaled plot plan of the area depicting distances from all potential or existing sources of contamination as defined in Section 2.42 and 2.53 of these Regulations, within a one hundred fifty (150) foot radius of all proposed public and industrial wells, and within a one hundred (100) foot radius of all other proposed wells. The plot plan shall also include all buildings and property lines, and all other physically limiting barriers such as overhead power lines;

14.2.3 The appropriate well permit application fee, if applicable;

14.2.4 Written documentation showing compliance with Section 13.01 of these Regulations.

14.2.5 The property owner's signature on a written request which specifies the Section(s) of these Regulations for which the variance is requested.

15 Public Hearings And Appeals

15.1 Public hearings shall be held in conformance with the requirements of 7 Del. C., §6006.

15.2 Decisions of the Secretary may be appealed to the Environmental Appeals Board pursuant to 7 Del. C., §6008.

Delaware Division of Water Resources



Working to protect your water supply!

**GROUND-WATER
WILLIE**

302-739-3665