SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

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R.61-71
South Carolina Well Standards

Effective Date: April 26, 2002

Bureau of Water
2600 Bull Street
Columbia, S.C. 29201

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SOUTH CAROLINA WELL STANDARDS
REGULATION 61-71

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(Statutory Authority: 1976 Code Section 44-55-40)

A. PURPOSE AND SCOPE.

These regulations establish minimum standards for the construction, maintenance, and operation of the following wells: individual residential, irrigation, monitoring (including non-standard installations), and boreholes to ensure that underground sources of drinking water are not contaminated and public health is protected. These regulations do not apply to public water wells as those standards are stated in R.61-58. Additional requirements may be found for injection wells in R.61-87; for water wells which produce greater than 3 million gallons per month in capacity use areas as stated in the regulations promulgated under the Groundwater Use and Reporting Act; for oil and gas exploration and production wells as required under the Oil & Gas Exploration, Drilling, Transportation and Production Act as stated in regulation R.121-8; and for monitoring and remediation wells required under the State Hazardous Waste Management Regulations (R.61-79). Permitting requirements for Individual Residential Wells and Irrigation Wells are found in R.61-44.

B. DEFINITIONS.

For the purpose of this regulation, the following terms are defined:

1. Annular Space - the space between the drill string or casing and the wall of the borehole.
2. Bored Well - a large diameter individual residential well or irrigation well, commonly equal to or greater than 24 inches in diameter, that is typically installed at a shallow depth and with casing constructed of rock, concrete, or ceramic material.
3. Borehole - a bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension.
4. Borehole Completion - the date the total depth of the borehole has been reached.
5. Boring – a borehole for the purpose of sampling sub-surface materials such as environmental soil sampling borings, geotechnical borings, or exploration borings, but does not include boreholes completed as wells.
6. Casing - a pipe or tubing of appropriate material, of varying diameter and weight, lowered into a borehole during or after drilling in order to support the sides of the hole and thus prevent the sides of the hole from caving, to prevent loss of drilling mud into permeable strata, or to prevent fluids from entering or leaving the borehole.
7. Certified Well Driller - a driller duly and currently registered in South Carolina by the Department of Labor, Licensing, and Regulation.
8. Confining Layer - a geologic formation, group of formations, or part of a formation that is capable of significantly limiting fluid movement between hydrogeologic units.
9. Consolidated Formation or Material – crystalline, metamorphic, limestone, or otherwise competent rock.

10. Conventionally Installed Monitoring Well – a monitoring well where an annular space is created during the well construction process.

11. Development - the removal of formation cuttings, fine-grained sediments, drilling fluids, or additives from the borehole.

12. Direct Push Monitoring Well - a type of monitoring well constructed by pushing casing or other sampling device into the subsurface to obtain water samples for groundwater quality analysis, or to measure groundwater levels, where little or no annular space is created.

13. Environmental Soil Sampling Boring - a borehole used to obtain a soil sample for contamination investigations.

14. Exploration Boring - any borehole for the purpose of sub-surface mineral investigation and exploration.

15. Forced Injection of Grout - the emplacing of grout through a tremie pipe by pumping as opposed to pouring by gravity.

16. Filter Pack - an artificial filter material that is placed in the annular space around the well screen.

17. Geotechnical Boring – a typically shallow borehole for determining physical properties of the soil and subsurface, including foundation or general geotechnical borings and other such shallow borings incidental to construction activities.

18. Geothermal System Well – a type of well that is used to provide heat exchange for heating and cooling systems where the piping is below ground; includes, but is not limited to, closed loop and open loop systems.

19. Individual Residential Well - a well intended to produce potable water for human consumption at a single residence or a family.

20. Irrigation Well - a well intended to produce water for uses other than human consumption, to include, but not be limited to, lawn and landscape watering and agricultural uses.

21. Monitoring Well - any well constructed specifically to obtain a sample of groundwater for analysis, or any well used to measure groundwater levels. These wells include, but are not limited to, wells constructed using conventional drilling techniques and direct push methods.

22. Permanent Monitoring Well – any monitoring well that is intended for multiple sampling events over time.

23. Sanitary Cover - a removable seal to prevent the entrance of contaminants or foreign matter into the well.

24. Sanitary Seal - a removable seal at the top of the casing, between the casing and pipe, wire, tool, or device, capable of supporting such tools or devices, having no opening that would enable the entrance of contaminants or foreign matter into the well.

25. Screen – a filtering device that serves as the intake portion of a well that allows water to enter the well while preventing sediment from entering the well.

26. Surface Water – all water, which is open to the atmosphere and is subject to surface runoff that includes lakes, streams, ponds, ditches, and reservoirs.

27. Temporary Monitoring Well – a monitoring well where a one-time groundwater sample or groundwater level measurement is obtained.

28. Thermoplastic - materials composed of acrylonitrile-butadiene-styrene (ABS), polyvinyl chloride (PVC), or styrene-rubber (SR) plastics.

29. Tremie - the use of a small diameter pipe inserted into the borehole through which the filter pack or grout is placed at the desired depth to either complete construction of the well or to abandon the boring.

30. Unconsolidated Formation or Material - layers or sequences of sands, silts, or clays.

31. Vent – a device to keep foreign matter out of the well and that allows the well to be vented to the atmosphere.

32. Well – any borehole completed for the purpose of extracting or injecting fluid. This shall include, but not be limited to, wells used for irrigation, individual residential drinking water, environmental restoration, geothermal well systems, or environmental sampling. Wells fall into one of the following types:

    a. Type I - open hole in bedrock aquifers;

    b. Type II - screened with natural filter in unconsolidated aquifers;

    c. Type III - screened with artificial filter in unconsolidated aquifers;

    d. Type IV - open hole in consolidated limestone aquifers;

    e. Type V - bored or dug well having a large diameter.

33. Well Completion Date – the date the casing has been grouted.

C. VARIANCES.

Any requests for variances to these regulations shall be directed in writing to the Department and shall be considered on a well-specific basis by the Department. A variance can be issued as an alternative construction method that ensures the equivalent protection of the groundwater resource and public health when the standards in this regulation cannot otherwise be met. The Department may revoke issued variances as determined to be appropriate by the Department.

D. GENERAL.

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per 40-23-10 et seq.

2. Analytical data submitted to the Department shall be from a South Carolina Certified Laboratory per R.61-81.

E. LOCATION OF WELLS.

1. Wells outlined in Section F and G shall be located the specified minimum distance from all of the following existing potential sources of contamination:

   a. Sewer lines ..... 20 feet

   b. Lakes, streams, surface-water bodies ..... 50 feet

   c. Septic tank/tile fields ..... 50 feet

   d. Animal feedlots, barns, stables ..... 50 feet

   e. Waste disposal--land application sites ..... 100 feet

   f. Waste treatment lagoons ..... 100 feet

   g. Chemical, herbicide, pesticide and petroleum storage or handling sites ..... 100 feet

   h. Landfills ..... 100 feet

   i. Hazardous waste landfills/surface impoundments ..... 100 feet

   j. Radioactive waste landfills ..... 100 feet

   k. Property lines and buildings ..... 5 feet

2. Certain conditions may require increased distances of certain wells from potential contamination sources or known contamination and the decision shall be made in consultation with the Department. These include but are not limited to:

   a. Type I and IV wells with less than twenty feet of casing

   b. Type I wells where fractured rock is at the surface

   c. Type II or III wells with no confining layers between the screened zone(s) and the ground surface

   d. Type IV wells where no confining layers overlie the open-hole limestone or the limestone is at shallow depth

   e. Type V wells because they are under water-table conditions

3. At the time of construction, all wells shall be accessible for cleaning, treatment, repair, inspection, and other attention as may be necessary.

F. INDIVIDUAL RESIDENTIAL AND IRRIGATION WELLS.

1. Drilling.

   a. The drilling process or use of drilling fluid additives shall not contaminate any aquifer.

   b. Water used in the drilling process shall be obtained from a source that will not result in chemical or biological contamination of any aquifer. Water taken directly from ponds, lakes, streams or other surface water sources shall not be used.

2. Grouting.

a. The diameter of the drilled hole shall be large enough to allow for a minimum of 1.5 inches of annular space on all sides of the casing for forced injection of grout through a tremie pipe.

b. Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.

(1) Neat cement grout shall be composed of Class A, Type I Portland Cement mixed with not more than seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement with a density of 15 to 16 pounds per gallon, or to manufacturer's specifications.

(2) Bentonite-cement grout shall be composed of powdered bentonite (less than 5% by weight) mixed at not more than 8 gallons of water to the bag, with a density of 14 to 15 pounds per gallon, or to manufacturer's specifications.

(3) High solids sodium bentonite grout shall have a minimum of 20% solids and be mixed per manufacturer's specifications with water and/or other required additives.

c. Grout shall fill the entire annular space from a minimum depth of twenty feet from the land surface at the time of well completion, unless otherwise approved by the Department. While the Department discourages wells less than 20 feet to be used for human consumption, it is recognized that due to differing hydrogeologic conditions across the state, some wells may need to be screened or completed at depths less than 20 feet to obtain potable water in the shallow aquifer. Therefore, wells less than 20 feet in depth, but no less than 15 feet in depth, are allowed. In these cases, in Type II and Type III wells, grout shall extend from one foot above the screen to the land surface and, in Type I and Type IV wells, the entire annular space shall be filled with grout. Any other minimum well depths may only be allowed per the variance procedure outlined in this regulation.

d. All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.

e. Wells shall be grouted in-place within five (5) days after borehole completion.

f. When high solids sodium bentonite grouts are used, a vapor barrier at the land surface at least the width of the annular space made of suitable materials, as approved by the Department, such as native soils, gravel,

sand, or thermoplastic material, is required for public safety and structural stability of the well.

3. Plumbness and Alignment.

Wells shall be constructed sufficiently plumb and straight so as to cause no interference with intended use.

4. Development.

a. Wells shall be properly developed. In a screened well, development shall be by a method that ensures that water is forced to flow into and out of the screen.

b. Development shall be complete when the well produces water typical of the aquifer being utilized.

5. Well Tested for Yield.

If a yield test is conducted, it shall be by a standard method and accurately measure flow. Results are to be included with the well record to be sent to the Department.

6. Backflow Prevention.

Approved backflow prevention devices are required on all wells that utilize a chemical feed system for any purpose other than water treatment. The backflow prevention device shall be installed so as to preclude any direct pathway for any contaminant to enter an underground source of drinking water.

7. Disinfection.

All individual residential wells and irrigation wells shall be disinfected upon well completion. The well shall also be disinfected upon any well maintenance, repair, pump repair, pump installation, or testing. Disinfectants shall be placed in the well in order to provide a chlorine residual from 50 ppm (milligrams per liter) to 250 ppm for a minimum of four hours before being flushed from the well. The method of chlorination shall be one that insures that the chlorine is uniformly distributed in the well. The well shall be flushed sufficiently after disinfection to remove the disinfectant and to condition the well for use.

8. Well Identification.

These wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible. The identification plate shall be permanently marked to show:

a. Company name and certification number of the driller who installed the well;

b. Date well was completed;

c. Total depth (feet); and,

d. Casing depth (feet).

9. Materials.

a. Casing.

(1) Casing may be driven, lowered, or installed in any manner that will effect a continuous water tight and plumb installation.

(2) A well point, drive pipe, or drive shoe shall be structurally suitable to prevent rupture during the driving of the casing.

(3) Permanent well casing shall be new, seamless, or electric-resistance welded steel or galvanized pipe or thermoplastic pipe.

(4) Casing shall have watertight joints that shall be glued or threaded and coupled if plastic, or electrically welded or threaded and coupled with heavy recessed-type couplings of steel, if metal.

(5) Casing shall be of standards classified by the American Society for Testing and Materials (ASTM) and shall be NSF approved.

(6) New steel casing which bears mill markings and which conforms to the standard and specifications ASTM A-53, ASTM A-120, or American Petroleum Institute (API-5L) for water well pipe shall be used.

(7) Casing weighing less than "standard weight" steel pipe is allowed by the Department for water wells when the following requirements are met:

(a) The casing shall have a minimum nominal wall thickness of 0.188 inches;

(b) Casing meets the requirements of American National Standards Institute and ASTM (ANSI/ASTM) for water well casing.

(8) In consolidated formations, the well casing shall be set into the formation so as to provide a watertight seal between the casing and the top of the consolidated formation.

(9) In unconsolidated material, well casing shall be set into the first confining layer or to twenty feet, whichever is greater.

(10) Casing installed shall extend a minimum of one foot above the land surface at the time of construction. If an above ground pump is used, the casing may extend less than one foot above the land surface or below the land surface with a protective wellhead cover that allows access to the wellhead if the piping connecting the well casing to the pump is glued or threaded and is watertight.

(11) Thermoplastic casing may be used provided the casing:

(a) Conforms to requirements of American National Standards Institute/American Society of Testing and Materials (ANSI/ASTM), specification F480-77 for thermoplastic water well casing pipe and couplings made in standard dimension ratios (SDR);

(b) Has minimum wall thickness and tolerances to meet or exceed requirements for SDR 26 thermoplastic water well casing pipe and couplings made in standard dimension ratios;

(c) Has wall thickness and tolerances to meet or exceed requirements for Schedule 40 thermoplastic water well casing pipe for nominal sizes three inches or smaller;

(d) Can be installed without interference from formational material or other objects that may cause physical damage to the casing during emplacement.

b. Screens.

(1) The well, if constructed to obtain water from an unconsolidated formation, shall be equipped with a screen that will prevent the entrance of formation material into the well after the well has been developed and completed.

(2) The well screen shall meet standards classified by the American Society for Testing and Materials (ASTM) and shall be National Sanitation Foundation (NSF) approved material, and shall be of a strength to satisfactorily withstand chemical or physical forces applied to it during and after installation.

(3) Thermoplastic well screens shall:

(a) Have a minimum wall thickness and tolerance which meet or exceed requirements for schedule 40 thermoplastic water well casing pipe for nominal sizes three inches and smaller;

(b) Have a minimum wall thickness and tolerance which meet or exceed requirements for SDR 26 thermoplastic water well casing for nominal sizes greater than three inches, and;

(c) Be installed in wells without interference from formation material or other objects that may cause physical damage during emplacement and do not exceed manufacturers recommendations for depth placement.

(d) Multi-screened wells shall not connect aquifers or zones that have documented differences:

(1) In water quality that would result in contamination of any aquifer or zone such that any State Primary Drinking Water standard is exceeded;

(2) In static water levels that would result in depletion of water from any aquifer or zone, or significant loss of head in any aquifer or zone.

(e) The bottom of the lower-most well screen shall be plugged or capped.

10. Filter Pack.

When a filter pack is used, the following criteria shall apply:

a. The filter pack shall be composed of uniformly sized, quartz sand or gravel being free from clay, silt, or other deleterious material.

b. The filter pack shall be installed using a method that ensures placement into the annular space around the screens.

c. The filter pack shall be disinfected prior to or during installation.

d. The filter pack shall not connect aquifers or zones that have documented differences:

(1) In water quality that would result in contamination of any aquifer or zone such that any State Primary Drinking Water standard is exceeded;

(2) In static water levels that would result in depletion of water from any aquifer or zone, or significant loss of head in any aquifer or zone.

11. Sanitary Seal.

a. A sanitary seal shall be provided on the top of the well casing.

b. If a vent is used, it shall be of a type to prevent the entrance of contaminants, insects, or rainwater into the well.

12. Reporting.

a. The Water Well Record Form 1903, or other approved form, shall be completed and submitted to the Department by the contractor within thirty days after well completion. In addition to the water well record, the driller shall submit additional information as available such as chemical or bacterial results, if taken, and pumping information.

b. A Form 1903 shall also be submitted for individual residential and irrigation wells that are abandoned.

13. Operations and Maintenance.

    a. All wells shall be operated and maintained at all times in such a manner so as to protect underground sources of drinking water from contamination and to protect public health. The well owner may be required to provide additional security against vandalism as appropriate. The well owner is responsible for routine maintenance and operation of the well.

    b. The well driller is responsible for ensuring wells are constructed in accordance with this regulation. Once the well driller has provided a properly constructed well to the well owner, the well driller is not responsible for normal wear of the well.

    c. A sampling spigot shall be installed on the wellhead.

14. Abandonment.

    a. When any well is removed from service or prior to putting in service, the well shall be sealed with a watertight cap or seal. The well shall be maintained such that it is not a source or channel of contamination while it is not in service. Until a well is abandoned, all provisions for protection of the water against contamination and for maintaining sanitary conditions around the well shall be carried out to the same extent as though the well were in routine use. This goal shall be met when conducting repair or maintenance on the well, surrounding structures, or pumps.

    b. Any well removed from service for longer than thirty-six months shall be permanently abandoned unless a variance from the Department is requested.

    c. Any well that acts as a source of contamination shall be repaired or permanently abandoned immediately after receipt of notice from the Department.

    d. Abandonment shall be by forced injection of grout or pouring through a tremie pipe starting at the bottom of the well or fill material and proceeding to the surface in one continuous operation.

    e. When an individual residential well or irrigation well is permanently abandoned, at a minimum, the well may be filled with either bentonite-cement, neat cement, 20% high solids sodium bentonite grout, sand, or gravel to no closer than twenty feet below the ground surface. The remaining twenty feet to the ground surface shall be filled with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout.

G. BORED INDIVIDUAL RESIDENTIAL AND IRRIGATION WELLS.

The construction of bored wells shall meet the following minimum requirements:

1. Drilling.

a. The drilling process or use of drilling fluid additives shall not contaminate any aquifer.

b. Water used in the drilling process shall be obtained from a source that will not result in chemical or biological contamination of any aquifer. Water taken directly from ponds, lakes, streams or other surface water sources shall not be used.

2. Grouting.

a. The diameter of the borehole shall be large enough to allow for a minimum of 1.5 inches of annular space on all sides of the casing for forced injection of grout through a tremie pipe.

b. Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.

(1) Neat cement grout shall be composed of Class A, Type I Portland Cement mixed with not more than seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement with a density of 15 to 16 pounds per gallon, or to manufacturers specifications

(2) Bentonite-cement grout shall be composed of powdered bentonite (less than 5% by weight) mixed at not more than 8 gallons of water to the bag, with a density of 14 to 15 pounds per gallon, or to manufacturers specifications.

(3) High solids sodium bentonite grout shall have a minimum of 20% solids and be mixed per manufacturers specifications with water and/or other required additives.

c. When high solids sodium bentonite grouts are used, a vapor barrier at the land surface made of suitable natural materials as approved by the Department, such as native soils, gravel, or sand, is required.

d. Grout shall fill the entire annular space from a minimum depth of fifteen feet from the land surface at the time of well completion to ensure that water does not enter the well from the joints in the well casing. Bored wells shall be greater than 15 feet in depth.

e. Grouting shall be done by forced injection of grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.

f. Grouting shall take place within five (5) days after borehole completion.

3. Development.

Development shall be complete when the well produces water typical of the aquifer being utilized.

4. Well Tested for Yield.

If a yield test is conducted, it shall be by a standard method and accurately measure flow. Results are to be included in the well record to be sent to the Department.

5. Backflow Prevention.

Approved backflow prevention devices are required on all wells that utilize a chemical feed system for any purpose other than water treatment. The backflow prevention device shall be installed so as to preclude any direct pathway for any contaminant to enter an underground source of drinking water.

6. Disinfection.

All individual residential wells shall be disinfected upon the initial installation of the pump and sanitary cover. The well shall also be disinfected upon any subsequent well maintenance, repair, pump repair, pump installation, or testing. Disinfectants shall be placed in the well in order to provide a chlorine residual from 50 ppm (milligrams per liter) to 250 ppm for a minimum of four hours before being flushed from the well. The method of chlorination shall be one that insures that the chlorine is uniformly distributed in the well. The well shall be flushed sufficiently after disinfection to remove the disinfectant and to condition the well for use.

7. Well Identification.

All wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible. The identification plate shall be permanently marked to show:

a. Company name and driller's certification number who installed the well;

b. Date well was completed;

c. Total depth (feet);

d. Casing depth (feet).

8. Casing.

a. Casing may be driven, lowered, or installed in any manner that will effect a continuous water tight and plumb installation.

b. Any piping connecting through the well casing shall be watertight.

9. Filter Pack.

When a filter pack is used, the following criteria shall apply:

a. The filter pack shall be composed of uniformly sized, quartz sand or gravel being free from clay, silt, or other deleterious material.

b. The filter pack shall be installed using a method approved by the Department into the annular space.

c. The filter shall be disinfected prior to or during installation.

10. Sanitary Cover.

A sanitary cover shall be provided on the top of the well casing.

11. Reporting.

a. The Water Well Record Form 1903, or other approved form, shall be completed and submitted to the Department by the contractor within thirty days after well completion. In addition to the water well record, the driller shall submit additional information as available such as chemical or bacterial results, if taken, and pumping information.

b. A Form 1903 shall also be submitted for bored wells that are abandoned.

12. Operations and Maintenance.

Bored wells shall be operated and maintained at all times in such a manner so as to protect underground sources of drinking water from contamination and to protect public health. The well owner may be required to provide additional security against vandalism as appropriate. The well driller is responsible for ensuring wells are constructed in accordance with this regulation. Once the well driller has provided a properly constructed well to the well owner, the well driller is not responsible for normal wear of the well. The well owner is responsible for maintenance and operation of the well.

13. Abandonment.

a. When a bored well is removed from service or prior to putting in service, the well shall be covered with a cap or seal. The well shall be maintained such that it is not a source or channel of contamination while not in service. Until a well is abandoned, all provisions for protection of the water against contamination and for maintaining sanitary conditions around the well shall be carried out to the same extent as though the well were in routine use. This goal shall be met when conducting repair or maintenance on the well, surrounding structures, or pumps.

b. Any well removed from service for longer than thirty-six months shall be permanently abandoned unless a variance from the Department is requested.

c. Any well that acts as a source of contamination shall be repaired or permanently abandoned immediately after receipt of notice from the Department.

d. Abandonment shall be by forced injection of grout or pouring through a tremie pipe starting at the bottom of the well or fill material and proceeding to the surface in one continuous operation, unless compacted clay is used.

e. The bored well shall be abandoned immediately upon being permanently taken out of service. The well may be filled with either bentonite-cement, neat cement, 20% high solids sodium bentonite grout, sand, or gravel to no closer than twenty feet below the ground surface. The remaining twenty feet to the ground surface shall be filled with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout, or compacted clay.

H. MONITORING WELLS

1. Requirements For All Permanent and Temporary Monitoring Wells.

a. Due to the nature and purpose of a monitoring well, the depth and location requirements in respect to surface water bodies, potential contamination sources, etc., are variable, and shall be approved on a case-by-case basis by the Department. All monitoring wells shall have Department approval prior to installation or abandonment. Prior to the construction of any monitoring well, the following information shall be completed on a form provided and/or approved by the Department and shall be submitted to the Department:

(1) Proposed well location(s) on a scaled map or plat;

(2) Proposed well construction details;

(3) Intended purpose of the well(s);

(4) Well owner's name and mailing address;

(5) Property owner's name and mailing address, if different from the well owner;

(6) Mailing address and county of location where monitoring wells are to be installed, if different from the well owner's or property owner's address;

(7) Proposed parameters to be analyzed; and,

(8) Proposed drilling date.

If any of the information provided to the Department changes, the Department shall be notified at least 24 hours prior to well construction.

b. All monitoring wells shall be drilled, constructed, maintained, operated, and/or abandoned to ensure that underground sources of drinking water are not contaminated.

c. All monitoring wells shall yield water samples and water levels that are representative of the zone monitored.

d. The well owner shall submit all analytical data and water levels obtained from each monitoring well to the Department within 30 days of receipt of laboratory results unless another schedule has been approved by the Department.

e. Any monitoring well which is destroyed, rendered unusable, or abandoned, shall be reported to the Department, and shall be properly abandoned, revitalized, or replaced as appropriate or as required by permit or regulation.

f. A Water Well Record Form 1903 or other form provided and/or approved by the Department shall be completed and submitted to the Department within 30 days after well completion or abandonment. At a minimum, the form shall contain the following information:

(1) Name and address of facility/owner;

(2) Surveyed or global positioning system location, in latitude and longitude or Universal Transverse Mercator coordinates, of monitoring well(s) on a scaled map or plat;

(3) Driller and certification number;

(4) Date drilled;

(5) Driller's or Geologist's log;

(6) Total depth;

(7) Screened interval;

(8) Diameter and construction details;

(9) Depth to groundwater with date and time measured;

(10) Surveyed elevation of measuring point with respect to an established benchmark.

(11) Monitoring well approval number issued by the Department.

g. Monitoring wells constructed and reported to satisfy permitting or other regulatory requirements are not required to submit duplicate reports under this regulation.

h. Any well that acts as a source of contamination shall be repaired or permanently abandoned immediately after receipt of notice from the Department.

2. Additional Requirements for Permanent Conventionally Installed Monitoring Wells

a. Grouting.

(1) These monitoring wells shall be grouted from the top of the bentonite seal to the land surface.

(2) Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.

(a) Neat cement grout shall be composed of Class A, Type I Portland Cement mixed with not more than seven (7) gallons of clean water per bag (one cubic

foot or 94 pounds) of cement with a density of 15 to 16 pounds per gallon, or to manufacturer's specifications

(b) Bentonite-cement grout shall be composed of powdered bentonite (less than 5% by weight) mixed at not more than 8 gallons of water to the bag, with a density of 14 to 15 pounds per gallon, or to manufacturer's specifications.

(c) High solids sodium bentonite grout shall have a minimum of 20% solids and be mixed per manufacturer's specifications with water and/or other required additives.

(3) The diameter of the drilled hole shall be large enough to allow for a minimum of 1.5 inches of annular space on all sides of the casing for forced injection of grout through a tremie pipe.

(4) All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.

(5) A cement or aggregate reinforced concrete pad at the ground surface of appropriate durability and strength, considering the setting and location of each well, that extends six inches beyond the borehole diameter and six inches below ground surface is required. The pad shall be capable of preventing infiltration between the surface casing and the borehole to the subsurface.

b. Construction and Materials

(1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be composed of material so as to minimally affect water quality analyses.

(2) Casing shall have a sufficient diameter to provide access for sampling equipment.

(3) A properly hydrated bentonite seal with a minimum thickness of twelve inches directly above the filter pack shall be used, if the well has a filter pack.

(4) The monitoring well intake or screen design shall minimize formational materials from entering the well. The filter pack

shall be utilized opposite the well screen as appropriate so that parameter analyses will be minimally affected.

(5) A locking cap or other security devices to prevent damage and/or vandalism shall be used.

(6) Monitoring wells completed below grade shall be in a watertight vault with a well cap to prevent infiltration of surface water into the well.

c. Well Identification.

All monitoring wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible. The identification plate shall be permanently marked to show:

(1) Company name and certification number of the driller who installed the well;

(2) Date well was completed;

(3) Total depth (feet);

(4) Casing depth (feet);

(5) Screened interval;

(6) Designator and/or identification number.

d. Development.

Development shall be complete when the well produces water typical of the aquifer being utilized.

e. Abandonment

Abandonment shall be by forced injection of grout or pouring through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation. The well shall be filled with either with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout, from the bottom of the well to the land surface.

3. Additional Requirements for Permanent Direct Push Monitoring Wells

a. Direct Push Wells cannot be installed below a confining layer unless it can be demonstrated to the satisfaction of the Department that cross-contamination of the aquifer systems can be prevented.

b. Grouting.

(1) These monitoring wells shall be grouted from the top of the bentonite seal to the land surface.

(2) Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.

(a) Neat cement grout shall be composed of Class A, Type I Portland Cement mixed with not more than seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement with a density of 15 to 16 pounds per gallon, or to manufacturer's specifications

(b) Bentonite-cement grout shall be composed of powdered bentonite (less than 5% by weight) mixed at not more than 8 gallons of water to the bag, with a density of 14 to 15 pounds per gallon, or to manufacturer's specifications.

(c) High solids sodium bentonite grout shall have a minimum of 20% solids and be mixed per manufacturer's specifications with water and/or other required additives.

(3) The diameter of the annular space shall be large enough to allow for forced injection of grout through a tremie pipe.

(4) All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.

(5) A cement or aggregate reinforced concrete pad at the ground surface of appropriate durability and strength, considering the setting and location of each well, that extends six inches beyond the borehole diameter and six inches below ground surface is required. The pad shall be capable of preventing infiltration between the surface casing and the borehole to the subsurface.

c. Construction and Materials

(1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be composed of material so as to minimally affect water quality analyses.

(2) Casing shall have a sufficient diameter to provide access for sampling equipment.

(3) The monitoring well intake or screen design shall minimize formational materials from entering the well. The well screen or intake shall be designed so that parameter analyses will be minimally affected.

(4) A locking cap or other security devices to prevent damage and/or vandalism shall be used.

(5) Monitoring wells completed below grade shall be in a watertight vault with a well cap to prevent infiltration of surface water into the well.

d. Well Identification.

All monitoring wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible. The identification plate shall be permanently marked to show:

(1) Company name and certification number of the driller who installed the well;

(2) Date well was completed;

(3) Total depth (feet);

(4) Casing depth (feet);

(5) Screened Interval;

(6) Designator and/or identification number.

e. Development.

Development shall be complete when the well produces water typical of the aquifer being utilized.

f. Abandonment

(1) Permanent Direct Push Wells that do not penetrate a confining layer shall be abandoned by removing all casing from the subsurface and be grouted by forced injection through a tremie pipe from the total depth to the land surface, or by forced injection or pouring of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation.

(2) Direct Push Wells that penetrate a confining layer shall be abandoned by forced injection or pouring of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation.

4. Additional Requirements For Temporary Monitoring Wells

a. Construction and Materials

(1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be

composed of material so as to minimally affect water quality analyses.

(2) Casing shall have a sufficient diameter to provide access for sampling equipment.

(3) The monitoring well intake or screen design shall minimize formational materials from entering the well. The filter pack or intake shall be utilized opposite the well screen as appropriate so that parameter analyses will be minimally affected.

b. Operation and Maintenance

All temporary monitoring wells shall be sealed with a watertight cap or seal until abandoned. Temporary monitoring wells shall be maintained such that they are not a source or channel of contamination before they are abandoned.

c. Abandonment.

(1) All temporary monitoring wells shall be abandoned within 5 days of borehole completion.

(2) A conventionally drilled temporary well shall be abandoned by forced injection of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation.

(3) A Temporary Direct Push Well that does not penetrate a confining layer shall be abandoned by forced injection of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through a tremie pipe after the sampling device has been removed.

(4) A Temporary Direct Push Well that penetrates a confining layer shall be abandoned by forced injection of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through the sampling device as the sampling device is removed from the sub-surface. Abandonment shall occur during the initial withdrawal from the original push borehole and not by a separate tremie tool after the sampling device has been removed to ensure the breech in the confining layer is permanently sealed.

5. Use of Water Wells as Monitoring Wells.

Due to the variability involved, the use of a potable water well as a monitoring well shall be approved by the Department on a case-by-case basis.

6. Non-Standard Monitoring Wells

Due to the variability involved, the use of construction methods, techniques, or monitoring well designs not covered in this regulation shall be approved by the Department on a case-by-case basis.

I. BORINGS.

1. Geotechnical Borings.

    a. Geotechnical borings shall be abandoned within five days of borehole completion.

    b. Geotechnical borings shall be backfilled with a suitable material, such as the native material removed from the boring, to eliminate safety hazards and infiltration of runoff into the boring.

2. Exploration Borings

    a. Exploration borings shall be abandoned or cased to observe groundwater levels within five days of borehole completion or completion of geophysical logging. When cased, the casing shall be grouted per the requirements of R.61-71.F.2. and shall be capped for safety when not in use.

    b. Exploration borings in near surface unconsolidated formations or saprolite shall be backfilled with a suitable material, such as the native material removed from the boring, to eliminate safety hazards and infiltration of runoff into the boring.

    c. Exploration borings in indurated or consolidated formations shall be abandoned by filling with either bentonite-cement, neat cement, 20% high solids sodium bentonite grout, sand, or gravel to within no less than twenty feet of the surface and the remainder shall be filled with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout.

    d. Exploration borings in indurated or consolidated formations shall be abandoned by forced injection of grout or pouring through a tremie pipe starting at the bottom of the borehole and proceeding to the surface in one continuous operation.

    e. Special precautions shall be used to abandon exploration borings if natural voids, such as solution cavities in limestone, significant fractures, and shear zones, are encountered. Suitable grout and grouting methods shall be used when such conditions exist to ensure the long-term integrity of the grout in the abandoned borehole.

    f. Exploration borings constructed on property that is included in an active mine permit shall be exempt from this Section of this regulation.

    g. A form provided and/or approved by the Department shall be completed and submitted to the Department within 30 days after completion of the exploration project, or phase in exploration drilling, whichever occurs first. The Department shall treat the approved form

completed and submitted for exploration boring abandonment as confidential trade secrets and proprietary business information and not subject to public disclosure under the Freedom of Information Act.

3. Environmental Soil Sampling Borings

   a. All analytical data obtained from each environmental soil sampling boring shall be submitted to the Department within 30 days of receipt of laboratory results unless another schedule has been approved by the Department.

   b. The boring shall be abandoned within five days of borehole completion.

   c. Borings five feet in depth or shallower may be abandoned by backfilling with native fill material.

   d. Borings greater than five feet in depth shall be completely filled from the bottom of the borehole to the land surface with bentonite-cement, neat cement, or 20% high solids sodium bentonite grout.

   e. The boring shall be abandoned by forced injection of grout or pouring through a tremie pipe starting at the bottom of the borehole and proceeding to the surface in one continuous operation.

   f. A Water Well Record Form 1903 or other form provided and/or approved by the Department shall be completed and submitted to the Department within 30 days after abandonment.

4. Horizontal Borings.

   a. Horizontal borings shall be backfilled with a suitable material, such as the native material removed from the boring, to eliminate safety hazards and infiltration of runoff into the boring.

J. GEOTHERMAL SYSTEM WELLS.

1. Drilling.

   a. The drilling process or use of drilling fluid additives shall not contaminate any aquifer.

   b. Water used in the drilling process shall be obtained from a source that will not result in chemical or biological contamination of any aquifer. Water taken directly from ponds, lakes, streams or other surface water sources shall not be used.

   c. Geothermal system wells shall not connect aquifers or zones that have documented differences:

      (1) In water quality that would result in contamination of any aquifer or zone such that any State Primary Drinking Water standard is exceeded;

(2) In static water levels that would result in depletion of water from any aquifer or zone, or significant loss of head in any aquifer or zone.

2. Grouting.

a. If the geothermal system well is to be cased, the diameter of the drilled hole shall be large enough to allow for a minimum of 1.5 inches of annular space on all sides of the casing for forced injection of grout through a tremie pipe. Grout shall fill the entire annular space from a minimum depth of twenty feet from the land surface at the time of well completion, unless otherwise approved by the Department.

b. If the geothermal system well will not be cased, the borehole may be filled with either bentonite-cement, neat cement, 20% high solids sodium bentonite grout, sand, or gravel to no closer than twenty feet below the ground surface. The remaining twenty feet to the ground surface shall be filled with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout.

c. Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.

(1) Neat cement grout shall be composed of Class A, Type I Portland Cement mixed with not more than seven (7) gallons of clean water per bag (one cubic foot or 94 pounds) of cement with a density of 15 to 16 pounds per gallon, or to manufacturer's specifications.

(2) Bentonite-cement grout shall be composed of powdered bentonite (less than 5% by weight) mixed at not more than 8 gallons of water to the bag, with a density of 14 to 15 pounds per gallon, or to manufacturer's specifications.

(3) High solids sodium bentonite grout shall have a minimum of 20% solids and be mixed per manufacturer's specifications with water and/or other required additives.

d. All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.

e. Geothermal system wells shall be grouted in-place within five (5) days after borehole completion.

f. When high solids sodium bentonite grouts are used, a vapor barrier at the land surface at least the width of the annular space made of suitable materials, as approved by the Department, such as native soils, gravel,

sand, or thermoplastic material, is required for public safety and structural stability of the well.

3. Well Identification.

These wells shall be properly labeled with an identification plate immediately upon well completion. The identification plate shall be constructed of a durable, weatherproof, rustproof, material. The identification plate shall be permanently secured to the well casing or enclosure floor around the casing where it is readily visible. The identification plate shall be permanently marked to show:

a. Company name and certification number of the driller who installed the well;

b. Date well was completed;

c. Total depth (feet); and

d. Casing depth (feet).

4. Reporting.

The Water Well Record Form 1903, or other approved form, shall be completed and submitted to the Department by the contractor within thirty days after well completion.

K. VIOLATIONS AND PENALTIES.

1. Violations of this regulation shall be subject to penalties as provided in Sections 48-1-320, 44-55-90 and 48-1-330 of the 1976 S.C. Code of Laws.

2. Whenever the Department finds that a well driller is in violation of a requirement under this regulation, the Department will issue a written notice of violation with a requirement to correct all violations within a specified time period. Whether the noted violation(s) is properly corrected within the specified time period, the extent of deviation from the regulation, the potential for harm, and the historical record of violations by that well driller, shall be considered by the Department in determining additional enforcement actions, if any, and any associated penalties.

3. Should a violation be determined by the Department to have occurred despite the well driller following all applicable regulations and manufacturer's specifications, the Department shall direct the well driller to correct the noted violation within a specified time period. If this violation is corrected within the specified time period, no monetary penalty will be assessed for that violation.

4. After written notice of violation, the Department may issue an order or commence an action in court requiring the well driller to comply with the permit, regulation, standard, or requirement, or may request the Attorney General to commence an action under this subsection in the appropriate court. The Department may also assess civil penalties as provided in this section for violations of the provisions of this regulation or for violating any order, permit, regulation, or standard.

5. A well driller who fails to take appropriate corrective action, after receiving written notice of violation of a provision of this regulation, is liable for civil penalties or criminal prosecution.
6. The Department shall have full access to a well driller's bond as required by the Department of Labor, Licensing, and Regulation to correct a violation of this regulation where, as part of a Department enforcement action, a well driller is unwilling or unable to take required corrective actions.
7. If the Department finds a person not certified by the Department of Labor, Licensing, and Regulation in the act of drilling a well, the Department may issue an order or field citation requiring the person to immediately cease and desist operations, or seek a court order enjoining further drilling.

L. SEVERABILITY.

Should any section, paragraph, sentence, clause, phrase, or other part of this regulation be declared invalid for any reason, the remainder shall not be affected thereby.