The Texas Commission on Environmental Quality (commission) adopts amendments to §§331.2, 331.62, 331.65, 331.144, 331.163 and new §331.21. Sections 331.2, 331.62, 331.65, 331.144, and 331.163 are adopted *with changes* to the proposed text as published in the May 30, 2003 issue of the *Texas Register* (28 TexReg 4259). Section 331.21 is adopted *without change* to the proposed text and will not be republished.

BACKGROUND AND SUMMARY OF THE FACTUAL BASIS FOR THE ADOPTED RULES

Senate Bill (SB) 405, 77th Legislature, established the Texas Board of Professional Geoscientists and the regulation of professional geoscientists. The Texas Geoscience Practice Act (the Act) requires that a person may not take responsible charge of a geoscientific report or a geoscientific portion of a report required by state agency rule unless the person is licensed through the Texas Board of Professional Geoscientists. The primary purpose of the amendments is to establish regulations for the public practice of geoscience in conformance with the Act by requiring a person who prepares and submits geoscientific information to the commission to be a licensed professional geoscientist. The Act also allows certain specified engineers to publicly practice geoscience in conformance with the Act. According to the bill analysis prepared at the time of passage, the ultimate purpose of the Act was public safety through the public registration of the practice of geoscience.

SECTION BY SECTION DISCUSSION

Adopted §331.2, Definitions, amends the introductory paragraph by deleting the word “shall” and the phrase “unless the context clearly indicates otherwise.” The definition of licensed professional

geoscientist is added as new paragraph (51). The remaining paragraphs are renumbered accordingly. A change from proposal in paragraph (23) spells out the acronym "UIC."

Adopted new §331.21, Required Submission of Geoscientific Information, requires that all geoscientific information submitted to the agency under this chapter shall be prepared by or under the supervision of a licensed professional geoscientist or licensed professional engineer and shall be signed, sealed, and dated by the licensed professional geoscientist or licensed professional engineer in accordance with the Texas Geoscience Practice Act and the Texas Engineering Practice Act.

Adopted §331.62, Construction Standards, adds a licensed professional geoscientist as a person qualified to supervise all phases of well construction and all phases of any well workover. The licensed professional geoscientist shall be knowledgeable and experienced in practical drilling engineering and be familiar with the special conditions and requirements of injection well construction. In addition, "as appropriate" has been added to §331.62(9) after the phrase "a licensed professional engineer or licensed professional geoscientist."

Adopted §331.65, Reporting Requirements, adds a licensed professional geoscientist as a person qualified to prepare and seal completion reports. A change from proposal in subsection (a)(1) adds the word "licensed" before "professional engineer."

Adopted §331.144, Approval of Plugging and Abandonment, adds a licensed professional geoscientist as a person qualified to certify the plugging and abandonment of wells in accordance with a plugging and abandonment plan. A change from proposal replaces the word "registered" with "licensed."

Adopted §331.163, Well Construction Standards, adds a licensed professional geoscientist as a person qualified to supervise all phases of well construction and all phases of any well workover. The licensed professional geoscientist shall be knowledgeable and experienced in practical drilling engineering and familiar with the special conditions and requirements of injection well construction. A change from proposal in subsections (h) and (i) adds the word "licensed" before "professional engineer." In addition, "as appropriate" has been added to §331.163(h) after the phrase "supervised by a licensed professional engineer or licensed professional geoscientist."

FINAL REGULATORY IMPACT ANALYSIS DETERMINATION

The commission reviewed the adopted rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225, and determined that the rulemaking is not subject to §2001.0225 because it does not meet the criteria for a "major environmental rule" as defined in that statute.

A "major environmental rule" means a rule, the specific intent of which, is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state.

The specific intent of the adopted rules is to establish regulations allowing for the public practice of geoscience in agency procedures in conformance with the Act. The Act requires that a person may not take responsible charge of a geoscientific report or a geoscientific portion of a report required by a state agency rule unless the person is licensed through the Texas Board of Professional Geoscientists. The Act also allows certain specified engineers to publicly practice geoscience in conformance with the Act. The adopted rules are not specifically intended to protect the environment or reduce risks to human health. The adopted rules are intended to establish procedures to require that specific reports and necessary data submitted to the commission be produced, signed, sealed, and dated by licensed professional geoscientists who have obtained their licenses through the Texas Board of Professional Geoscientists, and to make other corrections to the rules. Therefore, it is not anticipated that the adopted rules will adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state. The commission concludes that these adopted rules do not meet the definition of a major environmental rule.

Furthermore, even if the adopted rulemaking did meet the definition of a major environmental rule, the amendments are not subject to Texas Government Code, §2001.0225, because they do not accomplish any of the four results specified in §2001.0225(a). Section 2001.0225(a) applies to a rule adopted by an agency, the result of which is to: 1) exceed a standard set by federal law, unless the rule is specifically required by state law; 2) exceed an express requirement of state law, unless the rule is specifically required by federal law; 3) exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government to implement a state and federal

program; or 4) adopt a rule solely under the general powers of the agency instead of under a specific state law.

In this case, the adopted amendments to Chapter 331 do not meet any of these requirements. First, there are no applicable federal standards that these rules would address. Second, the adopted rules do not exceed an express requirement of state law. Third, there is no delegation agreement that would be exceeded by these adopted rules. Fourth, the commission adopts these rules to allow for the public practice of geoscience in agency procedures in conformance with the Act. Therefore, the commission does not adopt the rules solely under the commission's general powers.

TAKINGS IMPACT ASSESSMENT

The commission evaluated these rules and performed a preliminary assessment of whether these rules constitute a takings under Texas Government Code, Chapter 2007. The specific intent of the rules is to establish regulations allowing for the public practice of geoscience in agency procedures in conformance with the Act. The rules would substantially advance this stated purpose by requiring that specific reports and necessary data submitted to the commission be produced, signed, sealed, and dated by licensed professional geoscientists who have obtained their licenses through the Texas Board of Professional Geoscientists.

Promulgation and enforcement of these rules would be neither a statutory nor a constitutional taking of private real property. Specifically, the rules do not affect a landowner's rights in private real property by burdening private real property, nor restricting or limiting a landowner's right to property, or

reducing the value of property by 25% or more beyond that which would otherwise exist in the absence of the adopted rulemaking. These rules simply require that specific portions of applications or necessary data submitted to the commission be produced, signed, sealed, and dated by a qualified professional individual who has demonstrated his or her qualifications by obtaining a license to engage in the public practice of geoscience from the Texas Board of Professional Geoscientists. The Act also allows certain specified engineers to publicly practice geoscience in conformance with the Act. These rules do not affect any private real property.

There are no burdens imposed on private real property, and the benefits to society are better applications for environmental permits based upon reliable reports and data submitted by qualified licensed professional geoscientists.

CONSISTENCY WITH THE COASTAL MANAGEMENT PROGRAM

The commission reviewed the adopted rulemaking and found that the adoption is a rulemaking identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(b)(2), relating to Actions and Rules Subject to the Texas Coastal Management Program (CMP), or will affect an action and/or authorization identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(a)(6), and will therefore require that applicable goals and policies of the CMP be considered during the rulemaking process. The commission prepared a consistency determination for the rules under 31 TAC §505.22 and found that the rulemaking is consistent with the applicable CMP goals and policies. The following is a summary of that determination. The CMP goal applicable to the rulemaking is the goal to protect, preserve, restore, and enhance the diversity, quality, quantity, functions, and values of

coastal natural resource areas. CMP policies applicable to the adopted rules include the construction and operation of solid waste treatment, storage, and disposal facilities, and the discharge of municipal and industrial wastewater to coastal waters. Promulgation and enforcement of these rules will not violate (exceed) any standards identified in the applicable CMP goals and policies because the adopted rule changes do not modify or alter standards set forth in existing rules, and will not have a substantive effect on commission actions subject to the CMP. The adopted rulemaking would require a person who prepares and submits geoscientific information to the agency to be a licensed professional geoscientist. The Act also allows certain specified engineers to publicly practice geoscience in conformance with the Act.

PUBLIC COMMENT

A public hearing was not held on this rulemaking and no comments were received during the comment period, which closed June 30, 2003.

SUBCHAPTER A: GENERAL PROVISIONS

§331.2, §331.21

STATUTORY AUTHORITY

The amendment and new section are adopted under Texas Water Code, §5.103, which provides the commission with the authority to adopt rules necessary to carry out its power and duties under this code and other laws of this state; Texas Water Code, §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; Texas Health and Safety Code, §361.024, which authorizes the commission to establish standards of operation for the management and control of solid waste; and Texas Civil Statutes, Article 3271b, the Act, which authorizes the public practice of geoscience in the State of Texas.

§331.2. Definitions.

General definitions can be found in Chapter 3 of this title (relating to Definitions). The following words and terms, when used in this chapter, have the following meanings.

(1) **Abandoned well** - A well which has been permanently discontinued from use or a well for which, after appropriate review and evaluation by the commission, there is no reasonable expectation of a return to service.

(2) **Activity** - The construction or operation of an injection well for disposal of waste, or of pre-injection units for processing or storage of waste.

(3) **Affected person** - Any person whose legal rights, duties, or privileges may be adversely affected by the proposed injection operation for which a permit is sought.

(4) **Annulus** - The space in the wellbore between the injection tubing and the long string casing and/or liner.

(5) **Annulus pressure differential** - The difference between the annulus pressure and the injection pressure in an injection well.

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

(7) **Aquifer restoration** - The process used to achieve or exceed water quality levels established by the commission for a permit/production area.

(8) **Aquifer storage well** - A Class V injection well used for the injection of water into a geologic formation, group of formations, or part of a formation that is capable of underground storage of water for later retrieval and beneficial use.

(9) **Area of review** - The area surrounding an injection well described according to the criteria set forth in §331.42 of this title (relating to Area of Review) or in the case of an area permit, the project area plus a circumscribing area the width of which is either one fourth of a mile or a number calculated according to the criteria set forth in §331.42 of this title.

(10) **Area permit** - An injection well permit which authorizes the construction and operation of two or more similar injection wells within a specified area.

(11) **Artificial liner** - The impermeable lining of a pit, lagoon, pond, reservoir, or other impoundment, that is made of a synthetic material such as butyl rubber, chlorosulfonated polyethylene, elasticized polyolefin, polyvinyl chloride (PVC), other manmade materials, or similar materials.

(12) **Baseline quality** - The parameters and their concentrations that describe the local groundwater quality of an aquifer prior to the beginning of injection activities.

(13) **Baseline well** - A well from which groundwater is analyzed to define baseline quality in the permit area (regional baseline well) or in the production area (production area baseline well).

(14) **Buffer area** - The area between any mine area boundary and the permit area boundary.

(15) **Caprock** - A geologic formation typically overlying the crest and sides of a salt stock. The caprock consists of a complex assemblage of minerals including calcite ($CaCO_3$), anhydrite ($CaSO_4$), and accessory minerals. Caprocks often contain lost circulation zones characterized by rock layers of high porosity and permeability.

(16) **Captured facility** - A manufacturing or production facility that generates an industrial solid waste or hazardous waste that is routinely stored, processed, or disposed of on a shared basis in an integrated waste management unit owned, operated by, and located within a contiguous manufacturing complex.

(17) **Casing** - Material lining used to seal off strata at and below the earth's surface.

(18) **Cement** - A substance generally introduced as a slurry into a wellbore which sets up and hardens between the casing and borehole and/or between casing strings to prevent movement of fluids within, or adjacent to, a borehole, or a similar substance used in plugging a well.

(19) **Cementing** - The operation whereby cement is introduced into a wellbore and/or forced behind the casing.

(20) **Cesspool** - A drywell that receives untreated sanitary waste containing human excreta, and which sometimes has an open bottom and/or perforated sides.

(21) **Commercial facility** - A Class I permitted facility, where one or more commercial wells are operated.

(22) **Commercial underground injection control (UIC) Class I well facility** - Any waste management facility that accepts, for a charge, hazardous or nonhazardous industrial solid waste for disposal in a UIC Class I injection well, except a captured facility or a facility that accepts waste only from other facilities owned or effectively controlled by the same person.

(23) **Commercial well** - An underground injection control Class I injection well which disposes of hazardous or nonhazardous industrial solid wastes, for a charge, except for a captured facility or a facility that accepts waste only from facilities owned or effectively controlled by the same person.

(24) **Conductor casing or conductor pipe** - A short string of large-diameter casing used to keep the top of the wellbore open during drilling operations.

(25) **Cone of influence** - The potentiometric surface area around the injection well within which increased injection zone pressures caused by injection of wastes would be sufficient to drive fluids into an underground source of drinking water or freshwater aquifer.

(26) **Confining zone** - A part of a formation, a formation, or group of formations between the injection zone and the lowermost underground source of drinking water or freshwater aquifer that acts as a barrier to the movement of fluids out of the injection zone.

(27) **Contaminant** - Any physical, biological, chemical, or radiological substance or matter in water.

(28) **Control parameter** - Any chemical constituent of groundwater monitored on a routine basis used to detect or confirm the presence of mining solutions in a designated monitor well.

(29) **Disposal well** - A well that is used for the disposal of waste into a subsurface stratum.

(30) **Disturbed salt zone** - Zone of salt enveloping a salt cavern, typified by increased values of permeability or other induced anomalous conditions relative to undisturbed salt which lies more distant from the salt cavern, and is the result of mining activities during salt cavern development and which may vary in extent through all phases of a cavern including the post-closure phase.

(31) **Drilling mud** - A heavy suspension used in drilling an injection well, introduced down the drill pipe and through the drill bit.

(32) **Drywell** - A well, other than an improved sinkhole or subsurface fluid distribution system, completed above the water table so that its bottom and sides are typically dry except when receiving fluids.

(33) **Excursion** - The movement of mining solutions into a designated monitor well.

(34) **Existing injection well** - A Class I well which was authorized by an approved state or EPA-administered program before August 25, 1988 or a well which has become a Class I well as a result of a change in the definition of the injected waste which would render the waste hazardous under §335.1 of this title (relating to Definitions).

(35) **Fluid** - Material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.

(36) **Formation** - A body of rock characterized by a degree of lithologic homogeneity which is prevailingly, but not necessarily, tabular and is mappable on the earth's surface or traceable in the subsurface.

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

(38) **Fresh water** - Water having bacteriological, physical, and chemical properties which make it suitable and feasible for beneficial use for any lawful purpose.

(A) For the purpose of this subchapter, it will be presumed that water is suitable and feasible for beneficial use for any lawful purpose only if:

(i) it is used as drinking water for human consumption; or

(ii) the groundwater contains fewer than 10,000 milligrams per liter (mg/L) total dissolved solids; and

(iii) it is not an exempted aquifer.

(B) This presumption may be rebutted upon a showing by the executive director or an affected person that water containing greater than or equal to 10,000 mg/L total dissolved solids can be put to a beneficial use.

(39) **Groundwater** - Water below the land surface in a zone of saturation.

(40) **Groundwater protection area** - A geographic area (delineated by the state under the Safe Drinking Water Act, 42 United States Code, §300j-13) near and/or surrounding community and non-transient, non-community water systems that use groundwater as a source of drinking water.

(41) **Hazardous waste -** Hazardous waste as defined in §335.1 of this title (relating to Purpose, Scope, and Applicability).

(42) **Improved sinkhole** - A naturally occurring karst depression or other natural crevice found in carbonate rocks, volcanic terrain, and other geologic settings which has been modified by man for the purpose of directing and emplacing fluids into the subsurface.

(43) **Injection interval** - That part of the injection zone in which the well is authorized to be screened, perforated, or in which the waste is otherwise authorized to be directly emplaced.

(44) **Injection operations** - The subsurface emplacement of fluids occurring in connection with an injection well or wells, other than that occurring solely for construction or initial testing.

(45) **Injection well** - A well into which fluids are being injected. Components of an injection well annulus monitoring system are considered to be a part of the injection well.

(46) **Injection zone** - A formation, a group of formations, or part of a formation that receives fluid through a well.

(47) **In service** - The operational status when an authorized injection well is capable of injecting fluids, including times when the well is shut-in and on standby status.

(48) **Intermediate casing** - A string of casing with diameter intermediate between that of the surface casing and that of the smaller long string or production casing, and which is set and

cemented in a well after installation of the surface casing and prior to installation of the long string or production casing.

(49) **Large capacity cesspool** - A cesspool that is designed for a flow of greater than 5,000 gallons per day.

(50) **Large capacity septic system** - A septic system that is designed for a flow of greater than 5,000 gallons per day.

(51) **Licensed professional geoscientist** - A geoscientist who maintains a current license through the Texas Board of Professional Geoscientists in accordance with its requirements for professional practice.

(52) **Liner** - An additional casing string typically set and cemented inside the long string casing and occasionally used to extend from base of the long string casing to or through the injection zone.

(53) **Long string casing or production casing** - A string of casing that is set inside the surface casing and that usually extends to or through the injection zone.

(54) **Lost circulation zone** - A term applicable to rotary drilling of wells to indicate a subsurface zone which is penetrated by a wellbore, and which is characterized by rock of high porosity

and permeability, into which drilling fluids flow from the wellbore to the degree that the circulation of drilling fluids from the bit back to ground surface is disrupted or "lost."

(55) **Mine area** - The area defined by a line through the ring of designated monitor wells installed to monitor the production zone.

(56) **Mine plan** - A map of adopted mine areas and an estimated schedule indicating the sequence and timetable for mining and any required aquifer restoration.

(57) **Monitor well** - Any well used for the sampling or measurement of any chemical or physical property of subsurface strata or their contained fluids.

(A) Designated monitor wells are those listed in the production area authorization for which routine water quality sampling is required.

(B) Secondary monitor wells are those wells in addition to designated monitor wells, used to delineate the horizontal and vertical extent of mining solutions.

(C) Pond monitor wells are wells used in the subsurface surveillance system near ponds or other pre-injection units.

(58) **Motor vehicle waste disposal well** - A well used for the disposal of fluids from vehicular repair or maintenance activities, including, but not limited to, repair and maintenance facilities for cars, trucks, motorcycles, boats, railroad locomotives, and airplanes.

(59) **New injection well** - Any well, or group of wells, not an existing injection well.

(60) **New waste stream** - A waste stream not permitted.

(61) **Non-commercial facility** - A Class I permitted facility which operates only non-commercial wells.

(62) **Non-commercial underground injection control (UIC) Class I well facility** - A UIC Class I permitted facility where only non-commercial wells are operated.

(63) **Non-commercial well** - An underground injection control Class I injection well which disposes of wastes that are generated on-site, at a captured facility or from other facilities owned or effectively controlled by the same person.

(64) **Off-site** - Property which cannot be characterized as on-site.

(65) **On-site** - The same or geographically contiguous property which may be divided by public or private rights-of-way, provided the entrance and exit between the properties is at a cross-

roads intersection, and access is by crossing, as opposed to going along, the right-of-way. Noncontiguous properties owned by the same person but connected by a right-of-way which the owner controls and to which the public does not have access, is also considered on-site property.

(66) **Out of service** - The operational status when a well is not authorized to inject fluids, or the well itself is incapable of injecting fluids for mechanical reasons, maintenance operations, or well workovers or when injection is prohibited due to the well's inability to comply with the in-service operating standards of this chapter.

(67) **Permit area** - The area owned, or under lease by, the permittee which may include buffer areas, mine areas, and production areas.

(68) **Plugging** - The act or process of stopping the flow of water, oil, or gas into or out of a formation through a borehole or well penetrating that formation.

(69) **Point of injection** - For a Class V well, the last accessible sampling point prior to fluids being released into the subsurface environment.

(70) **Pollution** - The contamination of water or the alteration of the physical, chemical, or biological quality of water:

(A) that makes it harmful, detrimental, or injurious:

(i) to humans, animal life, vegetation, or property; or

(ii) to public health, safety, or welfare; or

(B) that impairs the usefulness or the public enjoyment of the water for any lawful and reasonable purpose.

(71) **Pre-injection units** - The on-site aboveground appurtenances, structures, equipment, and other fixtures including the injection pumps, filters, tanks, surface impoundments, and piping for wastewater transmission between any such facilities and the well that are, or will be, used for storage or processing of waste to be injected, or in conjunction with an injection operation.

(72) **Production area** - The area defined by a line generally through the outer perimeter of injection and recovery wells used for mining.

(73) **Production area authorization** - A document, issued under the terms of an injection well permit, approving the initiation of mining activities in a specified production area within a permit area.

(74) **Production zone** - The stratigraphic interval extending vertically from the shallowest to the deepest stratum into which mining solutions are authorized to be introduced.

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(75) **Radioactive waste** - Any waste which contains radioactive material in concentrations which exceed those listed in 10 Code of Federal Regulations Part 20, Appendix B, Table II, Column 2, as amended.

(76) **Restoration demonstration** - A test or tests conducted by a permittee to simulate production and restoration conditions and verify or modify the fluid handling values submitted in the permit application.

(77) **Restored aquifer** - An aquifer whose local groundwater quality has, by natural or artificial processes, returned to levels consistent with restoration table values or better as verified by an approved sampling program.

(78) **Salt cavern** - A hollowed-out void space that has been purposefully constructed within a salt stock, typically by means of solution mining by circulation of water from a well or wells connected to the surface.

(79) **Salt cavern confining zone** - A zone between the salt cavern injection zone and all underground sources of drinking water and freshwater aquifers, that acts as a barrier to movement of waste out of a salt cavern injection zone, and consists of the entirety of the salt stock excluding any portion of the salt stock designated as an underground injection control (UIC) Class I salt cavern injection zone or any portion of the salt stock occupied by a UIC Class II or Class III salt cavern or its disturbed salt zone.

(80) **Salt cavern injection interval** - That part of a salt cavern injection zone consisting of the void space of the salt cavern into which waste is stored or disposed of, or which is capable of, receiving waste for storage or disposal.

(81) **Salt cavern injection zone** - The void space of a salt cavern that receives waste through a well, plus that portion of the salt stock enveloping the salt cavern, and extending from the boundaries of the cavern void outward a sufficient thickness to contain the disturbed salt zone, and an additional thickness of undisturbed salt sufficient to ensure that adequate separation exists between the outer limits of the injection zone and any other activities in the domal area.

(82) **Salt cavern solid waste disposal well or salt cavern disposal well** - For the purposes of this chapter, regulations of the commission, and not to underground injection control (UIC) Class II or UIC Class III wells in salt caverns regulated by the Texas Railroad Commission, a salt cavern disposal well is a type of UIC Class I injection well used:

(A) to solution mine a waste storage or disposal cavern in naturally occurring salt; and/or

(B) to inject hazardous, industrial, or municipal waste into a salt cavern for the purpose of storage or disposal of the waste.

(83) **Salt dome** - A geologic structure that includes the caprock, salt stock, and deformed strata surrounding the salt stock.

(84) **Salt stock** - A geologic formation consisting of a relatively homogeneous mixture of evaporite minerals dominated by halite (NaCl) that has migrated from originally tabular beds into a vertical orientation.

(85) **Sanitary waste** - Liquid or solid waste originating solely from humans and human activities, such as wastes collected from toilets, showers, wash basins, sinks used for cleaning domestic areas, sinks used for food preparation, clothes washing operations, and sinks or washing machines where food and beverage serving dishes, glasses, and utensils are cleaned.

(86) **Septic system** - A well that is used to emplace sanitary waste below the surface, and is typically composed of a septic tank and subsurface fluid distribution system or disposal system.

(87) **Stratum** - A sedimentary bed or layer, regardless of thickness, that consists of generally the same kind of rock or material.

(88) **Subsurface fluid distribution system** - An assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground.

(89) **Surface casing** - The first string of casing (after the conductor casing, if any) that is set in a well.

(90) **Temporary injection point** - A method of Class V injection that uses push point technology (injection probes pushed into the ground) for the one-time injection of fluids into or above an underground source of drinking water.

(91) **Total dissolved solids (TDS)** - The total dissolved (filterable) solids as determined by use of the method specified in 40 Code of Federal Regulations Part 136, as amended.

(92) **Transmissive fault or fracture** - A fault or fracture that has sufficient permeability and vertical extent to allow fluids to move between formations.

(93) **Underground injection** - The subsurface emplacement of fluids through a well.

(94) **Underground injection control (UIC)** - The program under the federal Safe Drinking Water Act, Part C, including the approved Texas state program.

(95) **Underground source of drinking water (USDW)** - An "aquifer" or its portions:

(A) which supplies drinking water for human consumption; or

(B) in which the groundwater contains fewer than 10,000 milligrams per liter total dissolved solids; and

(C) which is not an exempted aquifer.

(96) **Upper limit** - A parameter value established by the commission in a permit/production area authorization which when exceeded indicates mining solutions may be present in designated monitor wells.

(97) **Verifying analysis** - A second sampling and analysis of control parameters for the purpose of confirming a routine sample analysis which indicated an increase in any control parameter to a level exceeding the upper limit. Mining solutions are assumed to be present in a designated monitor well if a verifying analysis confirms that any control parameter in a designated monitor well is present in concentration equal to, or greater than, the upper limit value.

(98) **Well** - A bored, drilled, or driven shaft whose depth is greater than the largest surface dimension, a dug hole whose depth is greater than the largest surface dimension, an improved sinkhole, or a subsurface fluid distribution system but does not include any surface pit, surface excavation, or natural depression.

(99) **Well injection** - The subsurface emplacement of fluids through a well.

(100) **Well monitoring** - The measurement by on-site instruments or laboratory methods of any chemical, physical, radiological, or biological property of the subsurface strata or their contained fluids penetrated by the wellbore.

(101) **Well stimulation** - Several processes used to clean the wellbore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for wastewater to move more readily into the formation, including, but not limited to, surging, jetting, blasting, acidizing, and hydraulic fracturing.

(102) **Workover** - An operation in which a down-hole component of a well is repaired, the engineering design of the well is changed, or the mechanical integrity of the well is compromised. 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.

§331.21. Required Submission of Geoscientific Information.

All geoscientific information submitted to the agency under this chapter shall be prepared by, or under the supervision of, a licensed professional geoscientist or a licensed professional engineer and shall be signed, sealed, and dated by the licensed professional geoscientist or licensed professional engineer in accordance with the Texas Geoscience Practice Act and the Texas Engineering Practice Act.

SUBCHAPTER D: STANDARDS FOR CLASS I WELLS OTHER THAN SALT CAVERN SOLID WASTE DISPOSAL WELLS

§331.62, §331.65

STATUTORY AUTHORITY

The amendments are adopted under Texas Water Code, §5.103, which provides the commission with the authority to adopt rules necessary to carry out its power and duties under this code and other laws of this state; Texas Water Code, §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; Texas Health and Safety Code, §361.024, which authorizes the commission to establish standards of operation for the management and control of solid waste; and Texas Civil Statutes, Article 3271b, the Act, which authorizes the public practice of geoscience in the State of Texas.

§331.62. Construction Standards.

All Class I wells shall be designed, constructed, and completed to prevent the movement of fluids that could result in the pollution of an underground source of drinking water (USDW).

(1) Design criteria. Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period. The well shall be designed and constructed to prevent potential leaks from the well, to prevent the movement of fluids along the wellbore into or between USDWs, to prevent the movement of fluids

along the wellbore out of the injection zone, to permit the use of appropriate testing devices and workover tools, and to permit continuous monitoring of injection tubing, long string casing, and annulus, as required by this chapter. All well materials must be compatible with fluids with which the materials may be expected to come into contact. A well shall be deemed to have compatibility as long as the materials used in the construction of the well meet or exceed standards developed for such materials by the American Petroleum Institute, the American Society for Testing Materials, or comparable standards acceptable to the executive director.

(A) Casing design. Surface casing shall be set to a minimum subsurface depth, as determined by the executive director, which extends into the confining bed below the lowest formation containing a USDW or freshwater aquifer. At least one long string casing, using a sufficient number of centralizers, shall extend to the injection interval. In determining and specifying casing and cementing requirements, the following factors shall be considered:

(i) depth of lowermost USDW or freshwater aquifer;

(ii) depth to the injection interval;

(iii) injection pressure, external pressure, internal pressure, and axial loading;

(iv) hole size;

(v) size and grade of all casing strings (wall thickness, diameter, nominal weight, length, joint specification, and construction material);

(vi) the maximum burst and collapse pressures, and tensile stresses which may be experienced at any point along the length of the casings at any time during the construction, operation, and closure of the well;

(vii) corrosive effects of injected fluids, formation fluids, and temperatures;

(viii) lithology of injection and confining intervals;

(ix) presence of lost circulation zones or other subsurface conditions that could affect the casing and cementing program;

(x) types and grades of cement; and

(xi) quantity and chemical composition of the injected fluid.

(B) Tubing and packer design. All Class I injection wells shall inject fluids through tubing with a packer, set at a depth specified by the executive director. Fluid seal systems will not be approved by the commission. The annulus system shall be designed and constructed to prevent

the leak of injection fluids into any unauthorized zones. In determining and specifying requirements for tubing and packer, the following factors shall be considered:

(i) depth to the injection zone;

(ii) characteristics of injection fluid (chemical content, corrosiveness, temperature, and density);

(iii) injection pressure;

(iv) annular pressure;

(v) rate (intermittent or continuous), temperature, and volume of injected fluid;

(vi) size of casing; and

(vii) tensile, burst, and collapse strengths of the tubing.

(2) Plans and specifications. Except as specifically required in the terms of the disposal well permit, the drilling and completion of the well shall be done in accordance with the requirements of this chapter and all permit application plans and specifications.

(3) Changes to plans and specifications. Any proposed changes to the plans and specifications must be approved in writing by the executive director that said changes provide protection standards equivalent to or greater than the original design criteria.

(A) If during the drilling and/or completion of the well, the operator proposes to change the cementing of the surface casing, the executive director shall require a written description of the proposed change, including any additional data necessary to evaluate the request. The operator may not execute the change until the executive director gives written approval. The operator may change the setting depth of the surface casing to a depth greater than that specified in the permit, either during drilling and/or completion, without approval from the executive director. Approval for setting depths shallower than specified in the permit will not be authorized.

(B) If the operator proposes to change the injection interval to one not reviewed during the permit application process, the operator shall submit an application to amend the permit. The operator may not inject into any unauthorized zone.

(C) Any other changes, including but not limited to the number of casing strings, changes in the size or material of intermediate and production casings, changes in the completion of the well, changes in the exact setting of screens or injection intervals within the permitted injection zone, and changes in the type of cement used, or method of cementing shall be considered minor changes. If minor changes are requested, the executive director may give immediate oral and subsequent written approval or written approval for those changes. The operator is required to submit a

detailed written description of all minor changes, along with the information required in §331.65 of this title (relating to Reporting Requirements), before approval for operation of the well may be granted.

(4) Drilling requirements.

(A) The well shall be drilled according to sound engineering practices to minimize problems which may jeopardize completion attempts, such as deviated holes, washouts and stuck pipe.

(B) As much as technically practicable and feasible, the hole should be drilled under laminar flow conditions, with appropriate fluid loss control, to minimize hole washouts.

(C) Immediately prior to running casing, the drilling fluid in the hole is to be circulated and conditioned to establish rheological properties commensurate with proper cementing practices.

(5) Construction performance standard. All Class I wells shall be cased and all casings shall be cemented to prevent the movement of fluids along the borehole into or between USDWs or freshwater aquifers, and to prevent movement of fluids along the borehole out of the injection zone.

(6) Cementing requirements, for all Class I wells constructed after the promulgation of this rule, including wells converting to Class I status.

(A) Cementing shall be by the pump and plug or other method approved by the executive director. Cementing may be accomplished by staging. Cement pumped shall be of a volume equivalent to at least 120% of the volume calculated necessary to fill the annular space between the hole and casing and between casing strings to the surface of the ground. The executive director may require more than 120% when the geology or other circumstances warrant it. A two-dimensional caliper shall be used to measure the hole diameter. If the two-dimensional caliper can not measure the diameter of the hole over an interval, then the minimum amount of cement needed for that interval shall be a volume calculated to be equivalent to or greater than 150% of the space between the casing and the maximum measurable diameter of the caliper.

(B) If lost circulation zones or other subsurface conditions are anticipated and/or encountered, which could result in less than 100% filling of the annular space between the casing and the borehole or the casings, the owner/operator shall implement the approved contingency plan submitted according to §331.121(a)(2)(O) of this title (relating to Class I Wells).

(7) Logs and tests.

(A) Integrity testing. Appropriate logs and other tests shall be conducted during the drilling and construction of Class I wells. All logs and tests shall be interpreted by the service company which processed the logs or conducted the test; or by other qualified persons. A minimum of the following logs and tests shall be conducted:

(i) deviation checks on all holes, conducted at sufficiently frequent intervals to assure that avenues for fluid migration in the form of diverging holes are not created during drilling;

(ii) for surface casing;

(I) spontaneous potential, resistivity, natural gamma, and caliper logs before the casing is installed;

(II) cement bond with variable density log, and temperature logs after casing is set and cemented; and

(III) any other test required by the executive director;

(IV) the executive director may allow the use of an alternate to subclauses (I) and (II) of this clause when an alternative will provide equivalent or better information; and

(iii) for intermediate and long string casing:

(I) spontaneous potential, resistivity, natural gamma, compensated density and/or neutron porosity, dipmeter/fracture finder, and caliper logs, before the casing is installed;

(II) a cement bond with variable density log, casing inspection, and temperature logs after casing is set and cemented, and an inclination survey; and

(III) any other test required by the executive director; and

(iv) a mechanical integrity test consisting of:

(I) a pressure test with liquid or gas;

(II) a radioactive tracer survey;

(III) a temperature or noise log;

(IV) a casing inspection log, if required by the executive director; and

(V) any other test required by the executive director.

(B) Pressure tests. Surface casing shall be pressure tested to 1,000 pounds per square inch, gauge (psig) for at least 30 minutes, and long string casing shall be tested to 1,500 psig for at least 30 minutes, unless otherwise specified by the executive director.

(C) Core samples. Full-hole cores shall be taken from selected intervals of the injection zone and lowermost overlying confining zone; or, if full-hole coring is not feasible or adequate core recovery is not achieved, sidewall cores shall be taken at sufficient intervals to yield representative data for selected parts of the injection zone and lowermost overlying confining zone. Core analysis shall include a determination of permeability, porosity, bulk density, and other necessary tests.

(8) Injectivity tests. After completion of the well, injectivity tests shall be performed to determine the well capacity and reservoir characteristics. Surveys shall be performed to establish preferred injection intervals. Prior to performing injectivity tests, the bottom hole pressure, bottom hole temperature, and static fluid level shall be determined, and a representative sample of formation fluid shall be obtained for chemical analysis. Information concerning the fluid pressure, temperature, fracture pressure and other physical and chemical characteristics of the injection and confining zones shall be determined or calculated.

(9) Construction and workover supervision. All phases of well construction and all phases of any well workover shall be supervised by qualified individuals acting under the responsible charge of a licensed professional engineer or licensed professional geoscientist, as appropriate, with

current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act, who is knowledgeable and experienced in practical drilling engineering and who is familiar with the special conditions and requirements of injection well construction.

(10) The executive director shall have the opportunity to witness all cementing of casing strings, logging and testing. The owner or operator shall submit a schedule of such activities to the executive director at least 30 days prior to commencing drilling of the well. The executive director shall be given at least 24 hour notice before each activity in order that a representative of the executive director may be present.

§331.65. Reporting Requirements.

(a) Pre-operation reports. For new wells, including wells converting to Class I status, the requirements are as follows.

(1) Completion report. Within 90 days after the completion or conversion of the well, the permittee shall submit a Completion Report to the executive director. The report must include a surveyor's plat showing the exact location and giving the latitude and longitude of the well. The report must also include a certification that a notation on the deed to the facility property or on some other instrument which is normally examined during title search has been made stating the surveyed location of the well, the well permit number, and its permitted waste streams. The permittee shall also include in the report the following, prepared and sealed by a licensed professional engineer or licensed

professional geoscientist with current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act:

(A) actual as-built drilling and completion data on the well;

(B) all logging and testing data on the well;

(C) a demonstration of mechanical integrity;

(D) anticipated maximum pressure and flow rate at which the permittee will operate;

(E) results of the injection zone and confining zone testing program as required in §331.62 of this title (relating to Construction Standards) and this subsection;

(F) adjusted formation pressure increase calculations, fluid front calculations and updated cross-sections of the confining and injection zones, based on the data obtained during construction and testing;

(G) the actual injection procedure;

(H) the compatibility of injected wastes with fluids in the injection zone and minerals in both the injection zone and the confining zone and materials used to construct the well;

(I) the calculated area of review and cone of influence based on data obtained during logging and testing of the well and the formation, and where necessary, revisions to the information submitted under §331.121 of this title (relating to Class I Wells);

(J) the status of corrective action required for defective wells in the area of review;

(K) a Well Data Report on forms provided by the executive director;

(L) compliance with the casing and cementing performance standard in §331.62(5) of this title; and

(M) compliance with the cementing requirements in §331.62(6) of this title.

(2) Local authorities. The permittee shall provide written notice to the executive director, in a manner specified by the executive director, that a copy of the permit has been properly filed with the health and pollution control authorities of the county, city, and town where the well is located.

(3) Start-up date and time. The permittee shall notify the executive director in writing of the anticipated well start-up date. Compliance with all pre-operation terms of the permit must occur prior to beginning injection operations. The permittee shall notify the executive director at least 24 hours prior to beginning drilling operations.

(4) Approval of construction and completion. Prior to beginning operations, the permittee must obtain written approval from the executive director, according to §331.45 of this title (relating to Executive Director Approval of Construction and Completion).

(b) Operating reports.

(1) Injection operation quarterly report. For non-commercial facilities only, within 20 days after the last day of the months of March, June, September, and December, the permittee shall submit to the executive director a quarterly report of injection operation on forms supplied by the executive director. These forms will comply with the reporting requirements of 40 Code of Federal Regulations (CFR) §146.69(a). The executive director may require more frequent reporting.

(2) Injection operation monthly report. Commercial facilities shall meet the following requirements.

(A) The permittee shall submit within 30 days after the last day of each month a report to the commission including the following information for wastes received and injected during the month:

(i) names and locations of the companies and plants generating the wastes;

(ii) chemical and physical characteristics and volume of waste received from each company including pH;

(iii) names of companies transporting the wastes; and

(iv) a log of injection operations for each injection episode including but not limited to time of injection, injection rate, injection pressures, injection fluid volume, injection fluid pH, and injection fluid density.

(B) The permittee shall submit to the commission within 20 days of the last day of each month a report of injection operations on forms provided by the commission. These forms shall comply with the reporting requirements of 40 CFR §146.69(a). The executive director may require more frequent reporting.

(3) Injection zone annual report. For all facilities, the permittee shall submit annually with the December report of injection operation an updated graphic or other acceptable report of the pressure effects of the well upon its injection zone as required by §331.64(g) of this title (relating to Monitoring and Testing Requirements). To the extent this information is reasonably available, the report must also include:

(A) locations of newly constructed or newly discovered wells that penetrate the confining and/or injection zone within the area of review if those wells were not included in the technical report accompanying the permit application or in later reports;

(B) a tabulation of data as required by §331.121(2)(B) of this title for wells within the area of review that penetrate the injection zone or confining zone;

(C) the condition of the wells identified in subparagraph (A) of this paragraph and their effect on the injection activities;

(D) the protocol followed to identify, locate, and ascertain the condition of the wells identified in subparagraph (A) of this paragraph;

(E) a corrective action plan for wells not adequately constructed, completed, or plugged; and

(F) for non-commercial facilities only, a current injection fluid analysis.

(4) Mechanical integrity and other reports. The permittee shall submit within 30 days after test completion, a report including both data and interpretation on the results of:

(A) periodic tests of mechanical integrity; and

(B) any other test of the injection well or injection zone if required by the executive director.

(5) Emergency report of leak or other failure. The permittee shall notify the Underground Injection Control (UIC) Unit of the Austin office of the commission within 24 hours of any significant change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure of the well equipment or injection zone integrity.

(c) Workover reports. Within 30 days after the completion of the workover, a report shall be filed with the executive director including the reason for well workover and the details of all work performed.

SUBCHAPTER I: FINANCIAL RESPONSIBILITY

§331.144

STATUTORY AUTHORITY

The amendment is adopted under Texas Water Code, §5.103, which provides the commission with the authority to adopt rules necessary to carry out its power and duties under this code and other laws of this state; Texas Water Code, §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; Texas Health and Safety Code, §361.024, which authorizes the commission to establish standards of operation for the management and control of solid waste; and Texas Civil Statutes, Article 3271b, the Act, which authorizes the public practice of geoscience in the State of Texas.

§331.144. Approval of Plugging and Abandonment.

Within 60 days after receiving certifications from the owner or operator and an independent licensed professional engineer or licensed professional geoscientist that plugging and abandonment has been accomplished in accordance with the plugging and abandonment plan, the executive director will notify the owner or operator in writing that he is no longer required by this section to maintain financial assurance for plugging and abandonment of the well, unless the executive director has reason to believe that plugging and abandonment has not been in accordance with the plugging and abandonment plan. Financial assurance may not be released without the written approval of the executive director.

SUBCHAPTER J: STANDARDS FOR CLASS I SALT CAVERN SOLID WASTE DISPOSAL WELLS

§331.163

STATUTORY AUTHORITY

The amendment is adopted under Texas Water Code, §5.103, which provides the commission with the authority to adopt rules necessary to carry out its power and duties under this code and other laws of this state; Texas Water Code, §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; Texas Health and Safety Code, §361.024, which authorizes the commission to establish standards of operation for the management and control of solid waste; and Texas Civil Statutes, Article 3271b, the Act, which authorizes the public practice of geoscience in the State of Texas.

§331.163. Well Construction Standards.

(a) Plans and specifications. Except as specifically required in the terms of the disposal well permit, drilling and completion of the well shall be done in accordance with all permit application plans and specifications. Any proposed changes to the plans and specifications must be approved in writing by the executive director that said changes provide protection standards equivalent to or greater than the original design criteria.

(b) Casing and cementing.

(1) All Class I salt cavern disposal wells shall be cased and all casings which extend to the surface shall be cemented to the surface to prevent the movement of fluids and waste into or between underground sources of drinking water (USDWs) or freshwater aquifers, and to prevent potential leaks of fluids and waste from the well. Cementing shall be by the pump and plug or other method approved by the commission, and cement circulated shall be of a volume equivalent to at least 120% of the calculated volume needed to fill the annular space between the hole and casing and between casing strings to the surface of the ground. Circulation of cement may be accomplished by staging. The executive director may approve an alternative method of cementing in cases where the cement cannot be recirculated to the surface, provided the owner or operator can demonstrate by using logs that the cement is continuous or does not allow any fluid and waste movement behind the well casings. Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period.

(A) Surface casing shall be set to a minimum subsurface depth, as determined by the executive director, which extends into a confining bed below the lowest formation containing a USDW or freshwater aquifer.

(B) At least one string of intermediate casing, using a sufficient number of centralizers, shall extend at least 100 feet into the salt stock.

(C) At least one long string casing, using a sufficient number of centralizers, shall extend into the salt stock, to the following depths, whichever is greater:

(i) 500 feet into the salt stock; or

(ii) 500 feet below any rock type of recognizable thickness as determined by logging, which is different from salt, and that is hydraulically connected to formations outside the salt stock. For the purposes of this rule, all rock types of recognizable thickness on logs which are different from salt shall be assumed to be in hydraulic connection unless demonstrated otherwise.

(2) In determining and specifying casing and cementing requirements, the following factors shall be considered:

(A) depth of lowermost USDW or freshwater aquifer;

(B) depth to the injection zone;

(C) injection pressure, external pressure, internal pressure, and axial loading;

(D) hole size;

(E) size and grade of all casing strings (wall thickness, diameter, nominal weight, length, joint specification, and construction material);

(F) the maximum burst and collapse pressures, and tensile stresses which may be experienced at any point along the length of the casings at any time during the construction, operation, and closure of the well;

(G) corrosive effects of injected materials, formation fluids, and temperatures;

(H) lithology of injection and confining zones;

(I) types and grades of cement;

(J) quantity and chemical composition of the injected fluid; and

(K) cement and cement additives which must, at a minimum, be of sufficient quality and quantity to maintain integrity over the design life of the well.

(c) Injection tubings. Except for circulation of drilling fluids during well construction, all injection activities for salt cavern construction and waste disposal in a salt cavern shall be performed using two concentric and removable injection tubings suspended from the wellhead.

(1) All injection activities during cavern construction shall be performed with the annulus between the tubing and long string casing filled with a noncorrosive fluid sufficient to protect the bond between salt, cement, and the long string casing seat.

(2) All injection of waste into a salt cavern shall be performed through the inner tubing with a packer to seal the annulus between the tubing and long string casing near the bottom of the long string casing.

(d) Well annulus system factors for consideration. All elements of the design of the well's tubing-long string casing annulus system, including the outer tubing and packer, shall be approved by permit or by the executive director's approval that any proposed modifications to the plans and specifications in the permit application will provide protection equivalent to or greater than the original plans and specifications. In determining and specifying requirements for a tubing and packer system, the following factors shall be considered:

(1) depth of setting;

(2) characteristics of injection fluid and waste;

(3) injection pressure;

(4) annular pressure;

(5) rate, temperature, and volume of injected fluid;

(6) size of casing; and

(7) tensile, burst, and collapse strengths of the tubing.

(e) Logs and tests.

(1) Geophysical logging. Appropriate logs and other tests shall be conducted during the drilling and construction phases of the well including drilling into the salt. All logs and tests shall be interpreted by the service company which processed the logs or conducted the test; or by other qualified persons. A minimum of the following logs and tests shall be conducted:

(A) deviation checks on all holes, conducted at sufficiently frequent intervals to assure that avenues for fluid migration in the form of diverging holes are not created during drilling;

(B) a spontaneous potential and resistivity log for all formations overlying the caprock;

(C) from the ground surface or from the base of conductor casing to the total investigated depth including all core hole or pilot hole:

(i) natural gamma ray log;

(ii) compensated density and neutron porosity logs;

(iii) acoustic or sonic log;

(iv) inclination (directional) survey; and

(v) caliper log (open hole);

(D) from the ground surface or from the base of conductor casing to the lowermost casing seat:

(i) cement bond with variable density log;

(ii) temperature log (cased hole); and

(iii) casing inspection log;

(E) fracture detector log from the base of the surface casing to the total investigated depth including all core hole or pilot hole; and

(F) a vertical seismic profile.

(2) Pressure tests.

(A) After installation and cementing of casings, and prior to drilling out the cemented casing shoe, surface casing shall be pressure tested at mill test pressure or 80% of the calculated internal pressure at minimum yield strength, and the intermediate and long string casing shall be tested to 1,500 pounds per square inch (psi) for 30 minutes, unless otherwise specified by the executive director.

(B) After drilling out the cemented long string casing shoe, and prior to drilling more than 100 feet of core hole or pilot hole below the long string casing shoe, the bond between the salt, cement, and casing shall be tested at a pressure of 0.8 psi per foot of depth.

(C) The pilot hole and/or core hole shall be tested between the long string casing shoe and the total investigated depth, at a casing seat pressure of 0.8 psi per foot of depth.

(3) Coring.

(A) Full-hole continuous cores shall be taken beginning at the top of the caprock, or if caprock is not encountered, from the top of the salt stock, to a total investigated depth of 1,000 feet below the intended cavern floor. Cores shall be analyzed at sufficient frequency to provide representative data for the caprock, salt cavern confining zone, and the salt cavern injection zone, including permeability, porosity, bulk density, compressive strength (uniaxial), shear strength (triaxial), water content, and compatibility with permitted waste material. The full-hole, continuous cores shall be photographed for permanent records. The photographs of the cores shall be submitted to the

commission as a part of the well completion report as required by §331.167(a)(1) of this title (relating to Reporting Requirements). The cores shall be archived at a facility approved by the executive director. The photos and cores will be maintained as public records.

(B) In situ permeability, lithostatic gradients, and fracture pressure gradients shall be determined in the core hole for the salt, within the cavern injection interval.

(C) Prior to commencement of injection for cavern construction, the pilot hole or core hole shall be filled with salt-saturated cement from total investigated depth back to the designed depth of the salt cavern floor.

(4) Well integrity testing. The mechanical integrity of a well must be demonstrated prior to initiation of injection activities. A mechanical integrity test shall consist of:

(A) a pressure test with liquid or gas;

(B) a temperature, noise log, or oxygen activation log;

(C) a casing inspection log, if required by the executive director; and

(D) any other test required by the executive director.

(f) Compatibility. All well materials must be compatible with formations and fluids with which the materials may be expected to come into contact. A well shall be deemed to have compatibility as long as the materials used in the construction of the well meet or exceed standards developed for such materials by the American Petroleum Institute (API), the American Society for Testing Materials (ASTM), or comparable standards acceptable to the executive director.

(g) Pre-injection units.

(1) The injection pump system shall be designed to assure that the surface injection pressure limitations authorized by the well permit shall not be exceeded.

(2) Instrumentation shall be installed to continuously monitor changes in annulus pressure and annulus fluid volume for the purpose of detecting well malfunctions.

(3) Pre-injection units, while allowing for pressure release, shall be designed to prevent the release of unauthorized cavern contents to the atmosphere.

(4) To protect the ground surface from spills and releases, the wellhead will have secondary containment in the form of a diked, impermeable pad or sump.

(h) Construction supervision. All phases of well construction and all phases of any well workover shall be supervised by a licensed professional engineer or licensed professional geoscientist,

as appropriate, with current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act, who is knowledgeable and experienced in practical drilling engineering and who is familiar with the special conditions and requirements of injection well construction.

(i) Approval of completion of the well construction stage. Prior to beginning cavern construction, the permittee shall obtain written approval from the executive director which states that the well construction is in compliance with the applicable provisions of the permit. To obtain approval, the permittee shall submit to the executive director within 90 days of completion of well construction, including all logging, coring, and testing of the pilot hole, the following reports and certifications prepared and sealed by a licensed professional engineer or licensed professional geoscientist with current registration under the Texas Engineering Practice Act or Texas Geoscience Practice Act:

(1) final construction, "as-built" plans and specifications, reservoir data, and an evaluation of the considerations set out in §331.45(2) of this title (relating to Executive Director Approval of Construction and Completion);

(2) certification that construction of the well has been completed in accordance with the provisions of the disposal well permit and with the design and construction specifications of the permittee's application; and

(3) certification that actual reservoir data obtained will not result in the need for a change in the operating parameters specified in the permit.