The Railroad Commission of Texas (Commission) adopts new Chapter 5, relating to Carbon Dioxide (CO_2), to implement Senate Bill (SB) 1387, 81st Legislature (Regular Session, 2009), which was effective September 1, 2009. SB 1387 amended the Texas Water Code and the Texas Natural Resources Code to provide for the implementation of projects involving the capture, injection, sequestration, or geologic storage of carbon dioxide (CO_2). Sections 5.101, 5.102, 5.201, and 5.208 are adopted without changes; §5.204 is adopted without changes to the text but with a modification to the font requirements in the required notices; and §§5.202, 5.203, 5.205, 5.206, and 5.207 are adopted with changes to the versions published in the October 15, 2010, issue of the *Texas Register* (35 TexReg 9177).

The purpose of the proposed rules is to protect underground sources of drinking water while promoting the capture and storage of anthropogenic CO_2. In a prior rulemaking action, the Commission proposed new Chapter 5, relating to Carbon Dioxide, which was published in the March 26, 2010, issue of the *Texas Register* (35 TexReg 2446). The Commission received numerous and extensive comments on that proposal. Because of the changes that the Commission made to the rules as originally proposed, the Commission withdrew the prior proposal and published the revised proposal in the October 15, 2010, issue of the *Texas Register* (35 *TexReg* 9177).

SB 1387 delegates to the Commission jurisdiction over the injection of anthropogenic CO_2 into productive formations and saline formations directly above and below the productive formations for the purpose of geological storage. The bill establishes an Anthropogenic Carbon Dioxide Storage Trust Fund to include fees established by the Commission for implementation. The bill also authorizes the Commission to issue a permit if the Commission finds that injection and geologic storage of anthropogenic CO_2 will not endanger or injure any oil, gas, or other mineral formation; that with proper safeguards, both ground and surface fresh water can be adequately protected from CO_2 migration or displaced formation fluids; that the injection of CO_2 will not endanger or injure human health and safety; that the reservoir into which the CO_2 is injected is suitable for or capable of being made suitable for protecting against the escape or migration of CO_2 from the reservoir; and that the permit applicant meets all of the other statutory and regulatory requirements for the issuance of the permit.

SB 1387 requires the Commission to adopt rules and procedures, including rules for geologic site characterization; area of review and corrective action; well construction; operation; mechanical integrity

testing; plugging; monitoring; post-injection site care and site closure; long-term stewardship of the geologic storage; enforcement; and the collection and administration of fees and penalties to cover the cost of permitting, monitoring, inspection, enforcement, and implementation associated with the program. SB 1387 requires coordination between the Commission and the Texas Commission on Environmental Quality (TCEQ) to ensure the regulation of CO_2 storage in Texas is being performed in an economically and environmentally sound manner. SB 1387 also requires that the permit applicant obtain and submit to the Commission a letter from the Executive Director of the TCEQ certifying that underground fresh water supplies will not be injured by the permitted activity.

SB 1387 also requires the Commission, TCEQ, and the University of Texas Bureau of Economic Geology (BEG) to conduct a study of, and report back to the legislature on, the appropriate agency to regulate the long-term storage of CO_2 into non-oil, gas, or geothermal producing geologic formations. SB 1387 further requires the Texas General Land Office (GLO), in conjunction with the Commission, TCEQ, and BEG, to develop recommendations for managing geologic storage of CO_2 on state-owned lands, including an assessment of storage capacity and new legal and regulatory frameworks that might be necessary. The agencies have prepared a joint report, which will be delivered to the Legislature as required on December 1, 2010. SB 1387 clearly states that the storage operator owns the anthropogenic CO_2 in a geologic storage facility and authorizes the Commission to regulate the withdrawal of any stored CO_2. Finally, SB 1387 requires the Commission's rules to be consistent with the regulations of the United States Environmental Protection Agency (EPA) and contemplates that the Commission will seek enforcement primacy from the EPA for the program.

On July 25, 2008, EPA proposed requirements for underground injection of CO_2 for geologic storage under the authority of the federal Safe Drinking Water Act (SDWA). The goal of the proposed regulations is to protect underground sources of drinking water (USDWs) while promoting carbon capture and storage. EPA proposed to create a new class of injection well, designated as Class VI. EPA used as the beginning framework the program for Class I hazardous injection wells, then added requirements to address the unique nature of CO_2 injection for geologic storage, relative buoyancy of CO_2, corrosivity in the presence of water, potential presence of impurities in the CO_2 stream, mobility within subsurface formations, and the large injection volumes expected. EPA's proposed rules would establish technical

criteria for geologic site characterization; area of review and corrective action; well construction and operation; mechanical integrity testing and monitoring; monitoring of the CO_2 plume and pressure front; groundwater monitoring; well plugging; extended post-injection site care; long-term financial assurance to ensure proper site care and closure; and site closure. The administrator of EPA signed these rules on November 22, 2010. The rules will be effective 30 days from the date of publication in the Federal Register.

As noted, SB 1387 contemplates that the Commission will seek enforcement authority (primacy) for the Underground Injection Control (UIC) program for geologic storage of anthropogenic CO_2 and the associated injection wells. Section 1425 of the federal SDWA allows states seeking primacy for Class II wells to demonstrate that their existing standards are effective in preventing endangerment of USDWs. These programs must include requirements for permitting, enforcement, inspection, monitoring, record-keeping, and reporting that demonstrate the effectiveness of their requirements. However, under Section 1422 of the federal SDWA, states applying to EPA for primary enforcement responsibility to administer the UIC program (primacy) must show that the state programs meet EPA's minimum federal requirements for UIC programs, including construction, operating, monitoring and testing, reporting, and closure requirements for well owners or operators.

Absent some action from Congress, states will be required to apply for primacy for the UIC program for geologic storage of CO_2 under Section 1422 of the federal SDWA. Therefore, the state's program must be at least as stringent as EPA's program. Where states do not seek this responsibility or fail to demonstrate that they meet EPA's minimum requirements, EPA is required to implement a UIC program for the state.

Comments

With respect to the revised proposal published in the *Texas Register* on October 15, 2010 (35 TexReg 9177), the Commission received comments from the Clean Coal Technology Foundation of Texas (the Foundation) and Denbury Onshore, LLC (Denbury). Neither stated support or opposition to the proposed rules in their entirety, but offered suggestions for revisions to some of the rule provisions.

The Foundation commented that it strongly supports the Commission's efforts to implement

SB 1387 to provide regulatory certainty and strong environmental protection of Texas' natural resources and expressed appreciation of the Commission's support in furthering the goal of making carbon capture and storage a Texas success story. The Commission appreciates this comment.

Denbury commented that many of the technical provisions presume all geologic storage sites and operations require the same generic activities, which provisions ignore practical differences between geologic sites and operations as well as probable advancements in industry technology or available information. Denbury stated that these distinct requirements belong in guidelines or as options on the forms to be filed by an applicant to provide flexibility to both the Commission and the industry in recognition of differences in geologic storage sites and operations as well as providing the possibility of using advances in technological tools. In this light, Denbury had several comments.

Denbury commented that §5.201(b), as proposed, contains a provision authorizing a "determination" to be made by the director that an injection well involved in enhanced recovery that is simultaneously being operated as a geologic storage facility may not truly be a Class II injection well. Further, upon this determination, an operator has only two choices: shut in the well or apply for a permit under Subchapter B. There is no provision for a third alternative that would allow an operator to demonstrate to the Commission that injection may be occurring for the purpose of pressure buildup in a portion of the reservoir and EOR is truly occurring simultaneously. The Commission needs to consider one alternative or the other for inclusion in the rule to provide for proper agency procedure under the Administrative Procedure Act.

The Commission does not agree with this comment. Proposed §5.201(b) states that, if the director determines that an injection well regulated under §3.46 should be regulated under this subchapter because the injection well is no longer being used for the primary purpose of enhanced recovery operations, the director must notify the operator of that determination and allow the operator at least 30 days (clarified from the March 2010 originally proposed "reasonable time") to respond to the determination and to file an application under this subchapter or cease operation of the well. Because the rule provides the operator with the ability to respond to such a determination, the rule is consistent with the Administrative Procedure Act. The Commission makes no change in response to this comment.

Denbury commented that, although it appreciates recognition of the Securities and Exchange

Commission restrictions included in proposed §5.202(c)(1), it recommended that notice of the permit transfer should be 45 days prior to transfer "of operations." The Commission agrees with this comment and has made this clarifying change.

In addition, Denbury recommended that the Commission clarify whether "plans required by §5.203 or §5.206" are intended to cover only the corrective action plan or every activity plan that is submitted as part of the application process. Sections 5.203 and 5.206 relate to application requirements and permit standards, respectively; therefore, "plans required by §5.203 or §5.206" refers to any plan required by either of those sections. The Commission makes no change in response to this comment.

Denbury commented that the Commission should accept suggested changes recommended by the Texas Oil and Gas Association (TXOGA) in its comment on the original proposal of new §5.203(c)(2)(A) that would limit the geologic and topographic maps and cross sections required to be submitted to those indicating the vertical and lateral limits of the lowermost USDW and in USDWs in the immediate vicinity of the proposed injection well. In that comment, TXOGA had recommended that the Commission revise §5.203(c)(2)(A) to clarify language relating to maps and stratigraphic cross sections. TXOGA stated that, as long as the applicant proposes to inject CO_2 below the lowermost underground source of drinking water (USDW), it is not necessary to require maps and stratigraphic cross sections for the entire extent of those USDWs above the lowermost USDW. TXOGA further stated that, although mapping and stratigraphic cross sections in the immediate vicinity of the proposed injection locations should be required, data regarding all USDWs in the area of review will be costly and difficult to collect; and the usefulness of such data is unclear.

The Commission does not agree with this comment. Proper review of the application must include a review of data on all USDWs in the area of review. In addition, the requirement is consistent with the requirement in EPA’s regulations, as signed by EPA Administrator Lisa Jackson on November 22, 2010, and is appropriate for the anticipated scale of a geologic storage facility. The Commission makes no change in response to this comment.

Denbury recommended that the Commission delete or further clarify language regarding the analytical results in proposed §5.203(c)(2)(F). Denbury stated that, because formation testing is a drilling or post-completion operation, the requirement to provide analytical results as part of the application

package cannot be met. The Commission disagrees with this comment. Information regarding the chemical and physical characteristics of the formation(s) into which injection will occur is necessary for modeling of the area of review. However, the Commission adopts some changes in §5.203(c)(2)(F) to clarify that the operator must submit a description of the formation testing program used and the analytical results used to determine the chemical and physical characteristics of the injection zone and the confining zone.

Denbury recommended the following change to proposed §5.203(f)(2)(C): "The operator must verify that proposed operational injection pressure does not exceed the fracture pressures for the injection and confining zone." Denbury stated that in order to "determine" that the fracture pressure as originally drafted, the fracture pressure would actually have to be exceeded. The Commission agrees in part with this comment. The EPA rules, as signed by Administrator Jackson on November 22, 2010, require that, at a minimum, the owner or operator must “determine or calculate” the fracture pressure of the injection and confining zones. However, fracture pressure changes with pore pressure increase as the reservoir fills up. Therefore, the Commission adopts clarifying wording to require that the owner or operator "determine *or calculate*" the fracture pressures. The Commission also adopts additional clarifying language stating that, if the fracture pressures are calculated, the Commission will limit the injection pressure to 90% of that calculated limit to ensure that the permitted injection pressure does not exceed the fracture pressures.

Denbury commented that the requirements in proposed §5.203(j)(2)(C), relating to corrosion monitoring, are too specific and fail to take into account prior well construction and the nature of carbon dioxide when injected. Denbury recommended that the Commission provide operators with more flexibility by limiting this requirement to well components that contact water-saturated carbon dioxide streams and state that this requirement is waived when the carbon dioxide stream is dehydrated to meet pipeline specifications. The Commission disagrees with this comment. Although Texas statutes define the standards for "pipeline quality" natural gas, there are no defined standards for "pipeline quality" CO_2. Dehydration of the CO_2 stream prior to injection may be sufficient to protect the tubing and packer of the injection well from corrosion; however, the CO_2 stream is "re-hydrated" once it contacts the formations. Thus, any exposed cement and casing strings in the injection well would likely be vulnerable to corrosion from exposure to acidic fluids. Also, casing and cement in other wells down gradient of the injection

wells may be exposed to corrosive properties of the re-hydrated injectate. The Commission makes no change in response to this comment.

Denbury commented that proposed §5.203(k)(2)(D) is not necessary because the wellbore will be flushed prior to plugging and most cements used for well plugging are sufficiently compatible with carbon dioxide. The Commission finds no reason to delete the language if operators already plan to flush wellbores prior to plugging and use cements that are compatible with the CO_2 stream and formation fluids. The Commission makes no change in response to this comment.

The Foundation recommended that the Commission remove references to "fresh water" from proposed §5.203(o) when describing the "letter from the Texas Commission on Environmental Quality" requirement. Because the letter is adequately described in §27.046 of the Texas Water Code, the Commission agrees with this comment and has made the recommended clarifying change.

The Foundation commented that the Commission should allow operators of carbon dioxide injection facilities to use insurance, trust funds, corporate guarantees, and other financial assurance mechanisms to satisfy the financial assurance requirements in §5.205. In support of this comment, the Foundation stated that such forms are routinely available under other federal environmental programs and stated that the Texas Commission on Environmental Quality's rules at 30 TAC §37.241 (relating to Insurance) provide for the use of insurance as a financial assurance mechanisms for closure, post-closure, and corrective action activities.

The Commission agrees with the comment that additional options should be available. Both EPA's and the Commission's proposed rules would require that operators demonstrate financial responsibility and maintain financial assurance for activities related to operating, maintaining, monitoring, and closing geologic storage facilities. The rule proposed by EPA on July 25, 2008, specifies only a general duty to obtain financial assurance acceptable to the Director, but did not designate any specific financial assurance mechanism to be used. The rules signed by EPA Administrator Jackson on November 22, 2010, included several options for financial assurance, as well as criteria for appropriate financial security. EPA also advised that it will be providing additional guidance on financial assurance at a later date.

The Commission finds that revising the rule to allow additional forms of financial assurance is

not within the scope of the notice of proposed rulemaking and therefore would be a major revision requiring republication of §5.205 to allow comment by interested persons. The Commission adopts the financial assurance provisions in §5.205 without changes to the proposed version, partly in the interest of timely adoption of rules to implement SB 1387, and partly because the various potential additional forms of financial assurance have not been fully evaluated in terms of either their compliance with EPA's rules or the nature and extent of the financial risk to the state. Some financial assurance instruments are not appropriate for all geologic storage activities. The appropriateness of the instrument is tied to the financial risk to the state. Section 5.205 requires financial assurance for the following geologic storage activities: corrective action, post-injection site care and monitoring, site closure (including injection well plugging), and emergency and remedial response. Trust funds, letters of credit, and surety bonds may be appropriate for corrective action. Trust funds may be appropriate for post-injection site care and site closure. Insurance may be appropriate for unforeseen circumstances, such as emergency response and remedial action. The Commission makes no change in response to this comment at this time, but will consider future amendments to allow additional mechanisms for financial assurance in the near future. The Commission welcomes comments from interested persons regarding the various forms of financial assurance and specifically whether certain forms of financial assurance are appropriate to mitigate particular risks to the state.

Denbury commented that the amount of financial assurance required in proposed §5.205(c) should be limited to the maximum amount necessary to perform post-injection monitoring, post-injection site care and closure of the geologic storage facility as was succinctly set forth in SB 1387, and should not have been expanded to cover additional activities of corrective action, emergency response, and remedial action. In the proposal preamble, the Commission stated that the financial assurance requirements establish the requirements of SB 1387. SB 1387 distinctly requires only that the operator maintain financial assurance to ensure that an abandoned injection well is properly plugged and that funds are available for plugging, post-injection site care, and closure of an injection well. Increasing the amount of financial assurance beyond that set forth in the statute will create an additional unnecessary expense for operators.

The Commission does not agree with this comment. Post-injection site care and closure of the

geologic storage facility could include the need for corrective action, emergency response, and remedial action. The Commission makes no change in response to this comment.

Denbury commented that, although it appreciated the changes made to proposed §5.203(a) regarding the use of licensed professionals if required under Chapter 1001 of the Occupations Code, relating to Texas Engineering Practices Act or Chapter 1002 relating to Texas Geoscientists Practices Act, this clarification should also be made in proposed §5.205(c)(2)(C)(ii). The Commission agrees with this comment and has made the recommended clarifying change.

The Foundation commented that the Commission's provision for reducing the amount of required financial assurance should not be limited to the financial assurance required for post-injection monitoring in proposed §5.205(c)(4). The Foundation stated that, although it appreciates that the Commission included a provision to allow for the reduction of the amount of financial assurance as the projects progress, the provision is too narrow because it applies only to that portion of the financial assurance required for post-injection monitoring. The Foundation stated that this provision should be broadened to allow for the reduction of financial assurance required for corrective action as the facility nears closure and that the rules could use the performance standards or benchmarks included in the rules that must be met before the facility can be closed after cessation of injection as milestones for the reduction. The Commission agrees with this comment and has made the recommended change.

Denbury commented that proposed §5.206(j) fails to include any obligation of time for review by, or even a response from, the Commission to a request for closure, which could result in indefinite continued unnecessary and expensive monitoring and reporting after a site is ready for permanent closure. Denbury and others previously suggested a 180-day period for the Commission to respond to such a request, either with approval for closure or denial. Denbury recommended that the Commission reconsider adding a definite time period to this section to minimize the economic impact on, and aid in the business planning of, a geologic storage facility operator seeking permanent closure for its facility.

The Commission notes that Denbury and others originally recommended, in comments filed on the initial proposal published in March 2010, that the Commission revise §5.206(j)(3) to provide for automatic authorization of site closure 180 days after monitor wells are plugged or properly managed unless the director affirmatively acts to extend the post-injection site care period. In joint comments, the

Texas Carbon Capture and Storage Association and the Environmental Defense fund had recommended that the Commission revise §5.206(j)(5), as originally proposed, to provide for a certificate of closure and to place time limits on the Commission to provide written notification of the decision to the operator: "*(5) Certificate of storage facility closure. Within 60 days of a determination by the director that the operator has made demonstrations required in subsection (j)(3) the director shall provide written notification of his decision to the operator*." The Commission disagrees with these comments. While such an automatic authorization might be appropriate in the case of a relatively minor activity, the Commission declines to provide for an automatic authorization for closure of a geologic storage facility. In addition, because of the expected complexities of some geologic storage facilities and declining staffing, the Commission declines at this time to commit to performing this review within a set time period. The Commission commits to working as efficiently as possible to provide operators with a determination regarding closure of a geologic storage facility in a timely manner.

The Foundation commented that the Commission should clarify that filing a certificate with a land plat delineating the storage area is an acceptable form of notice under §5.206(k), which states that the operator must record a notation on the deed to the facility property "or any other document that is normally examined during a title search that will in perpetuity" to provide certain information to a potential purchaser of the property. The Foundation appreciates that the Commission has provided for a notice mechanism other than the filing of a notation on every deed. The Foundation seeks clarification from the Commission that the filing of a certificate with a land plat delineating the storage area and setting further the information required under the regulation, is the type of document that would be acceptable to the Commission in meeting the requirements of this section. It is the intent of the Commission that the applicant submit a document that is acceptable to the county clerk for filing in the official public records of the county. The document must delineate the storage area and set forth the information required under the regulation. In addition, the document must contain the complete legal description of the affected property. The document may be a certificate with a land plat if that is acceptable to the county clerk for filing in the official public records of the county and the document contains the complete legal description of the affected property. The Commission's concern is that the document be in the official public record so that abstract companies or title insurance companies will find

it in a title search. The Commission adopts §5.206(k) with clarifying changes.

Denbury commented that it appreciates the changes to proposed §5.207(a)(2)(D)(iii) creating an exception to submitting a recalculated area of review as part of the annual report if the operator submits a statement signed by an appropriate company official; however, proposed §5.207(a)(2)(D)(vi) is burdensome and unnecessary. Denbury stated that proposed §5.207(a)(2)(D)(vi) appears to decimate the new exception by providing a means for the Commission to second-guess the analysis performed by the operator in applying for the exception. The rule already describes when the area of review and other plans must be updated and it is sufficient for an operator to submit a statement as part of the annual report confirming that data supports the area of review and plans on file with the Commission without going into the unnecessary detail now required.

The Commission agrees that the language in §5.207(a)(2)(D)(vi) should be clarified as follows: "(vi) The operator must maintain and update required plans in accordance with the provision of this *subchapter*." However, the Commission disagrees that the clause has an impact on a permittee's ability to determine whether updates are warranted by material change in the monitoring and operational data, or in the evaluation of these data. In addition, the information described in the clause clarifies the type of information needed by the permittee and the Commission to determine whether updates are warranted. The Commission makes no additional change in response to this comment.

Denbury further commented that in proposed §5.207(a)(2)(D)(vi)(III), which allows the director to require revision whenever the director deems necessary, it is not clear on what basis the director would make such a determination. The language grants the director undefined discretionary authority on a decision to update these plans, which in Denbury's view is best left to the operator who will continually be reviewing the appropriate data and determining whether a change in any of the plans is warranted by the data reviewed. The Commission disagrees with this comment. The language appropriately allows a permittee to determine whether updates, including reevaluation of the area of review, are necessary based on the permittee's review and evaluation of pertinent data. Further, the language also appropriately allows the Commission to require updates if the Commission disagrees with that interpretation.

ADOPTION

The Commission adopts new Chapter 5, relating to Carbon Dioxide (CO_2). The Commission adopts new Subchapter A, relating to General Provisions, and §5.101, relating to Purpose. The purpose of the new chapter is to implement the portion of the state program for geologic storage of anthropogenic CO_2 over which the Commission has jurisdiction consistent with state and federal law related to protection of underground sources of drinking water (USDWs) and sequestration of CO_2.

The Commission adopts new §5.102, relating to Definitions. Many of the terms defined in this section are the same as or consistent with definitions of the same terms that are ubiquitous in the underground injection control program. These include definitions of "area of review," "confining zone," "corrective action," "enhanced recovery operation," "fracture pressure," "injection zone," "mechanical integrity," "pressure front," "transmissive fault or fracture," "well stimulation," and "workover." The Commission has modified a few of these definitions as necessary for geologic sequestration.

The Commission defines the term "underground source of drinking water," a term used in the federal UIC program. Heretofore, the Commission has used the terms "fresh water" and "usable quality water" because they are used in the Texas statutes relating to underground injection. However, as noted before, use of the term "underground sources of drinking water" in the Commission's rules will make it easier for the EPA to approve any request for enforcement primacy. The Commission proposes to define "underground source of drinking water" as an aquifer or its portion which is not an exempt aquifer as defined in 40 Code of Federal Regulations §146.4 and which supplies any public water system, or contains a sufficient quantity of ground water to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 mg/l total dissolved solids.

The Commission defines other terms necessary to regulation of geologic storage of anthropogenic CO_2. The Commission defines the term "anthropogenic CO_2," slightly differently from the definition in Texas Water Code, §27.002, as added by SB 1387. The Commission defines the terms "geologic storage," "geologic storage facility or storage facility," and "reservoir" as those terms are defined in Texas Water Code, §27.002, as added by SB 1387. Definitions for the terms "CO_2 plume," "CO_2 stream," "post-injection facility care," and "facility closure" are modifications of the definitions of those terms as adopted by EPA.

The Commission adopts new Subchapter B, relating to Geologic Storage and Associated Injection of Anthropogenic Carbon Dioxide (CO_2). The Commission adopts new §5.201, relating to Applicability and Compliance, which states that Subchapter B applies to the geologic storage of anthropogenic CO_2 in, and the injection of anthropogenic CO_2 into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir. A reservoir that may be productive means an identifiable geologic unit that has had production in the past, which is similar to productive or previously productive reservoirs along the same or a similar trend, or potentially contains oil, gas, or geothermal resources based on analysis of geophysical and/or seismic data.

In accordance with SB 1387, §5.201(b) states that Subchapter B does not apply to the injection of fluid through the use of an injection well regulated under§3.46 of this title for the primary purpose of enhanced recovery operations from which there is reasonable expectation of more than insignificant future production volumes of oil, gas, or geothermal energy and operating pressures are no higher than reasonably necessary to produce such volumes or rates. However, the operator of an enhanced recovery project may propose simultaneously to permit the enhanced recovery project as a CO_2 geologic storage facility. There may not be much difference between injection pressures used for enhanced recovery and those for geologic storage; however, this may depend on the geology and hydrology of the storage facility and whether the operator proposes to allow the reservoir pressure to increase above the hydrostatic pressure on a long-term basis. Subsection (b) further states that, if the director determines that an injection well regulated under §3.46 should be regulated under this subchapter because the injection well is no longer being used for the primary purpose of enhanced recovery operations, the director must notify the operator of such determination and allow the operator at least 30 days to respond to the determination and to file an application under this subchapter or cease operation of the well. Additionally, this subchapter does not preclude an enhanced oil recovery project operator from opting into any other regulatory program that provides credit for anthropogenic CO_2 sequestered through the enhanced recovery project.

Section §5.201(c) states that, if a well is authorized as or converted to an anthropogenic CO_2 injection well for geologic storage, this subchapter would apply to the well.

Section §5.201(d) states that, if a provision of this subchapter conflicts with any provision or term of a Commission order or permit, the provision of such order or permit controls. Subsection §5.201(e)

requires the operator of a geologic storage facility to comply with all other applicable Commission rules and orders and states that, if a provision of Subchapter B conflicts with any provision or term of a Commission order or permit, the provision of the order or permit controls.

The Commission adopts §5.202, relating to Permit Required. Subsection (a) prohibits a person from beginning to drill or to operate an anthropogenic CO_2 injection well for geologic storage or constructing or operating a geologic storage facility regulated under this subchapter without first obtaining the necessary permit(s) from the Commission. Subsection (b) outlines the requirements for amendment of an existing geologic storage facility permit. Subsection (c) sets forth the requirements for transfer of a permit for a geologic storage facility permit from one operator to another operator. The Commission adopts subsection (c)(1) with a change as previously discussed in the preamble.

Subsection (d) states that the Commission has the authority to modify, cancel, or suspend a geologic storage facility permit after notice and opportunity for hearing under specific circumstances, listed in the subsection. Subsection (d) further provides that in the event of an emergency that threatens endangerment to USDWs or to life or property, or an imminent threat of uncontrolled escape of CO_2, the director may immediately order suspension of the operation of a geologic storage facility until a final order is issued pursuant to a hearing, if any.

The Commission adopts §5.203, relating to Application Requirements. Subsection (a) establishes the general requirements for the form of a permit application, the filing requirements, and providing general information. This subsection also states that the Commission may not issue a permit before receiving a complete application. The subsection further states that all reports must be prepared by a qualified and knowledgeable person. In addition, if required by the Texas Geoscientist Practice Act or the Texas Engineering Practices Act, a professional geoscientist or professional engineer must conduct the logging, sampling, and testing, and affix the appropriate seal on the resulting reports required under this subchapter. Subsection (b) establishes the requirements for surface map and information. Subsection (c) establishes the geologic, geochemical, and hydrologic information required with an application. These requirements are consistent with EPA's requirements. The Commission adopts subsection (c)(2)(F) with a change as previously discussed in the preamble.

Subsection (d) establishes the application requirements for the area of review and corrective

action. Paragraph (1) establishes the permit application requirements for the initial delineation of the area of review and the initial corrective action. Permit applicants must perform the initial delineation of the area of review using computational modeling to predict the lateral and vertical migration of the CO_2 plume, the formation fluids, and the pressure differentials required to cause movement of injected fluids or formation fluids into a USDW in the subsurface for three periods after initiation of injection: (1) five years after initiation of injection; (2) from initiation of injection to the end of the injection period proposed by the applicant; and (3) from initiation of injection to 10 years after the end of the injection period proposed by the applicant. The Commission has determined that delineation of the probable area of review after five years from commencement of injection will provide the operator and the Commission with useful information to verify the adequacy of the methods and programs used to delineate the areas of review throughout the life of the storage facility and to make any necessary adjustments shortly after the first five years of operation.

Subsection (d) also establishes the application requirements for identification of penetrations and table of wells and establishes the application requirements for any necessary corrective action. The applicant must include in the table of wells all penetrations that are known or reasonably discoverable through specialized knowledge or experience. Examples of such specialized knowledge or experience may include reviews of federal, state and local government records, interviews with past and present owners, operators and occupants, reviews of historical information (including aerial photographs, chain of title documents, and land use records), and visual inspections of the facility and adjoining properties. Subsection (d) further requires that the applicant submit an area of review and corrective action plan, and details what that plan must include. The requirements in this subsection are consistent with those in EPA's regulation.

Section §5.203(e) establishes the requirements for construction of anthropogenic CO_2 injection wells. These requirements are consistent with the requirements for Class II injection wells, with the addition of one requirement included in EPA's rules, *i.e.*, verification of the integrity and location of the cement using technology capable of radial evaluation of cement quality and identification of the location of channels to ensure that underground sources of drinking water will not be endangered. Existing wells that have been associated with injection of CO_2 for the purpose of enhanced recovery may be exempt

from provisions of these casing and cementing requirements if the applicant demonstrates that the well construction meets the general performance criteria. Subsection (e) also establishes the requirements for the well construction information that must be submitted with a permit application, including a well construction plan and a well stimulation plan. Such information is necessary to allow the director to determine whether the wells will be constructed to prevent endangerment of USDWs and will isolate the injected fluids to the storage reservoir.

Subsection (f), relating to logging, sampling, and testing, establishes the logging, sampling and testing results to be submitted with the application sufficient to determine the depth, thickness, porosity, permeability, and lithology of, and the geochemistry of any formation fluids in, all relevant geologic formations. Subsection (f) also requires the applicant to submit a plan for logging, sampling, and testing the injection well(s), after permitting but prior to injection well operation. The plan must describe the logs, surveys, and tests to be conducted to verify the depth, thickness, porosity, permeability, and lithology of, and the salinity of any formation fluids in, the formations that are to be used for monitoring, storage, and confinement to assure conformance with the injection well construction requirements, and to establish accurate baseline data against which future measurements may be compared. The subsection further requires the applicant to submit a sampling plan. The subsection establishes the criteria and information for both plans. These requirements are a modification of the requirements in EPA's rule §146.87 for Class VI wells, except that the Commission has included more performance requirements and fewer mandates that operators perform specific tests to allow the operator to use whatever tests provide the necessary demonstration and to allow for technological advancements in testing methods. The Commission adopts subsection (f)(2)(C) with a change as previously discussed in the preamble.

Subsection (g), relating to compatibility determination, requires an applicant to submit a determination of the compatibility of the CO_2 stream with the materials to be used to construct the well; fluids in the injection zone; and minerals in both the injection and the confining zone, based on the results of the formation testing program.

Subsection (h), relating to mechanical integrity testing information, sets forth the criteria and information to be submitted in a mechanical integrity testing plan. These requirements are a modification of the requirements in EPA's rule §146.89. The requirements include an initial annulus pressure test;

continuous monitoring of the injection pressure, rate, injected volumes, and pressure on the annulus between tubing and long string casing; an annual confirmation that the injected fluids are confined to the injection zone using a method approved by the director (e.g., diagnostic surveys, such as oxygen-activation logging or temperature or noise logs); and injection well testing after any workover that disturbs the seal between the tubing, packer, and casing, and at least once every five years to determine if leaks exist in the tubing, packer, or casing. The subsection further requires that the applicant submit a mechanical integrity testing plan and outlines the requirements of the plan.

Subsection (i), relating to operating information, establishes the maximum injection pressure and the requirement for an operating plan. This requirement is consistent with EPA's rules, except that it does not set the limit to 90% of the fracture pressure of the injection zone. Rather, the Commission proposes to set the maximum injection pressure to one that takes into account the risks of tensile failure and, where appropriate, geomechanical or other studies that assess the risk of tensile failure and shear failure; that with a reasonable degree of certainty will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults transecting the confining zone to become transmissive; and that in no case may cause the movement of injection or formation fluids in a manner that endangers USDWs.

Subsection (j), relating to monitoring, sampling, and testing plan, requires the applicant to prepare and submit a plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone. The subsection establishes the requirements of the plan, which are consistent with EPA's rules.

Subsection (k), relating to well plugging plan, sets forth the requirements for plugging injection and monitor wells. In accordance with §3.14 of this title, operators must plug monitor wells that penetrate the base of usable quality water and, upon abandonment, all injection wells. Operators must plug all monitoring wells that do not penetrate the base of usable quality water, in accordance with 16 TAC Chapter 76 (relating to Water Well Drillers and Water Well Plump Installers).

Subsection (l), relating to emergency and remedial response plan, requires that the applicant submit an emergency and remedial response plan that describes actions to be taken to address escape from the permitted injection interval or movement of the injection or formation fluids that may cause an

endangerment to USDWs during construction, operation, closure and post-closure periods; includes a safety plan that includes emergency response procedures, provisions to provide security against unauthorized activity, and CO_2 release detection and prevention measures; and includes a description of the training and testing that will be provided to each employee at the storage facility on operational safety and emergency response procedures to the extent applicable to the employee's duties and responsibilities.

Section 5.203(m), relating to post-injection facility care and facility closure plan, requires that an applicant submit a plan that includes the pressure differential between pre-injection and predicted post-injection pressures in the injection zone; the predicted position of the CO_2 plume and associated pressure front at closure as demonstrated in the area of review evaluation; a description of post-injection monitoring location, methods, and proposed frequency; a proposed schedule for submitting post-injection storage facility care monitoring results to the Commission; and the estimated cost of proposed post-injection care and closure.

Subsection (n), relating to financial responsibility, requires that an applicant demonstrate that the applicant has met the financial responsibility requirements under §5.205 of this subchapter. Such requirements are consistent with Texas Water Code, §27.050, and EPA's rule §146.85.

Subsection (o), relating to letter from the TCEQ, implements the requirement in Texas Water Code, §27.046, that an applicant submit a letter from the Executive Director of the TCEQ. The Commission adopts subsection (o) with a change as previously discussed in the preamble.

Subsection (p), relating to other information, requires that an applicant submit any other information requested by the director as necessary to discharge the Commission's duties under Texas Water Code, Chapter 27, Subchapter B-1, or deemed necessary by the director to clarify, explain, and support the required attachments, consistent with Texas Water Code, §27.044, as amended by SB 1387.

The Commission adopts §5.204, relating to Notice and Hearing. Subsection §5.204(a) requires the applicant to make a complete copy of the permit application available for the public to inspect and copy by filing a copy of the application with the County Clerk at the courthouse of the county or counties where the storage facility is to be located, or if approved by the director, at another equivalent public office. In addition, the subsection requires the applicant to provide an electronic copy of the complete application to be posted on the Commission's website. The applicant must file any subsequent revision of

an application with each County Clerk or other approved public office and must file at the Commission an electronic copy of the updated application at the same time the applicant files the revision at the Commission.

Subsection (b), relating to notice requirements, establishes the notice requirements for a permit application under this subchapter. Such notice is similar to the notice requirements for a gas storage facility under §3.96 of this title (relating to Underground Storage of Gas in Productive or Depleted Reservoirs), except that here the Commission proposes additional notice to surface owners, as well as mineral leaseholders and surface leaseholders adjoining the outermost boundary of the area of review.

In both subsections (a) and (b), the Commission adopts minor modifications to a portion of the text in the required notices. The sentences identifying the underground depth of the geologic storage reservoir must be in all capitals and bold font.

Subsection (c), relating to hearing requirements, is similar to the hearing requirements for an enhanced recovery injection well under §3.46 of this title. If the Commission receives a protest regarding an application for a new, or amendment of a permitted, geologic storage facility permit from a person who was notified pursuant to subsection (b) or from any other affected person within 30 days of the date of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later, then the applicant will be notified that the application cannot be administratively approved. The director will schedule a hearing on the application upon request of the applicant. The Commission must give notice of the hearing to all affected persons, local governments, and other persons who express, in writing, an interest in the application. After hearing, the examiner will recommend a final action by the Commission. If the Commission receives no protest regarding an application for a new, or amendment of a permitted, geologic storage facility permit from a person notified pursuant to subsection (a), or from any other affected person, the director may administratively approve the application. If the permit application for a new, or amendment of a permitted, geologic storage facility is administratively denied, a hearing will be scheduled upon written request of the applicant. After hearing, the examiner will recommend a final action by the Commission.

Section 5.205, relating to Fees and Financial Assurance, establishes three non-refundable fees: a base fee for each application to cover the Commission's costs for processing the application; an annual fee

based on the number of metric tons injected into the geologic storage facility; and an annual post-injection care fee to be paid each year the operator does not inject into the geologic storage facility until the director has authorized storage facility closure. These fees are in addition to the fee required for each injection well by §3.78 of this title (relating to Fees and Financial Security Requirements). Subsection (b), relating to financial responsibility, is consistent with of the Texas Water Code, §27.050, as added by SB 1387.

Subsection §5.205(c) establishes financial assurance requirements as required by Texas Water Code, §27.073, as added by SB 1387. The operator must comply with the requirements of §3.78 of this title for all monitoring wells that penetrate the base of usable quality water and all injection wells. In addition, an applicant for a geologic storage facility must file a bond or letter of credit that is in an amount approved by the director under this subsection and that meets the requirements of this subsection as to form and issuer. The Commission must approve the bond or letter of credit before issuing a permit. The Commission adopts subsection (c)(2)(C)(ii) and (c)(4) with changes as previously discussed in the preamble.

Subsection (d), relating to notice of adverse financial conditions, requires an operator notify the Commission of adverse financial conditions that may affect the operator's ability to carry out injection well plugging, post-injection storage facility care, and storage facility closure. The subsection requires that notice of bankruptcy be filed in accordance with §3.1 of this title (relating to Organization Report; Retention of Records; Notice Requirements). The bond must provide a mechanism for the bond or surety company to give prompt notice to the Commission and the operator of any action filed alleging insolvency or bankruptcy of the surety company or the bank or alleging any violation that would result in suspension or revocation of the surety or bank's charter or license to do business. Upon the incapacity of a bank or surety company by reason of bankruptcy, insolvency, or suspension, or of revocation of its charter or license, the operator will be deemed to be without bond coverage. The Commission must issue a notice to any operator who is without bond coverage and specify a reasonable period to replace bond coverage, not to exceed 90 days.

The Commission adopts §5.206, relating to Permit Standards. Subsection (a) establishes the general criteria for issuance of a permit. The language is consistent with Texas Water Code, §27.051(b-1),

as added by SB 1387. The Commission adds requirements, such as the applicant's submission of the letter from the Executive Director of the TCEQ required by Texas Water Code, §27.046; the applicant's demonstration that the applicant has a good faith claim to the necessary and sufficient property rights for construction and operation of the geologic storage facility; the applicant's payment of the fee required in §5.205(a) of this subchapter; the director's determination that the applicant has sufficiently demonstrated financial responsibility; and the applicant submitted to the director the required financial security.

Subsection (b) requires that construction of anthropogenic CO_2 injection wells meet the criteria in §5.203(e) of this subchapter; that within 30 days after the completion or conversion of an injection well, the operator file a complete record of the well on the Commission's approved form showing the current completion; and that an operator of a geologic storage facility must notify the director and obtain the director's approval prior to conducting any well workover.

Subsection (c) establishes the requirements for operating a geologic storage facility. The subsection requires the operator to maintain and comply with the approved operating plan and adhere to certain operating criteria relating to metering, injection pressure, annulus fluid, recording devices, alarms, and automatic shut-off systems.

Subsection (d) requires that the operator maintain and comply with the approved monitoring, sampling, and testing plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone.

Subsection (e) requires that the operator maintain and comply with the approved mechanical integrity testing plan submitted in accordance with §5.203(h) of this subchapter, and maintain mechanical integrity of the injection well at all times, except during periods of well workover.

Subsection (f) requires that, at the frequency specified in the approved area of review and corrective action plan or permit, or when monitoring and operational conditions warrant, the operator of a geologic storage facility must: (1) re-evaluate the area of review through computational modeling; (2) identify all wells in the re-evaluated area of review that require corrective action; (3) perform corrective action on wells requiring corrective action in the re-evaluated area of review; and (4) submit an amended area of review and corrective action plan or demonstrate to the director through monitoring data and

modeling results that no change to the area of review and corrective action plan is needed.

Subsection (g) requires that the operator maintain, update as necessary, and comply with the approved emergency and remedial response plan required by §5.203(l). The subsection also states the action an operator must take if the operator obtains evidence that the injected CO_2 stream and associated pressure front may cause an endangerment to USDWs and states that the director may allow the operator to resume injection prior to remediation if the operator demonstrates that the injection operation will not endanger USDWs. These requirements are consistent with the requirements in EPA's regulations at §146.94.

Subsection (h) requires the operator to give the division the opportunity to witness all testing and logging.

Subsection (i) requires the operator to maintain and comply with the approved well plugging plan required by §5.203(k).

Subsection (j) requires the operator of an injection well to maintain and comply with the approved post-injection storage facility care and closure plan required under proposed new §5.203(m). Prior to authorization for storage facility closure, the operator must submit to the director a demonstration, based on monitoring and other site-specific data, that the CO_2 plume and pressure front have stabilized and that no additional monitoring is needed to assure that the geologic storage facility will not endanger USDWs. Subsection (j) establishes the requirements necessary for the Commission to authorize closure. These requirements are generally consistent with EPA's regulation §146.93.

Section 5.206(k) requires the operator of a geologic storage facility to record specific information in a notation on the deed to the facility property or any other document to put any potential purchaser of the property on notice of certain facts, including the fact that the land has been used to geologically store CO_2.

Subsection (l) requires that the operator retain for three years following storage facility closure certain records collected during the post-injection storage facility care period. The subsection further requires that the operator deliver those records to the director at the conclusion of the retention period and that the records be retained at the Austin Headquarters of the Commission.

Subsection (m) requires identification of each location at which geologic storage activities take

place, including each injection well, by a sign that meets the requirements specified in §3.3 of this title (relating to Identification of Properties, Wells, and Tanks). In addition, each sign must include a telephone number at which the operator, or a representative of the operator, can be reached in the event of an emergency.

Subsection (n) states that, in any permit for a geologic storage facility, the director will impose terms and conditions reasonably necessary to protect USDWs, including the necessary casing. The subsection further states that the permits issued under this subchapter continue in effect until revoked, modified, or suspended by the Commission. Operators must comply with each requirement set forth in this subchapter as a condition of the permit unless specifically modified by the terms of the permit.

The Commission adopts §5.207, which establishes reporting and record-keeping requirements. The operator must file a complete record of all tests in duplicate with the district office within 30 days after the testing. In reporting the results of mechanical integrity tests to the director, the operator must include a description of the test(s) and the method(s) used. Various operating reports are due within 24 hours, within 30 days, semi-annually, annually, or on a cumulative basis. The operator must report to the district office orally as soon as practicable upon the discovery of any pressure changes or other monitoring data that indicate the presence of leaks in the well or the lack of confinement of the injected CO_2 stream to the geologic storage reservoir, and must confirm the report in writing within five working days.

Within 30 days, the operator must report the results of periodic tests for mechanical integrity; the results of any other test of the injection well conducted by the operator if required by the director; and a description of any well workover. These reports must include summary cumulative tables of the required information.

Semi-annually, the operator must report a summary of well head pressure monitoring; changes to the physical, chemical and other relevant characteristics of the CO_2 stream from the proposed operating data; monthly average, maximum, and minimum values for injection pressure, flow rate and volume, and annular pressure; a description of any event that significantly exceeds operating parameters for annulus pressure or injection pressure as specified in the permit; a description of any event that triggers a shutdown device and the response taken; and the results of monitoring prescribed under §5.206(d).

Other information that may be obtained annually includes but is not limited to reports of corrective action performed; new wells installed and the type, location, number and information required in §5.203(e); re-calculated area of review; tons of CO_2 injected; and other information that may be required by a particular permit. Section 5.207 also prescribes the reporting formats and record retention requirements. The Commission adopts subsection (a)(2)(D)(vi) with a change as previously discussed in the preamble.

The Commission adopts §5.208, relating to Penalties, which states that violations of this subchapter may subject the operator to penalties and remedies specified in the Texas Natural Resources Code, Title 3, Texas Water Code, Chapter 27, and other statutes administered by Commission, and that the certificate of compliance for any oil, gas, or geothermal resource well may be revoked in the manner provided in §3.73 of this title (relating to Pipeline Connection; Cancellation of Certificate of Compliance; Severance) for violation of this subchapter.

The Commission adopts the rules in new Chapter 5 pursuant to Texas Natural Resources Code, §81.051 and §81.052, which give the Commission jurisdiction over all persons owning or engaged in drilling or operating oil or gas wells in Texas and the authority to adopt all necessary rules for governing and regulating persons and their operations under the jurisdiction of the Commission; Texas Natural Resources Code, Chapter 91, Subchapter R, as enacted by SB 1387, relating to authorization for multiple or alternative uses of wells; Texas Water Code, Chapter 27, Subchapter C-1, as enacted by SB 1387, which gives the Commission jurisdiction over the geologic storage of CO_2 in, and the injection of CO_2 into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir; and Texas Water Code, Chapter 120, as enacted by SB 1387, which establishes the Anthropogenic Carbon Dioxide Storage Trust Fund, a special interest-bearing fund in the state treasury, to consist of fees collected by the Commission and penalties imposed under Texas Water Code, Chapter 27, Subchapter C-1, and to be used by the Commission for only certain specified activities associated with geologic storage facilities and associated anthropogenic CO_2 injection wells.

Texas Natural Resources Code, §81.051 and §81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120, are affected by the proposed new

rules.

Statutory authority: Texas Natural Resources Code, §81.051 and §81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120.

Cross-reference to statute: Texas Natural Resources Code, §81.051 and §81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120.

SUBCHAPTER A. GENERAL PROVISIONS

§5.101. Purpose.

The purpose of this chapter is to implement the portion of the state program for geologic storage of anthropogenic CO_2 over which the Railroad Commission has jurisdiction consistent with state and federal law related to protection of underground sources of drinking water.

§5.102. Definitions.

The following terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Affected person--A person who, as a result of actions proposed by an application for a geologic storage facility permit or an amendment or modification of an existing geologic storage facility permit, has suffered or may suffer actual injury or economic damage other than as a member of the general public.

(2) Anthropogenic carbon dioxide (CO_2)--

(A) CO_2 that would otherwise have been released into the atmosphere that has been:

(i) separated from any other fluid stream; or

(ii) captured from an emissions source, including:

(I) an advanced clean energy project as defined by Health and Safety Code, §382.003, or another type of electric generation facility; or

(II) an industrial source of emissions; and

(iii) any incidental associated substance derived from the source material for, or from the process of capturing, CO_2 described by clause (i) of this subparagraph; and

(iv) any substance added to CO_2 described by clause (i) of this subparagraph to enable or improve the process of injecting the CO_2; and

(B) does not include naturally occurring CO_2 that is produced, acquired, recaptured, recycled, and reinjected as part of enhanced recovery operations.

(3) Anthropogenic CO_2 injection well--An injection well used to inject or transmit anthropogenic CO_2 into a reservoir.

(4) Aquifer--A geologic formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

(5) Area of review--The subsurface three-dimensional extent of the CO_2 stream plume and the associated pressure front, as well as the overlying formations, any underground sources of drinking water overlying an injection zone along with any intervening formations, and the surface area above that delineated region.

(6) Carbon dioxide (CO_2) plume--The underground extent, in three dimensions, of an injected CO_2 stream.

(7) Carbon dioxide (CO_2) stream--CO_2 that has been captured from an emission source, incidental associated substances derived from the source materials and the capture process, and any substances added to the stream to enable or improve the injection process. The term does not include any CO_2 stream that meets the definition of a hazardous waste under 40 Code of Federal Regulations Part 261.

(8) Commission--A quorum of the members of the Railroad Commission of Texas convening as a body in open meeting.

(9) Confining zone--A geologic formation, group of formations, or part of a formation that is capable of limiting fluid movement from an injection zone.

(10) Corrective action--Methods to assure that wells within the area of review do not serve as conduits for the movement of fluids into or between underground sources of drinking water, including the use of corrosion resistant materials, where appropriate.

(11) Delegate--The person authorized by the director to take action on behalf of the

Railroad Commission of Texas under this chapter.

(12) Director--The director of the Oil and Gas Division of the Railroad Commission of Texas or the director's delegate.

(13) Division--The Oil and Gas Division of the Railroad Commission of Texas.

(14) Enhanced recovery operation--Using any process to displace hydrocarbons from a reservoir other than by primary recovery, including using any physical, chemical, thermal, or biological process and any co-production project. This term does not include pressure maintenance or disposal projects.

(15) Facility closure--The point at which the operator of a geologic storage facility is released from post-injection storage facility care responsibilities.

(16) Formation fluid--Fluid present in a formation under natural conditions.

(17) Fracture pressure--The pressure that, if applied to a subsurface formation, would cause that formation to physically fracture.

(18) Geologic storage--The long-term containment of anthropogenic CO_2 in a reservoir.

(19) Geologic storage facility or storage facility--The underground reservoir, underground equipment, injection wells, and surface buildings and equipment used or to be used for the geologic storage of anthropogenic CO_2 and all surface and subsurface rights and appurtenances necessary to the operation of a facility for the geologic storage of anthropogenic CO_2. The term includes any reasonable and necessary areal buffer, subsurface monitoring zones, and pressure fronts. The term does not include a pipeline used to transport CO_2 from the facility at which the CO_2 is captured to the geologic storage facility. The storage of CO_2 incidental to or as part of enhanced recovery operations does not in itself automatically render a facility a geologic storage facility.

(20) Injection zone--A geologic formation, group of formations, or part of a formation that is of sufficient areal extent, thickness, porosity, and permeability to receive CO_2 through a well or wells associated with a geologic storage facility.

(21) Mechanical integrity--

(A) An anthropogenic CO_2 injection well has mechanical integrity if:

(i) there is no significant leak in the casing, tubing, or packer; and

(ii) there is no significant fluid movement into a stratum containing an underground source of drinking water through channels adjacent to the injection well bore as a result of operation of the injection well.

(B) The Commission will consider any deviations during testing that cannot be explained by the margin of error for the test used to determine mechanical integrity, or other factors, such as temperature fluctuations, to be an indication of the possibility of a significant leak and/or the possibility of significant fluid movement into a stratum containing an underground source of drinking water through channels adjacent to the injection wellbore.

(22) Monitoring well--A well either completed or re-completed to observe subsurface phenomena, including the presence of anthropogenic CO_2, pressure fluctuations, fluid levels and flow, temperature, and/or in situ water chemistry.

(23) Operator--A person, acting for himself or as an agent for others, designated to the Railroad Commission of Texas as the person with responsibility for complying with the rules and regulations regarding the permitting, physical operation, closure, and post-closure care of a geologic storage facility, or such person's authorized representative.

(24) Person--A natural person, corporation, organization, government, governmental subdivision or agency, business trust, estate, trust, partnership, association, or any other legal entity.

(25) Post-injection facility care--Monitoring and other actions (including corrective action) needed following cessation of injection to assure that underground sources of drinking water are not endangered and that the anthropogenic CO_2 remains confined to the permitted injection interval.

(26) Pressure front--The zone of elevated pressure that is created by the injection of the CO_2 stream into the subsurface where there is a pressure differential sufficient to cause movement of the CO_2 stream or formation fluids from the injection zone into an underground source of drinking water.

(27) Reservoir--A natural or artificially created subsurface sedimentary stratum, formation, aquifer, cavity, void, or coal seam.

(28) Transmissive fault or fracture--A fault or fracture that has sufficient permeability and vertical extent to allow fluids to move beyond the confining zone.

(29) Underground source of drinking water--An aquifer or its portion which is not an

exempt aquifer as defined in 40 Code of Federal Regulations §146.4 and which:

(A) supplies any public water system; or

(B) contains a sufficient quantity of ground water to supply a public water system; and

(i) currently supplies drinking water for human consumption; or

(ii) contains fewer than 10,000 mg/l total dissolved solids.

(30) Well stimulation--Any of several processes used to clean the well bore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for fluid to move more readily into the formation including, but not limited to, surging, jetting, blasting, acidizing, and hydraulic fracturing.

(31) Workover--An operation in which a down-hole component of a well is repaired or the engineering design of the well is changed. Workovers include operations such as sidetracking, the addition of perforations within the permitted injection interval, and the addition of liners or patches. For the purposes of this chapter, workovers do not include well stimulation operations.

SUBCHAPTER B. GEOLOGIC STORAGE AND ASSOCIATED INJECTION OF ANTHROPOGENIC CARBON DIOXIDE (CO2)

§5.201. Applicability and Compliance.

(a) This subchapter applies to the geologic storage of anthropogenic CO_2 in, and the injection of anthropogenic CO_2 into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir. A reservoir that may be productive means an identifiable geologic unit that has had production in the past, which is similar to productive or previously productive reservoirs along the same or a similar trend, or potentially contains oil, gas, or geothermal resources based on analysis of geophysical and/or seismic data.

(b) This subchapter does not apply to the injection of fluid through the use of an injection well regulated under §3.46 of this title (relating to Fluid Injection into Productive Reservoirs) for the primary purpose of enhanced recovery operations from which there is reasonable expectation of more than insignificant future production volumes of oil, gas, or geothermal energy and operating pressures are no

higher than reasonably necessary to produce such volumes or rates. However, the operator of an enhanced recovery project may propose to also permit the enhanced recovery project as a CO_2 geologic storage facility simultaneously. If the director determines that an injection well regulated under §3.46 of this title should be regulated under this subchapter because the injection well is no longer being used for the primary purpose of enhanced recovery operations, the director must notify the operator of such determination and allow the operator at least 30 days to respond to the determination and to file an application under this subchapter or cease operation of the well. Additionally, this subchapter does not preclude an enhanced oil recovery project operator from opting into a regulatory program that provides carbon credit for anthropogenic CO_2 sequestered through the enhanced recovery project.

(c) This subchapter applies to a well that is authorized as or converted to an anthropogenic CO_2 injection well for geologic storage.

(d) If a provision of this subchapter conflicts with any provision or term of a Commission order or permit, the provision of such order or permit controls.

(e) The operator of a geologic storage facility must comply with the requirements of this subchapter as well as with all other applicable Commission rules and orders, including the requirements of Chapter 8 of this title (relating to Pipeline Safety Regulations) for pipelines and associated facilities.

§5.202. Permit Required.

(a) Permit required. A person may not begin drilling or operating an anthropogenic CO_2 injection well for geologic storage or constructing or operating a geologic storage facility regulated under this subchapter without first obtaining the necessary permit(s) from the Commission.

(b) Permit amendment.

(1) An operator must file an application to amend an existing geologic storage facility permit with the director:

(A) prior to expanding the areal extent of the storage reservoir;

(B) prior to increasing the permitted injection pressure;

(C) prior to adding injection wells; or

(D) at any time that conditions at the geologic storage facility materially deviate

from the conditions specified in the permit or permit application.

(2) Compliance with plan amendments required by this subchapter does not necessarily constitute a material deviation in conditions requiring an amendment of the permit.

(c) Permit transfer. An operator may transfer its geologic storage facility permit to another operator if the requirements of this subsection are met. A new operator may not assume operation of the geologic storage facility without a valid permit.

(1) Notice. An applicant must submit written notice of an intended permit transfer to the director at least 45 days prior to the date the transfer of operations is proposed to take place, unless such action could trigger U. S. Securities and Exchange Commission fiduciary and insider trading restrictions and/or rules.

(A) The applicant's notice to the director must contain:

(i) the name and address of the person to whom the geologic storage facility will be sold, assigned, transferred, leased, conveyed, exchanged, or otherwise disposed;

(ii) the name and location of the geologic storage facility and a legal description of the land upon which the storage facility is situated;

(iii) the date that the sale, assignment, transfer, lease conveyance, exchange, or other disposition is proposed to become final; and

(iv) the date that the transferring operator will relinquish possession as a result of the sale, assignment, transfer, lease conveyance, exchange, or other disposition.

(B) The person acquiring a geologic storage facility, whether by purchase, transfer, assignment, lease, conveyance, exchange, or other disposition, must notify the director in writing of the acquisition as soon as it is reasonably possible but not later than five business days after the date that the acquisition of the geologic storage facility becomes final. The director may not approve the transfer of a geologic storage facility permit until the new operator provides all of the following:

(i) the name and address of the operator from which the geologic storage facility was acquired;

(ii) the name and location of the geologic storage facility and a description of the land upon which the geologic storage facility is situated;

(iii) the date that the acquisition became or will become final;

(iv) the date that possession was or will be acquired; and

(v) the financial assurance required by this subchapter.

(2) Evidence of financial responsibility. The operator acquiring the permit must provide the director with evidence of financial responsibility satisfactory to the director in accordance with §5.205 of this title (relating to Fees, Financial Responsibility, and Financial Assurance).

(3) Transfer of responsibility. An operator remains responsible for the geologic storage facility until the director approves in writing the sale, assignment, transfer, lease, conveyance, exchange, or other disposition and the person acquiring the storage facility complies with all applicable requirements.

(d) Modification, cancellation, or suspension of a geologic storage facility permit.

(1) General. The director may modify, suspend, or cancel a geologic storage facility permit after notice and opportunity for hearing under any of the following circumstances:

(A) There is a material change in conditions in the operation of the geologic storage facility, or there are material deviations from the information originally furnished to the director. A change in conditions at a facility that does not affect the ability of the facility to operate without causing an unauthorized release of CO_2 and/or formation fluids is not considered to be material;

(B) Underground sources of drinking water are likely to be endangered as a result of the continued operation of the geologic storage facility;

(C) There are substantial violations of the terms and provisions of the permit or of applicable Commission orders or regulations;

(D) The operator misrepresented material facts during the permit application or issuance process; or

(E) Fluids are escaping or are likely to escape from the injection zone.

(2) Emergency shutdown. Notwithstanding the provisions of paragraph (1) of this subsection, in the event of an emergency that threatens endangerment to underground sources of drinking water or to life or property, or an imminent threat of uncontrolled release of CO_2, the director may immediately order suspension of the operation of the geologic storage facility until a final order is issued

pursuant to a hearing, if any.

§5.203. Application Requirements.

(a) General.

(1) Form and filing. Each applicant for a permit to construct and operate a geologic storage facility must file an application with the division in Austin on a form prescribed by the Commission. The applicant must file one copy of the application and all attachments with the division in an electronic format. On the same date, the applicant must file one copy with the appropriate district office(s) and one copy with the Executive Director of the Texas Commission on Environmental Quality. An applicant must ensure that the application is executed by a party having knowledge of the facts entered on the form and included in the required attachments. If otherwise required under Occupations Code, Chapter 1001, relating to Texas Engineering Practices Act, or Chapter 1002, relating to Texas Geoscientists Practices Act, respectively, a licensed professional engineer or geoscientist must conduct the geologic and hydrologic evaluations required under this section and must affix the appropriate seal on the resulting reports of such evaluations.

(2) General information. On the application, the applicant must include the name, mailing address, and location of the facility for which the application is being submitted and the operator's name, address, telephone number, Commission Organization Report number, and ownership of the facility.

(3) Application completeness. The Commission may not issue a permit before receiving a complete application. A permit application is complete when the director determines that the application contains information addressing each application requirement of the regulatory program and all information necessary to initiate the final review by the director.

(4) Reports. An applicant must ensure that all descriptive reports are prepared by a qualified and knowledgeable person and include an interpretation of the results of all logs, surveys, sampling, and tests required in this subchapter. The applicant must include in the application a quality assurance and surveillance plan for all testing and monitoring, which includes, at a minimum, validation of the analytical laboratory data, calibration of field instruments, and an explanation of the sampling and data acquisition techniques.

(b) Surface map and information. Only information of public record is required to be included on this map.

(1) The applicant must file with the director a surface map delineating the proposed location(s) of injection well(s) and the boundary of the geologic storage facility for which a permit is sought and the applicable area of review.

(2) The applicant must show within the area of review on the map the number or name and the location of:

(A) all known artificial penetrations through the confining zone, including injection wells, producing wells, inactive wells, plugged wells, or dry holes;

(B) the locations of cathodic protection holes, subsurface cleanup sites, bodies of surface water, springs, surface and subsurface mines, quarries, and water wells; and

(C) other pertinent surface features, including pipelines, roads, and structures intended for human occupancy.

(3) The applicant must identify on the map any known or suspected faults expressed at the surface.

(c) Geologic, geochemical, and hydrologic information.

(1) The applicant must submit a descriptive report prepared by a knowledgeable person that includes an interpretation of the results of appropriate logs, surveys, sampling, and testing sufficient to determine the depth, thickness, porosity, permeability, and lithology of, and the geochemistry of any formation fluids in, all relevant geologic formations.

(2) The applicant must submit information on the geologic structure and reservoir properties of the proposed storage reservoir and overlying formations, including the following information:

(A) geologic and topographic maps and cross sections illustrating regional geology, hydrogeology, and the geologic structure of the area from the ground surface to the base of the injection zone within the area of review that indicate the general vertical and lateral limits of all underground sources of drinking water within the area of review, their positions relative to the storage reservoir and the direction of water movement, where known;

(B) the depth, areal extent, thickness, mineralogy, porosity, permeability, and capillary pressure of, and the geochemistry of any formation fluids in, the storage reservoir and confining zone and any other relevant geologic formations, including geology/facies changes based on field data, which may include geologic cores, outcrop data, seismic surveys, well logs, and lithologic descriptions, and the analyses of logging, sampling, and testing results used to make such determinations;

(C) the location, orientation, and properties of known or suspected transmissive faults or fractures that may transect the confining zone within the area of review and a determination that such faults or fractures would not compromise containment;

(D) the seismic history, including the presence and depth of seismic sources, and a determination that the seismicity would not compromise containment;

(E) geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone;

(F) a description of the formation testing program used and the analytical results used to determine the chemical and physical characteristics of the injection zone and the confining zone; and

(G) baseline geochemical data for subsurface formations that will be used for monitoring purposes, including all formations containing underground sources of drinking water within the area of review.

(d) Area of review and corrective action. This subsection describes the standards for the information regarding the delineation of the area of review, the identification of penetrations, and corrective action that an applicant must include in an application.

(1) Initial delineation of the area of review and initial corrective action. The applicant must delineate the area of review, identify all wells that require corrective action, and perform corrective action on those wells. Corrective action may be phased.

(A) Delineation of area of review.

(i) Using computational modeling that considers the volumes and the physical and chemical properties of the injected CO_2 stream, the physical properties of the formation into which the CO_2 stream is to be injected, and available data including data available from logging, testing,

or operation of wells, the applicant must predict the lateral and vertical extent of migration for the CO_2 plume and formation fluids and the pressure differentials required to cause movement of injected fluids or formation fluids into an underground source of drinking water in the subsurface for the following time periods:

(I) five years after initiation of injection;

(II) from initiation of injection to the end of the injection period proposed by the applicant; and

(III) from initiation of injection to 10 years after the end of the injection period proposed by the applicant.

(ii) The applicant must use a computational model that:

(I) is based on geologic and reservoir engineering information collected to characterize the injection zone and the confining zone;

(II) is based on anticipated operating data, including injection pressures, rates, and total volumes over the proposed duration of injection;

(III) takes into account relevant geologic heterogeneities and data quality, and their possible impact on model predictions;

(IV) considers the physical and chemical properties of injected and formation fluids; and

(V) considers potential migration through known faults, fractures, and artificial penetrations and beyond lateral spill points.

(iii) The applicant must provide the name and a description of the model, software, the assumptions used to determine the area of review, and the equations solved.

(B) Identification and table of penetrations. The applicant must identify, compile, and submit a table listing all penetrations, including active, inactive, plugged, and unplugged wells and underground mines in the area of review that may penetrate the confining zone, that are known or reasonably discoverable through specialized knowledge or experience. The applicant must provide a description of each penetration's type, construction, date drilled or excavated, location, depth, and record of plugging and/or completion or closure. Examples of specialized knowledge or experience may include

reviews of federal, state, and local government records, interviews with past and present owners, operators, and occupants, reviews of historical information (including aerial photographs, chain of title documents, and land use records), and visual inspections of the facility and adjoining properties.

(C) Corrective action. The applicant must demonstrate whether each of the wells on the table of penetrations has or has not been plugged and whether each of the underground mines (if any) on the table of penetrations has or has not been closed in a manner that prevents the movement of injected fluids or displaced formation fluids that may endanger underground sources of drinking water or allow the injected fluids or formation fluids to escape the permitted injection zone. The applicant must perform corrective action on all wells and underground mines in the area of review that are determined to need corrective action. The operator must perform corrective action using materials suitable for use with the CO_2 stream. Corrective action may be phased.

(2) Area of review and corrective action plan. As part of an application, the applicant must submit an area of review and corrective action plan that includes the following information:

(A) the method for delineating the area of review, including the model to be used, assumptions that will be made, and the site characterization data on which the model will be based;

(B) for the area of review, a description of:

(i) the minimum frequency subject to the annual certification pursuant to §5.206(f) of this title (relating to Permit Standards) at which the applicant proposes to re-evaluate the area of review during the life of the geologic storage facility;

(ii) how monitoring and operational data will be used to re-evaluate the area of review; and

(iii) the monitoring and operational conditions that would warrant a re-evaluation of the area of review prior to the next scheduled re-evaluation; and

(C) a corrective action plan that describes:

(i) how the corrective action will be conducted;

(ii) how corrective action will be adjusted if there are changes in the area of review;

(iii) if a phased corrective action is planned, how the phasing will be

determined; and

(iv) how site access will be secured for future corrective action.

(e) Injection well construction.

(1) Criteria for construction of anthropogenic CO_2 injection wells. This paragraph establishes the criteria for the information about the construction and casing and cementing of, and special equipment for, anthropogenic CO_2 injection wells that an applicant must include in an application.

(A) General. The operator of a geologic storage facility must ensure that all anthropogenic CO_2 injection wells are constructed and completed in a manner that will:

(i) prevent the movement of injected CO_2 or displaced formation fluids into any unauthorized zones or into any areas where they could endanger underground sources of drinking water;

(ii) allow the use of appropriate testing devices and workover tools; and

(iii) allow continuous monitoring of the annulus space between the injection tubing and long string casing.

(B) Casing and cementing of anthropogenic CO_2 injection wells.

(i) The operator must ensure that injection wells are cased and the casing cemented in compliance with §3.13 of this title (relating to Casing, Cementing, Drilling, and Completion Requirements).

(ii) Casing, cement, cement additives, and/or other materials used in the construction of each injection well must have sufficient structural strength and must be of sufficient quality and quantity to maintain integrity over the design life of the injection well. All well materials must be suitable for use with fluids with which the well materials may be expected to come into contact and must meet or exceed test standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards as approved by the director.

(iii) Surface casing must extend through the base of the lowermost underground source of drinking water above the injection zone and must be cemented to the surface.

(iv) Circulation of cement may be accomplished by staging. The director may approve an alternative method of cementing in cases where the cement cannot be circulated to the

surface, provided the applicant can demonstrate by using logs that the cement does not allow fluid movement between the casing and the well bore.

(v) At least one long string casing, using a sufficient number of centralizers, must extend through the injection zone. The long string casing must isolate the injection zone and other intervals as necessary for the protection of underground sources of drinking water and to ensure confinement of the injected and formation fluids to the permitted injection zone using cement and/or other isolation techniques.

(vi) The applicant must verify the integrity and location of the cement using technology capable of radial evaluation of cement quality and identification of the location of channels to ensure that underground sources of drinking water will not be endangered.

(vii) The director may exempt existing wells that have been associated with injection of CO_2 for the purpose of enhanced recovery from provisions of these casing and cementing requirements if the applicant demonstrates that the well construction meets the general performance criteria in subparagraph (A) of this paragraph.

(C) Special equipment.

(i) Tubing and packer. All injection wells must inject fluids through tubing set on a mechanical packer. Packers must be set no higher than 100 feet above the top of the permitted injection interval or at a location approved by the director.

(ii) Pressure observation valve. The wellhead of each injection well must be equipped with a pressure observation valve on the tubing and each annulus of the well.

(2) Construction information. The applicant must provide the following information for each well to allow the director to determine whether the proposed well construction and completion design will meet the general performance criteria in paragraph (1) of this subsection:

(A) depth to the injection zone;

(B) hole size;

(C) size and grade of all casing and tubing strings (e.g., wall thickness, external diameter, nominal weight, length, joint specification and construction material, tubing tensile, burst, and collapse strengths);

(D) proposed injection rate (intermittent or continuous), maximum proposed surface injection pressure, and maximum proposed volume of the CO_2 stream;

(E) type of packer and packer setting depth;

(F) a description of the capability of the materials to withstand corrosion when exposed to a combination of the CO_2 stream and formation fluids;

(G) down-hole temperatures and pressures;

(H) lithology of injection and confining zones;

(I) type or grade of cement and additives;

(J) chemical composition and temperature of the CO_2 stream; and

(K) schematic drawings of the surface and subsurface construction details.

(3) Well construction plan. The applicant must submit an injection well construction plan that meets the criteria in paragraph (1) of this subsection.

(4) Well stimulation plan. The applicant must submit, as applicable, a description of the proposed well stimulation program and a determination that well stimulation will not compromise containment.

(f) Plan for logging, sampling, and testing of injection wells after permitting but before injection. The applicant must submit a plan for logging, sampling, and testing of each injection well after permitting but prior to injection well operation. The plan need not include identical logging, sampling, and testing procedures for all wells provided there is a reasonable basis for different procedures. Such plan is not necessary for existing wells being converted to anthropogenic CO_2 injection wells in accordance with this subchapter, to the extent such activities already have taken place. The plan must describe the logs, surveys, and tests to be conducted to verify the depth, thickness, porosity, permeability, and lithology of, and the salinity of any formation fluids in, the formations that are to be used for monitoring, storage, and confinement to assure conformance with the injection well construction requirements set forth in subsection (e) of this section, and to establish accurate baseline data against which future measurements may be compared. The plan must meet the following criteria and must include the following information.

(1) Logs and surveys of newly drilled and completed injection wells.

(A) During the drilling of any hole that is constructed by drilling a pilot hole that

is enlarged by reaming or another method, the operator must perform deviation checks at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling.

(B) Before surface casing is installed, the operator must run appropriate logs, such as resistivity, spontaneous potential, and caliper logs.

(C) After each casing string is set and cemented, the operator must run logs, such as a cement bond log, variable density log, and a temperature log, to ensure proper cementing.

(D) Before long string casing is installed, the operator must run logs appropriate to the geology, such as resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs, to gather data necessary to verify the characterization of the geology and hydrology.

(2) Testing and determination of hydrogeologic characteristics of injection and confining zone.

(A) Prior to operation, the operator must conduct tests to verify hydrogeologic characteristics of the injection zone.

(B) The operator must perform an initial pressure fall-off or other test and submit to the director a written report of the results of the test, including details of the methods used to perform the test and to interpret the results, all necessary graphs, and the testing log, to verify permeability, injectivity, and initial pressure using water or CO_2.

(C) The operator must determine or calculate the fracture pressures for the injection and confining zone. If the fracture pressures are determined through calculation, the Commission will include in any permit it might issue a limit of 90% of the calculated fracture pressure to ensure that the injection pressure does not exceed the fracture pressure.

(3) Sampling.

(A) The operator must record and submit the formation fluid temperature, pH, and conductivity, the reservoir pressure, and the static fluid level of the injection zone.

(B) The operator must submit analyses of whole cores or sidewall cores representative of the injection zone and confining zone and formation fluid samples from the injection zone. The director may accept data from cores and formation fluid samples from nearby wells or other

data if the operator can demonstrate to the director that such data are representative of conditions at the proposed injection well.

(g) Compatibility determination. Based on the results of the formation testing program required by subsection (f) of this section, the applicant must submit a determination of the compatibility of the CO_2 stream with:

(1) the materials to be used to construct the well;

(2) fluids in the injection zone; and

(3) minerals in both the injection and the confining zone.

(h) Mechanical integrity testing.

(1) Criteria. This paragraph establishes the criteria for the mechanical integrity testing plan for anthropogenic CO_2 injection wells that an applicant must include in an application.

(A) Other than during periods of well workover in which the sealed tubing-casing annulus is of necessity disassembled for maintenance or corrective procedures, the operator must maintain mechanical integrity of the injection well at all times.

(B) Before beginning injection operations and at least once every five years thereafter, the operator must demonstrate mechanical integrity for each injection well by pressure testing the tubing-casing annulus.

(C) Following an initial annulus pressure test, the operator must continuously monitor injection pressure, rate, injected volumes, and pressure on the annulus between tubing and long string casing to confirm that the injected fluids are confined to the injection zone.

(D) At least once every five years, the operator must confirm that the injected fluids are confined to the injection zone using a method approved by the director (e.g., diagnostic surveys such as oxygen-activation logging or temperature or noise logs).

(E) The operator must test injection wells after any workover that disturbs the seal between the tubing, packer, and casing in a manner that verifies mechanical integrity of the tubing and long string casing.

(F) An operator must either repair and successfully retest or plug a well that fails a mechanical integrity test.

(2) Mechanical integrity testing plan. The applicant must prepare and submit a mechanical integrity testing plan as part of a permit application. The plan must include a schedule for the performance of a series of tests at a minimum frequency of five years. The performance tests must be designed to demonstrate the internal and external mechanical integrity of each injection well. These tests may include:

(A) a pressure test with liquid or inert gas;

(B) a tracer survey such as oxygen-activation logging;

(C) a temperature or noise log;

(D) a casing inspection log; and/or

(E) any alternative method that provides equivalent or better information approved by the director.

(i) Operating information.

(1) Operating plan. The applicant must submit a plan for operating the injection wells and the geologic storage facility that complies with the criteria set forth in §5.206(c) of this title, and that outlines the steps necessary to conduct injection operations. The applicant must include the following proposed operating data in the plan:

(A) the average and maximum daily injection rates and volumes of the CO_2 stream;

(B) the average and maximum surface injection pressure;

(C) the source(s) of the CO_2 stream and the volume of CO_2 from each source; and

(D) an analysis of the chemical and physical characteristics of the CO_2 stream prior to injection.

(2) Maximum injection pressure. The director will approve a maximum injection pressure limit that:

(A) considers the risks of tensile failure and, where appropriate, geomechanical or other studies that assess the risk of tensile failure and shear failure;

(B) with a reasonable degree of certainty will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults transecting the confining zone

to become transmissive; and

(C) in no case may cause the movement of injection fluids or formation fluids in a manner that endangers underground sources of drinking water.

(j) Plan for monitoring, sampling, and testing after initiation of operation.

(1) The applicant must submit a monitoring, sampling, and testing plan for verifying that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone.

(2) The plan must include the following:

(A) the analysis of the CO_2 stream prior to injection with sufficient frequency to yield data representative of its chemical and physical characteristics;

(B) the installation and use of continuous recording devices to monitor injection pressure, rate, and volume, and the pressure on the annulus between the tubing and the long string casing, except during workovers;

(C) after initiation of injection, the performance on a semi-annual basis of corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion to ensure that the well components meet the minimum standards for material strength and performance set forth in subsection (e)(1)(A) of this section. The operator must report the results of such monitoring annually. Corrosion monitoring may be accomplished by:

(i) analyzing coupons of the well construction materials in contact with the CO_2 stream;

(ii) routing the CO_2 stream through a loop constructed with the materials used in the well and inspecting the materials in the loop; or

(iii) using an alternative method, materials, or time period approved by the director;

(D) monitoring of geochemical and geophysical changes, including:

(i) periodic sampling of the fluid temperature, pH, conductivity, reservoir pressure and static fluid level of the injection zone and monitoring for pressure changes, and for changes in geochemistry, in a permeable and porous formation near to and above the top confining zone;

(ii) periodic monitoring of the quality and geochemistry of an underground source of drinking water within the area of review and the formation fluid in a permeable and porous formation near to and above the top confining zone to detect any movement of the injected CO_2 through the confining zone into that monitored formation;

(iii) the location and number of monitoring wells justified on the basis of the area of review, injection rate and volume, geology, and the presence of artificial penetrations and other factors specific to the geologic storage facility; and

(iv) the monitoring frequency and spatial distribution of monitoring wells based on baseline geochemical data collected under subsection (c)(2) of this section and any modeling results in the area of review evaluation;

(E) tracking the extent of the CO_2 plume and the position of the pressure front by using indirect, geophysical techniques, which may include seismic, electrical, gravity, or electromagnetic surveys and/or down-hole CO_2 detection tools; and

(F) additional monitoring as the director may determine to be necessary to support, upgrade, and improve computational modeling of the area of review evaluation and to determine compliance with the requirements that the injection activity not allow the movement of fluid containing any contaminant into underground sources of drinking water and that the injected fluid remain within the permitted interval.

(k) Well plugging plan. The applicant must submit a well plugging plan for all injection wells and monitoring wells that penetrate the base of usable quality water that includes:

(1) a proposal for plugging all monitoring wells that penetrate the base of usable quality water and all injection wells upon abandonment in accordance with §3.14 of this title (relating to Plugging);

(2) proposals for activities to be undertaken prior to plugging an injection well, specifically:

(A) flushing each injection well with a buffer fluid;

(B) performing tests or measures to determine bottomhole reservoir pressure;

(C) performing final tests to assess mechanical integrity; and

(D) ensuring that the material to be used in plugging must be compatible with the CO_2 stream and the formation fluids;

(3) a proposal for giving notice of intent to plug monitoring wells that penetrate the base of usable quality water and all injection wells. The applicant's plan must ensure that:

(A) the operator notifies the director at least 60 days before plugging a well. At this time, if any changes have been made to the original well plugging plan, the operator must also provide a revised well plugging plan. At the discretion of the director, an operator may be allowed to proceed with well plugging on a shorter notice period; and

(B) the operator will file a notice of intention to plug and abandon (Form W-3A) a well with the appropriate Commission district office and the division in Austin at least five days prior to the beginning of plugging operations;

(4) a plugging report for monitoring wells that penetrate the base of usable quality water and all injection wells. The applicant's plan must ensure that within 30 days after plugging the operator will file a complete well plugging record (Form W-3) in duplicate with the appropriate district office. The operator and the person who performed the plugging operation (if other than the operator) must certify the report as accurate;

(5) a plan for plugging all monitoring wells that do not penetrate the base of usable quality water in accordance with 16 TAC Chapter 76 (relating to Water Well Drillers and Water Well Pump Installers); and

(6) a plan for certifying that all monitoring wells that do not penetrate the base of usable quality water will be plugged in accordance with 16 TAC Chapter 76.

(l) Emergency and remedial response plan. The applicant must submit an emergency and remedial response plan that:

(1) accounts for the entire area of review, regardless of whether or not corrective action in the area of review is phased;

(2) describes actions to be taken to address escape from the permitted injection interval or movement of the injection fluids or formation fluids that may cause an endangerment to underground sources of drinking water during construction, operation, closure, and post-closure periods;

(3) includes a safety plan that includes emergency response procedures, provisions to provide security against unauthorized activity, and CO_2 release detection and prevention measures; and

(4) includes a description of the training and testing that will be provided to each employee at the storage facility on operational safety and emergency response procedures to the extent applicable to the employee's duties and responsibilities. The operator must train all employees before commencing injection and storage operations at the facility. The operator must train each subsequently hired employee before that employee commences work at the storage facility. The operator must hold a safety meeting with each contractor prior to the commencement of any new contract work at a storage facility. Emergency measures specific to the contractor's work must be explained in the contractor safety meeting. Training schedules, training dates, and course outlines must be provided to Commission personnel upon request for the purpose of Commission review to determine compliance with this paragraph.

(m) Post-injection storage facility care and closure plan. The applicant must submit a post-injection storage facility care and closure plan. The plan must include:

(1) the pressure differential between pre-injection and predicted post-injection pressures in the injection zone;

(2) the predicted position of the CO_2 plume and associated pressure front at closure as demonstrated in the area of review evaluation required under subsection (d) of this section;

(3) a description of the proposed post-injection monitoring location, methods, and frequency;

(4) a proposed schedule for submitting post-injection storage facility care monitoring results to the division; and

(5) the estimated cost of proposed post-injection storage facility care and closure.

(n) Fees, financial responsibility, and financial assurance. The applicant must pay the fees, demonstrate that it has met the financial responsibility requirements, and provide the Commission with financial assurance as required under §5.205 of this title (relating to Fees, Financial Responsibility, and Financial Assurance).

(1) The applicant must demonstrate financial responsibility and resources for corrective

action, injection well plugging, post-injection storage facility care and storage facility closure, and emergency and remedial response until the director has provided to the operator a written verification that the director has determined that the facility has reached the end of the post-injection storage facility care period.

(2) In determining whether the applicant is financially responsible, the director must rely on the following:

(A) the person's most recent audited annual report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)). The date of the audit may not be more than one year before the date of submission of the application to the division; and

(B) the person's most recent quarterly report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)); or

(C) if the person is not required to file such a report, the person's most recent audited financial statement. The date of the audit must not be more than one year before the date of submission of the application to the division.

(o) Letter from the Texas Commission on Environmental Quality. The applicant must submit a letter from the Executive Director of the Texas Commission on Environmental Quality in accordance with Texas Water Code, §27.046.

(p) Other information. The applicant must submit any other information requested by the director as necessary to discharge the Commission's duties under Texas Water Code, Chapter 27, Subchapter B-1, or deemed necessary by the director to clarify, explain, and support the required attachments.

§5.204. Notice and Hearing.

(a) Placement of copy of application for public inspection. The applicant must make a complete copy of the permit application available for the public to inspect and copy by filing a copy of the application with the County Clerk at the courthouse of each county where the storage facility is to be located, or if approved by the director, at another equivalent public office. The applicant also must

provide an electronic copy of the complete application to enable the Commission to place the copy on the Railroad Commission Internet website. The applicant must file any subsequent revision of the application with the County Clerk or other approved public office and must file at the Commission an electronic copy of the updated application at the same time the applicant files the revision at the Commission.

(b) Notice requirements.

(1) General notice by publication. To give general notice to local governments and interested or affected persons, the applicant must publish notice of the application for an original or amended storage facility permit no later than the date the application is mailed to or filed with the director. The applicant must use the appropriate form of notice, include the information as set forth in subparagraph (A) or (B) of this paragraph, and cause the notice to be published once a week for three consecutive weeks in each newspaper of general circulation in each county where the storage facility is located or is to be located. The applicant must file proof of publication of the notice with the application.

(A) Form for notice by publication of an application for an anthropogenic CO_2 geologic storage facility permit.

Figure: 16 TAC §5.204(b)(1)(A)

NOTICE OF PERMIT APPLICATION
FOR A MAN-MADE CARBON DIOXIDE (CO_2) GEOLOGIC STORAGE FACILITY

> [Company name and address] is applying to the Railroad Commission of Texas for a permit to create, operate, or maintain an anthropogenic carbon dioxide (CO_2) geologic storage facility. The applicant proposes to geologically store man-made carbon dioxide (CO_2) in the [formation name]; [lease name]; [well number(s)]. The proposed facility will be located at [address]; approximately [direction and number of miles from nearest town] in the [field name] in [County or Counties]. The legal description of the property is as follows: [legal description, including section/survey/abstract]. **THE GEOLOGIC STORAGE RESERVOIR IS PROPOSED TO BE LOCATED UNDERGROUND FROM _____ TO _____ FEET BELOW THE GROUND SURFACE.**
>
> The following map shows the location of the proposed facility. [Include a United States Geological Survey 7.5-minute quadrangle map or maps showing towns; rivers, streams, or other bodies of water; local landmarks; and any other information, including routes, streets, or roads and accurate distance measurements necessary to allow local residents to readily identify the proposed location of the facility; showing the exact location and boundaries of the proposed facility; stating the name of the United States Geological Survey 7.5-minute quadrangle map(s) that contains the area shown or described; and indicating the north direction.]

A copy of the application is available for public inspection in the clerk's office in the [name of each county] County courthouse [address of each courthouse] and online at [website address].

LEGAL AUTHORITY: Texas Natural Resources Code, Title 3, and the Railroad Commission's Oil and Gas Division Rules (Statewide Rules) at 16 Tex. Admin. Code, Chapters 3 and 5.

Persons may request more information about, or make comments on, the application by contacting: Technical Permitting Section, Oil and Gas Division, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711, (512) 463-6792 or by e-mail at carbondioxide@rrc.state.tx.us. Persons who can show they may be adversely affected by the proposed storage facility may request a public hearing on the application. Such a request must be in writing and received within 30 days of the last date of publication of this notice. Requests for hearing should be sent to the Technical Permitting Section at the address above.

(B) Form for notice by publication of an application for amendment of an existing CO_2 geologic storage facility permit.

Figure: 16 TAC §5.204(b)(1)(B)

NOTICE OF APPLICATION TO AMEND A PERMIT FOR A MAN-MADE CARBON DIOXIDE (CO_2) GEOLOGIC STORAGE FACILITY

[Company name and address] is applying to the Railroad Commission of Texas for a amendment to an existing man-made carbon dioxide (CO_2) geologic storage facility permit. The applicant is storing man-made carbon dioxide (CO_2) in the [formation name]; [lease name]; [well number(s)]. The facility is located at [address]; approximately [direction and number of miles from nearest town] in the [field name] in [County or Counties]. The legal description of the property is as follows: [legal description, including section/survey/abstract]. **THE GEOLOGIC STORAGE RESERVOIR IS LOCATED UNDERGROUND FROM _____ TO _____ FEET BELOW THE GROUND SURFACE.**

The following map shows the location of the proposed facility. [Include a United States Geological Survey (USGS)7.5-minute quadrangle map or maps showing towns; rivers, streams, or other bodies of water; local landmarks; and any other information, including routes, streets, or roads and accurate distance measurements necessary to allow local residents to readily identify the proposed location of the facility; showing the exact location and boundaries of the proposed facility; stating the name of the USGS 7.5-minute quadrangle map(s) that contains the area shown or described; and indicating the north direction.]

The purpose of the requested permit amendment is to [state the purpose of amendment].

A copy of the application is available for public inspection in the clerk's office in the

[name of each county] County courthouse [address of each courthouse] and online at [website address].

LEGAL AUTHORITY: Texas Natural Resources Code, Title 3, and the Railroad Commission's Oil and Gas Division Rules (Statewide Rules) at 16 Tex. Admin. Code, Chapters 3 and 5.

Persons may request more information about, or make comments on, the application by contacting: Technical Permitting Section, Oil and Gas Division, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711, (512) 463-6792 or by e-mail at carbondioxide@rrc.state.tx.us. Persons who can show they may be adversely affected by the proposed storage facility may request a public hearing on the application. Such a request must be in writing and received within 30 days of the last date of publication of this notice. Requests for hearing should be sent to the Technical Permitting Section at the address above.

(C) The applicant must submit proof of publication of notice in the following form:

Figure: 16 TAC §5.204(b)(1)(C)

Affidavit of Publication
STATE OF TEXAS
COUNTY OF _____

Before me, the undersigned authority, on this day personally appeared [name of person], the [title of person] of the [name of newspaper], a newspaper having general circulation in [name(s) of county(ies)] County(ies), Texas, who being by me duly sworn, deposes and says that the foregoing attached notice was published in said newspaper on the following date(s), to wit: [list all dates of publication].

[signature of person]
[typed or printed name of person

Subscribed and sworn to before me this the [day] of [month], [year], to certify which witness my hand and seal of office.

[signature of notary]
[typed or printed name of notary]

Notary Public in and for
[name of county] County, Texas.

(2) Individual notice.

(A) Persons to notify. By no later than the date the application is mailed to or filed with the director, the applicant must give notice of an application for a permit to operate a CO_2

storage facility, or to amend an existing storage facility permit to:

(i) each adjoining mineral interest owner, other than the applicant, of the outmost boundary of the proposed geologic storage facility;

(ii) each leaseholder of minerals lying above or below the proposed storage reservoir;

(iii) each adjoining leaseholder of minerals offsetting the outermost boundary of the proposed geologic storage facility;

(iv) each owner or leaseholder of any portion of the surface overlying the proposed storage reservoir and the adjoining area of the outermost boundary of the proposed geologic storage facility;

(v) the clerk of the county or counties where the proposed storage facility is located;

(vi) the city clerk or other appropriate city official where the proposed storage facility is located within city limits; and

(vii) any other class of persons that the director determines should receive notice of the application.

(B) Content of notice. Individual notice must consist of:

(i) the applicant's intention to construct and operate an anthropogenic CO_2 geologic storage facility;

(ii) a description of the geologic storage facility location;

(iii) each physical location and the internet address at which a copy of the application may be inspected; and

(iv) a statement that:

(I) affected persons may protest the application;

(II) protests must be filed in writing and must be mailed or delivered to Technical Permitting, Oil and Gas Division, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711; and

(III) protests must be received by the director within 30 days of the date

of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later.

(3) Individual notice by publication. The applicant must make diligent efforts to ascertain the name and address of each person identified under paragraph (2)(A) of this subsection. The exercise of diligent efforts to ascertain the names and addresses of such persons requires an examination of county records where the facility is located and an investigation of any other information that is publicly and/or reasonably available to the applicant. If, after diligent efforts, an applicant has been unable to ascertain the name and address of one or more persons required to be notified under paragraph (2)(A) of this subsection, the applicant satisfies the notice requirements for those persons by the publication of the notice of application as required in paragraph (1) of this subsection. The applicant must submit an affidavit to the director specifying the efforts that the applicant took to identify each person whose name and/or address could not be ascertained.

(c) Hearing requirements.

(1) If the Commission receives a protest regarding an application for a new permit or for an amendment of an existing permit for a geologic storage facility from a person notified pursuant to subsection (b) of this section or from any other affected person within 30 days of the date of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later, then the director will notify the applicant that the director cannot administratively approve the application. Upon the written request of the applicant, the director will schedule a hearing on the application. The Commission must give notice of the hearing to all affected persons, local governments, and other persons who express, in writing, an interest in the application. After the hearing, the examiner will recommend a final action by the Commission.

(2) If the Commission receives no protest regarding an application for a new permit or for the amendment of an existing permit for a geologic storage facility from a person notified pursuant to subsection (b) of this section or from any other affected person, the director may administratively approve the application.

(3) If the director administratively denies an application for a new permit or for the amendment of an existing permit for a geologic storage facility, upon the written request of the applicant,

the director will schedule a hearing. After hearing, the examiner will recommend a final action by the Commission.

§5.205. Fees, Financial Responsibility, and Financial Assurance.

(a) Fees. In addition to the fee for each injection well required by §3.78 of this title (relating to Fees and Financial Security Requirements), the following non-refundable fees must be remitted to the Commission with the application:

(1) Base application fee.

(A) The applicant must pay to the Commission an application fee of $50,000 for each permit application for a geologic storage facility.

(B) The applicant must pay to the Commission an application fee of $25,000 for each application to amend a permit for a geologic storage facility.

(2) Injection fee. The operator must pay to the Commission an annual fee of $0.025 per metric ton of CO_2 injected into the geologic storage facility.

(3) Post-injection care fee. The operator must pay to the Commission an annual fee of $50,000 each year the operator does not inject into the geologic storage facility until the director has authorized storage facility closure.

(4) The anthropogenic CO_2 storage trust fund shall be capped at $5,000,000.

(b) Financial responsibility.

(1) A person to whom a permit is issued under this subchapter must provide annually to the director evidence of financial responsibility that is satisfactory to the director. The operator must demonstrate and maintain financial responsibility and resources for corrective action, injection well plugging, post-injection storage facility care and storage facility closure, and emergency and remedial response until the director has provided written verification that the director has determined that the facility has reached the end of the post-injection storage facility care period.

(2) In determining whether the person is financially responsible, the director must rely on:

(A) the person's most recent audited annual report filed with the U. S. Securities

and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)); and

(B) the person's most recent quarterly report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)); or

(C) if the person is not required to file such a report, the person's most recent audited financial statement. The date of the audit must not be more than one year before the date of submission of the application to the director.

(3) The applicant's demonstration of financial responsibility must account for the entire area of review, regardless of whether corrective action in the area of review is phased.

(c) Financial assurance.

(1) Injection and monitoring wells. The operator must comply with the requirements of §3.78 of this title for all monitoring wells that penetrate the base of usable quality water and all injection wells.

(2) Geologic storage facility.

(A) The applicant must include in an application for a geologic storage facility permit:

(i) a written estimate of the highest likely dollar amount necessary to perform post-injection monitoring and closure of the facility that shows all assumptions and calculations used to develop the estimate;

(ii) a copy of the form of the bond or letter of credit that will be filed with the Commission; and

(iii) information concerning the issuer of the bond or letter of credit including the issuer's name and address and evidence of authority to issue bonds or letters of credit in Texas.

(B) A geologic storage facility may not receive CO_2 until a bond or letter of credit in an amount approved by the director under this subsection and meeting the requirements of this subsection as to form and issuer has been filed with and approved by the director.

(C) The determination of the amount of financial assurance for a geologic storage facility is subject to the following requirements:

(i) The director must approve the dollar amount of the financial assurance. The amount of financial assurance required to be filed under this subsection must be equal to or greater than the maximum amount necessary to perform corrective action, emergency response, and remedial action, post-injection monitoring and site care, and closure of the geologic storage facility, exclusive of plugging costs for any well or wells at the facility, at any time during the permit term in accordance with all applicable state laws, Commission rules and orders, and the permit;

(ii) A qualified professional engineer licensed by the State of Texas, as required under Occupations Code, Chapter 1001, relating to Texas Engineering Practices Act, must prepare or supervise the preparation of a written estimate of the highest likely amount necessary to close the geologic storage facility. The operator must submit to the director the written estimate under seal of a qualified licensed professional engineer, as required under Occupations Code, Chapter 1001, relating to Texas Engineering Practices Act; and

(iii) The Commission may use the proceeds of financial assurance filed under this subsection to pay the costs of plugging any well or wells at the facility if the financial assurance for plugging costs filed with the Commission is insufficient to pay for the plugging of such well or wells.

(D) Bonds and letters of credit filed in satisfaction of the financial assurance requirements for a geologic storage facility must comply with the following standards as to issuer and form.

(i) The issuer of any geologic storage facility bond filed in satisfaction of the requirements of this subsection must be a corporate surety authorized to do business in Texas. The form of bond filed under this subsection must provide that the bond be renewed and continued in effect until the conditions of the bond have been met or its release is authorized by the director.

(ii) Any letter of credit filed in satisfaction of the requirements of this subsection must be issued by and drawn on a bank authorized under state or federal law to operate in Texas. The letter of credit must be an irrevocable, standby letter of credit subject to the requirements of

Texas Business and Commerce Code, §§5.101 - 5.118. The letter of credit must provide that it will be renewed and continued in effect until the conditions of the letter of credit have been met or its release is authorized by the director.

(E) The operator of a geologic storage facility must provide to the director annual written updates of the cost estimate to increase or decrease the cost estimate to account for any changes to the area of review and corrective action plan, the emergency response and remedial action plan, the injection well plugging plan, and the post-injection storage facility care and closure plan. The operator must provide to the director upon request an adjustment of the cost estimate if the director has reason to believe that the original demonstration is no longer adequate to cover the cost of injection well plugging and post-injection storage facility care and closure.

(3) The director may consider allowing the phasing in of financial assurance for only corrective action based on project-specific factors.

(4) The director may approve a reduction in the amount of financial assurance required for post-injection monitoring and/or corrective action based on project-specific monitoring results.

(d) Notice of adverse financial conditions.

(1) The operator must notify the Commission of adverse financial conditions that may affect the operator's ability to carry out injection well plugging and post-injection storage facility care and closure. An operator must file any notice of bankruptcy in accordance with §3.1(f) of this title (relating to Organization Report; Retention of Records; Notice Requirements). The operator must give such notice by certified mail.

(2) The operator filing a bond must ensure that the bond provides a mechanism for the bond or surety company to give prompt notice to the Commission and the operator of any action filed alleging insolvency or bankruptcy of the surety company or the bank or alleging any violation that would result in suspension or revocation of the surety or bank's charter or license to do business.

(3) Upon the incapacity of a bank or surety company by reason of bankruptcy, insolvency or suspension, or revocation of its charter or license, the Commission must deem the operator to be without bond coverage. The Commission must issue a notice to any operator who is without bond coverage and must specify a reasonable period to replace bond coverage, not to exceed 90 days.

§5.206. Permit Standards.

(a) General criteria. The director may issue a permit under this subchapter if the applicant demonstrates and the director finds that:

(1) the injection and geologic storage of anthropogenic CO_2 will not endanger or injure any existing or prospective oil, gas, geothermal, or other mineral resource, or cause waste as defined by Texas Natural Resources Code, §85.046(11);

(2) with proper safeguards, both underground sources of drinking water and surface water can be adequately protected from CO_2 migration or displaced formation fluids;

(3) the injection of anthropogenic CO_2 will not endanger or injure human health and safety;

(4) the reservoir into which the anthropogenic CO_2 is injected is suitable for or capable of being made suitable for protecting against the escape or migration of anthropogenic CO_2 from the storage reservoir;

(5) the geologic storage facility will be sited in an area with suitable geology, which at a minimum must include:

(A) an injection zone of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the CO_2 stream; and

(B) a confining zone(s) that is laterally continuous and free of known transecting transmissive faults or fractures over an area sufficient to contain the injected CO_2 stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without compromising the confining zone or causing the movement of fluids that endangers underground sources of drinking water;

(6) the applicant for the permit meets all of the other statutory and regulatory requirements for the issuance of the permit;

(7) the applicant has provided a letter from the Executive Director of the Texas Commission on Environmental Quality in accordance with §5.203(o) of this title (relating to Application Requirements);

(8) the applicant has provided a signed statement that the applicant has a good faith claim

to the necessary and sufficient property rights for construction and operation of the geologic storage facility for at least the first five years after initiation of injection in accordance with §5.203(d)(1)(A) of this title;

(9) the applicant has paid the fees required in §5.205(a) of this title (relating to Fees, Financial Responsibility, and Financial Assurance);

(10) the director has determined that the applicant has sufficiently demonstrated financial responsibility as required in §5.205(b) of this title; and

(11) the applicant submitted to the director financial assurance in accordance with §5.205(c) of this title.

(b) Injection well construction.

(1) Construction of anthropogenic CO_2 injection wells must meet the criteria in §5.203(e) of this title.

(2) Within 30 days after the completion or conversion of an injection well subject to this subchapter, the operator must file with the division a complete record of the well on the appropriate form showing the current completion.

(3) Except in the case of an emergency repair, the operator of a geologic storage facility must notify the director at least 48 hours, and obtain the director's approval, prior to conducting any well workover that involves running tubing and setting packer(s), beginning any workover or remedial operation, or conducting any required pressure tests or surveys. In the case of an emergency repair, the operator must notify the director of such emergency repair as soon as reasonably practical.

(c) Operating a geologic storage facility.

(1) Operating plan. The operator must maintain and comply with the approved operating plan.

(2) Operating criteria.

(A) Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.

(B) The total volume of CO_2 injected into the storage facility must be metered through a master meter or a series of master meters. The volume of CO_2 injected into each injection well

must be metered through an individual well meter.

(C) The operator must comply with a maximum surface injection pressure limit approved by the director and specified in the permit. In approving a maximum surface injection pressure limit, the director must consider the results of well tests and, where appropriate, geomechanical or other studies that assess the risks of tensile failure and shear failure. The director must approve limits that, with a reasonable degree of certainty, will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults or fractures transecting the confining zone to become transmissive. In no case may injection pressure cause movement of injection fluids or formation fluids in a manner that endangers underground sources of drinking water. The director may approve a plan for controlled artificial fracturing of the injection zone.

(D) The operator must fill the annulus between the tubing and the long string casing with a corrosion inhibiting fluid approved by the director.

(E) The operator must install and use continuous recording devices to monitor the injection pressure, and the rate, volume, and temperature of the CO_2 stream. The operator must monitor the pressure on the annulus between the tubing and the long string casing. The operator must continuously record, continuously monitor, or control by a preset high-low pressure sensor switch the wellhead pressure of each injection well.

(F) The operator must comply with the following requirements for alarms and automatic shut-off systems.

(i) The operator must install and use alarms and automatic shut-off systems designed to alert the operator and shut-in the well when operating parameters such as annulus pressure, injection rate or other parameters diverge from permitted ranges and/or gradients. On offshore wells, the automatic shut-off systems must be installed down-hole.

(ii) If an automatic shutdown is triggered or a loss of mechanical integrity is discovered, the operator must immediately investigate and identify as expeditiously as possible the cause. If, upon investigation, the well appears to be lacking mechanical integrity, or if monitoring otherwise indicates that the well may be lacking mechanical integrity, the operator must:

(I) immediately cease injection;

(II) take all steps reasonably necessary to determine whether there may have been a release of the injected CO_2 stream into any unauthorized zone;

(III) notify the director as soon as practicable, but within 24 hours;

(IV) restore and demonstrate mechanical integrity to the satisfaction of the director prior to resuming injection; and

(V) notify the director when injection can be expected to resume.

(d) Monitoring, sampling, and testing requirements. The operator of an anthropogenic CO_2 injection well must maintain and comply with the approved monitoring, sampling, and testing plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone. The director may require additional monitoring as necessary to support, upgrade, and improve computational modeling of the area of review evaluation and to determine compliance with the requirement that the injection activity not allow movement of fluid that would endanger underground sources of drinking water.

(e) Mechanical integrity.

(1) The operator must maintain and comply with the approved mechanical integrity testing plan submitted in accordance with §5.203(j) of this title.

(2) Other than during periods of well workover in which the sealed tubing-casing annulus is of necessity disassembled for maintenance or corrective procedures, the operator must maintain mechanical integrity of the injection well at all times.

(3) The operator must either repair and successfully retest or plug a well that fails a mechanical integrity test.

(4) The director may require additional or alternative tests if the results presented by the operator do not demonstrate to the director that there is no leak in the casing, tubing, or packer or movement of fluid into or between formations containing underground sources of drinking water resulting from the injection activity.

(f) Area of review and corrective action. Notwithstanding the requirement in §5.203(d)(2)(B)(i) of this title to perform a re-evaluation of the area of review, at the frequency specified in the area of

review and corrective action plan or permit, the operator of a geologic storage facility also must conduct the following whenever warranted by a material change in the monitoring and/or operational data or in the evaluation of the monitoring and operational data by the operator:

(1) a re-evaluation of the area of review by performing all of the actions specified in §5.203(d)(1)(A) - (C) of this title to delineate the area of review and identify all wells that require corrective action;

(2) identify all wells in the re-evaluated area of review that require corrective action;

(3) perform corrective action on wells requiring corrective action in the re-evaluated area of review in the same manner specified in §5.203(d)(1)(C) of this title; and

(4) submit an amended area of review and corrective action plan or demonstrate to the director through monitoring data and modeling results that no change to the area of review and corrective action plan is needed.

(g) Emergency, mitigation, and remedial response.

(1) Plan. The operator must maintain and comply with the approved emergency and remedial response plan required by §5.203(l) of this title. The operator must update the plan in accordance with §5.207(a)(2)(D)(vi) of this title (relating to Reporting and Record-Keeping). The operator must make copies of the plan available at the storage facility and at the company headquarters.

(2) Training.

(A) The operator must prepare and implement a plan to train and test each employee at the storage facility on occupational safety and emergency response procedures to the extent applicable to the employee's duties and responsibilities. The operator must make copies of the plan available at the geological storage facility. The operator must train all employees before commencing injection and storage operations at the facility. The operator must train each subsequently hired employee before that employee commences work at the storage facility.

(B) The operator must hold a safety meeting with each contractor prior to the commencement of any new contract work at a storage facility. The operator must explain emergency measures specific to the contractor's work in the contractor safety meeting.

(C) The operator must provide training schedules, training dates, and course

outlines to Commission personnel upon request for the purpose of Commission review to determine compliance with this paragraph.

(3) Action. If an operator obtains evidence that the injected CO_2 stream and associated pressure front may cause an endangerment to underground sources of drinking water, the operator must:

(A) immediately cease injection;

(B) take all steps reasonably necessary to identify and characterize any release;

(C) notify the director as soon as practicable but within at least 24 hours; and

(D) implement the approved emergency and remedial response plan.

(4) Resumption of injection. The director may allow the operator to resume injection prior to remediation if the operator demonstrates that the injection operation will not endanger underground sources of drinking water.

(h) Commission witnessing of testing and logging. The operator must provide the division with the opportunity to witness all testing and logging. The operator must submit a proposed schedule of such activities to the Commission at least 30 days prior to conducting the first test and submit notice at least 48 hours in advance of any actual testing or logging. Testing and logging may not commence before the end of the 48-hour period unless authorized by the director.

(i) Well plugging. The operator of a geologic storage facility must maintain and comply with the approved well plugging plan required by §5.203(k) of this title.

(j) Post-injection storage facility care and closure.

(1) Post-injection storage facility care and closure plan.

(A) The operator of an injection well must maintain and comply with the approved post-injection storage facility care and closure plan.

(B) The operator must update the plan in accordance with §5.207(a)(2)(D)(vi) of this title.

(C) Upon cessation of injection, the operator of a geologic storage facility must either submit an amended plan or demonstrate to the director through monitoring data and modeling results that no amendment to the plan is needed.

(2) Post-injection storage facility monitoring. Following cessation of injection, the

operator must continue to conduct monitoring as specified in the approved plan until the director determines that the position of the CO_2 plume and pressure front are such that the geologic storage facility will not endanger underground sources of drinking water.

(3) Prior to closure. Prior to authorization for storage facility closure, the operator must demonstrate to the director, based on monitoring, other site-specific data, and modeling that is reasonably consistent with site performance that no additional monitoring is needed to assure that the geologic storage facility will not endanger underground sources of drinking water. The operator must demonstrate, based on the current understanding of the site, including monitoring data and/or modeling, all of the following:

(A) the estimated magnitude and extent of the facility footprint (the CO_2 plume and the area of elevated pressure);

(B) that there is no leakage of either CO_2 or displaced formation fluids that will endanger underground sources of drinking water;

(C) that the injected or displaced fluids are not expected to migrate in the future in a manner that encounters a potential leakage pathway into underground sources of drinking water;

(D) that the injection wells at the site completed into or through the injection zone or confining zone will be plugged and abandoned in accordance with these requirements; and

(E) any remaining facility monitoring wells will be properly plugged or are being managed by a person and in a manner approved by the director.

(4) Notice of intent for storage facility closure. The operator must notify the director at least 120 days before storage facility closure. At the time of such notice, if the operator has made any changes to the original plan, the operator also must provide the revised plan. The director may approve a shorter notice period.

(5) Authorization for storage facility closure. No operator may initiate storage facility closure until the director has approved closure of the storage facility in writing. After the director has authorized storage facility closure, the operator must plug all wells in accordance with the approved plan required by §5.203(k) of this title.

(6) Storage facility closure report. Once the director has authorized storage facility

closure, the operator must submit a storage facility closure report within 90 days that must thereafter be retained by the Commission in Austin. The report must include the following information:

(A) documentation of appropriate injection and monitoring well plugging. The operator must provide a copy of a survey plat that has been submitted to the Regional Administrator of Region 6 of the United States Environmental Protection Agency. The plat must indicate the location of the injection well relative to permanently surveyed benchmarks;

(B) documentation of appropriate notification and information to such state and local authorities as have authority over drilling activities to enable such state and local authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the injection and confining zones; and

(C) records reflecting the nature, composition and volume of the CO_2 stream.

(7) Certificate of closure. Upon completion of the requirements in paragraphs (3) - (6) of this subsection, the director will issue a certificate of closure. At that time, the operator is released from the requirement in §5.205(c) of this title to maintain financial assurance.

(k) Deed notation. The operator of a geologic storage facility must record a notation on the deed to the facility property; on any other document that is normally examined during title search; or on any other document that is acceptable to the county clerk for filing in the official public records of the county that will in perpetuity provide any potential purchaser of the property the following information:

(1) a complete legal description of the affected property;

(2) that land has been used to geologically store CO_2;

(3) that the survey plat has been filed with the Commission;

(4) the address of the office of the United States Environmental Protection Agency, Region 6, to which the operator sent a copy of the survey plat; and

(5) the volume of fluid injected, the injection zone or zones into which it was injected, and the period over which injection occurred.

(l) Retention of records. The operator must retain for five years following storage facility closure records collected during the post-injection storage facility care period. The operator must deliver the records to the director at the conclusion of the retention period, and the records must thereafter be

retained at the Austin headquarters of the Commission.

(m) Signs. The operator must identify each location at which geologic storage activities take place, including each injection well, by a sign that meets the requirements specified in §3.3(1), (2), and (5) of this title (relating to Identification of Properties, Wells, and Tanks). In addition, each sign must include a telephone number where the operator or a representative of the operator can be reached 24 hours a day, seven days a week in the event of an emergency.

(n) Other permit terms and conditions. In any permit for a geologic storage facility, the director must impose terms and conditions reasonably necessary to protect underground sources of drinking water. Permits issued under this subchapter continue in effect until revoked, modified, or suspended by the Commission. The operator must comply with each requirement set forth in this subchapter as a condition of the permit unless modified by the terms of the permit.

§5.207. Reporting and Record-Keeping.

(a) The operator of a geologic storage facility must provide, at a minimum, the following reports to the director and retain the following information.

(1) Test records. The operator must file a complete record of all tests in duplicate with the district office within 30 days after the testing. In conducting and evaluating the tests enumerated in this subchapter or others to be allowed by the director, the operator and the director must apply methods and standards generally accepted in the industry. When the operator reports the results of mechanical integrity tests to the director, the operator must include a description of the test(s) and the method(s) used. In making this evaluation, the director must review monitoring and other test data submitted since the previous evaluation.

(2) Operating reports. The operator also must include summary cumulative tables of the information required by the reports listed in this paragraph.

(A) Report within 24 hours. The operator must report to the appropriate district office the discovery of any significant pressure changes or other monitoring data that indicate the presence of leaks in the well or the lack of confinement of the injected gases to the geologic storage reservoir. Such report must be made orally as soon as practicable, but within 24 hours, following the

discovery of the leak, and must be confirmed in writing within five working days.

(B) Report within 30 days. The operator must report:

(i) the results of periodic tests for mechanical integrity;

(ii) the results of any other test of the injection well conducted by the operator if required by the director; and

(iii) a description of any well workover.

(C) Semi-annual report. The operator must report:

(i) a summary of well head pressure monitoring;

(ii) changes to the physical, chemical, and other relevant characteristics of the CO_2 stream from the proposed operating data;

(iii) monthly average, maximum and minimum values for injection pressure, flow rate and volume, and annular pressure;

(iv) a description of any event that significantly exceeds operating parameters for annulus pressure or injection pressure as specified in the permit;

(v) a description of any event that triggers a shutdown device and the response taken; and

(vi) the results of monitoring prescribed under §5.206(d) of this title (relating to Permit Standards).

(D) Annual reports. The operator must submit an annual report detailing:

(i) corrective action performed;

(ii) new wells installed and the type, location, number, and information required in §5.203(e) of this title (relating to Application Requirements);

(iii) re-calculated area of review unless the operator submits a statement signed by an appropriate company official confirming that monitoring and operational data supports the current delineation of the area of review on file with the Commission;

(iv) the updated area for which the operator has a good faith claim to the necessary and sufficient property rights to operate the geologic storage facility;

(v) tons of CO_2 injected; and

(vi) The operator must maintain and update required plans in accordance with the provisions of this subchapter.

(I) Operators must submit an annual statement, signed by an appropriate company official, confirming that the operator has:

(-a-) reviewed the monitoring and operational data that are relevant to a decision on whether to reevaluate the area of review and the monitoring and operational data that are relevant to a decision on whether to update an approved plan required by §5.203 or §5.206 of this title; and

(-b-) determined whether any updates were warranted by material change in the monitoring and operational data or in the evaluation of the monitoring and operational data by the operator.

(II) Operators must submit either the updated plan or a summary of the modifications for each plan for which an update the operator determined to be warranted pursuant to subclause (I) of this clause. The director may require submission of copies of any updated plans and/or additional information regarding whether or not updates of any particular plans are warranted.

(III) The director may require the revision of any required plan whenever the director determines that such a revision is necessary to comply with the requirements of this title.

(vii) other information as required by the permit.

(b) Report format. The operator must report the results of injection pressure and injection rate monitoring of each injection well on Form H-10, Annual Disposal/Injection Well Monitoring Report, and the results of mechanical integrity testing on Form H-5, Disposal/Injection Well Pressure Test Report. Operators must submit other reports in a format acceptable to the Commission. At the discretion of the director, other formats may be accepted.

(c) Record retention. The operator must retain all wellhead pressure records, metering records, and integrity test results for at least five years. The operator must retain all documentation of good faith claim to necessary and sufficient property rights to operate the geologic storage facility until the director issues the final certificate of closure in accordance with §5.206(j)(7) of this title.

§5.208. Penalties.

(a) General. An operator that violates this subchapter may be subject to penalties and remedies specified in the Texas Natural Resources Code, Title 3, Texas Water Code, Chapter 27, and other statutes administered by the Commission.

(b) Certificate of compliance. The Commission may revoke a certificate of compliance for any oil, gas, or geothermal resource well in the manner provided in §3.73 of this title (relating to Pipeline Connection; Cancellation of Certificate of Compliance; Severance) for violation of this subchapter.

This agency hereby certifies that the sections as adopted have been reviewed by legal counsel and found to be a valid exercise of the agency's legal authority.

Issued in Austin, Texas, on November 30, 2010.

Filed with the Office of the Secretary of State on November 30, 2010.

RAILROAD COMMISSION OF TEXAS

Victor G. Carrillo, Chairman

Elizabeth A. Jones, Commissioner

Michael L. Williams, Commissioner

ATTEST:

Secretary of the Commission

Mary Ross McDonald
Managing Director, Special Counsel
Office of General Counsel
Railroad Commission of Texas