

STATEMENT OF BASIS AND PURPOSE

RULES AND REGULATIONS FOR WATER WELL CONSTRUCTION, PUMP INSTALLATION, CISTERN INSTALLATION, AND MONITORING AND OBSERVATION WELL/HOLE CONSTRUCTION 2 CCR 402-2

EFFECTIVE: September 1, 2016

This Statement of Basis and Purpose identifies the statutory authority for each proposed rule and regulation and describes the purpose of each rule. Where appropriate, this document also elaborates upon and clarifies certain provisions in the Construction Rules.

RULE 1 TITLE

These Rules have been referenced by different titles over the years. Generally, the Rules apply to those structures over which the Board has jurisdiction, which are referenced in the title of the Rules.

RULE 2 AUTHORITY

The authority of the Board of Examiners of Water Well Construction and Pump Installation Contractors (“Board”) to promulgate these Rules arises from the general assembly’s creation of the Board to ensure protection of the groundwater resources of the State of Colorado and public health and safety. See § 37-91-101, C.R.S. This Rule cites the specific statutory authority of the Board to promulgate minimum standards for certain activities and for the construction of certain types of structures, and to revise such regulations in accordance with the Board’s statutory authority and the State Administrative Procedure Act of article 4 of title 24, C.R.S.

RULE 3 SCOPE

The statutory authority for this Rule is found in sections 37-91-101(1); 37-91-102; 37-91-104(1)(c), (j), & (k); 37-91-106(3) & (4); and 37-91-110(2), C.R.S. The purpose of this Rule is to identify the activities and individuals to which these Rules apply.

Rule 3.4 identifies all materials incorporated by reference in these Rules as authorized by section 24-4-103(12.5), C.R.S, and explains how copies of such materials may be obtained.

RULE 4 PURPOSE

The statutory authority for this rule is found in sections 37-91-104(1)(c), (j), & (k); 37-91-106(3) & (4); and 37-91-110(2), C.R.S. The purpose of this Rule is to identify the broad purposes for the Rules as a whole. These Rules specify minimum standards for construction materials and methods. As required by Rule 10.1.1, when mandated by geologic, hydrogeologic, or well construction conditions, a licensed contractor must apply or use higher standards, higher grade construction materials, and more thorough site-specific construction and installation methods to comply with the purpose of these Rules.

Rule 4.6 was added to the Rules under the authority of section 37-91-106(4).

RULE 5 DEFINITIONS

The statutory authority for this Rule is found in sections 37-91-101(1); 37-91-102; 37-91-104(1)(c), (j), & (k); 37-91-106(3) & (4); and 37-91-110(2), C.R.S. The purpose of this Rule is to identify the terms used throughout the Rules.

Section 37-91-102, C.R.S. defines nineteen terms used in these Rules. Unlike the previous version of the Rules, this version provides verbatim the statutory language of all terms defined by the General Assembly. This Rule also defines additional terms to ensure that their meanings and usage are clearly understood.

The definitions of the different aquifer “types” in Rule 5.2 were expanded for clarification and simplification. In order to properly regulate construction of wells drilled into different geological formations in Colorado, it is necessary to classify and define distinct aquifer types according to their hydrogeological characteristics. Although Colorado has distinct, named aquifers, these aquifers may be found with localized or regional geologic features. For example, certain Denver basin aquifers may be a Type I or Type II aquifer, depending on the specific subsurface position of the aquifer. Therefore, these Rules designate four types of aquifers, and specific construction standards for each type, in order to ensure that a well constructed in a particular location will be constructed to protect the groundwater resources of the State of Colorado based on the characteristics of the aquifer at that location.

Rule 5.2.2.1: Type I aquifer refers to an aquifer overlain by a confining geologic layer, regardless of whether the aquifer is confined based on hydrostatic pressure. In some cases, Type I aquifers may become ‘unconfined’ based on changing water levels, thereby affecting the hydrostatic pressure of the aquifer.

Rule 5.2.2.2: Type II aquifers while not overlain by a confining layer may or may not underlie a Type III (unconsolidated aquifer).

Rule 5.2.2.3: Type III aquifer - The new definition makes clear that any well drilled into unconsolidated material is a Type III well and that impermeable layers that do not act as hydraulic boundaries may exist within these deposits.

Rule 5.2.2.4 defines the Laramie-Fox Hills aquifer as a separate aquifer type, because of unique issues of poor water quality found in this aquifer and adjacent geologic units. There is an increasing reliance by homeowners and communities on this aquifer in areas without other viable water supplies. These Rules identify specific minimum construction standards for wells drilled into the Laramie-Fox Hills aquifer. The Laramie-Fox Hills aquifer is also administratively defined in the Denver Basin Rules, 2 CCR 402-6 (2015) See Rule 10.4.8

Rule 5.2.3, the definition of “Authorized individual,” was modified in order to allow for an individual not registered as a professional geologist or professional engineer to request designation by the Board as an Authorized Individual based on unique qualifications and experience, and on a case-by-case basis.

In Rule 5.2.9, the definition of “Cistern” was modified in order to distinguish cisterns used for domestic water supply from an “artificial reservoir” such as livestock storage tanks or other device not intended for public or domestic use.

Rule 5.2.12: Confining layers are administratively defined for the Denver Basin and for Designated Ground Water Basins. Confining layers between aquifers outside of these administratively-defined areas are those as mapped in geologic literature.

Rule 5.2.25: a definition for “hydraulic fracturing of a water well” was added to the Rules in 2016 because of the increasing use of hydraulic fracturing techniques to stimulate water production for certain wells. Such techniques, if performed in certain hydrogeologic settings, may present a risk to the integrity of confining layers that bound aquifers. See Rule 10.1.6.

In Rule 5.2.30, monitoring and observation holes are distinguished from test holes as those boreholes constructed for the purpose of observing, measuring, or sampling groundwater. Because monitoring and observation holes will be used for monitoring and observing groundwater (and thus will be open holes, presenting a risk of groundwater contamination if not constructed and abandoned properly), they must be registered with the State Engineer and constructed only by an authorized individual. This includes environmental boreholes constructed for repeated observations of groundwater. These are distinguished from “test holes” as defined in Rule 5.2.51. Monitoring and observation holes include holes constructed as air sparge wells and piezometers.

5.2.49: The definition of “static water level” is meant to limit the potential for reporting a water level on the construction report that has not yet reached equilibrium. The static water level is an important data point for pump installers and scientists researching aquifer conditions and this definition will hopefully result in better reporting.

Rule 5.2.51: The definition of “test hole” was expanded to distinguish such holes, used exclusively for geotechnical, geophysical, or geologic investigation, or soil/rock sampling, from monitoring and observation holes used for observations of groundwater. Holes drilled with the intent of investigating or measuring groundwater are not test holes. Test holes include inclinometers and soil vapor extraction holes.

Rules 5.2.63 and 5.2.64 define and distinguish between a “well yield estimate” and a “well yield test,” which are two types of procedures designed to estimate or test the stabilized production rate of a well. See Rules 10.8 and 12.

RULE 6 GENERAL RULES

The statutory authority for this Rule is found in sections 37-91-101(1); 37-91-102; 37-91-104(1)(c), (j), & (k); 37-91-106(3); and 37-91-110(2), C.R.S.

Rule 6 implements general statutory provisions that apply to well construction and the installation of pumping equipment. Rule 6 also advises contractors of certain State Engineer’s notice and permitting requirements.

Rule 6.1 explains that the licensing process and those functions associated with obtaining and maintaining a license, previously explained in the Construction Rules, are now found in the BOE Rules, 2 CCR 402-14.

Rule 6.2 clarifies well permit requirements by identifying the types of work for which the State Engineer requires the issuance of a new well permit, and specifying that a contractor must determine that a valid well permit exists prior to and during all phases of well construction and installation of pumping equipment. For enforcement purposes, this Rule also requires a copy of the well permit to be available at the well site at all times such work is being performed.

Rule 6.2.2.1 requires all contractors or their direct employees to possess, make available, and post at the well site a copy of the well permit for the well on which work is being performed. This rule also requires compliance with all conditions of approval of well permits, including advance notification of well construction or pump installation. If the applicable well permit includes such a condition, details for compliance with the advance notification requirement will be included in the well permit.

Rule 6.2.2.2 allows a contractor who is unable to verify that a well permit exists or is required for the work being requested on a well, to notify the State Engineer of the work performed and to provide information about the well within thirty days of performing the work. While this Rule recognizes the practical difficulties that a contractor may encounter when performing emergency repairs on an existing well, it does not relieve a contractor of the responsibility for complying with statutory requirements and Rule 6.2.2.

Rule 6.2.3 addresses situations where the State Engineer has issued a well permit authorizing construction of a well at any point within a specified tract of land and provides that the well construction contractor must identify within 60 days of completion the location of the constructed well pursuant to the conditions of the well permit.

Rule 6.3 sets forth the notice requirements of the State Engineer for the construction of dewatering wells and monitoring and observation holes, and for the construction of test holes that will penetrate through a confining layer between aquifers. Rules 6.3.1 and 6.3.2 clarify who is responsible for providing such notice, and Rule 6.3.3 establishes time periods for completing construction of structures for which notice was given under this Rule.

Table 1 lists the general types of wells and holes, identifies who may construct such wells and holes, identifies when a permit or notice is required prior to construction, and indicates what types of excavations can be constructed and plugged and sealed by a person with a special license. This table was revised to clarify license, permit, and notice requirements.

Rule 6.4 sets forth the conditions under which the State Engineer has deemed that approval of the construction of dewatering wells or monitoring and observation holes with less than the required notice may be obtained.

Rule 6.5 requires all licensed contractors, private drillers, private pump installers and authorized individuals, upon request by the State Engineer or his staff, to identify any well, test hole or monitoring and observation hole/well that they intend to construct or work on within a specified five-day period. This Rule was modified to change the time period from three days to five days in order to allow the Chief Well Inspector to request advance notice of anticipated activities over a longer time period. Such notifications will assist the State Engineer in enforcement and monitoring efforts.

Rule 6.6 establishes that the construction standards of these Rules are minimum standards that contractors must comply with for all hole/well construction, pump installation, and cistern installation. If more stringent or comprehensive standards that apply to the work being performed are set forth in federal, state, county, local or municipal laws, regulations or codes, the contractor must comply with such standards. It is the contractor's responsibility to know if such more stringent or comprehensive standards exist and to comply with such standards. Under no circumstances will the minimum standards of the Rules serve to insulate a contractor or other individual from complying with the valid and existing requirements of a local, state, or federal jurisdiction.

Rule 6.7 prohibits the use of products and materials which may be health hazards and is patterned after and complies with similar standards established for drinking water regulations. Pipe thread compounds are used on drilling equipment and may commonly be applied generously to ensure an excess amount remains on tools after tightening. Therefore, where such compounds contain hazardous or toxic substances, excess amounts could be left in the well after drilling, which causes a serious risk to public health. The purpose of this rule is to prevent use of materials or products that may pose a risk to public health and safety and to the groundwater resources of Colorado.

Rule 6.8 addresses the disposal of fluids generated during well construction, development or disinfection. The improper disposal of such fluids into the surface or ground waters of the state may contaminate those waters and is therefore prohibited unless authorized by the appropriate agency. The purpose of this Rule is to alert well construction contractors and pump installation contractors so that they can avoid these potential hazards and obtain proper authorization if necessary.

Rule 6.9. The water used in drilling fluids, developing and cleaning, or hydraulically fracturing or stimulating a well can potentially contaminate both the well and the aquifer. To minimize such hazards, Rule 6.9 requires contractors to obtain such water from an approved public supply, and sets forth disinfection requirements for water obtained from a surface or ground water source when an approved public supply is not available. Contractors and authorized individuals must comply with local regulations, and the prior appropriation system, when obtaining water from flowing streams. Information on requirements for using water from rivers and streams can be obtained from the water commissioner or Office of the Division Engineer in the water district at issue.

Rule 6.10 Drilling fluid additives should be specifically approved by the Board. A list will be maintained on the Board's website. The approval process for new additives will require that information about an additive be brought before the board for review at their regularly scheduled meeting.

RULE 7 LICENSING

Previous versions of these Rules included licensing and bonding requirements in Rule 7 and Rule 8. Those Rules are now found in the Rules and Regulations for Administration of Licensing, Financial Responsibility, Continuing Education, and Remedial Action (BOE Rules), 2 CCR 402-14. To avoid any confusion, and to maintain a consistent Rule numbering system for these Construction Rules, Rule 7 and Rule 8 have been left blank.

RULE 8 FINANCIAL RESPONSIBILITY

Previous versions of these Rules included licensing and bonding requirements in Rule 7 and Rule 8. Those Rules are now found in the Rules and Regulations for Administration of Licensing, Financial Responsibility, Continuing Education, and Remedial Action (BOE Rules), 2 CCR 402-14. To avoid any confusion, and to maintain a consistent Rule numbering system for these Construction Rules, Rule 7 and Rule 8 have been left blank.

RULE 9 WELLS AND HOLES WHICH MAY BE CONSTRUCTED BY OTHER THAN A WELL CONSTRUCTION CONTRACTOR

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-104(1)(c), (j), & (k); 37-91-106(3); and 37-91-110(2), C.R.S. The Purpose of this Rule is to identify the basic types of activities that may be completed by persons that are not licensed for water well construction or pump installation, as well as notification and reporting requirements. Additionally, this Rule identifies certain structures that do not have minimum construction standards.

Thousands of test holes are drilled each year in Colorado to investigate the subsurface geology and to obtain data needed to design buildings, bridges, highways, dams and other structures. The majority of these holes are constructed by soil engineering firms, consultant engineers or geologists with their own equipment, or by specialized firms providing equipment and operators for hire. Generally, these individuals and/or firms do not have experience with water well construction, and thus are unable to qualify to take the examination for a well construction contractor's license.

Large numbers of monitoring and observation holes/wells are constructed every year to monitor fluctuations of the water table and to collect aquifer data or water quality samples. Many of these are located around or within known or suspected locations of contaminated groundwater. Some are required to be located at solid or hazardous waste disposal sites, and wells are now required to monitor for potential contamination from underground storage tanks. Many of these are being constructed by other than licensed contractors, because quite often, licensed water well contractors do not have the specialized equipment necessary to construct test holes and/or monitoring and observation holes/wells.

Rule 9.1 identifies the individual responsibility for compliance with the provisions of the Rules for those holes or wells that can be constructed by persons not licensed for water well construction. Rule 9.1 was reworded to clarify the meaning of the rule. Three specific type of individuals are authorized to construct the structures identified in Rule 9, and those individuals are identified in Rule 9.1.

After consideration of the many different types of excavations which are constructed, the Board determined that the excavations listed in Rule 9.2 could be constructed and otherwise worked on by persons other than a licensed contractor, provided that the excavation does not penetrate through a confining layer between two adjacent aquifers. Where such excavations may penetrate through a confining layer between aquifers, adequate experience, equipment, knowledge, and training is necessary to ensure protection to the aquifers and prevent contamination or interconnection.

Therefore, any excavation that penetrates a confining layer must be constructed by an individual licensed for water well construction, unless a person with requisite knowledge, skill, and training requests and receives a special license issued by the Board under the procedures identified in the BOE

Rule, 2 CCR 402-14. The Board recognizes that certain individuals possess the ability to properly construct and abandon wells so as to prevent cross-contamination, who are not licensed contractors or do not have the water well construction experience needed to take the examination for a license. The Board's intention is to issue a special license to persons meeting the requirements of Section 37-91-105, C.R.S. and the requirements of the BOE Rules, 2 CCR 402-14, who can demonstrate that they know how to properly construct monitoring or observation holes/wells or test holes through a confining layer between adjacent aquifers. This provision should allow geological, geotechnical, and engineering consulting firms to continue their current normal business after obtaining the special license.

Rule 9.2. identifies common types of excavations that may be constructed by an authorized individual. A "horizontal drain" is a type of dewatering system, so it was eliminated in this list to avoid redundancy. Should there be any question as to whether a person is qualified or allowed to construct a particular type of excavation, it is the responsibility of that person to contact the Board of Examiners for a determination as to whether the person is authorized to construct the structure.

Rules 9.2.1 and 9.2.2 set forth the State Engineer's required notice prior to construction of dewatering wells and monitoring holes and the requirements for filing construction reports for such structures.

Rule 9.3 identifies the specific construction Rules that apply to the construction and the plugging, sealing and abandoning of excavations included in Rule 9.

Rules 9.3.2 and 9.3.3 were added to the Rules. Rule 9.3.2 concerns dewatering wells and dewatering systems that do not penetrate a confining layer and are not constructed in a vertical borehole in order to address confusion concerning the relevant construction standards applicable to such excavations. Dewatering wells and systems are commonly constructed as part of home or commercial construction to eliminate or minimize the presence of shallow groundwater for proper construction, on a temporary or permanent basis. Individuals constructing such excavations must ensure that such excavations prevent contamination of nearby surface water or groundwater, and must comply with any relevant local, state, or federal requirements. Abandonment of such excavations, however, must be performed in accordance with Rule 16.4.1 in order to ensure that such excavations will prevent the rapid infiltration to groundwater of any surface contamination in the future.

Rule 9.3.3 concerns pond or lake "wells," which will intercept and use groundwater for beneficial use and therefore require well permits from the State Engineer. However, such excavations, to the extent that they do not penetrate a confining layer between aquifers, present minimal risk to groundwater. Therefore, this rule provides no minimum universal construction standards for ponds or lakes permitted as wells by the State Engineer. However, construction of such excavations must ensure that contaminants are prevented from entering the pond or lake.

Rule 9.4 details the requirements for plugging accidental penetrations through a confining layer, in order to prevent the interconnection or cross-contamination of water from different aquifers.

Rule 9.6 prohibits the conversion to a production water well of any excavation constructed pursuant to a notice of intent as provided in Rules 6.3 and in accord with the requirements of Rule 9. This provision stems from the Board's concern that unlicensed contractors have neither the knowledge, skill, or equipment needed to properly construct excavations that will be eventually converted into water supply wells. The adoption of Rule 9.6 also ensures consistency with Rule 6.1 and Section 37-90-138(3), C.R.S., (which require a permit be obtained from the State Engineer prior to constructing a

new well or performing work on an existing well under the authority of the State Engineer) while allowing for the construction of test holes and monitoring and observation holes without engaging the permit process prior to their construction.

RULE 10 MINIMUM WELL CONSTRUCTION STANDARDS

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-102; 37-91-104(1)(c), (j), & (k); 37-91-106(3); 37-91-109(1); and 37-91-110(2), C.R.S. The purpose of this Rule is to identify the minimum construction standards for water wells or other excavations constructed in different types of aquifers in Colorado, in order to ensure that such construction prevents harm to the public health, will not impair water quality or cause contamination of shared groundwater resources, and will ensure the safety of groundwater resources for Colorado's existing and future populations.

In general, Rule 10 establishes minimum construction standards for production water wells, injection wells and all other wells, in order to provide for the reasonable life of a well, to produce an adequate supply of groundwater when such water is available, to prevent the intermingling of water between aquifers, and to prevent contamination of the aquifer and the groundwater. These minimum standards do not relieve a contractor from employing more stringent practices or standards in response to specific geologic, hydrologic or construction situations. These construction standards apply to all wells as that term is defined in Section 37-91-102(16), C.R.S., except for those wells that are described in Rule 9.

Rule 10.1 summarizes common industry practices and objectives necessary to prevent injury to humans and livestock and to protect a well from the entry of contaminants.

Rule 10.1.1, requires a licensed contractor to apply or use higher standards, higher grade of materials and/or more thorough and protective, site-specific construction and installation methods to comply with the purpose of these Rules when mandated by geologic, hydrologic or particular construction conditions.

Rules 10.1.2 through 10.1.4 establish the responsibility of the contractor to be informed of potential hazards prior to well construction and set forth requirements that are intended to safeguard humans, animals, and groundwater during the well construction process. Rule 10.1.2 was amended to ensure the contractor is familiar with the geology of all aquifers AND confining layers he/she will encounter and require the contractor to advise well owners of the potential for encountering known poor water quality or contamination.

Rule 10.1.5 requires that nested wells be grouted to prevent intermingling of water from different aquifers in the borehole and thereby prevent the cross-contamination of groundwater from different aquifers.

A Rule which previously concerned "gravel pit wells," was removed from the Rules. A related rule, concerning construction standards for pond or lakes permitted as wells, was added at Rule 9.3.6. The Board does not have jurisdiction over excavations made for the purpose of obtaining or prospecting for minerals, including sand and gravel, even where such excavations are later permitted by the State Engineer as "wells". See 37-92-102(16)(b)(I).

Rule 10.1.6 addresses hydraulic fracturing of water wells. This rule ensures the fracturing process does not damage the confining layer between two aquifers.

Rule 10.2 addresses well locations. In selecting well sites, it is important to consider topography, surface drainage, floodplain, and proximity to leach fields, feedlots and corrals, surface water courses, septic tanks, and sewer lines as potential sources for contamination. It is necessary for the contractor to comply with local (city, county, etc.) spacing requirements for distances from potential sources of contamination that may exceed the distances stated in this Rule. Compliance with the Board's Rules in no way insulates or exempts a contractor from complying with more strict requirements of local jurisdictions. In choosing a well site, consideration must also be given to the accessibility of the location for the construction equipment and for any future repairs to and plugging of the well. The current rules are promulgated to maximize the distance between the well and contaminant sources, but within the practical limits of lot size.

In the event a well must be constructed less than 100 feet horizontally from a potential source of contaminants, or less than 50 feet from a septic tank, sewer line, or other vessel containing contaminants, this Rule establishes a procedure for a greater minimum grouting depth near the surface to provide additional protection from contamination. Figures 2a and 2b are included in Rule 10.2 to illustrate the construction requirements for wells less than 100 feet from a contaminant source or 50 feet from a vessel. The Rule explains procedure and requirements for obtaining a variance from the minimum spacing and/or grouting requirements when those standards present practical difficulties or unusual hardship. The minimum grouting depth requirements of Rule 10.2.3 are based on ensuring protection to the groundwater from sources of contamination nearby for replacement wells.

Rule 10.3 describes well casing criteria. The diameter, wall thickness, and materials of the well casing affect the life of the well and the size of the pump equipment that may be installed. In selecting casing materials, a contractor must consider the type of formations penetrated by the borehole, depth of well, corrosive conditions known or anticipated, and purpose for which the well is constructed. Only steel casing may be used where well casing will be exposed at the surface and/or where substantial weight will be attached to the well casing.

Rule 10.3.1 describes the condition of well casing to be used. Oil field pipe, including gas-line pipe, may be contaminated with residual hydrocarbons and is not suitable for water wells, its use is prohibited. This Rule eliminated the use of used surface casing. Only new casing should be installed in wells because used casing may be corroded or contaminated, even though it may not immediately appear so.

Rule 10.3.2 addresses minimum well casing diameter requirements. To be more definitive in describing casing diameters, these Rules refer to inside diameter (ID) instead of outside diameters (OD). Minimum steel well casing diameter was increased to 4.5 inches ID to reduce the number of pumps becoming stuck in a well due to biofouling or corrosion. Steel casing with an ID of at least 4.5 inches is available for use by contractors, according to contractors and suppliers. Pumps can commonly become stuck in older steel-cased wells that have an ID of less than 4.5 inches, due to corrosion or other issues. Stuck pumps prevent proper abandonment of wells and may lead to a risk of groundwater contamination. Corrosion is not a concern with PVC casing, and wells constructed using 4-inch ID PVC casing have been shown to be acceptable for wells constructed in certain locations. PVC casing may not be exposed above the ground surface, as required in Rule 10.3.1.

Rule 10.3.3 presents well casing thickness requirements. Adequate casing wall thickness is required to prevent collapse due to hydrostatic pressures. PVC casing with wall thicknesses less than 0.237 inches has been shown to be inadequate for deeper wells because of the risk of collapse caused by hydrostatic pressure differences inside and outside of the casing. A majority of contractors currently use schedule 40 PVC for these reasons; increasing the minimum PVC well casing thickness will better ensure protection to groundwater resources and provide a longer-lasting well for Colorado well users.

Rule 10.3.4 was added to the Rules to prohibit certain casing perforation methods or designs that leave debris on the inside of the well casing, such as “torch-cut slots.” Debris or protrusions in the inside of the well casing has caused difficulties with removing pumps for service or replacement. Stuck pumps, which may lead to well abandonment procedures that include leaving the pump in place, present a danger to the quality of groundwater resources. Oxygen-acetylene torches are prohibited on well casings less than 5 inches in diameter because they often result in debris left inside the casing. Plasma torches are allowed in all cases because the cuts do not leave debris inside the well casing.

Rule 10.4 outlines required construction procedures for wells. The size of the borehole and casing, and the amount, type and placement method of the grout are construction components important in achieving an effective seal to prevent the entry and/or migration of contaminants into and through the borehole and to confine groundwater production to the specified aquifer or authorized producing interval. This Rule requires that certain minimum depths of steel casing be used at ground surface to protect against breakage and to provide resistance to degradation by sunlight.

Rule 10.4.1 requires centralizers to be installed in all grouted intervals of the production casing in order to maintain the natural seal between aquifers. Casing lengths typically run over 40 feet long, so the minimum distance between centralizers should be no more than 50 feet to allow the well constructor to determine where the centralizers should properly be located on the casing. For grouted intervals that span less than 50 feet, the interval must be centralized at the top and bottom of the grouted interval. Unless centralizers are properly installed to center the production casing in a borehole, grout may not adequately flow around the casing or set at a minimum thickness in order to properly seal the well between aquifers, thereby presenting a risk of aquifer cross-contamination. Further, properly-grouted surface casing is the most important protection against surface contamination. Therefore, this rule was amended to require centralizers be installed within five feet of the base of the surface casing, to ensure that the annular space outside of the surface casing is grouted uniformly and the casing is centered in the borehole.

Rule 10.4.2 identifies minimum requirements for wells constructed using surface casing, in order to ensure that surface contamination will be prevented from migrating into groundwater.

Rule 10.4.3 addresses minimum grout and casing requirements for wells constructed without surface casing.

Rule 10.4.4 discusses minimum annular space requirements for grouted intervals of wells. The size of the annular space is an important factor in obtaining an effective and permanent seal in a well. In general, a larger annular space, in conjunction with the use of casing centralizers, is much more likely to result in an effective seal in the borehole than a smaller annular space that allows the casing to be in contact with the borehole wall during grouting. To simplify Rule 10.4.4, annular space requirements are no longer dependent on grouting techniques. The exception to this Rule is where grout is poured from the surface and the casing is not vibrated. This method of placement requires a larger annular space.

Rule 10.4.5 establishes minimum standards for the intervals of grout and watertight casing in wells constructed into Type I (confined) aquifers. Continued and accelerated development of groundwater resources of deeper confined aquifers, and the likelihood that aquifers will increasingly be used for underground storage and recovery, require minimum construction standards that will ensure that wells are constructed to withdraw water from only the authorized zone of production and to prevent leakage to and from the surface and between aquifers through the borehole. Different ownership of waters in adjacent aquifers, the associated administration of separate water sources, and the potential for cross-contamination of adjacent aquifers through the borehole dictate that the construction of wells into and through Type I aquifers must be accomplished using appropriate materials installed according to specified procedures. Obtaining a permanent grout seal between aquifers is essential in preventing the unnecessary loss of hydrostatic pressure in a confined aquifer and is necessary for the administration of water rights from the confined aquifer. In addition to the larger annular space explained above, grouting materials and intervals are specified in this Rule to achieve the necessary separation of aquifers. Information that would allow drillers to accurately determine the depth of confining layers is not always available, therefore the best approach to protect groundwater resources is to grout from the top of the production zone back up to the depth required by Rule 10.4.5.2. In addition, grouting through overlying aquifers and confining layers protects the integrity of the casing from poor water quality and corrosion. Figures 4a and 4b are included in this Rule to illustrate the necessary elements of well construction in Type I aquifers.

Rule 10.4.5.1 addresses wells in Type I aquifers that penetrate only one (1) confining layer. These wells can be constructed with PVC or steel casing and the minimum grout interval overlying the production zone is 60 feet. However, if the well is constructed with steel casing, the entire annular space between the casing and borehole must be filled with grout from the production zone to the top of the well. PVC casing does not have the structural integrity to withstand extended grout intervals. At a certain depth, the heat from hydration, and weight of grout, will cause PVC to collapse.

Rule 10.4.5.2 addresses wells in Type I aquifers that penetrate more than one (1) confining layer. Because these wells require the sealing of more than one overlying aquifer, the only way to ensure a proper grout seal across all confining layers is to grout the entire annular space from the production zone to a level above the uppermost (shallowest) confining layer. Due to the heat from hydration and weight of grout, steel casing is required for wells completed in these aquifers.

Rule 10.4.5.3 prohibits compromising the integrity of a confining layer through hydraulic fracturing or artificial stimulation of Type I water wells. For the reasons stated above, wells drilled into Type I aquifers must protect against cross-contamination between different aquifers and the loss of hydrostatic pressure of a confined aquifer.

Rules 10.4.6, 10.4.6.1 and 10.4.6.2 establish minimum standards for the intervals of grout and watertight casing in wells constructed into Type II (unconfined bedrock) aquifers; such as the unconfined portion of a Denver Basin aquifer (except for the Laramie-Fox Hills aquifer, see Rule 10.4.8), the fractured granite common in mountain locations, and other water bearing formations that are neither under confined conditions nor consist of recently deposited unconsolidated alluvial and/or colluvial materials. These Rules designate two distinct Type II aquifers; those overlain by an alluvial/colluvial aquifer and those not overlain by an alluvial/colluvial aquifer. The required minimum depths of watertight casing and grout placement will afford reasonable protection from surface and near surface contamination of wells constructed into unconfined bedrock.

Rule 10.4.6.3 addresses the issue of intermingling of water between unconfined bedrock and overlying alluvial aquifers. Figure 4c is included in this Rule to illustrate the necessary elements of well construction in Type II aquifers.

Rule 10.4.7 establishes minimum standards for wells constructed into Type III aquifers (unconfined, unconsolidated material) such as recently deposited material located adjacent to river and stream channels or unconsolidated materials emplaced by gravity (slope wash). The vulnerability to contamination of wells constructed into Type III aquifers is well-recognized. The standards adopted in this Rule recognize that most wells constructed into Type III aquifers are shallow with a static water level near the land surface and that often, little natural protection from contamination is found between the land surface and the water table. The minimum depth of steel casing, solid casing, and grout interval reflect consideration of these factors. Contractors are encouraged to exceed these minimum standards in instances where the installation of additional grout is practical and may afford the well a greater degree of protection from contamination. Figure 4d is included in this Rule to illustrate the necessary elements of construction of wells completed into Type III aquifers.

Rule 10.4.8 sets out minimum construction standards for all wells that are constructed in the aquifer identified by the State Engineer's office as the Laramie-Fox Hills aquifer. Because of the number of wells drilled in the aquifer, and the expected future wells that will be drilled, the Board has identified minimum standards to ensure that wells constructed in the Laramie-Fox Hills aquifer will be protected from known sources of poor groundwater quality. The Laramie-Fox Hills aquifer is a large aquifer that, in certain locations, was previously categorized as either Type I or Type II. However, the aquifer has known zones of poor water quality, especially near the surface in some regions. Because of the need to ensure that Laramie-Fox Hills aquifer wells will protect the existing groundwater resource and will provide quality water to customers, Rule 10.4.8.2 requires contractors to grout all Laramie-Fox Hills aquifer wells from the top of the permitted production zone up to ten feet above the base of the surface casing, or to the depth required by Rule 10.5.2.1 if no surface casing is installed.

Rule 10.4.9 describes an alternative construction method whereby the inner casing is extended above the land surface and the outer casing is cut off at the surface. Of primary concern in this Rule is the necessity of obtaining a watertight seal to prevent contaminants from entering or moving in the annulus between the casings.

Rule 10.4.10. Filter packs requiring the periodic replenishment of additional pack materials must be equipped so that the material can be inserted through an approved filler tube.

Rule 10.4.11 provides requirements for obtaining approval of plans for the construction of infiltration galleries and gallery-type wells. Figure 5 illustrates some of the essential elements of construction of gallery-type wells and provides some acceptable examples of their construction. Due to the high potential for contamination of these types of wells, it is necessary that the construction plans be approved prior to construction so that conditions may be imposed, if necessary, to reduce the risk of such contamination.

Rules 10.4.12 and 13 express the necessity of maintaining a vertical (or near vertical) borehole. A vertical borehole allows casing to be more easily installed and centered within the hole for proper grouting. Vertical wells also minimize wear on casing and pumping equipment due to gravity induced contact of the components within the borehole. Although the State Engineer may allow directional drilling, the minimum well construction standards in these Rules were developed for conventional drilling and construction methods. It is necessary that the Board specifically review and approve well

construction procedures that include directional drilling methods that do not comply with the minimum standards of these Rules. Where a contractor, or private driller, desires to construct a well using directional drilling techniques, the contractor must first obtain a permit from the State Engineer for the specific well construction sought, before requesting a variance from the Board under the procedures of Rule 18.

Rule 10.5 addresses minimum grouting standards for wells. Grouting is the only means by which the annular space between the casing and the borehole wall can be artificially sealed with a permanent obstruction that prevents the downward flow or percolation of contaminants from the surface or known zones of subsurface contamination through the borehole into the well and aquifer. Grouting is also the only means by which a permanent seal can be placed between aquifers to ensure that the penetration of the confining layer or layers does not become a conduit for the exchange of groundwater in different aquifers and a potential avenue for cross-contamination of aquifers. Grouting between aquifers is also necessary to prevent the unnecessary loss of hydrostatic pressure in a confined aquifer and is essential for the administration of water rights and entitlements to withdraw water from a specific aquifer.

As explained above, the placement of grout is crucial to proper well construction in two primary categories, i.e., 1) near surface to prevent contamination from entering the well from the surface and 2) between aquifers to prevent intermingling of waters from different aquifers. Achieving an adequate grout seal depends on several factors which include the type of grout material used, the means of placement of the grout, the ability to place grout so that voids and intervals of contact between the well casing and borehole wall are eliminated or minimized, and the overall length of the grouted interval. Rule 10.5, in conjunction with Table 2, is intended to set standards for all water wells for the type of grout that may be used, to explain mixing and placement standards, and to establish standard depths below the land surface to the top of near surface grout seals. Standards for grout material, grout interval, and placement procedure for sealing between aquifers are set forth in Rule 10.5.

Table 2 outlines the standards for achieving an acceptable grout mixture of common grouts, depending on the material used and the placement method employed. The table also categorizes commonly used grout materials and identifies those areas in the Rules that address or may restrict the use of certain materials. Table 2 allows for the use of bentonite and alternative grouts in water wells upon written request and approval from the Board. As described in Table 2's "Approved Grouts" section, a maximum of 6 gallons of water per 94 pound bag of cement is necessary to allow for adequate mixing of cement for neat cement and cement-sand grouts in accordance with guidelines published by the National Groundwater Association (NGWA), the American Water Works Association (AWWA) and Environmental Protection Agency (EPA). A maximum of 7 gallons of water per 94 pound sack of concrete grout is also in line with AWWA and EPA standards.

Rule 10.5.2.1 sets standards for the depth to the top of the uppermost grouted interval in all wells. In some instances, pitless adapters or pitless units mustnot be installed if such installation would cause the destruction of a minimum continuous grout interval. Parts a and b of this Rule describe the depth to the top of the uppermost grout interval according to different construction methods (with or without a pitless adapter or pitless unit). Figure 3 is included in this Rule to illustrate the essential elements of well construction near the land surface and includes an indication of both steel casing requirements and grout depth and interval requirements. Figure 4b illustrates the essential elements of well construction in Type II and Type III aquifers when grout cannot be placed directly between the outermost casing and the borehole wall in the uppermost part of the well.

Rule 10.5.3 describes methods of placement for various grout mixtures and establishes standards for the maximum depth to which grout can be poured from the surface. A maximum depth and an adequate annular space are required to properly pour grout to ensure that it reaches the bottom of the interval and to prevent the alteration of the proportions and consistency of the grout mixture during placement. The method of grout placement is important in assuring that the borehole annulus is completely sealed as intended. Positive displacement of the grout mixture from the bottom of the interval upward is the best and recommended placement method. If necessary, grout can be placed in stages to limit hydrostatic pressures generated during placement.

Rules 10.5.3.2 and 10.5.3.3 establish the conditions for which the placement grout poured from the surface is sanctioned. Due to the uncertainty in borehole geometry, pouring is restricted to forty feet below ground surface and only in a dry annulus. Cement-sand or concrete grout mixes can only be poured into a hole with a minimum annular space of 6 inches because of its high viscosity.

Rule 10.5.3.4, in conjunction with Table 2, sets forth the general limitations for the use of bentonite grouts in water wells and specifies the method of grout placement when the use of bentonite grout has been approved by the Board (see "Bentonite" in Table 2). Because of the numerous considerations involved in the appropriate use, mixing and placement of the various bentonite grout products available, the Board requires that a variance from grout requirements of Rule 10.5 be obtained to ensure that an adequate and permanent grout seal will be achieved. Bentonite grouts may achieve a good annular seal only where the interval remains hydrated. Also, the shear strength of bentonite grouts is insufficient to allow it to be used to separate aquifers where different hydrostatic pressures may exist.

Rule 10.5.4 specifies the required minimum setting time for cement grout prior to the resumption of well construction and/or cleaning and development. To determine the appropriate set times required for neat cement and cement with additives, contractors or private drillers should refer to the grout tables published by Halliburton Services. The Setting time for bentonite grout will be specified in the conditions of approval of the written variance granted for its use and will be in accordance with the manufacturer's recommendations.

Rule 10.6 describes minimum standards for well development and cleaning. Once constructed, and allowing adequate time for any grout that has been placed to set, the completed well must be cleaned of drilling fluids and cuttings and developed to ensure that the well is ready for installation of the pumping equipment. Proper well cleaning and development is necessary to ensure public health for the consumer of the water and to prevent contamination to aquifers. Cleaning and development is required by the well construction contractor, so that a constructed well is prepared for pump installation. Well development is a necessary step in the construction of a water well and is directly related to well design and aquifer characteristics. Well development should establish optimal hydraulic contact between the well and the geologic formation that supplies water, provide an acceptable level of sand and turbidity, and provide for an appropriate level of drawdown at the production pumping rate.

Rule 10.8 requires contractors to measure, and report, a completed well's static water level. Such information is necessary to provide the well owner, pump installer, and the State Engineer's office with information on groundwater levels.

Rule 10.9 requires flowing wells to be equipped with a device that completely controls the flow from the well. Uncontrolled flowing wells waste water, create disposal problems and must be properly equipped to control and stop the flow prior to completing the well construction.

RULE 11 MINIMUM PUMP INSTALLATION AND CISTERN INSTALLATION STANDARDS

The purpose of this Rule is to establish the minimum standards for installing pumping equipment and cisterns that are connected to water well supply systems in order ensure that such installation prevents harm to the public health, will not impair water quality or cause contamination of shared groundwater resources, and will ensure the safety of groundwater resources for Colorado's existing and future populations.

To prevent the contamination of wells and to protect the aquifers and the public health, only individuals authorized by the Board may install pumping equipment and/or cisterns connected to water well supply systems. Standards for pump installations are necessary to assure that pumping equipment is installed to meet the intended purpose of the well and is compatible with the yield of the well. Fittings and connections must be selected and installed to allow water to discharge from the well while providing a watertight seal to prevent leakage of water or the entry of contaminants. Cistern installation standards are necessary to ensure that cistern installations connected to a water well supply system are accomplished in a manner that maintains sanitary conditions for the water supply and prevents backflow contamination to groundwater resources.

Rule 11.1 identifies the limited conditions under which an authorized individual may install pumping equipment, authorizes well construction contractors to install temporary pumps solely for well development and testing, and cross-references Rule 14.4 regarding the installation of temporary pumps in monitoring and observation holes/wells. The Rule reflects the statutory requirement that only a licensed pump installation contractor (or private pump installer) can install a cistern or other water storage tank between the wellhead and pressure tank. See § 37-91-109(2), C.R.S . This Rule also emphasizes a pump installation contractor's responsibility for ensuring that a valid well permit authorizing pump installation exists and cross-references Rules 6.2.2.1 and 6.2.2.2, which address how to fulfill this responsibility. Rule 11.1.2 identifies the limited conditions under which a pump installation contractor may remove and install casing or liners. Rule 11.1.3 prohibits licensed pump installers from installing grout in the annular space of a well, or between well casing; grout installation in a water well at depth is a task for which a water well construction license is required. However, a pump installation contractor may install grout as necessary to install a pitless adapter (assuming the required minimum continuous grout interval is maintained) and to abandon a well pursuant to Rule 16.

Rule 11.2 establishes pump installation and cistern installation standards intended to prevent the entry of foreign matter and contaminants into all wells, regardless of whether water withdrawn from a well is used for human consumption. Rules 11.2.1 and 11.2.2. address the installation of pitless adapters or pitless units and of well seals. Where installation of such devices will require some grout removal, any such alteration of grout must still maintain the minimum continuous grout interval required by Rule 10.4. Rule 11.2.4 provides for the penetration of cisterns to install water lines and electrical wires.

Rule 11.3 identifies considerations for locating a cistern to promote sanitary installations that protect the water in the well and aquifer from contamination. Rules 11.3.1 through 11.3.4 address the standards for installing a cistern below ground level. The standards are adopted to prevent rupture or structural failure of the cistern and to prevent contamination from entering the cistern. Rule 11.3.5 addresses the placement of cisterns above ground level and the need for the supporting structure to carry anticipated loads. Rule 11.3.6 identifies the need for cistern placement at a location that is accessible for maintenance and repair. Rule 11.3.7 identifies persons qualified to connect existing

cisterns to water well supply systems. Only persons qualified to install pumps may connect existing cisterns to water well supply systems because of the risk of contamination to the water supply and aquifer from improperly connected systems.

Rule 11.4 restricts the location of a cistern to at least 100 feet from a leach field and at least 50 feet from a septic tank or other vessel containing contaminants. As with the location of a well, the location of a cistern may be closer than the specified distances only if prior approval of a variance is obtained from the Board. Rule 11.4 also provides the procedure for obtaining a variance to the distance requirements.

Rule 11.5 specifies that a sealed cover or cap is required for all wells and cisterns. After recent experience with forest fires in areas of Colorado where wells were equipped with PVC caps, this rule was clarified to require metal well seals and well caps to protect groundwater from serious contamination caused by fires and subsequent failing of plastic or PVC well caps and well seals. The intent of the Rule is that no well is left open or is equipped with a lid or cover that does not prevent the entry of organisms and fluids into the well.

Rule 11.5.1 addresses well or cistern vents, which, when needed, allow the water level in the well to move freely in response to the operation of the pump or changes in atmospheric pressure. It is the responsibility of the pump installation contractor to determine whether a vent is required.

Rule 11.6 establishes standards for well vaults to minimize the possibility of contamination of the well and aquifer from the presence of insects or animals and improper drainage in existing wells where the casing terminates below ground level. Rule 11.6.2 charges contractors who encounter unacceptable well vaults with the responsibility of either bringing such vaults into compliance with these Rules or with notifying the Board of Examiners of such well vaults. A contractor may install a new well vault only if specifically approved by the Board as part of a variance. Rules 11.6.1 and 11.6.2 were modified only for grammatical reasons; no new mandate to retrofit existing well vaults was imposed.

Rule 11.7 addresses the installation of water level sounding tubes intended to allow the measurement of the water level. Air lines easily tangle or become slack, leading to incorrect measurements and stuck pumps. Sounding tubes are more reliable and sturdy measurement devices. These devices minimize lost probes and damage to the pumping equipment and facilitate the use of these wells for scientific, engineering and regulatory studies as provided for in Section 37-91-106(4), C.R.S.

Rule 11.8 clarifies which aspects of the installation of electrical and plumbing connections between the well and the water system a licensed pump installation contractor may perform, and informs contractors that electrical and plumbing connections are governed by other rules and regulations and are subject to permitting and inspection by other regulatory agencies.

Rules 11.9 and 11.10 are intended to provide for the safe operation of pressurized water systems and to prevent damage to the pump and contamination of the aquifer from the backflow of water in the system. Rule 11.10.1 informs the contractor of other rules and regulations that govern the installation of pumping systems that supply irrigation water where chemicals are injected into the water. Rule 11.10.2 requires cisterns to be installed with an anti-siphon device to prevent uncontrolled flow from the cistern.

Because materials used during the installation of a pumping system may accidentally introduce bacteria or other contaminants into the well, Rule 11.11 requires a contractor to disinfect the well and pumping system after installing the pump and prior to leaving the work site.

RULE 12 WELL TESTING

The statutory authority for this rule is found in sections 37-91-106(4), and 37-91-110(1)(b) & (2), C.R.S. The purpose of this rule is to establish minimum standards for the testing of water wells.

Every well must be tested to obtain an estimate of what the well will produce and to determine if the well produces sufficient water to serve the purpose for which it was constructed. Well yield estimates can be conducted using a variety of procedures of variable accuracy. The well yield estimate approximates the amount of water the well will produce at the time of well construction and assists the well owner and pump installer in determining the size of pumping equipment to be installed. Well owners or contractors who desire or need a more reliable estimate of long-term well yield should arrange for a sustained pump test (well yield test) to be conducted on the well. After installation of the permanent pumping system, the equipment must be tested to ensure the proper operation of the equipment installed and to verify the production rate of the well under normal operating conditions. Rule 12 establishes what the tests should show and clarifies which contractor is responsible for performing and reporting well yield estimates and production equipment tests.

RULE 13 SAMPLING, MEASURING AND TEST-PUMPING

The statutory authority for this rule is found in section 37-91-106(4), C.R.S. The purpose of this rule is to provide minimum standards for sampling, measuring, or test pumping groundwater to ensure that shared groundwater resources are protected from contamination.

Because inserting probes and sampling equipment potentially may contaminate wells, Rule 13 mandates that all equipment used for sampling, measuring and test-pumping must be disinfected prior to its use in wells. Rule 13 identifies who may remove a well seal, who may perform sampling, measuring or test-pumping, and the purposes to which sampling, measuring and test-pumping are limited, and requires that the well owner know that such activities will be performed. Rule 13 also requires a person conducting such activities to notify the well owner, in writing, of any problems encountered and directs the person who removed the well seal to ensure its proper reinstallation.

RULE 14 MINIMUM STANDARDS FOR MONITORING AND OBSERVATION HOLES, MONITORING AND OBSERVATION WELLS, AND TEST HOLES

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-104(1)(c), (j) & (k); 37-91-106(4). The purpose of this rule is to establish minimum construction standards for certain types of holes and wells that may be constructed by authorized individuals who are not specifically licensed by the Board. Such holes and wells must be constructed up to these minimum standards to ensure protection to shared groundwater resources, especially shallow groundwater and alluvial aquifers near the surface.

Rule 14.1 discusses general authorized uses of monitoring and observation holes/wells and test holes and provides information and reference regarding who may construct certain monitoring and observation holes/wells. The purpose for which such holes are constructed defines the type of hole or well and thus the minimum standards and authorization required. Rules 14.1.3 to 14.1.6 summarize industry practices necessary to prevent injury to humans and animals and to insure that the construction and maintenance of such structures is consistent with their intended purpose.

Rule 14.2 explains the differences between a monitoring and observation “hole” and monitoring and observation “well”. Essentially, a monitoring and observations hole is a type of monitoring and observation well that is intended to be a temporary structure (in existence less than eighteen months) and is constructed pursuant to proper notice provided to the State Engineer, while a monitoring and observation well is a more permanent structure that has been granted a permit by the State Engineer. Although often constructed for similar purposes, the duration of each type of structure’s intended use differs. Because monitoring and observation wells will be in place for more than 18 months, it must meet certain construction standards, and be registered accordingly with the State Engineer’s Office, in order to ensure that it will adequately prevent groundwater resources from contamination. Rule 14.2.1.3 identifies the person responsible for ensuring proper permitting or abandonment of a monitoring and observation hole.

Subsequent or alternative use of a monitoring hole also differs from that of a monitoring well. Current procedures of the State Engineer allow a monitoring and observation hole, that was constructed pursuant to the proper notice required by the State Engineer, to be converted only for use as a long term monitoring and observation well or as a recovery well for remediation of the aquifer. However, a monitoring and observation well that was constructed subsequent to obtaining a monitoring and observation well permit may be re-permitted for other uses, including the withdrawal of water to provide a water supply. Conversion of a monitoring and observation well that was constructed pursuant to a monitoring and observation well permit to a production well may occur only if the structure has been constructed by a licensed well construction contractor in accordance with the minimum construction standards for water wells adopted in these Rules and upon obtaining the appropriate well permit to withdraw and use groundwater from the State Engineer. This requirement ensures that the well will be constructed by individuals with requisite knowledge of well construction standards necessary to protect groundwater and to ensure an adequately-functioning well for the ultimate users of such water supply.

Whether the construction of a monitoring and observation hole or well is for short term testing and monitoring or for long term use, consideration must be given to the location of the structure for maintenance, repair, and ultimately the plugging, sealing, and abandonment of the structure. The Rule also specifies that construction reporting requirements are the same for these structures as they are for water wells.

Rule 14.3 sets forth the minimum construction standards for monitoring and observation holes and wells and provides some general examples of acceptable design and construction (see Figure 6). The standards contained in the Rule are consistent with current industry practices and afford the greatest possible flexibility for methods of construction while maintaining the safeguards necessary to protect the potable water supply and to prevent the structures from becoming a hazard to public health. Rule 14.3.3 prohibits the use of PVC casing for completing above-ground wellheads due to the potential for groundwater contamination from PVC failures, especially in areas with forest fire risks.

Rule 14.4 explains the conditions and limitations of placing pumping equipment in a monitoring and observation hole or well and explains the current requirements of the State Engineer with regard to withdrawing water from a monitoring and observation hole or well.

Rule 14.5 provides an explanation of the current requirements of the State Engineer with regard to when notice for the construction of a test hole is required and establishes the duration that test holes may remain open. This Rule distinguishes between test holes that penetrate through a confining layer, and those that do not, because any drilling into or through confining layers presents a risk of aquifer cross-contamination, reduction of hydrostatic pressure, or other contamination to shared groundwater resources. As defined by the Colorado General Assembly, test holes are only those excavations intended for geotechnical, geophysical, or geologic investigation, such as soil or rock-sampling. If such a hole will be used for environmental observations of groundwater levels, it is a monitoring and observation hole. Test holes may not be used for repeated observation, measurement, or sampling of groundwater.

RULE 15 MINIMUM DISINFECTION STANDARDS

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-104(1)(c); 37-91-106(3); and 37-91-110(1)(b) & (2), C.R.S. The purpose of this rule is to require completed groundwater excavations be properly decontaminated for the use for which they were constructed.

Materials and equipment used to construct, repair or modify wells, install production equipment, install cisterns and for sampling, measuring and test-pumping of wells frequently becomes contaminated. To protect the groundwater and aquifers from contamination, each well, cistern and any equipment subsequently used in the well or cistern must be disinfected.

This Rule provides minimum standards for the mixing and strength of the disinfectant solution and contact times to assure the proper disinfection of the well, materials and equipment.

Chlorine compounds in solution ensure thorough disinfection while compressed or pelletized chlorine tablets introduced directly into the well can be ineffective for the initial disinfection of a well if they do not completely dissolve.

However, as provided in Rule 15.2.b, chlorine tablets are appropriate for use as part of regular disinfection or well maintenance, and are commonly used for this purpose.

Disinfection contact times are commensurate with ANSI/NGWA-01-14 Section 9 standards.

Table 4 is intended to assist in the preparation of the minimum strengths of disinfectant solutions. Concentrations are specified in units of mg/l (milligrams per liter), which are approximately equivalent to ppm (parts per million) for the values used in these Rules.

Rule 15.7 recognizes that the water used in the drilling process potentially may introduce contaminants into a well and restricts the types of containers in which such water can be transported for drilling purposes. Monitoring and observation wells, where the use of a disinfectant will interfere with the purpose of the well, are exempt from Rule 15.

RULE 16 STANDARDS FOR PLUGGING, SEALING, AND ABANDONING WELLS AND BOREHOLES

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-104(1)(c), (j), & (k); 37-91-106(3); 37-91-109(1); and 37-91-110(2), C.R.S. The purpose of this Rule is to identify the minimum standards for the proper abandonment of water wells and other excavations constructed into the ground that, if not adequately sealed and abandoned, present a risk to the health and safety of Colorado's shared groundwater resources.

Wells that are not being used or that are incapable of being used are safety hazards to people and livestock and present potential avenues for contamination of aquifers and groundwater. Rule 16 addresses procedures to assure that unused wells are properly plugged, sealed, and abandoned by persons having the necessary equipment and training. Whenever the surface area of a well site will be reclaimed, the plugged wells should be cut off sufficiently deep to allow normal activity to proceed on the land surface.

Wells that were constructed through more than one aquifer must be plugged, sealed, and abandoned by a licensed well construction contractor to ensure that the necessary watertight plug is properly placed at the first confining layer on top of each aquifer. To assure that no hydraulic connection between aquifers exists through the borehole, the casing opposite confining layers must be either grouted in the borehole casing annulus, be removed, or be perforated. The intervals between grout plugs must be filled with clean materials. Well owners who abandon their own well must consult with a licensed water well construction contractor or Board staff prior to abandoning their well because understanding the hydrogeology of the aquifer(s) is important in applying proper techniques for well abandonment and protection of the groundwater resources of the State of Colorado.

Individuals licensed to install pumping equipment have the requisite knowledge and ability to properly plug, seal, and abandon wells that do not require removal of casing that penetrates a confining layer.

RULE 17 REPORTING REQUIREMENTS

The statutory authority for this rule is found in section 37-91-110(2), C.R.S. The purpose of this Rule is to require the submittal of reports concerning the construction of certain excavations as necessary for documenting the location of such excavations, gathering information about hydrogeological conditions of Colorado, and for ensuring compliance with permits and water rights requirements.

Work reports are essential in documenting where wells, test holes, and monitoring and observation holes and wells are constructed, the lithology of geologic formations and aquifers encountered, details of methods and materials used in constructing the well, test hole, or monitoring and observation hole or well, the measurement of the estimated yield of the well, and reporting the type of pumping equipment installed and the tested production of the equipment.

Rule 17.1.1 describes the driller's requirement to complete a well construction and yield estimate report. This form will more accurately represent the drilling contractor's estimate of well yield and ensure construction specifications meet the minimum standards.

Rule 17.1.2 requires a pump installation report every time a new pump is installed or the depth setting is changed. These reports become part of the structure's permanent record for future reference should repair, replacement, or plugging of the well become necessary and to ensure the moved or replaced pumps are in compliance with the original permit. The reports are also necessary for administrative purposes mandated by the provisions of Articles 90 and 91 of Title 37, C.R.S., and to verify compliance with these Rules. A contractor's submittal of a completed work report initiates the period of liability for the contractor for the subject well construction and/or pump installation and is instrumental in preventing the expiration of a well permit. The data submitted on work reports provides the well owner with documentation for water rights proceedings and real estate transactions and enables the Board to monitor and ensure public health and safety.

17.1.3 Well Yield Test Report is the form where pumping test or aquifer test data are reported. The form will include instructions for the submission of pressure transducer data in spreadsheet form. This report must be submitted if the well yield test is performed during the process of well construction.

Rule 17.1.4 addresses Well Abandonment Reports. When any well, monitoring and observation hole/well, dewatering well, or a test hole penetrating a confining layer is taken out of service, it is important to identify and document the equipment removed from the structure, the amounts and types of materials used to plug the structure, and the placement method and intervals of all plugs installed in the structure. This information is necessary to verify the status of a structure and compliance with the provisions of these Rules and regulatory requirements.

Rule 17.1.6 Cistern Installation Report Cisterns filled from a water well are required to be installed by a licensed pump installation contractor. An installation report has not been required so with the implementation of the reporting requirement we now have a means to track cistern installations, the installer and inspection of the installation if needed.

Rule 17.1.7 Post-Construction Well Inspection Report Form GWS-68 used to verify the construction of an existing well for permitting purposes must be completed or verified by a licensed water well construction contractor. This will help identify if any wells that are contamination sources and need repaired or abandoned and if it meets the description of a well.

To provide a minimum of necessary data and a uniform presentation of the required information, Rule 17 provides that the reports must be submitted on a form provided by or approved by the State Engineer. This Rule also establishes criteria for the timely submittal and certification as to the truthfulness of the reports. Rule 17.4 underscores the importance of accurate reports by establishing that such reports are deemed to be completed, signed and certified under oath.

Rule 17.5: Prior to regulation of well construction, numerous wells were constructed or pumping equipment installed without regard to protecting the well from damage and preventing the entry of contaminants. Persons authorized to repair wells and pumping equipment need to correct any such unsanitary conditions encountered. If unable to bring the well into compliance with the standards of these Rules, the person doing the work should provide the information to the Board, or include on the work report any non-compliant conditions not corrected. Such notice will inform the well owner of the non-compliant conditions and will provide the Board and, if necessary, other regulatory agencies with an opportunity to order remedial actions necessary to protect the groundwater supplies of the State.

Rule 17.7: Previously, no records were collected and maintained for the many bacteriological, organic and inorganic chemical analyses performed on newly constructed wells. Knowledge and recording of such water quality data are necessary to locate and identify potable and contaminated groundwater. This information is necessary for the proper design and construction of new wells so that contaminated groundwater can be identified, avoided, and/or contained to protect the public health. Submission to the State Engineer of available water quality data for newly constructed wells becomes part of a data base for statewide ground water quality information.

RULE 18 VARIANCES

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-104(1)(c), (j), (k) & (2); 37-91-106(3); 37-91-109(1); and 37-91-110(2), C.R.S. The purpose of this Rule is to allow the Board to approve alternate methods of construction or abandonment of an excavation over which it has jurisdiction, in the event that the individual requesting such alternative to the minimum standards can adequately demonstrate that the variance will protect the health and safety of the public and prevent contamination to Colorado's groundwater.

These Rules establish the minimum standards for common well construction and plugging, sealing, and abandoning methods, equipment and materials used, types of pump installation, cistern installation, and the submission of work reports. However, given the diversity of conditions encountered in the state, Rule 18 recognizes the occasional need for different standards and use of alternative materials, equipment or techniques, provided that such proposals meet the statutory requirements for protecting the groundwater and the aquifers from contamination.

Rule 18.2.1 provides that, to be able to deviate from the minimum standards, a request must be submitted in writing and approved prior to performing such work. Recognizing that conditions or circumstances may arise during well construction that necessitate varying from the minimum standards, this Rule also authorizes variance requests by telephone or fax under such conditions or circumstances, provided that approval of the variance is obtained prior to completing such well construction.

Rule 18.2.2 allows the Board to delegate the authority to issue certain categorical variance requests pursuant to specific direction. Such delegation is explicitly authorized and contemplated by section 37-91-104(2), C.R.S.

Rule 18.4 clarifies the finality of the Board's decision on a variance request and the right to appeal such decision under the Colorado State Administrative Procedures Act.

RULE 19 EMERGENCY

The statutory authority for this rule is found in sections 37-91-101(1); 37-91-102; 37-91-104(1)(c), (j), & (k); 37-91-106(3); 37-91-109(1); and 37-91-110(2), C.R.S. The purpose of this Rule is to ensure that, even in the case of an emergency, excavations under the Board's jurisdiction must still be constructed upon approval of the State Engineer. Because contamination to groundwater from improper construction practices may cause permanent or costly damage to Colorado's groundwater resources,

emergency circumstances do not negate the requirement to receive necessary approvals and comply with any conditions imposed.

In certain instances, health considerations or sudden well failures may require the construction of a well prior to being able to obtain the required permit. This Rule sets forth the State Engineer's requirement for obtaining approval to proceed in such situations.

RULE 20 PETITIONS

The statutory authority for this rule is found in section 24-4-105(11). The purpose of this Rule is to comply with the requirement of section 24-4-105(11) and provide the Board's procedures for entertaining, in its discretion, any petitions for declaratory orders to terminate controversies or to remove uncertainties as to the applicability to the petitioners of any statutory provision or of any rule or order of the agency.

RULE 21 SEVERABILITY

The statutory authority for this rule is found in sections 37-91-104(1)(c), (j), & (k); and 37-91-110(2), C.R.S. The purpose of this Rule is to clarify that each rule is independent of the others, so that if any one Rule is found to be invalid, the remainder will remain in effect.

RULE 22 REVISIONS

The statutory authority for this rule is found in sections 37-91-104(1)(c), (j), & (k); and 37-91-110(2), C.R.S.

As new technologies, construction methods and equipment become available, it may become necessary for the Board to revise the minimum standards of these Rules. This Rule recognizes the ability of the Board to make any required changes, subject to the requirements of the State Administrative Procedure Act.