

STATEMENT OF BASIS AND PURPOSE FOR 2004 GEOTHERMAL RULES

This "Statement of Basis and Purpose" has been prepared to elaborate on and clarify the reasons for and the intent of the Geothermal Rules.

RULE 1 TITLE

The title of the Rules reflects their purpose of providing for the permitting and construction of geothermal wells and the appropriation of geothermal fluids. The short title adequately describes the Rules and does not conflict with any other known title.

RULE 2 AUTHORITY

Sections 37-90.5-106 and 107, C.R.S. (2003), give the State Engineer the authority to issue permits for geothermal wells and to adopt rules and regulations necessary to protect the public health, safety, welfare and the environment, and to prevent the waste of any geothermal resource. This section also requires the State Engineer to adopt rules for the assessment of reasonable fees for the processing and granting of permits.

In addition to the specific authority cited above, the proposed Rules are necessary for the State Engineer to carry out his responsibilities and authority with respect to the administration and protection of vested geothermal and water rights, pursuant to Sections 37-80-102(g) and (k), and Section 37-90-108, C.R.S. (2003).

RULE 3 SCOPE AND PURPOSE

The purpose of these Rules and Regulations is to enable the State Engineer to carry out the provisions of the Geothermal Resources Act, Article 90.5 of Title 37, C.R.S. These Rules and Regulations establish minimum standards required for protecting the public health, safety, welfare, and the environment, and preventing the waste of geothermal resources that may result from the construction and use of geothermal wells.

These Rules are limited to the permitting of individuals to perform/supervise drilling and grouting in the construction of vertical closed-loop geexchange systems, and to perform/supervise excavation and backfilling of horizontal closed-loop geexchange systems, the permitting and the constructing of, and the diversion of geothermal fluids

from new wells, and increasing the production from, expanding the use of, or changing the producing reservoir for existing wells. They do not apply to the appropriation and use of geothermal fluids resulting from surface diversions from natural streams or lakes, or naturally flowing springs. Also excluded from these Rules are wells subject to the jurisdiction of the Colorado Mined Land Reclamation Board, the Colorado Oil and Gas Conservation Commission, and water wells subject to Articles 90 and 92 of Title 37, C.R.S. (2003), permitted by the Colorado Ground Water Commission or the State Engineer.

The loop fields of geexchange systems utilize the earth's geothermal properties, and are therefore regulated under these Rules. Since they do not appropriate or divert subsurface fluids, they are differentiated in these Rules from geothermal wells that appropriate or divert subsurface fluids. For the purposes of these Rules, the loop fields of geexchange systems and geothermal wells are both referred to as "geothermal wells" or "wells." Heat pump systems that do not use the earth's geothermal properties are not considered to be geothermal wells and are excluded from these Rules.

With the exception of geexchange systems, the construction of a geothermal well and the diversion of geothermal fluid from a well does not differ from the construction of a water well and the diversion of ground water. Therefore, these Rules are designed to be consistent with the statutes and practices for permitting, constructing and administering water wells. These Rules rely on and do not duplicate existing well construction rules. Since geothermal wells could encounter potentially greater depths or higher temperatures and pressures than ordinary water wells, these Rules have incorporated some of the construction and operating provisions from the rules adopted by the Colorado Oil and Gas Conservation Commission in addition to the Water Well Construction Rules, 2 CCR 402-2.

These Rules provide minimum construction standards designed to protect the health and safety of the public and prevent contamination of geothermal reservoirs and aquifers through the unpermitted migration of fluids through well bores. These minimum standards do not prevent an owner or operator from using higher standards or better quality materials for the construction and the operation of a geothermal well.

The provisions of these Rules allow the State Engineer to obtain records for and monitor the uses of geothermal resources in Colorado. Records of installations of loop fields for geexchange systems, well construction and knowledge of geothermal uses provide the State Engineer with means to protect valid, prior water or geothermal rights, and to seek enforcement if violations are found or other rights are injured.

These Rules do not apply to permitting the discharge of a geothermal fluid. They do advise a geothermal well owner of their responsibility for obtaining any required permit from the Colorado Water Quality Control Commission in the case of discharges to the surface stream systems or the U.S. Environmental Protection Agency for underground injection.

RULE 4 DEFINITIONS

The terms used in these Rules that are defined by statutes, Sections 37-90.5-103, 37-91-102 and 37-90-103, C.R.S. (2003), are listed for reference purposes. They have the identical meaning as in the cited references and are not repeated in this Rule. Other terms are defined so that their meaning is clearly understood. The terms defined in Rules 4.2.4, 4.2.5, 4.2.14, 4.2.18, 4.2.28.2 and 4.2.28.3 are specific to the installation of loop fields in a geoexchange system.

Underground disposal of geothermal fluids may be desirable or necessary. Reinjecting these fluids into the same zone from which they were produced will lessen the impact of fluid withdrawals on other valid, prior water or geothermal rights, minimize the impact of temperature extractions on the geothermal reservoir and most likely have the least problems associated with different water qualities. Therefore, Rule 4.2.24 defines “re injection” as reintroducing geothermal fluids through a well into the same reservoir from which they were produced.

RULE 5 GENERAL RULES

Rule 5 contains general provisions addressing the responsibilities of geothermal well owners, operators and certified individuals, requirements for the operation and use of geothermal wells, and the State Engineer's authority to enter upon a well owner's property and inspect and monitor the construction of geothermal wells and diversion of geothermal resources and for enforcing compliance with these Rules and applicable statutes. The provisions of this Rule are similar to the State Engineer's statutory authority for regulating surface water diversions and water wells.

Rules 5.1, 5.2, 5.15, and 5.16 address the responsibilities of the well owner, operator, constructor, and certified individual for owning, operating, constructing, repairing, plugging, or maintaining safety of a geothermal well.

Rule 5.3 clarifies the State Engineer's authority to enter upon a geothermal well owner's property for the purpose of inspecting facilities producing and recovering geothermal resources and for otherwise enforcing compliance with these Rules.

Rule 5.5 describes the standard requirement for drilling vertical boreholes (within allowable sidetracking) unless directional drilling has been specifically approved by the State Engineer. Rule 5.6 describes the requirements, including notice that must be met to obtain approval for directional drilling.

When a single well is proposed to recover geothermal resources from multiple reservoirs, Rule 5.7 establishes a procedure to inform and seek input from the owners of any valid,

prior water or geothermal rights located within 1/2 mile of the proposed well. The notice to, and consent from, other owners may facilitate the application process and obviate the need for a hearing.

Rules 5.9, 5.10, 5.11, 5.13, 5.16, and 5.17 delineate further responsibilities of a well owner or operator in complying with these Rules and related requirements of the State Engineer.

Rules 5.12, 5.14, and 5.18 provide advisory information to the well owner or operator on obtaining a priority for, and permitting the discharge of, a geothermal fluid. Non-compliant conditions need to be reported to the State Engineer so that he is aware of, and can assist with, remedial or corrective measures.

It is possible that the owner may wish to dispose of a geothermal fluid produced from an open system into a sanitary collection and treatment system. This practice can interfere with the operation of the disposal system if it was not designed to handle the additional effluent. Rule 5.12 is designed to alert geothermal well owners of this potential problem.

RULE 6 GEOTHERMAL WELL PERMIT REQUIREMENTS

This Rule describes the requirement of a permit for different types of geothermal wells and for certified individuals, the permit application, evaluation process, permit conditions, application fees, permit expiration, denial and appealing decisions of the State Engineer.

Rules 6.1, 6.2 and 6.5 describe the requirement for a permit to construct and replace different types of open system geothermal wells, for certified individuals to perform/supervise the construction of loop fields for geoexchange systems and to record existing geothermal wells constructed prior to July 1, 1983. Rule 6.2 also describes some of the primary types of information required on the application, and provides criteria for permitting the different types of open system geothermal wells.

Rule 6.3 describes application filing fees for a permit to construct a geothermal well and/or appropriate a geothermal fluid, to replace an existing geothermal well, to expand or change the use of a geothermal well, to register an existing geothermal well, to extend the expiration date of a permit or to obtain a permit for a certified individual.

Rule 6.4 specifies criteria for evaluation of a geothermal well location with respect to property boundaries, contaminant sources, other wells, springs and valid, prior water or geothermal rights not owned by the applicant, as well as for issuance of a permit. This information is required to evaluate the potential of injury to existing valid, prior water or geothermal rights, to protect surface and ground water resources and to protect the geothermal resource.

Rule 6.6 provides for notice to be given to other governmental agencies that may have information, comments, or jurisdiction over a geothermal well, or involved activity. The Rule provides a minimum list of agencies that will be noticed. The Rule also specifies the maximum comment period for noticed agencies.

Rule 6.7 addresses expiration, extension and permanent validation of a geothermal permit. The Rule also describes the requirement for a certified individual to obtain an annual permit for the installation of loop fields in a geoexchange system.

Rules 6.8 and 6.9 describes the denial process for a geothermal well permit and the means for appeal by any person aggrieved by a decision of the State Engineer in granting or denying a geothermal permit.

RULE 7 CERTIFICATION

Section 37-90.5-102(1)(b), C.R.S. (2003) declares that the development of geothermal resources should occur in a manner that safeguards life, health, property, public welfare and the environment. The purpose of Rule 7.1 is to achieve this goal in the context of the construction of loop fields for geoexchange systems. To accomplish the statutory directive, the State Engineer requires that an individual who intends to perform/supervise the construction of loop fields must obtain certification from the State Engineer by demonstrating familiarity with the Geothermal Rules.

Rule 7.2.1 identifies the minimum information that an applicant must provide on the certification application. The information is necessary if the State Engineer needs to contact the applicant.

Rules 7.3, 7.4, 7.4.1, and 7.5 discuss minimum qualifications for certification and the examination for certification prescribed by the State Engineer. The examination is primarily to evaluate an applicant's familiarity with the Geothermal Rules as they apply to the construction of loop fields for geoexchange systems. A provision for an oral examination is included so that the State Engineer can more fully evaluate an applicant who has experienced difficulty in passing the written examination.

Rule 7.6 provides that an applicant requesting certification must show that the work to be performed under the certification will be covered by a bond, insurance, or some alternative funds in an amount of at least \$10,000. The amount specified is the same as is required for water well construction contractors to maintain a drilling license.

Rule 7.7 and 7.7.1 specify that an individual must be certified to perform/supervise drilling, excavating, backfilling and/or grouting procedures and, if supervising such procedures, the individual must be on site during the procedures.

Rule 7.7.2 provides that, where more than one certified individual is involved in the construction of a loop field or loop fields at a common job site, one certified individual may submit the required work reports for the construction.

Rules 7.8, 7.8.1 and 7.8.2 describe a direct connection between the activation of a certification and the individual's possession of a valid geothermal well permit authorizing the construction of loop fields for geoexchange systems. The Rules explain the certification is only activated when the individual has the required geothermal well permit and that the certification is considered inactive when the permit expires. Renewal of a permit issued to the individual re-activates the certification if it has not been inactive for more than two years. The Rules indicate that permit to construct loop fields is valid for one year and that any loop field constructed without the required well permit and associated certification is subject to an order from the State Engineer to have the loops plugged.

RULE 8 MINIMUM STANDARDS FOR TYPE A GEOTHERMAL WELLS

Section 37-90.5-106(4), C.R.S. (2003) describes two types of geothermal wells; those that have a total depth not exceeding 2,500 feet and encounter geothermal fluids with temperatures not exceeding 212° Fahrenheit, and those that exceed the aforementioned depth or temperature thresholds. The two types of wells described by statute are defined in these Rules as Type A and Type B geothermal wells, respectively. Rule 8.1 recognizes that there are also different kinds of Type A geothermal wells based on differing construction requirements and techniques.

Rule 8.2 explains that a Type A-OS well (an open system geothermal well not exceeding 2,500 feet in depth and encountering fluids with temperatures not exceeding 212° Fahrenheit) is essentially a water well and is within the statutory definition of a "well;" differing only in the beneficial use of the ground water withdrawn. For this reason, the construction of a Type A-OS well is under the authority of the State Board of Examiners of Water Well Construction and Pump Installation Contractors and subject to the applicable provisions of Article 91 of Title 37 and standards of the Water Well Construction Rules, 2 CCR 402-2.

Rule 8.2.1 advises that a Type A-OS well must be constructed by or under the supervision of a contractor licensed by the State Board of Examiners of Water Well Construction and Pump Installation Contractors, and that pumping equipment can only be installed in a Type A-OS geothermal well by or under the supervision of a pump installation contractor holding a valid license from said Board.

Rule 8.2.2 specifies that construction of a Type A-OS well must comply with the minimum well construction standards of the Water Well Construction Rules, 2 CCR 402-2. In addition, a Type A-OS geothermal well is subject to any pertinent requirements specified in these Geothermal Rules or requirements stated in the conditions of

approval for the geothermal well permit. This Rule enables the State Engineer to modify construction requirements and use conditions to address specific or unique circumstances.

For the protection of public health and the environment, Rule 8.2.3 requires the installation of blowout prevention equipment when constructing a Type A well into a reservoir containing fluids with temperatures greater than 120° Fahrenheit. The Rule also requires that the geothermal well owner or operator install and maintain equipment necessary to completely control and contain the flow of fluids from the well and to provide on-site personnel with any protective equipment that may be needed to avoid injury while performing construction and testing.

Rule 8.3 states that construction materials that are buried or submerged for the construction of a Type A-CLH or Type A-CLV geothermal well must meet standards expressed in these Rules. The specified standards reflect minimum material standards necessary to protect the public health, ground water resources, and the environment. The Rule provides that it is the certified individual's responsibility to use materials exceeding the specified minimum standards if local conditions indicate that a higher standard of materials is needed.

Rule 8.3.1 specifies that high density polyethylene pipe (HDPE) and vinyl coated copper tubing are the only pipe/tubing materials approved for installation in trenches and boreholes constructed for a geexchange system. The Rule indicates that the polyethylene pipe material must meet the standards for high density polyethylene pipe (HDPE) described in Section 1 of the International Ground Source Heat Pump Association, Oklahoma State University, publication "Closed-Loop/Geothermal Heat Pump Systems: Design and Installation Standards 2000."

The pipe standards may also be found in "Closed-Loop Geothermal Systems, Slinky® Installation Guide," 1994, published by the National Rural Electric Cooperative Association, Oklahoma State University, International Ground Source Heat Pump Association, and Electric Power Research Institute. Further discussion of HDPE pipe standards is available in Appendix C of the "Closed-Loop/Ground Source Heat Pump Systems, Installation Guide," 1988, National Rural Electric Cooperative Association, Oklahoma State University, International Ground Source Heat Pump Association. All of the above references rely on ASTM standards for PE pipe.

At the recommendation of closed-loop geexchange designers and installers operating in Colorado, polybutylene pipe (PB), formerly approved for use in the construction of loop fields in a geexchange system, has not been specifically approved in these Rules for the construction of loop fields in a geexchange system. Its use in construction of the buried portions of loop fields in a geexchange system will require obtaining a variance from these Rules prior to installation.

Vinyl coated copper tubing is commonly used in the construction of direct exchange (DX) loop fields in a geoexchange system. The Rule requires that the material must be specifically designed for use in geothermal applications.

To ensure that all buried pipe is joined to prevent leakage of the circulating fluid/vapor and loss of operating pressure, Rule 8.3.1.1 requires that HDPE pipe be joined by heat fusion in accordance with the pipe manufacturer's specifications and that copper tubing be brazed using the nitrogen brazing technique, unless otherwise specified by the manufacturer. Rule 8.3.1.2 allows the use of threaded connections or clamps only above ground level or at a service outlet where the connection can be visually inspected for leaks and accessed for repair if necessary.

In terms of protecting the public health, ground water resources, and the environment, grout (and its proper mixing and placement) is the most important component of a vertical closed-loop geoexchange system. Rule 8.3.2 provides a list of materials approved for use in grouting boreholes constructed for loop fields in a geoexchange system. The selection of a grout material that is suited for loop fields in geoexchange system design and the subsurface environment into which it is placed is the responsibility of the certified individual. Grouting of the loop field boreholes should be viewed as permanent emplacement of a low permeability material that will endure for the life of the loop fields in a geoexchange system and maintain its integrity as a component of the abandoned structure.

Sodium bentonite should not be used to grout boreholes that have encountered ground water with a high concentration of calcium or magnesium, or when the borehole has penetrated an extended interval of dry, porous sand and/or gravel where fluid loss to the formation is likely.

Rule 8.3.2.1 expresses the importance of proper mixing of grout materials to achieve maximum effectiveness as a sealing agent. It is the responsibility of the certified individual to ensure that the grout mixture is produced in accordance with the manufacturer's specifications. Use of excess water in a grout mixture is a common temptation when it appears that a grout material is too viscous to be easily pumped. However, the Rule specifically prohibits using water in excess of the amount specified in the directions for mixing provided by the manufacturer. Excess water in the mixture can diminish the sealing properties of the grout. An accurate report of the grout mix must be provided on the construction report.

Approved circulating fluids are listed in Rule 8.3.3. The fluids stated in the Rule are approved based on their potential for causing minimum impacts to public health and the environment should they leak from the system or be spilled during construction activities. Use of a circulating fluid or vapor not specifically approved in Rule 8.3.3 requires obtaining a variance from the State Engineer.

Rule 8.4 addresses construction of Type A-CLH geothermal wells (horizontal closed-loop geoexchange systems that do not encounter geothermal fluids with temperatures

exceeding 212° Fahrenheit). The Rule acknowledges the manufacturer's and system designer's expertise in construction of loop fields and defers to their specifications for such installation. However, the Rule does not abrogate the owner's, operator's, constructor's or certified individual's responsibility to comply with all applicable provisions of these Rules (e.g. materials, circulating fluids, testing, reporting, etc.).

To further protect the public health, ground water resource, and the environment, the Rule also declares that only a certified individual may perform/supervise the construction of a loop field. Therefore, any person who intends to perform/supervise the construction of a Type A-CLH well must obtain certification from the State Engineer and maintain the certification in accordance with the policies of the State Engineer adopted for such certification.

To minimize the potential for creating a sink or sump where contaminants from the surface can accumulate and potentially enter the ground water resource, Rule 8.4.1 requires that the material used to backfill a trench or excavation constructed for the installation of horizontal loops be no more permeable than the surrounding soil. It is recognized that most trenches or excavations will be filled with the material removed during excavation. The Rule requires that the backfill material be compacted during the backfill process so that a depression will not form as a result of settling of the material over time.

Rule 8.4.2 is specific to Type-CLH systems that utilize loops submerged in a pond or lake as the material medium for heat transfer. The Rule specifies construction/supervision by a certified individual and compliance with all testing requirements for the loops. Paramount in the Rule is the need to take all necessary precautions to prevent spillage or leakage of circulating fluids (other than clean water) and the means to contain the fluid should such spill or leak occur.

Rule 8.5 is developed to set standards for drilling boreholes and grouting of Type A-CLV geothermal wells (vertical closed-loop geexchange systems that do not exceed a depth of 2500 feet or encounter geothermal fluids with temperatures exceeding 212° Fahrenheit). The Rule addresses the need to contain ground water and geothermal fluids in the aquifers or hydrogeologic units in which they are encountered. The provisions of the Rule and its subsections are consistent with the primary objectives of these Rules: to protect the public health, ground water and geothermal resources, the environment, and to prevent material injury to any valid, prior water or geothermal rights or waste of the resource.

To facilitate the proper installation of grout material in a borehole necessary to achieve a permanent grout seal, Rule 8.5.1 requires that the borehole diameter exceed the composite loop dimension by at least one inch on all sides of the piping or tubing. A loop must be located in the hole in such a way as to ensure that grout material fully encases the loop and establishes a seal between the loop material and the borehole wall.

Rule 8.5.2 requires that all boreholes constructed in a loop field for a Type A-CLV geoechange system be completely filled with an approved grout material. The Rule specifies that grout must be pumped through a tremie pipe lowered to the bottom of the hole so that any fluid in the hole will be displaced by the grout material as the hole is filled. Materials specifically prohibited from use as grout material are identified in the Rule.

To achieve the necessary grout seal through the entire length of a borehole, the grout must be placed before there is any collapse of material within the borehole. Rule 8.5.3 requires the placement of grout in a borehole as soon as possible after drilling and the installation of the loop.

Rule 8.5.4 addresses the grouting requirement in a borehole that penetrates a confining layer or confining layers. The installation of a cement grout plug across the confining layer is to ensure that the grout material will achieve and maintain a seal between aquifers that may contain fluids under differing hydrostatic pressures.

Rules 8.6 and 8.7 are developed to minimize the potential for leakage of the circulating fluid into the subsurface. Rule 8.6 requires a pressure test and visual inspection of the pipe or tubing to be installed in the loop field to determine if leaks exist that must be fixed. An additional pressure test is required after installation of the loops to ensure the structural integrity of the pipe/tubing and connections. Rule 8.7 requires that a pressure shutdown switch be installed so that fluid circulation will cease when a pressure change results from a ruptured pipe in the loop field.

In the event a geothermal fluid with an unanticipated temperature exceeding 212° Fahrenheit is encountered during the construction of a Type A geothermal well, Rule 8.8 requires that all construction activities cease until authorization has been obtained from the State Engineer to complete the well as a Type B geothermal well. Construction must cease to allow the State Engineer an opportunity to consult with the Oil and Gas Conservation Commission and Water Quality Control Division prior to authorizing construction of a Type B geothermal well as required by law.

RULE 9 MINIMUM STANDARDS FOR TYPE B GEOTHERMAL WELLS

The bases for defining Type B geothermal wells and providing for additional construction standards are:

- a. Section 37-90.5-106(4) requires that the Oil and Gas Conservation Commission be advised of all applications for these types of geothermal wells and that their comments be considered in issuing permits; and
- b. oil field equipment, drilling technology and experience is required to construct and complete a deep well or a well with high temperature and pressure.

While the well construction principles and methods for a Type B well do not differ from that of a Type A-OS well, most licensed water well construction contractors do not have the necessary equipment or experience to construct a Type B geothermal well. On the other hand, oil field contractors usually lack the statutory qualifications for a licensed water well contractor. In order to provide flexibility for a geothermal well owner to select a qualified contractor and equipment, Rule 9.1 exempts, but does not preclude, a Type B geothermal well from being constructed by a contractor licensed by the State Board of Examiners of Water Well Construction and Pump Installation Contractors.

Due to the potential for encountering higher pressures in a Type B geothermal well, Rules 9.2, 9.2.1 and 9.2.2 specify different minimum casing and grouting standards than are required by the Water Well Construction Rules, 2 CCR 402-2. The use of steel surface casing, cement grout and blow-out preventers are necessary for controlling any high pressured fluid encountered during the construction of a geothermal well.

Rule 9.3 specifies that the construction contractor is responsible for selecting and installing casing and grout material that will contain fluids in the aquifers in which they are encountered and that are sufficient to prevent collapse, rupture, or failure from exposure to the subsurface environment.

Rule 9.4 and its subsections address the type, interval, placement, and testing of grout required in the construction of a Type B geothermal well. The information regarding these parameters must be reported to the State Engineer upon completion of construction of the well. The purpose of Rule 9.4 and its subsections is to protect the ground water resources, public health and the environment by ensuring that construction of a geothermal well contains geothermal fluid within the aquifer or interval in which the fluid is encountered.

The use of blowout preventers in the construction of a Type B geothermal well is required by Rule 9.5. Blow out prevention is necessary to ensure that geothermal fluids are completely controlled at all times during construction of the well. The Rule provides for obtaining a waiver by variance from the State Engineer of this requirement when it can be shown that such equipment is not needed.

RULE 10 MINIMUM STANDARDS FOR GEOTHERMAL REINJECTION WELLS

The construction of a geothermal reinjection well does not differ significantly from that of other geothermal wells. Therefore, Rule 10.1 applies the respective construction standards for Type A-OS and Type B wells to a geothermal reinjection well. However, the use and operation of a geothermal reinjection well, especially at higher flow rates and pressures, has a greater potential for contaminating aquifers and ground water.

Rule 10.2 and its subsections prescribe a mechanical integrity test prior to injecting a fluid to protect against a well failure creating a potential source of underground contamination from the escape of an injected fluid. The 300 psi pressure test was adopted from the Oil and Gas Commission's rules in order to provide a minimum test of the injection piping. Performing the well/aquifer test required by Rule 10.4 is necessary in order to establish hydraulic characteristics of the injection reservoir and to determine the maximum allowable injection pressure.

Rules 10.3 and 10.5 provide for equipping a reinjection well so that injection pressure can be monitored and controlled within the limit placed on the injection well.

RULE 11 PLUGGING OF GEOTHERMAL WELLS

An unused or inoperable geothermal well is potentially hazardous to the public health, ground water resources, and the environment. In order to minimize this hazard, a geothermal well must be plugged and sealed when no longer used or needed. Rule 11.1 specifies that it is the well owner's responsibility to ensure that an unused geothermal well is properly plugged.

Rule 11.2 provides general standards for plugging a geothermal well and identifies the reasons for requiring proper well plugging. Detailed construction information is generally needed to ensure that the plugging program accomplishes the stated objectives.

Rule 11.2.1 established a minimum plug length of 50 feet because of the potential for higher pressure in a flowing Type A-OS or Type B well and the need to confine the injected fluid to the injection zone of a reinjection well.

Plugging operations for a Type A-OS geothermal well are similar to those for a water well and are therefore, under the authority of the State Board of Examiners of Water Well Construction and Pump Installation Contractors. Thus, Rule 11.3 relies on the provisions of the Water Well Construction Rules, 2 CCR 402-2, for plugging a non-flowing Type A-OS geothermal well.

The minimum standards of the Water Well Construction Rules, 2 CCR 402-2, are not adequate for plugging a geothermal well producing a hot fluid under pressure or a well which is used for reinjection purposes. Rule 11.4 provides the State Engineer an opportunity to review and approve methods and materials proposed to be used for plugging a Type B, reinjection or flowing Type A-OS well. Submitting a plan and obtaining approval prior to the plugging of a well allows the State Engineer to be aware of and be a witness to the plugging of a geothermal well.

Proper plugging of loop-field piping or tubing for a Type A-CLH or Type A-CLV well is explained in Rule 11.5. To protect the ground water resources, public health, and the

environment, the Rule requires that the buried closed loops be completely filled with a cement slurry that is pumped through the loops.

RULE 12 RECORDS AND REPORTING REQUIREMENTS

Reports are essential for documenting where a geothermal well was constructed, the description of the strata encountered, details of methods and materials used, the type of equipment installed in the well, and hydrologic and production information. These reports become part of the permanent geothermal well record and are necessary to verify compliance with the laws and the Rules and provide a reference when repairs, replacement or plugging of the well become necessary. The provisions of Rule 12 are required to provide guidance on the type of records which should be kept and when they must be submitted. These provisions are based on, and similar to, the Water Well Construction Rules, 2 CCR 402-2.

Rules 12.1 through 12.5 provide information on certification of documents, format, and appropriate forms for submitting a permit application and describe the retention of records.

Rule 12.6 addresses data confidentiality. Generally, records concerning geologic and hydrologic information submitted to and filed by the State Engineer are considered to be public records. Some of the data required to be reported may be proprietary information if additional leases or the well siting is being considered. Such records may be kept confidential by the State Engineer if requested by the well owner. Keeping such information confidential for a period of 1 year appears adequate to complete leasing of other geothermal prospects or secure other well sites.

Rules 12.7 through 12.11 describe reports, records, and associated documents that are to be submitted by the well owner and the construction contractor to serve as evidence that a well has been constructed, geothermal resources can be recovered, a permit to construct has been exercised and geothermal resources have been applied to a beneficial use.

The provisions of Rule 12.12 are necessary for an independent verification of the materials used in plugging Type A-OS, Type B and reinjection wells when the procedure cannot be witnessed by the State Engineer or his staff.

RULE 13 GEOTHERMAL MANAGEMENT DISTRICTS

The Geothermal Resources Act allows the State Engineer to adopt procedures for establishing a geothermal management district. The purpose of a district is to control geothermal well spacing, fluid production, and the quantity of a geothermal resource

extracted from a proven geothermal field, and to adopt comprehensive plans for the most efficient use of the geothermal resource.

Rule 13.1 is intended to prevent speculative petitions for areas with an undefined geothermal resource of unknown economic value and ensure that only the State Engineer and those persons likely to develop a delineated geothermal resource, or likely to be affected by such development in a proven geothermal area, are allowed to request the establishment of a geothermal management district. Rule 13.2 establishes criteria that are necessary and must be considered for the formation of a geothermal management district.

In view of the varied hydrologic and geologic conditions of geothermal resources in Colorado, and in order to accommodate any valid, prior water or geothermal rights, Rule 13.3 provides for the creation of a geothermal management district through a hearing process governed by the Administrative Procedures Act (APA). A hearing for the formation of a geothermal management district may be initiated by the State Engineer upon his own motion or by a proposal from any interested person if, in the State Engineer's evaluation of the contents of the proposal, he finds that there is sufficient information to indicate that the quantity, quality and boundaries of the geothermal resource are reasonably known and that production of the resource may be best accomplished through the formation of a district.

Rule 13.4 provides a means of transferring certain authority from the State Engineer to a geothermal management district that can demonstrate the organization, capability and resources to administer the management plan. Transfer of authority to a geothermal management district is limited to the functions specified in section 37-90.5-108(1)(a), (b), and (c). The State Engineer may transfer all or part of the stated authorities.

In the development and production of the geothermal resource within a management district, it may be advantageous to adopt special rules for administration and development of the resource. Rule 13.5 provides for the adoption of special field rules by the State Engineer. Special field rules will be adopted in accordance with the APA and the State Engineer's Procedural Rules, 2 CCR 402-5, when it is determined by the State Engineer that such rules are desirable or necessary.

RULE 14 VARIANCES

These Rules address the minimum permit requirements and construction standards for a geothermal well. Some of these standards may not be applicable under the varied hydrologic and geologic circumstances or the particular needs of an applicant. The need for different standards, use of alternate materials, equipment or techniques not specified by these Rules is recognized. This Rule allows the well construction contractor or certified individual the right to request an alternate proposal to be considered by the State Engineer.

RULE 16 REVISIONS

As new technologies, materials, construction methods, and equipment are developed and become available, revisions of these Rules by the State Engineer may become necessary. This Rule allows the State Engineer to initiate changes to these Rules as may be required from time to time.