

AZ Draft Underground Injection Control Program
AAC Title 18, Chapter 9, Article 6

AZ Draft Underground Injection Control Program1
AAC Title 18, Chapter 9, Article 6.....1
Part A: General Provisions3
 R18-9-A601: Applicability3
 [144.3;146.3] R18-9-A602: Definitions4
 [144.5] R18-9-A603: Confidentiality of Information8
 [144.6; 146.5] R18-9-A604: Classifications of Wells8
 [144.7] R18-9-A605: Identification of Underground Sources of Drinking Water and Exempt Aquifers.....10
 [146.4] R18-9-A606: Criteria for Exempted Aquifers.....12
Part B: General Program Requirements.....12
 [144.11] R18-9-B607: Prohibition of Unauthorized Injection.....12
 [144.12] R18-9-B608: Prohibition of Movement of Fluid into Underground Sources of Drinking Water13
 [144.13] R18-9-B609: Prohibition of Class IV Wells13
 [144.16] R18-9-B610: Waiver of Requirement by Director14
 [144.17] R18-9-B611: Records.....14
 [146.6] R18-9-B612: Area of Review14
 [146.8] R18-9-B613: Mechanical Integrity15
 [146.10] R18-9-B614: Plugging and Abandoning Class I, II, III, IV, and V Wells16
 [144.19] R18-9-B615: Transitioning from Class II to Class VI Injection Well.....17
Part C: Authorization by Permit for Underground Injection17
 [144.31] R18-9-C616: Individual Permits; Application for Individual Permits17
 [124.3] R18-9-C617: Application for a Permit.....19
 [144.32] R18-9-C618: Signatories.....19
 [124.6; 124.9] R18-9-C619: Draft Permits20
 [124.8] R18-9-C620: Fact Sheet.....20
 [124.10] R18-9-C621: Public Notice of Permit Actions and

Public Comment Period.....	21
[124.11] R18-9-C622: Public Comments and Requests for Public Hearings	22
[124.12] R18-9-C623: Public Hearings	22
[124.17] R18-9-C624: Response to Comments	23
[144.33] R18-9-C625: Area Permits.....	23
[144.34] R18-9-C626: Emergency Permits	23
[144.35] R18-9-C627: Effect of a Permit	24
[124.15] R18-9-C628: Issuance and Effective Date of Permit	24
[144.36] R18-9-C629: Permit Duration.....	24
[144.37] R18-9-C630: Continuation of Expiring Permits	25
[144.38] R18-9-C631: Permit Transfer.....	25
[124.5] R18-9-C632: Modification; Revocation and Reissuance; or Termination of Permits.....	26
[144.39] R18-9-C633: Modification; Revocation and Reissuance of Permits.....	26
[144.41] R18-9-C634: Minor Modifications of Permits	28
[144.40] R18-9-C635: Termination of Permits	28
[124.19] R18-9-C636: Appeal of UIC Permits.....	29
Part D: Permit Conditions for Underground Injection.....	29
[144.51] R18-9-D637: Conditions Applicable to All Permits	29
[144.52] R18-9-D638: Establishing Permit Conditions.....	32
[144.53] R18-9-D639: Compliance Schedules	34
[144.54] R18-9-D640: Requirements for Recording and Reporting Monitoring Results.....	35
[144.55;146.7] R18-9-D641: Corrective Action.....	35
Part E: Class I Injection Well Requirements	36
[146.12] R18-9-E642: Class I; Construction Requirements	36
[146.13] R18-9-E643: Class I; Operating, Monitoring, and Reporting Requirements	38
[146.14] R18-9-E644: Class I; Information to be Considered by the Director.....	39
Part F: Class II Injection Well Requirements	40
[146.22] R18-9-F645: Class II; Construction Requirements	40
[146.23] R18-9-F646: Class II; Operating, Monitoring, and Reporting Requirements	42
[146.24] R18-9-F647: Class II; Information to be Considered by the Director.....	43
Part G: Class III Injection Well Requirements	44
[146.32] R18-9-G648: Class III; Construction Requirements	44
[146.33] R18-9-G649: Class III; Operating, Monitoring, and Reporting Requirements	45
[146.34] R18-9-G650: Class III; Information to be considered by the Director.....	46
Part H: Class IV Injection Well Requirements	48
[144.23] R18-9-H651: Class IV; Prohibition and Closure Requirements	48
Part I: Class V Injection Well Requirements.....	48

[144.24;144.84] R18-9-I652: Class V; General Requirements.....	48
[144.25] R18-9-I653: Class V; Requiring a Permit	49
[144.26; 144.83a] R18-9-I654: Class V; Inventory Requirements for Class V Wells Authorized by Rule	49
[144.27; 144.83b] R18-9-I655: Class V; Requiring Other Information	50
[144.88] R18-9-I656: Class V; Prohibition of Class V Large Capacity Cesspools and Motor Vehicle Waste Disposal Wells.....	50
[144.15] R18-9-I657: Class V; Prohibition of non-experimental Class V wells for geologic sequestration	50
Part J: Class VI Injection Well Requirements	50
[146.81] R18-9-J658: Class VI; Applicability.....	50
[146.82] R18-9-J659: Class VI; Required Permit Information.....	52
[146.83] R18-9-J660: Class VI; Minimum Criteria for Siting.....	54
[146.84] R18-9-J661: Class VI; Area of Review and Corrective Action	54
[146.85] R18-9-J662: Class VI; Financial Responsibility	56
[146.86] R18-9-J663: Class VI; Injection Well Construction Requirements	60
[146.87] R18-9-J664: Class VI; Logging, Sampling, and Testing Prior to Well Operation.....	61
[146.88] R18-9-J665: Class VI; Injection Well Operating Requirements.....	62
[146.89] R18-9-J666: Class VI; Mechanical Integrity.....	63
[146.90] R18-9-J667: Class VI; Testing and Monitoring Requirements	64
[146.91] R18-9-J668: Class VI; Reporting Requirements.....	65
[146.92] R18-9-J669: Class VI; Injection Well Plugging.....	67
[146.93] R18-9-J670: Class VI; Post-Injection Site Care and Site Closure.....	67
[146.94] R18-9-J671: Class VI; Emergency and Remedial Response.....	70
[146.95] R18-9-J672: Class VI; Injection Depth Waiver Requirements	71
Table 1: Applicable Standards.....	74

Part A: General Provisions

R18-9-A601: Applicability

- A. This Article and **40 CFR Part 145**, Subpart C provide the minimum requirements imposed through the State of Arizona’s Underground Injection Control (UIC) program under ARS Title 49, Chapter 2, Article 3.3 (Underground Injection Control Permit Program) and pursuant to Part C of the Safe Drinking Water Act (SDWA) (Pub. L. 93-523, as amended; [42 U.S.C. 300f](#) et seq.).
- B. Underground injection is prohibited in the State of Arizona unless authorized by permit or rule under this Article. Any injection activity authorized by permit or rule under this Article shall prohibit the movement of fluid containing any contaminant into underground sources of drinking water, where the presence of that contaminant may cause a violation of this Article or may adversely affect the health of persons.
- C. Injection wells regulated under this Article are categorized into six classes based on characteristics of the injection well activity. Owners or operators of injection wells regulated under all six classes must

be authorized by permit (all classes) or rule (Class V only if no permit is required) pursuant to the requirements of this Article. This Article is organized as follows:

1. Part A includes regulatory objectives, general applicability characteristics, and the basic program structure.
 2. Part B includes the general program elements and conditions that apply to all injection activity regulated under this Article.
 3. Part C includes the permit applications, individual permits, emergency permits, fact sheets, public notice and public comment period, permit transfers, and modification and termination of permits.
 4. Part D includes the specific conditions, or types of conditions, that must, be included in all permits.
 5. Part E includes Class I injection well requirements, such as construction; operation; monitoring; reporting; and other regulatory duties.
 6. Part F includes Class II injection well requirements, such as construction; operation; monitoring; reporting; and other regulatory duties.
 7. Part G includes Class III injection well requirements, such as construction; operation; monitoring; reporting; and other regulatory duties.
 8. Part H details the state law prohibition for any Class IV well, which inject hazardous or radioactive waste directly into an underground source of drinking water.
 9. Part I includes Class V injection well requirements, such as authorizations by rule; individual permits; inventory submittals; and other regulatory duties.
 10. Part J includes Class VI injection well requirements, such as applicability; financial responsibility; siting; construction; operation; monitoring; reporting; post-injection care and closure; and other regulatory duties.
- D. The Director may identify aquifers and portions of aquifers which are actual or potential sources of drinking water, to assist in carrying out his or her duty pursuant to this Article. Any aquifer meeting the criteria under R18-9-A602(SSS) shall be protected as an underground source of drinking water, even if it has not been explicitly identified pursuant to this Section.
- E. The Director may also designate exempted aquifers using the criteria in R18-9-A606. Such aquifers are those which may qualify as underground sources of drinking water to be protected, but that have no real potential to be used as drinking water sources. No aquifer is an exempted aquifer until it has been affirmatively designated pursuant to R18-9-A605 and approved by EPA pursuant to 40 CFR §145.32.

[144.3;146.3] R18-9-A602: Definitions

- A. “Abandoned well” means a *well* whose use has been permanently discontinued or which is in a state of disrepair such that it cannot be used for its intended purpose or for observation purposes.
- B. “Administrator” means the Administrator of the United States Environmental Protection Agency (EPA), or an authorized representative.
- C. “Application” means the ADEQ prescribed method for applying for a *permit*, including any additions, revisions or modifications to the forms.
- D. “Appropriate Act and regulations” means the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA); or Safe Drinking Water Act (SDWA), whichever is applicable; and applicable regulations promulgated under those statutes.
- E. “Aquifer” means 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.

- F. “Area of review” means the area surrounding an *injection well* described according to the criteria set forth in R18-9-B612 146.6 or in the case of an area permit, the *project* area plus a circumscribing area the width of which is either 1/4 of a mile or a number calculated according to the criteria set forth in R18-9-B612 146.6.
- G. “Arizona UIC Memorandum of Understanding” means the agreement between the *Administrator* and the *Director* that coordinates *EPA* and *ADEQ* activities, responsibilities, and programs under the *Arizona UIC Program*.
- H. “Arizona UIC Program” means the UIC program administered by the *Director* and approved by *EPA* according to *SDWA* Sections 1422.
- I. “Casing” means a pipe or tubing of appropriate material, of varying diameter and weight, lowered into a borehole during or after drilling to support the sides of the hole and prevent the walls from caving; to prevent loss of *drilling mud* into porous ground; or to prevent water, gas, or other *fluid* from entering or leaving the hole.
- J. “Catastrophic collapse” means the sudden and utter failure of overlying *strata* caused by removal of underlying materials.
- K. “Cementing” means the operation whereby a cement slurry is pumped into a drilled hole and/or forced behind the *casing*.
- L. “Cesspool” means a *drywell* that receives untreated *sanitary waste* containing human excreta, and which sometimes has an open bottom and/or perforated sides.
- M. “Confining bed” means a body of impermeable or distinctly less permeable material stratigraphically adjacent to one or more *aquifers*.
- N. “Confining zone” means a geological *formation*, group of formations, or Parts of a formation that is capable of limiting fluid movement above an injection zone.
- O. “Contaminant” means any physical, chemical, biological, or radiological substance or matter in water.
- P. “Conventional mine” means an open pit or underground excavation for the production of minerals.
- Q. “Director” means the Director of the Arizona Department of Environmental Quality or the Director’s designee.
- R. “Disposal well” means a *well* that is used for the disposal of waste into a subsurface *stratum*.
- S. “Draft permit” means a document prepared under R18-9-C619 124.6 indicating the *Director's* tentative decision to issue, renew, modify, revoke and reissue, or terminate a *permit*. A notice of intent to terminate a *permit*, and a notice of intent to deny a *permit*, as discussed in R18-9-C632 124.5 are types of *draft permits*. A denial of a request for modification, revocation and reissuance, or termination, as discussed in R18-9-C632 124.5 is not a *draft permit*.
- T. “Drilling mud” means a heavy suspension used in drilling an *injection well*, introduced down the drill pipe and through the drill bit.
- U. “Drywell” means 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*.
- V. “Effective date of the Arizona UIC Program” means the date that the *Arizona UIC Program* is approved or established by the *Administrator*.
- W. “Environmental Protection Agency” or “EPA” means the United States Environmental Protection Agency.
- X. “Emergency permit” means a UIC *permit* issued in accordance with R18-9-C626 144.34.
- Y. “Exempted aquifer” means an *aquifer* or its portion that meets the criteria in the definition of *underground source of drinking water* but which has been exempted according to the procedures in R18-9-A605 144.7.

- Z. “Existing injection well” means an *injection well* other than a *new injection well*.
- AA. “Experimental technology” means a technology which has not been proven feasible under the conditions in which it is being tested.
- BB. “Facility” or “activity” means any UIC *injection well* subject to regulation under this Article.
- CC. “Fault” means a surface or zone of rock fracture along which there has been displacement.
- DD. “Flow rate” means the volume per time unit given the flow of gases or other *fluid* substance which emerges from an orifice, pump, turbine, or passes along a conduit or channel.
- EE. “Fluid” means any material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.
- FF. “Formation” means a body of consolidated or unconsolidated 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.
- GG. “Formation fluid” means *fluid* present in a *formation* under natural conditions as opposed to introduced *fluids*, such as *drilling mud*.
- HH. “Generator” means any person, by site location, whose act or process produces hazardous waste identified or listed in AAC Title 18, Chapter 8 (Hazardous Waste Management).
- II. “Geologic sequestration” means the long-term containment of a gaseous, liquid, or supercritical *carbon dioxide stream* in subsurface *geologic formations*. This term does not apply to carbon dioxide capture or transport.
- JJ. “Ground water” means water below the land surface in a zone of saturation.
- KK. “Hazardous waste” means a hazardous waste as defined in ARS 49-921 **40 CFR 261.3**.
- LL. “Improved sinkhole” means a naturally occurring karst depression or other natural crevice found in volcanic terrain and other geologic settings which have been modified by man for the purpose of directing and emplacing *fluids* into the subsurface.
- MM. “Indian lands” means *Indian country* as defined in 18 U.S.C. 1151.
- NN. “Indian Tribe” means any *Indian Tribe* having a Federally recognized governing body carrying out substantial governmental duties and powers over a defined area.
- OO. “Injection well” means a *well* into which *fluids* are being injected.
- PP. “Injection zone” means a geological *formation* group of formations, or Part of a formation receiving *fluids* through a *well*.
- QQ. “Lithology” means the description of rocks on the basis of their physical and chemical characteristics.
- RR. “Major facility” means any UIC *facility or activity* classified as such by the *Administrator* in conjunction with the Director.
- SS. “New injection wells” means an *injection well* which began injection after the *effective date of the Arizona UIC Program*.
- TT. “Owner” or “operator” means the *owner or operator* of any *facility or activity* subject to regulation under the *Arizona UIC program*.
- UU. “Packer” means a device lowered into a well to produce a fluid-tight seal.
- VV. “Permit” means an authorization issued by the *Director* pursuant to this Article that has been the subject of final agency action, including an area permit under R18-9-C625 **144.33** and an emergency permit under R18-9-C626 **144.34**.
- WW. “Person” means an individual, employee, officer, managing body, trust, firm, joint-stock company, consortium, public or private corporation, Partnership, association or state, a political subdivision of this state, a commission, the United States government or any federal facility, interstate body, Tribal agency, or other entity.

- XX. “Plugging” means 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*.
- YY. “Plugging record” means a systematic listing of permanent or temporary abandonment of water, oil, gas, test, exploration and waste *injection wells*, and may contain a well log, description of amounts and types of plugging material used, the method employed for *plugging*, a description of *formations* which are sealed and a graphic log of the well showing formation location, formation thickness, and location of plugging structures.
- ZZ. “Point of injection” means the last accessible sampling point prior to waste *fluids* being released into the subsurface environment through a Class V injection well. For example, the point of injection of a Class V septic system might be the distribution box-the last accessible sampling point before the waste fluids drain into the underlying soils. For a dry well, it is likely to be the well bore itself.
- AAA. “Pressure” means the total load or force per unit area acting on a surface.
- BBB. “Project” means a group of *wells* in a single operation.
- CCC. “Radioactive Waste” means any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR Part 20, appendix B, table II, column 2.
- DDD. “RCRA” means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Pub. L. 94-580, as amended by Pub. L. 95-609, Pub. L. 96-510, 42 U.S.C. 6901 et seq.).
- EEE. “Sanitary waste” means liquid or solid wastes 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. Sources of these wastes may include single or multiple residences, hotels and motels, restaurants, bunkhouses, schools, ranger stations, crew quarters, guard stations, campgrounds, picnic grounds, day-use recreation areas, other commercial facilities, and industrial facilities provided the waste is not mixed with industrial waste.
- FFF. “Schedule of compliance” means a schedule of remedial measures included in a *permit* including an enforceable sequence of interim requirements leading to compliance with the *appropriate Act and regulations*.
- GGG. “Safe Drinking Water Act” or “SDWA” means the Safe Drinking Water Act (Pub. L. 93-523, as amended; 42 U.S.C. 300f et seq.).
- HHH. “Septic system” means a *well* that is used to emplace *sanitary waste* below the surface and is typically comprised of a septic tank and *subsurface fluid* distribution system or disposal system.
- III. “Site” means the land or water area where any *facility* or *activity* is physically located or conducted, including adjacent land used in connection with the *facility* or *activity*.
- JJJ. “Stratum” means a single sedimentary bed or layer, or series of layers that consists of generally the same kind of rock material regardless of thickness. The plural of *stratum* is strata.
- KKK. “Subsidence” means the lowering of the natural land surface in response to earth movements; lowering fluid pressures; removal of underlying support material by mining or solution of solids, either artificially or from natural causes; compaction due to wetting; oxidation of organic matter in soils; or added load on the land surface.
- LLL. “Subsurface fluid distribution system” means an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute *fluids* below the surface of the ground.
- MMM. “Surface casing” means the first string of *well casing* to be installed in the *well*.

- NNN. "Total dissolved solids" or "TDS" means the total dissolved (filterable) solids as determined by use of the method specified in AAC R9-14-610 or R9-14-611 40 CFR Part 136.
- OOO. "Transferee" means the *owner* or *operator* receiving ownership and/or operational control of the *well*.
- PPP. "Transferor" means the *owner* or *operator* transferring ownership and/or operational control of the *well*.
- QQQ. "Underground Injection Control" or "UIC" means the Underground Injection Control program under Part C of the Safe Drinking Water Act, including the *Arizona UIC Program*.
- RRR. "Underground injection" means a *well injection*.
- SSS. "Underground source of drinking water" or "USDW" means an *aquifer* or its portion that:
 1. which supplies any public water system; or
 2. which contains sufficient quantity of ground water to supply a public water system; and
 1. currently supplies drinking water for human consumption; or
 2. contains fewer than 10,000 mg/l total dissolved solids; and
 3. which is not an exempted aquifer.
- TTT. "Well" means a bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or a dug hole whose depth is greater than the largest surface dimension; or, an improved sinkhole; or a *subsurface fluid distribution system*.
- UUU. "Well injection" means the subsurface emplacement of *fluids* through a *well*.
- VVV. "Well plug" means a watertight and gastight seal installed in a borehole or *well* to prevent movement of *fluids*.
- WWW. "Well stimulation" means 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 wastewater to move more readily into the *formation* and includes surging, jetting, blasting, acidizing, or hydraulic fracturing.
- XXX. "Well monitoring" means the measurement, by on-site instruments or laboratory methods, of the quality of water in a *well*.

[144.5] R18-9-A603: Confidentiality of Information

- A. In accordance with ARS 49-205, any information submitted to the Director pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, the Director may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in ARS 49-205 (Availability of information to the public).
- B. Claims of confidentiality for the following information will be denied:
 1. The name and address of any permit applicant or permittee.
 2. Information which deals with the existence, absence, or level of contaminants in drinking water.

[144.6; 146.5] R18-9-A604: Classifications of Wells

- A. Class I wells are industrial and municipal disposal wells that inject fluids beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking

- water. Wells injecting hazardous or radioactive waste below the lowermost formation containing an underground source of drinking water within one-quarter mile of the well bore are strictly prohibited.
- B. Class II wells are wells that injects fluids:
1. That are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral Part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
 2. For enhanced recovery of oil or natural gas.
 3. For storage of hydrocarbons which are liquid at standard temperatures and pressure.
- C. Class III wells are injection wells used for the extraction of minerals, including:
1. Sulfur mining by the Frasch process.
 2. In-situ production of uranium or other metals from those ore bodies not conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V.
 3. Solution mining of salts or potash.
- D. Class IV wells inject hazardous or radioactive fluids into or above a formation with an USDW located within one-quarter mile of the well are prohibited under this Article. Wells used to inject hazardous waste-contaminated ground water that is of acceptable quality to aid remediation and is being reinjected into the same formation from which it was drawn shall not be prohibited by this Section if such injection is approved by the Director pursuant to provisions for cleanup of releases consistent with federal regulations under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), pursuant to requirements and provisions under RCRA, or other remedial actions that have been reviewed and approved by the appropriate governmental authority and taken pursuant to the applicable state laws.
- E. Class V wells are injection wells not included in Class I, II, III, IV, or VI. Class V wells include but are not limited to:
1. Air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling in a heat pump.
 2. Cesspools including multiple dwelling, community or regional cesspools, or other devices that receive wastes which have an open bottom and sometimes have perforated sides. The UIC requirements do not apply to single family residential cesspools nor to non-residential cesspools which receive solely sanitary wastes and have the capacity to serve fewer than 20 persons a day.
 3. Cooling water return flow wells used to inject water previously used for cooling.
 4. Drainage wells used to drain surface fluid, primarily storm runoff, into a subsurface formation.
 5. Dry wells used for the injection of wastes into a subsurface formation.
 6. Recharge wells used to replenish the water in an aquifer.
 7. Salt water intrusion barrier wells used to inject water into a fresh water aquifer to prevent the intrusion of salt water into the fresh water.
 8. Sand backfill and other backfill wells used to inject a mixture of water and sand, mill tailings or other solids into mined out portions of subsurface mines, except for radioactive wastes.
 9. Septic system wells used to inject the waste or effluent from a multiple dwelling, business establishment, community or regional business establishment septic tank. Except for single-family residential septic system wells or non-residential septic system wells used solely for

the disposal of sanitary waste with the capacity to serve fewer than 20 persons a day or a design capacity of less than 3,000 gallons per day.

10. Subsidence control wells, other than those used in oil or natural gas production, that inject fluids into a non-oil or gas producing zone to reduce or eliminate subsidence associated with freshwater overdraft.
11. Injection wells associated with the recovery of geothermal energy for heating, aquaculture, and production of electric power.
12. Wells used for solution mining of conventional mines such as stopes leaching.
13. Wells used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts.
14. Injection wells used in experimental technologies.
15. Injection wells used for in situ recovery of lignite, coal, tar sands, and oil shale.

F. Class VI well are wells that are:

1. not experimental in nature that are used for geologic sequestration of carbon dioxide beneath the lowermost formation containing a USDW;
2. wells used for geologic sequestration of carbon dioxide that have been granted a waiver of the injection depth requirements pursuant to requirements at R18-9-J672 146.95; or
3. wells used for geologic sequestration of carbon dioxide that have received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to R18-9-A605 146.4 of this Chapter and R18-9-A604 144.7.

[144.7] R18-9-A605: Identification of Underground Sources of Drinking Water and Exempt Aquifers

- A. The Director may identify, by narrative description, illustration, maps, or other means, and shall protect as underground sources of drinking water, all aquifers and Parts of aquifers that meet the definition of underground source of drinking water in R18-9-A602(SSS) 144.3, except to the extent there is an applicable aquifer exemption under Subsection (B) of this Section or an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration under Subsection (B) of this Section. Other than EPA-approved aquifer exemption expansions that meet R18-9-A606(A)(2) 40 CFR 146.4(b), new aquifer exemptions shall not be issued for Class VI injection wells. Even if an aquifer has not been specifically identified by the Director, it is an underground source of drinking water if it meets the definition under R18-9-A602(SSS) 144.3.
- B. Aquifer exemptions requirements:
 1. The Director may identify, by narrative description, illustrations, maps, or other means, and describe in geographic and/or geometric terms, such as vertical and lateral limits and gradient, that are clear and definite, all aquifers or Parts thereof that the Director proposes to designate as exempt aquifer using criteria in R18-9-A606 146.4.
 2. No designation of an exempted aquifer submitted as Part of Arizona's UIC program shall be final until approved by EPA as Part of the Arizona UIC Program. No designation of an expansion to the areal extent of a Class II enhanced oil recovery or enhanced gas recovery aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration shall be final until approved by the EPA as a substantial revision of the Arizona UIC Program in accordance with 40 CFR 145.32.

3. Subsequent to the program approval or promulgation, the Director may, after notice and opportunity for public hearing, identify additional exempted aquifers. Exemption of aquifers identified:
 - a. under R18-9-A606(A)(2) 146.4(b) shall be treated as a program revision under 40 CFR 145.32;
 - b. under R18-9-A606(A)(3) 146.4(c) shall become final if the Director submits the exemption in writing to the Administrator and the Administrator has not disapproved the designation within 45 days. Any disapproval by the Administrator shall state the reasons and shall constitute final agency action for purposes of judicial review.

C. Additional aquifer exemption requirements:

1. For Class III wells, the Director shall require an applicant for a permit which necessitates an aquifer exemption under R18-9-A606(A)(2)(a) 146.4(b)(1) to furnish the data necessary to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing. Information contained in the mining plan for the proposed project, such as a map and general description of the mining zone, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining method.
2. For Class II wells, a demonstration of commercial producibility shall be made as follows:
 - a. For a Class II well to be used for enhanced oil recovery processes in a field or project containing aquifers from which hydrocarbons were previously produced, commercial producibility shall be presumed by the Director upon a demonstration by the applicant of historical production having occurred in the project area or field.
 - b. For Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced, information such as logs, core data, formation description, formation depth, formation thickness and formation parameters such as permeability and porosity shall be considered by the Director, to the extent such information is available.

D. Owners or operators of Class II enhanced oil recovery or enhanced gas recovery wells may request that the Director approve an expansion to the areal extent of an aquifer exemption already in place for a Class II enhanced oil recovery or enhanced gas recovery well for the exclusive purpose of Class VI injection for geologic sequestration. Such requests must be treated as a substantial program revision to an approved State UIC program under 40 CFR 145.32 and will not be final until approved by EPA.

1. The owner or operator of a Class II enhanced oil recovery or enhanced gas recovery well that requests an expansion of the areal extent of an existing aquifer exemption for the exclusive purpose of Class VI injection for geologic sequestration must define, by narrative description, illustrations, maps or other means, and describe in geographic and/or geometric terms, such as vertical and lateral limits and gradient, that are clear and definite, all aquifers or Parts thereof that are requested to be designated as exempted using the criteria in R18-9-A606 146.4.
2. In evaluating a request to expand the areal extent of an aquifer exemption of a Class II enhanced oil recovery or enhanced gas recovery well for the purpose of Class VI injection, the Director must determine that the request meets the criteria for exemptions in R18-9-A606 146.4. In making the determination, the Director shall consider:
 - a. current and potential future use of the USDWs to be exempted as drinking water resources;

- b. the predicted extent of the injected carbon dioxide plume, and any mobilized fluids that may result in degradation of water quality, over the lifetime of the geologic sequestration project, as informed by computational modeling performed pursuant to R18-9-J661(C)(1) 146.84(c)(1), in order to ensure that the proposed injection operation will not at any time endanger USDWs including non-exempted portions of the injection formation;
- c. whether the areal extent of the expanded aquifer exemption is of sufficient size to account for any possible revisions to the computational model during reevaluation of the area of review, pursuant to R18-9-J661(E) 146.84(e); and
- d. any information submitted to support a waiver request made by the owner or operator under R18-9-J672 146.95, if appropriate.

[146.4] R18-9-A606: Criteria for Exempted Aquifers

- A. An aquifer or a portion thereof which meets the criteria for an “underground source of drinking water” in R18-9-A602(SSS) 146.3 may be determined under R18-9-A605 144.7 to be an “exempted aquifer” for Class I-V wells if it meets the criteria in Subsections (A)(1) through (A)(3) of this Section. Class VI wells must meet the criteria under Subsection (A)(4) of this Section.
 - 1. It does not currently serve as a source of drinking water; and
 - 2. It cannot now and will not in the future serve as a source of drinking water because:
 - a. It is mineral hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as Part of a permit application for a Class II or Class III operation to contain minerals or hydrocarbons that consider their quantity and location are expected to be commercially producible;
 - b. It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technically impractical;
 - c. It is so contaminated that it would be economically or technologically impractical to render that fit for human consumption; or
 - d. It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or
 - 3. The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.
 - 4. The areal extent of an aquifer for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under R18-9-A605(D) 144.7(d) if it meets the following criteria:
 - a. it does not currently serve as a source of drinking water; and
 - b. the total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and
 - c. it is not reasonably expected to supply a public water system.

Part B: General Program Requirements

[144.11] R18-9-B607: Prohibition of Unauthorized Injection

Any underground injection, except into a well authorized by rule or authorized by permit under the Arizona UIC program, is prohibited. The construction of any well required to have a permit is prohibited until the permit has been issued.

[144.12] R18-9-B608: Prohibition of Movement of Fluid into Underground Sources of Drinking Water

- A. No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under this Article, as shown in Table 1, or may otherwise adversely affect the health of persons. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met.
- B. For Class I, II, III, and VI wells, if any water quality monitoring of an underground source of drinking water indicates the movement of any contaminant into the underground source of drinking water, except as authorized under this Article, the Director shall prescribe such additional requirements for construction, corrective action, operation, monitoring, or reporting (including closure of the injection well) as are necessary to prevent such movement. In the case of wells authorized by permit, these additional requirements shall be imposed by modifying the permit in accordance with R18-9-C633 144.39, or the permit may be terminated under R18-9-C635 144.40 if cause exists, or appropriate enforcement action may be taken if the permit has been violated. In the case of Class V wells authorized by rule see R18-9-I652 through R18-9-I657 in Part I of this Article.
- C. For Class V wells, if at any time the Director learns that a Class V well may cause a violation of primary drinking water regulations under this Article, he or she shall:
 - 1. require the injector to obtain an individual permit;
 - 2. order the injector to take such actions (including, where required, closure of the injection well) as may be necessary to prevent the violation; or
 - 3. take enforcement action.
- D. Whenever the Director learns that a Class V well may be otherwise adversely affecting the health of persons, he or she may prescribe such actions as may be necessary to prevent the adverse effect, including any action authorized under Subsection (C) of this Section.
- E. Notwithstanding any other provision of this Section, the Director may take emergency action upon receipt of information that a contaminant which is present in or likely to enter a public water system or underground source of drinking water may present an imminent and substantial endangerment to the health of persons.

[144.13] R18-9-B609: Prohibition of Class IV Wells

- A. The following are prohibited, except as provided in Subsection (C) of this Section:
 - 1. The construction of any Class IV well.
 - 2. The operation or maintenance of any Class IV well not in operation prior to July 18, 1980.
 - 3. The operation or maintenance of any Class IV well that was in operation prior to July 18, 1980, after six months following the effective date of Arizona's approved UIC Program.
 - 4. Any increase in the amount of hazardous waste or change in the type of hazardous waste injected into a Class IV well.
- B. The owner or operator of a Class IV well shall comply with the requirements of R18-9-H651 144.23 regarding closure of Class IV wells.
- C. Wells used to inject contaminated groundwater that has been treated and is being reinjected into the same formation that it was drawn are not prohibited by this Section if such injection is approved by EPA or the State of Arizona pursuant to provisions for cleanup of releases under CERCLA, pursuant to requirements and provisions under RCRA, or other remedial actions that have been reviewed and approved by the appropriate governmental authority and taken pursuant to the applicable state laws.

[144.16] R18-9-B610: Waiver of Requirement by Director

- A. When injection does not occur into, through, or above an underground source of drinking water, the Director may authorize a well or project with less stringent requirements for area of review, construction, mechanical integrity, operation, monitoring, and reporting than required under this Article or R18-9-D638 40CFR Part 146 or 144.52 to the extent that reduction in requirements will not result in an increased risk of movement of fluids into an underground source of drinking water.
- B. When injection occurs through or above an underground source of drinking water, but the radius of endangering influence when computed under R18-9-B612(A) 146.6(a) is smaller or equal to the radius of the well, the Director may authorize a well or project with less stringent requirements for operation, monitoring, and reporting than required under 40 CFR Part 146 or R18-9-D638 144.52 to the extent that a reduction in requirements will not result in an increased risk of movement of fluids into an underground source of drinking water.
- C. When reducing requirements under this Section, the Director shall prepare a fact sheet under R18-9-C620 124.8 explaining the reasons for the action.

[144.17] R18-9-B611: Records

The Director may require, by written notice on a selective well-by-well basis, an owner or operator of an injection well to establish and maintain records, make reports, conduct monitoring, and provide other information as is deemed necessary to determine whether the owner or operator has acted or is acting in compliance with this Article and Part C of the SDWA or its implementing regulations.

[146.6] R18-9-B612: Area of Review

- A. The area of review for each injection well or each field, project or area of the State shall be determined according to this Section. The Director may solicit input from the owners or operators of injection wells within the State as to which method is most appropriate for each geographic area or field.
- B. Where the area of review is determined according to the zone of endangering influence:
 - 1. The zone of endangering influence shall be:
 - a. In the case of application(s) for well permit(s) under R18-9-C616 144.31 that area the radius of which is the lateral distance in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water; or
 - b. In the case of an application for an area permit under R18-9-C625 144.33, the project area plus a circumscribing area the width of which is the lateral distance from the perimeter of the project area, in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water.
 - 2. Computation of the zone of endangering influence may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the injection well or pattern. The following modified Theis equation illustrates one form which the mathematical model may take.

$$r = \left(\frac{2.25KHt}{S10^x} \right)^{1/2}$$

where:

$$X = \frac{4\pi KH(h_w - h_{bo} \times S_p G_b)}{2.3Q}$$

r = Radius of endangering influence from injection well (length)

K = Hydraulic conductivity of the injection zone (length/time)

H = Thickness of the injection zone (length)

t = Time of injection (time)

S = Storage coefficient (dimensionless)

Q = Injection rate (volume/time)

h_{bo} = Observed original hydrostatic head of injection zone (length) measured from the base of the lowermost underground source of drinking water

h_w = Hydrostatic head of underground source of drinking water (length) measured from the base of the lowest underground source of drinking water

$S_p G_b$ = Specific gravity of fluid in the injection zone (dimensionless)

π = 3.142 (dimensionless)

The above equation is based on the following assumptions:

1. The injection zone is homogenous and isotropic;
2. The injection zone has infinite area extent;
3. The injection well penetrates the entire thickness of the injection zone;
4. The well diameter is infinitesimal compared to "r" when injection time is longer than a few minutes; and
5. The emplacement of fluid into the injection zone creates instantaneous increase in pressure.

C. Where Fixed Radius is used, the following shall apply:

1. In the case of application(s) for well permit(s) under R18-9-C616 144.31 a fixed radius around the well of not less than one-quarter mile may be used.
2. In the case of an application for an area permit under R18-9-C625 144.33, a fixed radius width of not less than one-quarter mile for circumscribing area may be used.
3. In determining the fixed radius, the following factors shall be taken into consideration: Chemistry of injected and formation fluids; hydrogeology; population and ground-water use and dependence; and historical practices in the area.

D. If the area of review is determined by a mathematical model pursuant to Subsections (B) of this Section, the permissible radius is the result of such calculation even if it is less than one-fourth mile.

[146.8] R18-9-B613: Mechanical Integrity

A. An injection well has mechanical integrity if:

1. there is no significant leak in the casing, tubing or packer; and
2. there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore.

B. One of the following methods must be used to evaluate the absence of significant leaks under Subsection (A)(1) of this Section:

1. following an initial pressure test, monitoring of the tubing-casing annulus pressure with sufficient frequency to be representative, as determined by the Director, while maintaining an annulus pressure different from atmospheric pressure measured at the surface;
2. pressure test with liquid or gas; or
3. records of monitoring showing the absence of significant changes in the relationship between injection pressure and injection flow rate for the following Class II enhanced recovery wells:
 - a. existing wells completed without a packer provided that a pressure test has been performed and the data is available and provided further that one pressure test shall be performed at a time when the well is shut down and if the running of such a test will not cause further loss of significant amounts of oil or gas; or
 - b. existing wells constructed without a long string casing, but with surface casing which terminates at the base of fresh water provided that local geological and

hydrological features allow such construction and provided further that the annular space shall be visually inspected. For these wells, the Director shall prescribe a monitoring program which will verify the absence of significant fluid movement from the injection zone into an USDW.

- C. One of the following methods must be used to determine the absence of significant fluid movement under Subsection (A)(2) of this Section:
1. the results of a temperature or noise log;
 2. for Class II only, cementing records demonstrating the presence of adequate cement to prevent such migration;
 3. for Class III wells where the nature of the casing precludes the use of the logging techniques prescribed at Subsection (C)(1) of this Section, cementing records demonstrating the presence of adequate cement to prevent such migration; or
 4. for Class III wells where the Director elects to rely on cementing records to demonstrate the absence of significant fluid movement, the monitoring program prescribed by R18-9-G649(B) 146.33(b) shall be designed to verify the absence of significant fluid movement.
- D. The Director may allow the use of a test to demonstrate mechanical integrity other than those listed in Subsections (B) and (C)(2) of this Section with the written approval of the Administrator.
- E. In conducting and evaluating the tests enumerated in this Section or others to be allowed by the Director, the owner or operator and the Director shall apply methods and standards generally accepted in the industry. When the owner or operator reports the results of mechanical integrity tests to the Director, he shall include a description of the test(s) and the method(s) used. In making his/her evaluation, the Director shall review monitoring and other test data submitted since the previous evaluation.
- F. The Director may require additional or alternative tests if the results presented by the owner or operator under Subsection (E) of this Section 146.8(e) are not satisfactory to the Director to demonstrate that there is no movement of fluid into or between USDWs resulting from the injection activity.

[146.10] R18-9-B614: Plugging and Abandoning Class I, II, III, IV, and V Wells

- A. Requirements for Class I, II and III wells.
1. Prior to abandoning Class I, II and III wells, the well shall be plugged with cement in a manner which will not allow the movement of fluids either into or between underground sources of drinking water. The Director may allow Class III wells to use other plugging materials if the Director is satisfied that such materials will prevent movement of fluids into or between underground sources of drinking water.
 2. Placement of the cement plugs shall be accomplished by one of the following:
 - a. The Balance method;
 - b. The Dump Bailer method;
 - c. The Two-Plug method; or
 - d. An alternative method approved by the Director, which will reliably provide a comparable level of protection to underground sources of drinking water.
 3. The well to be abandoned shall be in a state of static equilibrium with the mud weight equalized top to bottom, either by circulating the mud in the well at least once or by a comparable method prescribed by the Director, prior to the placement of the cement plug(s).
 4. The plugging and abandonment plan required under R18-9-D637(A)(15) 40 CFR 144.51(o) and R18-9-D638(A)(5) 144.52(a)(6) shall, in the case of a Class III project which underlies or is in an aquifer which has been exempted under R18-9-A606 146.4, also demonstrate adequate protection of USDWs. The Director shall prescribe aquifer cleanup

and monitoring where he deems it necessary and feasible to insure adequate protection of USDWs.

- B. Requirements for Class IV wells. Prior to abandoning a Class IV well, the owner or operator shall close the well in accordance with R18-9-H651 144.23(b).
- C. Requirements for Class V wells.
 - 1. Prior to abandoning a Class V well, the owner or operator shall close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under Table 1 of this Article 40 CFR Part 141 or may otherwise adversely affect the health of persons.
 - 2. The owner or operator shall dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements.

[144.19] R18-9-B615: Transitioning from Class II to Class VI Injection Well

- A. Owners and operators that are injecting carbon dioxide for the primary purpose of long-term storage into an oil and gas reservoir must apply for and obtain a Class VI geologic sequestration permit when there is an increased risk to the USDWs compared to Class II operations. In determining if there is an increased risk to USDWs, the owner or operator must consider the factors specified in Subsection (B) of this Section 144.19(b).
- B. The Director shall determine when there is an increased risk to USDWs compared to Class II operations and a Class VI permit is required. In order to make this determination the Director shall consider the following:
 - 1. increase in reservoir pressure within the injection zone(s);
 - 2. increase in carbon dioxide injection rates;
 - 3. decrease in reservoir production rates;
 - 4. distance between the injection zone(s) and USDWs;
 - 5. suitability of the Class II area of review delineation;
 - 6. quality of abandoned well plugs within the area of review;
 - 7. the owner's or operator's plan for recovery of carbon dioxide at the cessation of injection;
 - 8. the source and properties of injected carbon dioxide; and
 - 9. any additional site-specific factors as determined by the Director.

Part C: Authorization by Permit for Underground Injection

[144.31] R18-9-C616: Individual Permits; Application for Individual Permits

- A. Unless an underground injection well is authorized by rule under R18-9-I652, all injection activities including construction of an injection well are prohibited until the owner or operator is authorized by permit. Authorization by rule for a well or project that has submitted a permit application terminates for the well or project upon the effective date of the permit. Procedures for applications, issuance, and administration of emergency permits are found exclusively under R18-9-C626 144.34.
- B. When a facility or activity is owned by one person but is operated by another person, it is the operator's duty to obtain a permit.
- C. Any person who performs or proposes an underground injection for which a permit is or will be required shall submit an application to the Director in accordance with the Arizona UIC program as follows:

1. For existing wells, as expeditiously as practicable and in accordance with the schedule in any program description under 40 CFR §145.23(f).
 2. For new injection wells, except new wells authorized by an existing area permit under R18-9-C625(C) 144.33(c), a reasonable time before construction is expected to begin.
- D. The Director shall not issue a permit before receiving a complete application for a permit except for emergency permits issued under R18-9-C626. An application for a permit is complete when the Director receives an application form and any supplemental information completed to his or her satisfaction. The completeness of any application for a permit shall be judged independently of the status of any other permit application or permit for the same facility or activity.
- E. All applicants for Class I, II, III, and V permits shall provide the following information to the Director, using the application form provided by the Director. Applicants for Class VI permits shall follow the criteria provided in R18-9-J659 146.82.
1. The activities conducted by the applicant that require it to obtain permits under RCRA, UIC, the Arizona Pollution Discharge Elimination system (AZPDES) program under the Clean Water Act, or the Prevention of Significant Deterioration (PSD) program under the Clean Air Act.
 2. Name, mailing address, and location of the facility for which the application is submitted.
 3. Up to four NAICS codes which best reflect the principal products or services provided by the facility.
 4. The operator's name, address, telephone number, ownership status, and status as Federal, State, private, public, or other entity.
 5. A listing of all permits or construction approvals received or applied for under any of the following programs:
 - a. Hazardous Waste Management program under RCRA.
 - b. UIC program under SDWA.
 - c. AZPDES program under CWA.
 - d. Prevention of Significant Deterioration (PSD) program under the Clean Air Act.
 - e. Nonattainment program under the Clean Air Act.
 - f. National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under the Clean Air Act.
 - g. Dredge and fill permits under Section 404 of CWA.
 - h. Other relevant environmental permits, including State permits.
 6. A topographic map (or other map if a topographic map is unavailable) extending one mile beyond the property boundaries of the source depicting the facility and each of its intake and discharge structures; each of its hazardous waste treatment, storage, or disposal facilities; each well where fluids from the facility are injected underground; and those wells, springs, and other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within a quarter mile of the facility property boundary.
 7. A brief description of the nature of the business.
 8. A plugging and abandonment plan that meets the requirements of R18-9-B614 146.10 and is acceptable to the Director.
- F. Applicants shall keep records of all data used to complete permit applications and any supplemental information submitted under this Section for a period of at least three years from the date the application is signed.

[124.3] R18-9-C617: Application for a Permit

- A. Any person requiring a permit under this Article shall complete, sign, and submit to the Director an application for each permit required.
- B. The Director shall not begin the processing of a permit until the applicant has fully complied with the application requirements for that permit.
- C. Permit applications must comply with the signature and certification requirements of R18-9-C618 144.32.

[144.32] R18-9-C618: Signatories

- A. All permit applications, except those submitted for Class II wells, shall be signed as follows:
 - 1. For a corporation: by a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means:
 - a. a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or
 - b. the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - 2. For a Partnership or sole proprietorship: by a general Partner or the proprietor, respectively; or
 - 3. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this Section, a principal executive officer of a Federal agency includes:
 - a. the chief executive officer of the agency; or
 - b. a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
- B. All reports required by permits, other information requested by the Director, and all permit applications submitted for Class II wells under R18-9-C616 144.31 shall be signed by a person described in Subsection (A) of this Section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - 1. the authorization is made in writing by a person described in Subsection (A) of this Section;
 - 2. the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility; and
 - 3. the written authorization is submitted to the Director.
- C. If an authorization under Subsection (B) of this Section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Subsection (B) of this Section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.
- D. Any person signing a document under Subsection (A) or (B) of this Section shall make the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am

aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[124.6; 124.9] R18-9-C619: Draft Permits

- A. Once an application is complete, the Director shall preliminarily decide whether to prepare a draft permit or deny the application.
- B. If the Director decides to prepare a draft permit, he or she shall prepare a draft permit that contains the following information:
 - 1. all conditions under R18-9-D637 144.51;
 - 2. all compliance schedules under R18-9-D639 144.53;
 - 3. all monitoring requirements under R18-9-D640 144.54;
 - 4. permit conditions under R18-9-D638 144.52; and
 - 5. a brief summary of the basis for the draft permit conditions, including references to applicable statutory or regulatory provisions and appropriate supporting references to the administrative record.
- C. All draft permits prepared under this Section shall be accompanied by a fact sheet pursuant to R18-9-C620 124.8, and shall be based on the administrative record, publicly noticed, and made available for comment. The Director shall give notice of opportunity for a public hearing, issue a final decision, and respond to comments.
- D. The provisions of all draft permit prepared under this Section shall be based on the administrative record when public notice is given after the effective date of regulations under this Article.
- E. For preparing the draft permit under this Section, the administrative record shall consist of:
 - 1. The application, if required, and any supporting data furnished by the applicant;
 - 2. The draft permit or notice of intent to deny the application or to terminate the permit;
 - 3. The fact sheet under R18-9-C620 124.8;
 - 4. All documents cited in the fact sheet; and
 - 5. Other documents contained in the supporting file for the draft permit.
- F. Material readily available at the issuing office or published material that is generally available, and that is included in the administrative record under Subsection (E) of this Section, need not be physically included with the rest of the record as long as it is specifically referred to in the fact sheet.

[124.8] R18-9-C620: Fact Sheet

- A. A fact sheet shall be prepared for every draft permit for a major UIC facility or activity, and for every draft permit that the Director finds is the subject of wide-spread public interest or raises major issues. The fact sheet shall briefly set forth the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit. The Director shall send the fact sheet to the applicant and, on request, to any other person.
- B. The fact sheet shall include, when applicable:
 - 1. A brief description of the type of facility or activity that is the subject of the draft permit.
 - 2. The type and quantity of wastes, fluids, or pollutants that are proposed to be or are being injected.
 - 3. A brief summary of the basis for the draft permit conditions including references to applicable statutory or regulatory provisions and appropriate supporting references to the administrative record.
 - 4. Reasons why any requested variance or alternatives to required standards do or do not appear justified.

5. A description of the procedures for reaching a final decision on the draft permit, including:
 - a. the beginning and ending dates of the comment period under R18-9-C621 124.10 and the address where comments will be received;
 - b. procedures for requesting a hearing and the nature of that hearing; and
 - c. any other procedures by which the public may Participate in the final decision.
6. The name and telephone number of a person to contact for additional information.

[124.10] R18-9-C621: Public Notice of Permit Actions and Public Comment Period

- A. The Director shall give public notice that the following actions have occurred:
 1. a draft permit that has been prepared under R18-9-C619(B) 124.6(d); and
 2. a hearing has been scheduled under R18-9-C623 124.12.
- B. Public notices may describe more than one permit or permit action.
- C. Public notice of the preparation of a draft permit required under Subsection (A) of this Section:
 1. shall allow at least 30 days for public comment; and
 2. shall be given at least 30 days before the hearing date.
- D. Public notice of activities described in Subsection (A) of this Section shall be given by the following methods:
 1. Newspaper publication in accordance with R18-1-401(A)(1).
 2. Delivery of a notice to any person otherwise entitled to receive notice under this Subsection may waive his or her rights to receive notice for any classes and categories of permits, including the following:
 - a. the applicant;
 - b. any other agency that the Director knows has issued or is required to issue a RCRA, CAA, NPDES, 404, sludge management permit, or ocean dumping permit under the Marine Research Protection and Sanctuaries Act for the same facility or activity, including EPA when the draft permit is prepared by the state;
 - c. federal and state agencies with jurisdiction over fish, shellfish, and wildlife resources and other coastal zone management plans, the Advisory Council on Historic Preservation, State Historic Preservation Officers, and any affected States, including Indian Tribes treated as States;
 - d. for Class I injection UIC permits only, the state and local oil and gas regulatory agencies and state agencies regulating mineral exploration and recovery;
 - e. persons on a mailing list developed by:
 - i. including those who request in writing to be on the list;
 - ii. soliciting persons for "area lists" from Participants in past permit proceedings in that area; and
 - iii. notifying the public of the opportunity to be put on the mailing list through periodic publication in the public press and in such publications as Regional and State funded newsletters, environmental bulletins, or State law journals.
 - f. to any unit of local government having jurisdiction over the area where the facility is proposed to be located, and to each State agency having an authority under State law with respect to the construction or operation of such facility; and
 - g. for Class VI injection well UIC permits, mailing or e-mailing a notice to State and local oil and gas regulatory agencies and State agencies regulating mineral exploration and recovery, the Director of the Public Water Supply Supervision program in the State, and all agencies that oversee injection wells in the State.
 3. Any other method reasonably calculated to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to elicit public Participation.
- E. All public notices issued under this Part shall contain the following minimum information:

1. name and address of the office processing the permit action for the notice being given;
 2. name and address of the permittee or permit applicant and, if different, of the facility or activity regulated by the permit;
 3. a brief description of the business conducted at the facility or activity described in the permit application or the draft permit;
 4. name, address, and telephone number of a person from whom interested persons may obtain further information, including copies of the draft permit or draft general permit, as the case may be, fact sheet, and the application;
 5. a brief description of the comment procedures required under R18-9-C622 124.11 and R18-9-C623 124.12 and the time and place of any hearing that will be held, including a statement of procedures to request a hearing and other procedures that the public may use to Participate in the final permit decision;
 6. the location of the administrative record, the time at which the record will remain open for public inspection, and a statement that all data submitted by the applicant is available as Part of the administrative record; and
 7. any additional information considered necessary or proper.
- F. In addition to the general public notice described in Subsection (E) of this Section, the public notice of hearing under R18-9-C623 124.12 shall contain the following information:
1. reference to the date of previous public notices relating to the permit;
 2. date, time, and place of the hearing; and
 3. a brief description of the nature and purpose of the hearing, including the applicable rules and procedures.
- G. In addition to the general public notice described in Subsection (E) of this Section, the Director shall deliver a copy of the fact sheet, permit application, and draft permit to all persons identified in Subsections (D)(1)(a), (D)(1)(b), and (D)(1)(c).

[124.11] R18-9-C622: Public Comments and Requests for Public Hearings

During the public comment period provided under R18-9-C621 124.10, any interested person may submit written comments on the draft permit and may request a public hearing, if no hearing has already been scheduled. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised in the hearing. All comments shall be considered in making the final decision and shall be answered as provided in R18-9-C624 124.17.

[124.12] R18-9-C623: Public Hearings

- A. The Director shall hold a public hearing whenever he or she finds, on the basis of a request, a significant degree of public interest in a draft permit(s).
- B. The Director may also hold a public hearing at his or her discretion such as when a hearing might clarify one or more issues involved in the permit decision. The Director may designate a presiding officer if a hearing is held.
- C. Public notice of the hearing shall be given as specified in R18-9-C621 124.10.
- D. Any person may submit oral or written statements and data concerning the draft permit. Reasonable limits may be set upon the time allowed for oral statements, and the submission of statements in writing may be required. The public comment period under R18-9-C621 124.10 shall automatically be extended to the close of any public hearing under this Section. The hearing officer may also extend the comment period by so stating at the hearing.

[124.17] R18-9-C624: Response to Comments

- A. At the time that any final permit is issued under R18-9-C628 124.15, the Director shall issue a response to comments. This response shall:
 - 1. specify which provisions, if any, of the draft permit have been changed in the final permit decision, and the reasons for the change; and
 - 2. briefly describe and respond to all significant comments on the draft permit raised during the public comment period, or during any hearing.
- B. Any document cited in the response to comments shall be included in the administrative record for the final permit decision under R18-9-C628 124.15. If new points are raised or new material supplied during the public comment period, ADEQ may document its response to those matters by adding new materials to the administrative record.
- C. The response to comments shall be available to the public.

[144.33] R18-9-C625: Area Permits

- A. The Director may issue a permit on an area basis, rather than for each well individually, provided that the permit is for injection wells:
 - 1. described and identified by location in permit application(s) if they are existing wells, except that the Director may accept a single description of wells with substantially the same characteristics;
 - 2. within the same well field, facility site, reservoir, project, or similar unit in located in Arizona;
 - 3. operated by a single owner or operator;
 - 4. used to inject fluids other than hazardous waste; and
 - 5. other than Class VI Wells.
- B. Area permits shall specify:
 - 1. the area within which underground injections are authorized; and
 - 2. the requirements for construction, monitoring, reporting, operation, and abandonment, for all wells authorized by the permit.
- C. The area permit may authorize the permittee to construct and operate, convert, or plug and abandon wells within the permit area provided:
 - 1. the permittee notifies the Director at such time as the permit requires;
 - 2. the additional well satisfies the criteria in Subsection (A) of this Section and meets the requirements specified in the permit under Subsection (B) of this Section; and
 - 3. the cumulative effects of drilling and operation of additional injection wells are considered by the Director during evaluation of the area permit application and are acceptable to the Director.
- D. If the Director determines any well that is constructed pursuant to Subsection (C) of this Section does not satisfy any of the requirements of Subsections (C)(1) and (2) of this Section the Director may modify the permit under R18-9-C633 144.39, terminate under R18-9-C635 144.40, or take enforcement action. If the Director determines that cumulative effects are unacceptable, the permit may be modified under R18-9-C633 144.39.

[144.34] R18-9-C626: Emergency Permits

- A. Notwithstanding any other provision of this Article, the Director may temporarily permit a specific underground injection if:

1. an imminent and substantial endangerment to the health of persons will result unless a temporary emergency permit is granted; or
 2. a substantial and irretrievable loss of oil or gas resources will occur unless a temporary emergency permit is granted to a Class II well; and
 - a. timely application for a permit could not practicably have been made; and
 - b. the injection will not result in the movement of fluids into underground sources of drinking water; or
 3. a substantial delay in production of oil or gas resources will occur unless a temporary emergency permit is granted to a new Class II well and the temporary authorization will not result in the movement of fluids into an underground source of drinking water.
- B. Requirements for issuance.
1. Any temporary permit under Subsection (A)(1) of this Section shall be for no longer term than required to prevent the hazard.
 2. Any temporary permit under Subsection (A)(2) of this Section shall be for no longer than 90 days, except that if a permit application has been submitted prior to the expiration of the 90-day period, the Director may extend the temporary permit until final action on the application.
 3. Any temporary permit under Subsection (A)(3) of this Section shall be issued only after a complete permit application has been submitted and shall be effective until final action on the application.
 4. Notice of any temporary permit under this Section shall be published in accordance with R18-9-C622 124.11 within ten days of the issuance of the permit.
 5. The temporary permit under this Section may be either oral or written. If oral, it must be followed within five calendar days by a written temporary emergency permit.
 6. The Director shall condition the temporary permit in any manner he or she determines is necessary to ensure that the injection will not result in the movement of fluids into an underground source of drinking water.

[144.35] R18-9-C627: Effect of a Permit

- A. Except for Class II and III wells, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with this Article and Part C of the SDWA. A permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in R18-9-C633 and R18-9-C635 144.39 and 144.40.
- B. The issuance of a permit does not convey any property rights of any sort, or any exclusive privilege.
- C. The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

[124.15] R18-9-C628: Issuance and Effective Date of Permit

After the close of the public comment period under R18-9-C621 124.10 on a draft permit, the Director shall issue a final permit decision. The Director shall notify the applicant and each person who has submitted written comments or requested notice of the final permit decision. This notice shall include reference to the procedures for appealing a decision on a UIC permit under R18-9-C636 124.19. For purposes of this Section, a final permit decision means a final decision to issue, deny, modify, revoke and reissue, or terminate a permit.

[144.36] R18-9-C629: Permit Duration

- A. Permits for Class I and Class V wells shall be effective for a fixed term not to exceed ten years. UIC permits for Class II and III wells shall be issued for a period up to the operating life of the facility. UIC permits for Class VI wells shall be issued for the operating life of the facility and the post-injection site care period. The Director shall review each issued Class II, III, and VI well UIC permit

- at least once every five years to determine whether it should be modified, revoked and reissued, terminated, or a minor modification made as provided in R18-9-C633 144.39.
- B. Except as provided in R18-9-C630 144.37, the term of a permit shall not be extended by modification beyond the maximum duration specified in this Section.
 - C. The Director may issue any permit for a duration that is less than the full allowable term under this Section.

[144.37] R18-9-C630: Continuation of Expiring Permits

- A. The conditions of an expiring permit continue in force under ARS 41-1092.11(A) until the effective date of a new permit if:
 - 1. the permittee has submitted a timely application that is a complete application for a new permit; and
 - 2. the Director, through no fault of the permittee, does not issue a new permit with an effective date on or before the expiration date of the prior permit.
- B. Permits continued under this Section remain fully effective and enforceable.
- C. When the permittee is not in compliance with the conditions of the expiring or expired permits the Director may choose to do any or all of the following:
 - 1. initiate enforcement action based upon the permit that has been continued;
 - 2. issue a notice of intent to deny the new permit. If the permit is denied, the owner or operator would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operating without a permit;
 - 3. issue a new permit under this Article Part 124 with appropriate conditions; or
 - 4. take other action as authorized under this Article.
- D. An EPA-issued permit does not continue in force beyond its time expiration date under Federal law if at that time a State is the permitting authority. Once approved by EPA, the Arizona UIC Program may continue either EPA or State-issued permits until the effective date of the new permits. Otherwise the facility or activity is operating without a permit from the time of expiration of the old permit to the effective date of the new permit issued by the State of Arizona.

[144.38] R18-9-C631: Permit Transfer

- A. Except as provided in Subsection (B) of this Section, a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued under R18-9-C633(B)(2) under §144.39(b)(2), or a minor modification made R18-9-C634(A)(4) under §144.41(d), to identify the new permittee and incorporate such other requirements as may be necessary under this Article the Safe Drinking Water Act.
- B. As an alternative to transfers under Subsection (A) of this Section, any UIC permit for a well not injecting hazardous waste or injecting carbon dioxide for geological sequestration may be automatically transferred to a new permittee if:
 - 1. the current permittee notifies the Director at least 30 days in advance of the proposed transfer date referred to in Subsection (B)(2) of this Section;
 - 2. the notice includes a written agreement between the existing and new permittees containing a specific date for transfer or permit responsibility, coverage, and liability between them, and the notice demonstrates that the financial responsibility requirements of R18-9-D638(A)(6) §144.52(a)(7) will be met by the new permittee; and
 - 3. the Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify or revoke and reissue the permit. A modification under this Section may

also be a minor modification under R18-9-C634 144.41. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Subsection (B)(2) of this Section.

[124.5] R18-9-C632: Modification; Revocation and Reissuance; or Termination of Permits

- A. Permits may only be modified or revoked and reissued pursuant to R18-9-C633 144.39 or terminated pursuant to R18-9-C635 144.40 either at the request of any interested person, including the permittee, or upon the Director's initiative. All requests shall be made in writing and shall contain facts or reasons supporting the request.
- B. If the Director decides the request is not justified, he or she shall send the requester a brief written response giving a reason for the decision. Denials of requests for modification, revocation and reissuance, or termination are not subject to public notice, comment, or hearings.
- C. If the Director preliminarily decides to modify or revoke and reissue a permit under R18-9-C633 144.39, he or she shall prepare a draft permit under R18-9-C619 124.6 incorporating the proposed changes. The Director may request additional information and, in the case of a modified permit, may require the submission of an updated application. The Director shall require the submission of a new application in the case of revoked and reissued permits.
- D. In a permit modification under this Section, only those conditions to be modified shall be reopened when a new draft permit is prepared. All other aspects of the existing permit shall remain in effect for the duration of the unmodified permit. When a permit is revoked and reissued under this Section, the entire permit is reopened just as if the permit had expired and was being reissued. During any revocation and reissuance proceeding the permittee shall comply with all conditions of the existing permit until a new final permit is reissued.
- E. Minor modifications pursuant to R18-9-C634 144.41 are not subject to the requirements of this Section.
- F. If the Director preliminarily decides to terminate under R18-9-C635 144.40 where the permittee objects, he or she shall issue a notice of intent to terminate. A notice of intent to terminate is a type of draft permit which follows the same procedures as any draft permit prepared pursuant to R18-9-C619 124.6.
- G. In the case of EPA-issued permits, a notice of intent to terminate or a complaint shall not be issued if the Administrator, the Director, and the permittee agree to termination in the course of transferring permit responsibility to the State pursuant to the Arizona UIC Memorandum of Understanding 40 CFR 145.25(b)(1).

[144.39] R18-9-C633: Modification; Revocation and Reissuance of Permits.

- A. When the Director receives any information (for example, inspects the facility, receives information submitted by the permittee as required in the permit, receives a request for modification or revocation and reissuance under R18-9-C632 124.5, or conducts a review of the permit file) he or she may determine whether or not one or more of the causes listed in Subsections (B) and (C) of this Section for modification or revocation and reissuance or both exist. If cause exists, the Director may modify or revoke and reissue the permit accordingly, subject to the limitations of Subsection (D) of this Section, and may request an updated application if necessary. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term. If cause does not exist under this Section or R18-9-C634 144.41, the Director shall not modify or revoke and reissue the permit. If a permit modification satisfies the criteria in R18-9-C634 144.41 for "minor modifications" the permit may be modified without a draft permit or public review. Otherwise, a draft permit must be prepared and other procedures under this Article Part 124 must be followed.

- B. For Class II, Class III or Class VI wells the following may be causes for revocation and reissuance as well as modification; and for all other wells the following may be cause for revocation or reissuance as well as modification when the permittee requests or agrees:
1. There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit.
 2. Permits other than for Class II and III wells may be modified during their terms for this cause only if the information was not available at the time of permit issuance, other than revised regulations, guidance, or test methods, and would have justified the application of different permit conditions at the time of issuance. For UIC area permits under R18-9-C625 144.33, this cause shall include any information indicating that cumulative effects on the environment are unacceptable.
 3. The standards or regulations on which the permit was based have been changed by promulgation of new or amended standards or regulations or by judicial decision after the permit was issued. Permits other than those for Class II, Class III or Class VI wells may be modified during their permit terms for this cause only as follows:
 - a. For promulgation of amended standards or regulations, when:
 - i. the permit condition requested to be modified was based on a regulation promulgated under this Article;
 - ii. ADEQ has revised, withdrawn, or modified that portion of the regulation on which the permit condition was based, and
 - iii. a permittee requests modification in accordance with R18-9-C632 124.5 within 90 days after ARIZONA ADMINISTRATIVE REGISTER notice of the ADEQ action on which the request is based.
 - b. For judicial decisions, a court of competent jurisdiction has remanded and stayed ADEQ promulgated regulations if the remand and stay concern that portion of the regulations on which the permit condition was based and a request is filed by the permittee in accordance with R18-9-C632 124.5 within 90 days of judicial remand.
 4. The Director determines good cause exists for modification of a compliance schedule, such as an act of God, strike, flood, or materials shortage or other events over which the permittee has little or no control and for which there is no reasonably available remedy. See also R18-9-C634 144.41 (minor modifications).
 5. Additionally, for Class VI wells, whenever the Director determines that permit changes are necessary based on:
 - a. area of review reevaluations under R18-9-J661(E)(1) 146.84(e)(1);
 - b. any amendments to the testing and monitoring plan under R18-9-J667(A)(10) 146.90(j);
 - c. any amendments to the injection well plugging plan under R18-9-J669(C) 146.92(c);
 - d. any amendments to the post-injection site care and site closure plan under R18-9-J670(A)(3) 146.93(a)(3);
 - e. any amendments to the emergency and remedial response plan under R18-9-J671(D) 146.94(d); or
 - f. a review of monitoring and/or testing results conducted in accordance with permit requirements.
- C. The following are causes to modify or, alternatively, revoke and reissue a permit:
1. Cause exists for termination under R18-9-C635 144.40, and the Director determines that modification or revocation and reissuance is appropriate.

2. The Director has received notification of a proposed transfer of the permit. A permit also may be modified to reflect a transfer after the effective date of an automatic transfer under R18-9-C631(B) 144.38(b) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new permittee.
 3. A determination that the waste being injected is a hazardous waste as defined in ARS 49-921 40 CFR §261.3 either because the definition has been revised, or because a previous determination has been changed.
- D. Suitability of the facility location will not be considered at the time of permit modification or revocation and reissuance unless new information or standards indicate that a threat to human health or the environment exists which was unknown at the time of permit issuance.

[144.41] R18-9-C634: Minor Modifications of Permits

- A. Upon the consent of the permittee, the Director may modify a permit to make the corrections or allowances for changes in the permitted activity listed in this Section, without following the procedures of this Article Part 124. Any permit modification not processed as a minor modification under this Section must be made for cause and with a draft permit and public notice as required by R18-9-C633 144.39. Minor modifications may only:
1. correct typographical errors;
 2. require more frequent monitoring or reporting by the permittee;
 3. change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement;
 4. allow for a change in ownership or operational control of a facility where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director;
 5. change quantities or types of fluids injected which are within the capacity of the facility as permitted and, in the judgment of the Director, would not interfere with the operation of the facility or its ability to meet conditions described in the permit and would not change its classification;
 6. change construction requirements approved by the Director pursuant to R18-9-D638(A)(1) 144.52(a)(1), provided that any such alteration shall comply with the requirements of this Article Part and Part 146;
 7. amend a plugging and abandonment plan that has been updated under R18-9-D638(A)(5) 144.52(a)(6); or
 8. amend a Class VI injection well testing an monitoring plan, plugging plan, post-injection site care and site closure plan, or emergency and remedial response plan where the modifications merely clarify or correct the plan, as determined by the Director.

[144.40] R18-9-C635: Termination of Permits

- A. The Director may terminate a permit during its term, or deny a permit renewal application for the following causes:
1. noncompliance by the permittee with any condition of the permit;
 2. the permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the permittee's misrepresentation of any relevant facts at any time;
- or

3. a determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.
- B. The Director shall follow the applicable procedures as required under R18-9-C632(F) in terminating any permit under this Section.

[124.19] R18-9-C636: Appeal of UIC Permits

All appeals of UIC permits shall be conducted in accordance with ARS § 49-323 and A.A.C.R2-17-101 *et.seq.*

Part D: Permit Conditions for Underground Injection

[144.51] R18-9-D637: Conditions Applicable to All Permits

- A. The following conditions apply to all UIC permits. All conditions applicable to all permits shall be incorporated into the permits issued under this Article, either expressly or referenced by specific citation. If incorporated by reference, a specific citation to this Section must be given in the permit.
1. The permittee must comply with all conditions of any permit issued under this Article. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and this Article and is grounds for enforcement action; for permit modification, revocation and reissuance, or termination; or for denial of a permit renewal application unless otherwise authorized in an emergency permit under R18-9-C626 144.34.
 2. If the permittee wishes to continue any activity regulated by permit under this Article after the expiration date of this permit, the permittee must apply for and obtain a new permit.
 3. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
 4. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.
 5. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control, and related appurtenances, that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.
 6. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
 7. This permit does not convey property rights of any sort, or any exclusive privilege.
 8. The permittee shall furnish to the Director, within a time specified, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

9. The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:
 - a. enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
 - b. have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 - c. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
 - d. sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by this Article **the SDWA**, any substances or parameters at any location.
10. Monitoring and records.
 - a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
 - b. The permittee shall retain records of all monitoring information, including the following:
 - i. calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report, or application. This period may be extended by request of the Director at any time; and
 - ii. the nature and composition of all injected fluids until three years after the completion of any plugging and abandonment procedures specified under R18-9-D638(A)(5) **144.52(a)(6)**, or under this Article **Part 146** as appropriate. The Director may require the owner or operator to deliver the records to the Director at the conclusion of the retention period.
 - c. Records of monitoring information shall include:
 - i. the date, exact place, and time of sampling or measurements;
 - ii. the individual(s) who performed the sampling or measurements;
 - iii. the date(s) analyses were performed;
 - iv. the individual(s) who performed the analyses;
 - v. the analytical techniques or methods used; and
 - vi. the results of such analyses.
 - d. Owners or operators of Class VI wells shall retain records as specified in Part J of this Article **subpart H of Part 146**, including R18-9-J661(G) **146.84(g)**, R18-9-J668(A)(6) **146.91(f)**, R18-9-J669(D) **146.92(d)**, R18-9-J670(F) **146.93(f)**, and R18-9-J670(H) **146.93(h)**.
11. All applications, reports, or information submitted to the Director shall be signed and certified as required under R18-9-C618 **144.32**.
12. Reporting requirements.
 - a. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility.
 - b. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.
 - c. This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit

to change the name of the permittee and incorporate such other requirements as may be necessary under this Article.

- d. Monitoring results shall be reported at the intervals specified in this permit.
- e. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 30 days following each schedule date.
- f. The permittee shall report any noncompliance that may endanger health or the environment within 24 hours, including:
 - i. any monitoring or other information that indicates any contaminant may cause an endangerment to a USDW; or
 - ii. any noncompliance with a permit condition or malfunction of the injection system that may cause fluid migration into or between USDWs.

Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

- g. The permittee shall report all instances of noncompliance not reported under Subsections (A)(12)(a), (A)(12)(d), (A)(12)(e), and (A)(12)(f) of this Section, at the time monitoring reports are submitted. The reports shall contain the information listed in Subsection (A)(12)(f) of this Section.
 - h. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.
13. Except for all new wells authorized by an area permit under R18-9-C625(C) 144.33(c), a new injection well may not commence injection until construction is complete; and:
- a. the permittee has submitted notice of completion of construction to the Director; and
 - b. either of the following apply:
 - i. the Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the permit; or
 - ii. the permittee has not received notice from the Director of his or her intent to inspect or otherwise review the new injection well within 13 days of the date of the notice under Subsection (A)(13)(a) of this Section, in which case prior inspection or review is waived and the permittee may commence injection. The Director shall include in his notice a reasonable time period in which he shall inspect the well.
14. The permittee shall notify the Director at such times as the permit requires before conversion or abandonment of the well or in the case of area permits before closure of the project.
15. A Class I, II, or III permit shall include, and a Class V permit may include, conditions that meet the requirements of R18-9-B614 146.10 to ensure that plugging and abandonment of the well will not allow the movement of fluids into or between USDWs. Where the plan meets the requirements of R18-9-B614 146.10, the Director shall incorporate the plan into the permit as a permit condition. Where the Director's review of an application indicates that the permittee's plan is inadequate, the Director may require the applicant to revise the plan, prescribe conditions meeting the requirements of this Subsection, or deny the permit. A Class VI permit shall include conditions that meet the requirements set forth in R18-9-J669

146.92. Where the plan meets the requirements of R18-9-J669 146.92, the Director shall incorporate it into the permit as a permit condition. For purposes of this Subsection, temporary or intermittent cessation of injection operations is not abandonment.

16. Within 60 days after plugging a well or at the time of the next quarterly report, whichever is less, the owner or operator shall submit a report to the Director. If the quarterly report is due less than 15 days before completion of plugging, then the report shall be submitted within 60 days. The report shall be certified as accurate by the person who performed the plugging operation. Such report shall consist of either:

- a. a statement that the well was plugged in accordance with the plan previously submitted to the Director; or
- b. where actual plugging differed from the plan previously submitted, and updated version of the plan on the form supplied by the Director, specifying the differences.

17. Duty to establish and maintain mechanical integrity.

- a. The owner or operator of a Class I, II, III or VI well permitted under this Article shall establish mechanical integrity prior to commencing injection or on a schedule determined by the Director. Thereafter the owner or operator of Class I, II, and III wells must maintain mechanical integrity as defined in R18-9-B613 146.8 and the owner or operator of Class VI wells must maintain mechanical integrity as defined in R18-9-J666 146.89.
- b. When the Director determines that a Class I, II, III or VI well lacks mechanical integrity pursuant to R18-9-B613 or R18-9-J666 146.8 or 146.89 for Class VI, he or she shall give written notice of his or her determination to the owner or operator. Unless the Director requires immediate cessation, the owner or operator shall cease injection into the well within 48 hours of receipt of the Director's determination. The Director may allow plugging of the well pursuant to the requirements of R18-9-B614 146.10 or require the permittee to perform such additional construction, operation, monitoring, reporting, and corrective action as is necessary to prevent the movement of fluid into or between USDWs caused by the lack of mechanical integrity. The owner or operator may resume injection upon written notification from the Director that the owner or operator has demonstrated mechanical integrity pursuant to R18-9-B613 146.8.
- c. The Director may allow the owner or operator of a well that lacks mechanical integrity pursuant to R18-9-B613(A)(1) 146.8(a)(1) to continue or resume injection, if the owner or operator has made a satisfactory demonstration that there is no movement of fluid into or between USDWs.

[144.52] R18-9-D638: Establishing Permit Conditions

A. In addition to conditions required in R18-9-D637 144.51, the Director shall establish conditions, as required on a case-by-case basis under R18-9-C629 144.36 (Permit Duration), R18-9-D639 144.53 (Schedules of Compliance), and R18-9-D640 144.54 (Requirements for Recording and Reporting Monitoring Results). Permits for owners or operators of Class VI injection wells shall include conditions meeting the requirements of Part J of this Article subpart H of Part 146. Permits for other wells shall contain the following requirements, when applicable.

1. Construction requirements as set forth in this Article Part 146. Existing wells shall achieve compliance with such requirements according to a compliance schedule established as a permit condition. The owner or operator of a proposed new injection well shall submit plans for testing, drilling, and construction as Part of the permit application. Except as authorized by an area permit, no construction may commence until a permit has been issued containing construction requirements. New wells shall be in compliance with these requirements prior to commencing injection operations. Changes in construction plans during construction may

be approved by the Director as minor modifications as defined under R18-9-635. No such changes may be physically incorporated into construction of the well prior to approval of the modification by the Director.

2. Corrective action as set forth in R18-9-D641 and R18-9-J661 144.55, 146.7, and 146.84.
3. Operation requirements as set forth in this Article 40 CFR Part 146; the permit shall establish any maximum injection volumes and/or pressures necessary to assure that fractures are not initiated in the confining zone, that injected fluids do not migrate into any underground source of drinking water, that formation fluids are not displaced into any underground source of drinking water, and to assure compliance with the operating requirements under this Article Part 146.
4. Monitoring and reporting requirements as set forth in this Article 40 CFR Part 146. The permittee shall be required to identify types of tests and methods used to generate the monitoring data. Monitoring of the nature of injected fluids shall comply with an analytical method prescribed in A.A.C. R9-14-610, or an alternative analytical method approved under A.A.C. R9-14-610(C), or as approved by the Director. A test result from a sample taken to determine compliance with a national primary drinking water standard is valid only if the sample is analyzed by a laboratory that is licensed by the Arizona Department of Health Services, an out-of-state laboratory licensed under A.R.S. § 36-495.14, or a laboratory exempted under A.R.S. § 36-495.02, for the analysis performed.
5. After a cessation of operations for two years the owner or operator shall plug and abandon the well in accordance with the plan unless he:
 - a. provides notice to the Director; and
 - b. describes actions or procedures, satisfactory to the Director, that the owner or operator will take to ensure that the well will not endanger USDWs during the period of temporary abandonment. These actions and procedures shall include compliance with the technical requirements applicable to active injection wells unless waived by the Director.
6. Financial responsibility.
 - a. The permittee, including the transferor of a permit, is required to demonstrate and maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner prescribed by the Director until:
 - i. the well has been plugged and abandoned in accordance with an approved plugging and abandonment plan pursuant to R18-9-D637(A)(15), R18-9-B614, and R18-9-J669 144.51(o), 146.10, and 146.92, and submitted a plugging and abandonment report pursuant to R18-9-D637(A)(16) 144.51(p); or
 - ii. the well has been converted in compliance with the requirements of R18-9-D637(A)(14) 144.51(n); or
 - iii. the transferor of a permit has received notice from the Director that the owner or operator receiving transfer of the permit, the new permittee, has demonstrated financial responsibility for the well.
 - b. The permittee shall show evidence of such financial responsibility to the Director by the submission of a surety bond, or other adequate assurance, such as a financial statement or other materials acceptable to the Director. For Class VI wells, the permittee shall show evidence of such financial responsibility to the Director by the submission of a qualifying instrument, such as a financial statement or other materials acceptable to the Director. The owner or operator of a Class VI well must comply with the financial responsibility requirements set forth in R18-9-J662 146.85.

7. A permit for any Class I, II, III or VI well or injection project that lacks mechanical integrity shall include, and for any Class V well may include, a condition prohibiting injection operations until the permittee shows to the satisfaction of the Director under R18-9-B613 or R18-9-J666 146.8, or 146.89 of this Chapter for Class VI, that the well has mechanical integrity.
 8. The Director shall impose on a case-by-case basis such additional conditions as are necessary to prevent the migration of fluids into underground sources of drinking water.
- B. In addition to conditions required in all permits the Director shall establish conditions in permits as required on a case-by-case basis, to provide for and assure compliance with all applicable requirements of this Article; the SDWA; and 40 CFR Parts 144, 145, 146, and 124.
- C. An applicable requirement is:
1. a State statutory or regulatory requirement that takes effect prior to final administrative disposition of the permit; or
 2. any requirement to take effect prior to the modification or revocation and reissuance of a permit, to the extent allowed under R18-9-C633 144.39.
- D. New or reissued permits, and to the extent allowed under R18-9-C633 144.39 modified or revoked and reissued permits, shall incorporate each of the applicable requirements referenced in this Section 144.52.
- E. All permit conditions shall be incorporated either expressly or by reference. If incorporated by reference, a specific citation to the applicable regulations or requirements must be given in the permit.

[144.53] R18-9-D639: Compliance Schedule

- A. A permit may, when appropriate, specify a schedule for compliance with this Article.
1. Any compliance schedules shall require compliance as soon as possible, and in no case later than three years after the effective date of the permit.
 2. Except as provided in Subsection (B)(1)(b) of this Section, if a permit establishes a compliance schedule that exceeds one year from the date of permit issuance, the schedule shall set forth interim requirements and the dates for their achievement.
 - a. The time between interim dates shall not exceed one year.
 - b. If the time necessary for completion of any interim requirement is more than one year and is not readily divisible into stages for completion, the permit shall specify interim dates for the submission of reports of progress toward completion of the interim requirements and indicate a projected completion date.
 3. The permit shall be written to require that if Subsection (A)(1) of this Section is applicable, progress reports be submitted no later than 30 days following each interim date and the final date of compliance.
- B. A permit applicant or permittee may cease conducting regulated activities at a given time by plugging and abandonment rather than continue to operate and meet permit requirements as follows:
1. If the permittee decides to cease conducting regulated activities at a given time within the term of a permit which has already been issued:
 - a. the permit may be modified to contain a new or additional schedule leading to timely cessation of activities; or
 - b. the permittee shall cease conducting permitted activities before noncompliance with any interim or final compliance schedule requirement already specified in the permit.

2. If the decision to cease conducting regulated activities is made before issuance of a permit whose term will include the termination date, the permit shall contain a schedule leading to termination that will ensure timely compliance with the applicable requirements.
3. If the permittee is undecided whether to cease conducting regulated activities, the Director may issue or modify a permit to contain two schedules as follows:
 - a. both schedules shall contain an identical interim deadline requiring a final decision on whether to cease conducting regulated activities no later than a date that ensures sufficient time to comply with applicable requirements in a timely manner if the decision is to continue conducting regulated activities;
 - b. one schedule shall lead to timely compliance with applicable requirements;
 - c. the second schedule shall lead to cessation of the regulated activities by a date that ensures timely compliance with applicable requirements; and
 - d. each permit containing two schedules shall include a requirement that after the permittee has made a final decision under Subsection (B)(3)(a) of this Section it shall follow the schedule leading to compliance if the decision is to continue conducting the regulated activities, and follow the schedule leading to termination if the decision is to cease conducting regulated activities.
4. The applicant's or permittee's decision to cease conducting regulated activities shall be evidenced by a firm public commitment satisfactory to the Director, such as a resolution of the board of Directors of a corporation.

[144.54] R18-9-D640: Requirements for Recording and Reporting Monitoring Results

- A. All permits shall specify:
 1. requirements concerning the proper use, maintenance, and installation, when appropriate, of monitoring equipment or methods, including biological monitoring methods when appropriate;
 2. required monitoring including type, intervals, and frequency sufficient to yield data that are representative of the monitored activity including when appropriate, continuous monitoring; and
 3. applicable reporting requirements based upon the impact of the regulated activity and as specified under this Article. Reporting shall be no less frequent than specified in the above regulations.

[144.55;146.7] R18-9-D641: Corrective Action

- A. Applicants for Class I, II, or III injection well permits shall identify the location of all known wells within the injection well's area of review that penetrates the injection zone, or in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review penetrating formations affected by the increase in pressure. For such wells that are improperly sealed, completed, or abandoned, the applicant shall also submit a plan consisting of such steps or modifications as are necessary to prevent movement of fluid into underground sources of drinking water. Where the plan is adequate, the Director shall incorporate it into the permit as a condition. Where the Director's review of an application indicates that the permittee's plan is inadequate, the Director shall require the applicant to revise the plan, prescribe a plan for corrective action as a condition of the permit under Subsection (B) through (E) of this Section, or deny the application. The Director may disregard the provisions of R18-9-B612 146.6 and this Section when reviewing an application to permit an existing Class II well.
- B. Any permit issued for an existing injection well, other than Class II wells, requiring corrective action shall include a compliance schedule requiring any corrective action accepted or prescribed under Subsection (A) of this Section to be completed as soon as possible.

- C. No owner or operator of a new injection well may begin injection until all required corrective action has been taken.
- D. The Director may require as a permit condition that injection pressure be so limited that pressure in the injection zone does not exceed hydrostatic pressure at the site of any improperly completed or abandoned well within the area of review. This pressure limitation shall satisfy the corrective action requirement. Alternatively, such injection pressure limitation can be Part of a compliance schedule and last until all other required corrective action has been taken.
- E. When setting corrective action requirements for Class III wells, the Director shall consider the overall effect of the project on the hydraulic gradient in potentially affected USDWs, and the corresponding changes in potentiometric surface(s) and flow direction(s) rather than the discrete effect of each well. If a decision is made that corrective action is not necessary based on the determinations above, the monitoring program required in R18-9-G649(B) 146.33(b) shall be designed to verify the validity of such determinations.
- F. In determining the adequacy of corrective action proposed by the applicant under this Section and in determining the additional steps needed to prevent fluid movement into underground sources of drinking water, the following criteria and factors shall be considered by the Director:
 - 1. nature and volume of injected fluid;
 - 2. nature of native fluids or by-products of injection;
 - 3. potentially affected population;
 - 4. geology;
 - 5. hydrology;
 - 6. history of the injection operation;
 - 7. completion and plugging records;
 - 8. abandonment procedures in effect at the time the well was abandoned; and
 - 9. hydraulic connections with underground sources of drinking water.

Part E: Class I Injection Well Requirements

[146.12] R18-9-E642: Class I; Construction Requirements

- A. All Class I wells shall be sited so that they will inject into a formation that is beneath the lowermost formation that contains an underground source of drinking water for all underground sources of drinking water located within on quarter mile of any well bore so that all of the following conditions are met:
 - 1. all underground sources of drinking water located within one quarter mile of the well bore are identified,
 - 2. the lowermost formation containing one of the sources underground sources of drinking water is identified,
 - 3. all Class I wells will be sited in such a fashion that it will inject into a formation that is beneath the formation identified Subsection(A)(2) of this Section.
- B. All Class I wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:
 - 1. depth to the injection zone;
 - 2. injection pressure, external pressure, internal pressure, and axial loading;

3. hole size;
 4. size and grade of all casing strings, such as wall thickness, diameter, nominal weight, length, joint specification, and construction material;
 5. corrosiveness of injected fluid, formation fluids, and temperatures;
 6. lithology of injection and confining intervals; and
 7. type or grade of cement.
- C. All Class I injection wells, except those municipal wells injecting non-corrosive wastes, shall inject fluids through tubing with a packer set immediately above the injection zone, or tubing with an approved fluid seal as an alternative. The tubing, packer, and fluid seal shall be designed for the expected service.
1. The use of other alternatives to a packer may be allowed with the written approval of the Director. To obtain approval, the operator shall submit a written request to the Director, which shall set forth the proposed alternative and all technical data supporting its use. The Director shall approve the request if the alternative method will reliably provide a comparable level of protection to underground sources of drinking water. The Director may approve an alternative method solely for an individual well or for general use.
 2. In determining and specifying requirements for tubing, packer, or alternatives the following factors shall be considered:
 - a. depth of setting;
 - b. characteristics of injection fluid such as chemical content, corrosiveness, and density;
 - c. injection pressure;
 - d. annular pressure;
 - e. rate, temperature and volume of injected fluid; and
 - f. size of casing.
- D. Appropriate logs and other tests shall be conducted during the drilling and construction of new Class I wells. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the Director. At a minimum, such logs and tests shall include:
1. Deviation checks on all holes constructed by first drilling a pilot hole, and then enlarging the pilot hole by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid migration in the form of diverging holes are not created during drilling.
 2. Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required, the following logs shall be considered for use in the following situations:
 - a. For surface casing intended to protect underground sources of drinking water:
 - i. resistivity, spontaneous potential, and caliper logs before the casing is installed; and
 - ii. a cement bond, temperature, or density log after the casing is set and cemented.
 - b. For intermediate and long strings of casing intended to facilitate injection:
 - i. resistivity, spontaneous potential, porosity, and gamma ray logs before the casing is installed;
 - ii. fracture finder logs; and

- iii. a cement bond, temperature, or density log after the casing is set and cemented.
- E. At a minimum, the following information concerning the injection formation shall be determined or calculated for new Class I wells:
1. fluid pressure;
 2. temperature;
 3. fracture pressure;
 4. other physical and chemical characteristics of the injection matrix; and
 5. physical and chemical characteristics of the formation fluids.

[146.13] R18-9-E643: Class I; Operating, Monitoring, and Reporting Requirements

- A. Operating requirements shall, at a minimum, specify that:
1. Except during stimulation injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case shall injection pressure initiate fractures in the confining zone or cause the movement of injection or formation fluids into an underground source of drinking water.
 2. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.
 3. Unless an alternative to a packer has been approved under R18-9-E642(C) 146.12(c), the annulus between the tubing and the long string of casings shall be filled with a fluid approved by the Director and a pressure, also approved by the Director, shall be maintained on the annulus.
- B. Monitoring requirements shall, at a minimum, include:
1. the analysis of the injected fluids with sufficient frequency to yield representative data of their characteristics;
 2. installation and use of continuous recording devices to monitor injection pressure, flow rate and volume, and the pressure on the annulus between the tubing and the long string of casing;
 3. a demonstration of mechanical integrity pursuant to R18-9-B613 146.8 at least once every five years during the life of the well; and
 4. the type, number and location of wells within the area of review to be used to monitor any migration of fluids into and pressure in the underground sources of drinking water, the parameters to be measured and the frequency of monitoring.
- C. Reporting requirements shall, at a minimum, include:
1. Quarterly reports to the Director on:
 - a. the physical, chemical and other relevant characteristics of injection fluids;
 - b. monthly average, maximum and minimum values for injection pressure, flow rate and volume, and annular pressure; and
 - c. the results of monitoring prescribed under Subsection (B)(4) of this Section.
 2. Reporting the results, with the first quarterly report after the completion, of:
 - a. periodic tests of mechanical integrity;
 - b. any other test of the injection well conducted by the permittee if required by the Director; and
 - c. any well work over.
- D. Ambient monitoring.

1. Based on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect such movement, the Director shall require the owner or operator to develop a monitoring program. At a minimum, the Director shall require monitoring of the pressure buildup in the injection zone annually, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve.
2. When prescribing a monitoring system the Director may also require:
 - a. continuous monitoring for pressure changes in the first aquifer overlying the confining zone. When such a well is installed, the owner or operator shall, on a quarterly basis, sample the aquifer and analyze for constituents specified by the Director;
 - b. the use of indirect, geophysical techniques to determine the position of the waste front, the water quality in a formation designated by the Director, or to provide other site specific data;
 - c. periodic monitoring of the ground water quality in the first aquifer overlying the injection zone;
 - d. periodic monitoring of the ground water quality in the lowermost USDW; and
 - e. any additional monitoring necessary to determine whether fluids are moving into or between USDWs.

[146.14] R18-9-E644: Class I; Information to be Considered by the Director

- A. This Section sets forth the information which must be considered by the Director in authorizing Class I wells. For an existing or converted new Class I well the Director may rely on the existing permit file for those items of information listed below which are current and accurate in the file. For a newly drilled Class I well, the Director shall require the submission of all the information listed below. For both existing and new Class I wells certain maps, cross-Sections, tabulations of wells within the area of review and other data may be included in the application by reference provided they are current, readily available to the Director and sufficiently identified to be retrieved.
- B. Prior to the issuance of a permit for an existing Class I well to operate or the construction or conversion of a new Class I well the Director shall consider the following:
 1. information required in R18-9-C616 40 CFR 144.31 and 144.31(g);
 2. a map showing the injection well(s) for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number, or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines, quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record is required to be included on this map;
 3. a tabulation of data on all wells within the area of review which penetrate into the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require;
 4. maps and cross Sections indicating the general vertical and lateral limits of all underground sources of drinking water within the area of review, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection;
 5. maps and cross Sections detailing the geologic structure of the local area;
 6. generalized maps and cross Sections illustrating the regional geologic setting;
 7. proposed operating data:
 - a. average and maximum daily rate and volume of the fluid to be injected;

- b. average and maximum injection pressure; and
 - c. source and an analysis of the chemical, physical, radiological and biological characteristics of injection fluids;
 8. proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the receiving formation;
 9. proposed stimulation program;
 10. proposed injection procedure;
 11. schematic or other appropriate drawings of the surface and subsurface construction details of the well.
 12. contingency plans to cope with all shut-ins or well failures so as to prevent migration of fluids into any underground source of drinking water;
 13. plans, including maps, for meeting the monitoring requirements in R18-9-E643(B) 146.13(b);
 14. for wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under R18-9-D641 40 CFR 144.55;
 15. construction procedures including a cementing and casing program, logging procedures, deviation checks, and a drilling, testing, and coring program; and
 16. a certificate that the applicant has assured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by R18-9-D638 40 CFR 144.52122-42(g).
- C. Prior to granting approval for the operation of a Class I well the Director shall consider the following information:
1. all available logging and testing program data on the well;
 2. a demonstration of mechanical integrity pursuant to R18-9-B613 146.8;
 3. the anticipated maximum pressure and flow rate at which the permittee will operate;
 4. the results of the formation testing program;
 5. the actual injection procedure;
 6. the compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone; and
 7. the status of corrective action on defective wells in the area of review.
- D. Prior to granting approval for the plugging and abandonment of a Class I well the Director shall consider the following information:
1. the type and number of plugs to be used;
 2. the placement of each plug including the elevation of the top and bottom;
 3. the type and grade and quantity of cement to be used;
 4. the method for placement of the plugs; and
 5. the procedure to be used to meet the requirements of R18-9-B614(C) 146.10(c).

Part F: Class II Injection Well Requirements

[146.22] R18-9-F645: Class II; Construction Requirements

- A. All new Class II wells shall be sited in such a fashion that they inject into a formation which is separated from any USDW by a confining zone that is free of known open faults or fractures within the area of review.

- B. All Class II injection wells:
1. shall be cased and cemented to prevent movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:
 - a. depth to the injection zone;
 - b. depth to the bottom of all USDWs; and
 - c. estimated maximum and average injection pressures.
 2. In addition the Director may consider information on:
 - a. nature of formation fluids;
 - b. lithology of injection and confining zones;
 - c. external pressure, internal pressure, and axial loading;
 - d. hole size;
 - e. size and grade of all casing strings; and
 - f. class of cement.
- C. The requirements in Subsection (B) of this Section need not apply to existing or newly converted Class II wells located in existing fields if:
1. regulatory controls for casing and cementing existed for those wells at the time of drilling and those wells are in compliance with those controls; and
 2. well injection will not result in the movement of fluids into an underground source of drinking water so as to create a significant risk to the health of persons.
- D. The requirements in Subsection (B) of this Section need not apply to newly drilled wells in existing fields if:
1. they meet the requirements of the State for casing and cementing applicable to that field at the time of submission of the State program to the Administrator; and
 2. well injection will not result in the movement of fluids into an underground source of drinking water so as to create a significant risk to the health of persons.
- E. Appropriate logs and other tests shall be conducted during the drilling and construction of new Class II wells. A descriptive report interpreting the results of that portion of those logs and tests which specifically relate to (1) an USDW and the confining zone adjacent to it, and (2) the injection and adjacent formations shall be prepared by a knowledgeable log analyst and submitted to the Director. At a minimum, these logs and tests shall include:
1. Deviation checks on all holes constructed by first drilling a pilot hole and then enlarging the pilot hole, by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling.
 2. Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required the following shall be considered by the Director in setting logging and testing requirements:
 - a. For surface casing intended to protect underground sources of drinking water in areas where the lithology has not been determined:
 - i. electric and caliper logs before casing is installed; and
 - ii. a cement bond, temperature, or density log after the casing is set and cemented.
 - b. For intermediate and long strings of casing intended to facilitate injection:

- i. electric, porosity and gamma ray logs before the casing is installed;
- ii. fracture finder logs; and
- iii. a cement bond, temperature, or density log after the casing is set and cemented.

F. At a minimum, the following information concerning the injection formation shall be determined or calculated for new Class II wells or projects:

- 1. fluid pressure;
- 2. estimated fracture pressure; and
- 3. physical and chemical characteristics of the injection zone.

[146.23] R18-9-F646: Class II; Operating, Monitoring, and Reporting Requirements

A. Operating requirements shall, at a minimum, specify that:

- 1. Injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In no case shall injection pressure cause the movement of injection or formation fluids into an underground source of drinking water.
- 2. Injection between the outermost casing protecting underground sources of drinking water and the well bore shall be prohibited.

B. Monitoring requirements shall, at a minimum, include:

- 1. monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics;
- 2. observation of injection pressure, flow rate, and cumulative volume at least with the following frequencies:
 - a. weekly for produced fluid disposal operations;
 - b. monthly for enhanced recovery operations;
 - c. daily during the injection of liquid hydrocarbons and injection for withdrawal of stored hydrocarbons; and
 - d. daily during the injection phase of cyclic steam operations; and
 - e. record one observation of injection pressure, flow rate and cumulative volume at reasonable intervals no greater than 30 days;
- 3. a demonstration of mechanical integrity pursuant to R18-9-B613 146.8 at least once every five years during the life of the injection well;
- 4. maintenance of the results of all monitoring until the next permit review; and
- 5. hydrocarbon storage and enhanced recovery may be monitored on a field or project basis rather than on an individual well basis by manifold monitoring. Manifold monitoring may be used in cases of facilities consisting of more than one injection well, operating with a common manifold. Separate monitoring systems for each well are not required provided the owner/operator demonstrates that manifold monitoring is comparable to individual well monitoring.

C. Reporting requirements.

- 1. Reporting requirements shall at a minimum include an annual report to the Director summarizing the results of monitoring required under Subsection (B) of this Section. Such summary shall include monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid. Previously submitted information may be included by reference.

2. Owners or operators of hydrocarbon storage and enhanced recovery projects may report on a field or project basis rather than an individual well basis where manifold monitoring is used.

[146.24] R18-9-F647: Class II; Information to be Considered by the Director

- A. This Section sets forth the information which must be considered by the Director in authorizing Class II wells. Certain maps, cross-sections, tabulations of wells within the area of review, and other data may be included in the application by reference provided they are current, readily available to the Director and sufficiently identified to be retrieved.
- B. Prior to the issuance of a permit for an existing Class II well to operate or the construction or conversion of a new Class II well the Director shall consider the following:
 1. Information required in R18-9-C616 40 CFR 144.31 and 144.31(g).
 2. A map showing the injection well or project area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, and water wells. The map may also show surface bodies of waters, mines (surface and subsurface), quarries and other pertinent surface features including residences and roads, and faults if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map. This requirement does not apply to existing Class II wells.
 3. A tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review included on the map required under Subsection (B)(2) of this Section which penetrate the proposed injection zone or, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Director may require. In cases where the information would be repetitive and the wells are of similar age, type, and construction the Director may elect to only require data on a representative number of wells. This requirement does not apply to existing Class II wells.
 4. Proposed operating data:
 - a. average and maximum daily rate and volume of fluids to be injected;
 - b. average and maximum injection pressure; and
 - c. source and an appropriate analysis of the chemical and physical characteristics of the injection fluid.
 5. Appropriate geological data on the injection zone and confining zone including lithologic description, geological name, thickness and depth.
 6. Geologic name and depth to bottom of all underground sources of drinking water which may be affected by the injection.
 7. Schematic or other appropriate drawings of the surface and subsurface construction details of the well.
 8. In the case of new injection wells the corrective action proposed to be taken by the applicant under R18-9-D641 40 CFR 144.55.
 9. A certificate that the applicant has assured through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by R18-9-D638(A)(6) 40 CFR 144.52(a)(7).
- C. In addition the Director may consider the following:

1. proposed formation testing program to obtain the information required by R18-9-F645(F) 146.22(g);
 2. proposed stimulation program;
 3. proposed injection procedure;
 4. proposed contingency plans, if any, to cope with well failures so as to prevent migration of contaminating fluids into an underground source of drinking water;
 5. Plans for meeting the monitoring requirements of R18-9-F646(B) 146.23(b).
- D. Prior to granting approval for the operation of a Class II well the Director shall consider the following information:
1. all available logging and testing program data on the well;
 2. a demonstration of mechanical integrity pursuant to R18-9-B613 146.8;
 3. the anticipated maximum pressure and flow rate at which the permittee will operate;
 4. the results of the formation testing program;
 5. the actual injection procedure; and
 6. for new wells the status of corrective action on defective wells in the area of review.
- E. Prior to granting approval for the plugging and abandonment of a Class II well the Director shall consider the following information:
1. the type, and number of plugs to be used;
 2. the placement of each plug including the elevation of top and bottom;
 3. the type, grade, and quantity of cement to be used;
 4. the method of placement of the plugs; and
 5. the procedure to be used to meet the requirements of R18-9-B614(A) 146.10(c).

Part G: Class III Injection Well Requirements

[146.32] R18-9-G648: Class III; Construction Requirements

- A. All new Class III wells shall be cased and cemented to prevent the migration of fluids into or between underground sources of drinking water. The Director may waive the cementing requirement for new wells in existing projects or portions of existing projects where he has substantial evidence that no contamination of underground sources of drinking water would result. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:
1. depth to the injection zone;
 2. injection pressure, external pressure, internal pressure, axial loading, etc.;
 3. hole size;
 4. size and grade of all casing strings, such as wall thickness, diameter, nominal weight, length, joint specification, and construction material;
 5. corrosiveness of injected fluids and formation fluids;
 6. lithology of injection and confining zones; and
 7. type and grade of cement.
- B. Appropriate logs and other tests shall be conducted during the drilling and construction of new Class III wells. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the Director. The logs and tests appropriate to each type of

Class III well shall be determined based on the intended function, depth, construction and other characteristics of the well, availability of similar data in the area of the drilling site and the need for additional information that may arise from time to time as the construction of the well progresses. Deviation checks shall be conducted on all holes where pilot holes and reaming are used, unless the hole will be cased and cemented by circulating cement to the surface. Where deviation checks are necessary they shall be conducted at sufficiently frequent intervals to assure that vertical avenues for fluid migration in the form of diverging holes are not created during drilling.

- C. Where the injection zone is a formation which is naturally water-bearing the following information concerning the injection zone shall be determined or calculated for new Class III wells or projects:
 - 1. fluid pressure;
 - 2. fracture pressure; and
 - 3. physical and chemical characteristics of the formation fluids.
- D. Where the injection formation is not a water-bearing formation, the information in Subsection (C)(2) of this Section must be submitted.
- E. Where injection is into a formation which contains water with less than 10,000 mg/l TDS monitoring wells shall be completed into the injection zone and into any underground sources of drinking water above the injection zone which could be affected by the mining operation. These wells shall be located in such a fashion as to detect any excursion of injection fluids, process by-products, or formation fluids outside the mining area or zone. If the operation may be affected by subsidence or catastrophic collapse the monitoring wells shall be located so that they will not be physically affected.
- F. Where injection is into a formation which does not contain water with less than 10,000 mg/l TDS, no monitoring wells are necessary in the injection stratum.
- G. Where the injection wells penetrate an USDW in an area subject to subsidence or catastrophic collapse an adequate number of monitoring wells shall be completed into the USDW to detect any movement of injected fluids, process by-products or formation fluids into the USDW. The monitoring wells shall be located outside the physical influence of the subsidence or catastrophic collapse.
- H. In determining the number, location, construction and frequency of monitoring of the monitoring wells the following criteria shall be considered:
 - 1. the population relying on the USDW affected or potentially affected by the injection operation;
 - 2. the proximity of the injection operation to points of withdrawal of drinking water;
 - 3. the local geology and hydrology;
 - 4. the operating pressures and whether a negative pressure gradient is being maintained;
 - 5. the nature and volume of the injected fluid, the formation water, and the process by-products; and
 - 6. the injection well density.

[146.33] R18-9-G649: Class III; Operating, Monitoring, and Reporting Requirements

- A. Operating requirements prescribed shall, at a minimum, specify that:
 - 1. Except during well stimulation, injection pressure at the wellhead shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case, shall injection pressure initiate fractures in the confining zone or cause the migration of injection or formation fluids into an underground source of drinking water.
 - 2. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.

- B. Monitoring requirements shall, at a minimum, specify:
1. Monitoring of the nature of injected fluids with sufficient frequency to yield representative data on its characteristics. Whenever the injection fluid is modified to the extent that the analysis required by R18-9-G650(B)(7)(c) 40 CFR 146.34(a)(7)(iii) is incorrect or incomplete, a new analysis as required by R18-9-G650(B)(7)(c) 40 CFR 146.34(a)(7)(iii) shall be provided to the Director.
 2. Monitoring of injection pressure and either flow rate or volume semi-monthly, or metering and daily recording of injected and produced fluid volumes as appropriate.
 3. Demonstration of mechanical integrity pursuant to R18-9-B613 146.8 at least once every five years during the life of the well for salt solution mining.
 4. Monitoring of the fluid level in the injection zone semi-monthly, where appropriate and monitoring of the parameters chosen to measure water quality in the monitoring wells required by R18-9-G648(E) 146.32(e), semi-monthly.
 5. Quarterly monitoring of wells required by R18-9-G648(G) 146.32(g).
 6. All Class III wells may be monitored on a field or project basis rather than an individual well basis by manifold monitoring. Manifold monitoring may be used in cases of facilities consisting of more than one injection well, operating with a common manifold. Separate monitoring systems for each well are not required provided the owner/operator demonstrates that manifold monitoring is comparable to individual well monitoring.
- C. Reporting requirements shall, at a minimum, include:
1. quarterly reporting to the Director on required monitoring;
 2. results of mechanical integrity and any other periodic test required by the Director reported with the first regular quarterly report after the completion of the test; and
 3. monitoring may be reported on a project or field basis rather than individual well basis where manifold monitoring is used.

[146.34] R18-9-G650: Class III; Information to be considered by the Director

- A. This Section sets forth the information which must be considered by the Director in authorizing Class III wells. Certain maps, cross Sections, tabulations of wells within the area of review, and other data may be included in the application by reference provided they are current, readily available to the Director and sufficiently identified to be retrieved.
- B. Prior to the issuance of a permit for an existing Class III well or area to operate or the construction of a new Class III well the Director shall consider the following:
1. Information required in R18-9-C616 40 CFR 144.31 and 144.31(g).
 2. A map showing the injection well or project area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, public water systems and water wells. The map may also show surface bodies of waters, mines (surface and subsurface) quarries and other pertinent surface features including residences and roads, and faults if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.
 3. A tabulation of data reasonably available from public records or otherwise known to the applicant on wells within the area of review included on the map required under Subsection (B)(2) of this Section which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Director may require. In cases where the

information would be repetitive and the wells are of similar age, type, and construction the Director may elect to only require data on a representative number of wells.

4. Maps and cross Sections indicating the vertical limits of all underground sources of drinking water within the area of review, their position relative to the injection formation, and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection;
 5. Maps and cross Sections detailing the geologic structure of the local area;
 6. Generalized map and cross Sections illustrating the regional geologic setting;
 7. Proposed operating data:
 - a. average and maximum daily rate and volume of fluid to be injected;
 - b. average and maximum injection pressure; and
 - c. qualitative analysis and ranges in concentrations of all constituents of injected fluids. If the information is confidential pursuant to R18-9-A603 an applicant may, in lieu of the ranges in concentrations, choose to submit maximum concentrations which shall not be exceeded. In such a case the applicant shall retain records of the undisclosed concentrations and provide them upon request to the Director as Part of any enforcement investigation.
 8. proposed formation testing program to obtain the information required by R18-9-G648(C) 146.32(c).
 9. proposed stimulation program;
 10. proposed injection procedure;
 11. schematic or other appropriate drawings of the surface and subsurface construction details of the well;
 12. plans (including maps) for meeting the monitoring requirements of R18-9-G649(B) 146.33(b);
 13. expected changes in pressure, native fluid displacement, direction of movement of injection fluid;
 14. contingency plans to cope with all shut-ins or well failures so as to prevent the migration of contaminating fluids into underground sources of drinking water;
 15. a certificate that the applicant has assured, through a performance bond, or other appropriate means, the resources necessary to close, plug, or abandon the well as required by R18-9-D638(A)(5) 40 CFR 144.52(a)(7); and
 16. the corrective action proposed to be taken under R18-9-D641 40 CFR 144.55.
- C. Prior to granting approval for the operation of a Class III well the Director shall consider the following information:
1. all available logging and testing data on the well;
 2. a satisfactory demonstration of mechanical integrity for all new wells and for all existing salt solution wells pursuant to R18-9-B613 146.8;
 3. the anticipated maximum pressure and flow rate at which the permittee will operate;
 4. the results of the formation testing program;
 5. the actual injection procedures; and
 6. the status of corrective action on defective wells in the area of review.
- D. Prior to granting approval for the plugging and abandonment of a Class III well the Director shall consider the following information:
1. the type and number of plugs to be used;
 2. the placement of each plug including the elevation of the top and bottom;
 3. the type, grade and quantity of cement to be used;

4. the method of placement of the plugs; and
5. the procedure to be used to meet the requirements of R18-9-B614(A) 146.10(c).

Part H: Class IV Injection Well Requirements

[144.23] R18-9-H651: Class IV; Prohibition and Closure Requirements

- A. Closure
 1. Prior to abandoning any Class IV well, the owner or operator shall plug or otherwise close the well in a manner acceptable to the Director.
 2. The owner or operator of a Class IV well must notify the Director of intent to abandon the well at least thirty days prior to abandonment.
- B. Injection wells used to inject contaminated ground water that has been treated and is being injected into the same formation from which it was drawn are authorized by rule for the life of the well if such subsurface emplacement of fluids is approved by EPA, or the Director, pursuant to provisions for cleanup of releases under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601-9675, or pursuant to requirements and provisions under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901-6992k.

Part I: Class V Injection Well Requirements

[144.24;144.84] R18-9-I652: Class V; General Requirements

- A. The following requirements apply to Class V Wells authorized by rule:
 1. A Class V Injection well is authorized by rule subject to the conditions under this Section.
 2. Well authorization under this Section expires upon the effective date of a permit issued pursuant to R18-9-I653 144.25, R18-9-C616 144.31, R18-9-C625 144.33, R18-9-C626 144.34, or upon proper closure of the well.
 3. An owner or operator of a well that is authorized by rule pursuant to this Section is prohibited from injecting into the well:
 - a. upon the effective date of an applicable permit denial;
 - b. upon failure to submit a permit application in a timely manner pursuant to R18-9-I653 or R18-9-C616 144.25 or 144.31;
 - c. upon failure to submit inventory information in a timely manner pursuant to R18-9-I654 144.26; or
 - d. upon failure to comply with a request for information in a timely manner pursuant to R18-9-I655 144.27.
- B. The following requirements apply for all Class V Wells:
 1. With certain exceptions listed in Subsection (B) of this Section, Class V injection activity is “authorized by rule,” meaning owners and operators must comply with all the requirements of this Article but do not have to get an individual permit. Well authorization expires once the injection well has been properly closed.
 2. A Class V well requires a permit and shall no longer be authorized by rule if one of any one of the following:
 - a. Failure to comply with the prohibition of movement standard in R18-9-B608(A) 144.12a.

- b. The Director specifically requires a Class V permit for the well to operate. In which case rule authorization expires upon the effective date of the permit issued, or you are prohibited from injecting into your well upon:
 - i. failure to submit a permit application in a timely manner as specified in a notice from the Director; or
 - ii. upon the effective date of permit denial.
 - c. Failure to submit inventory information as required under R18-9-I654 144.83a.
 - d. Failure to comply with the Director's request for additional information under R18-9-I655 144.83b in a timely manner.
3. Prior to abandoning a Class V well the owner or operator shall:
- a. plug or otherwise close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under R18-9-B608(A) 144.12a, or may otherwise adversely affect the health of persons.
 - b. dispose of or otherwise manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements.
4. In limited cases, the Director may authorize the conversion (reclassification) of a motor vehicle waste disposal well to another type of Class V well. Motor vehicle wells may only be converted if: all motor vehicle fluids are segregated by physical barriers and are not allowed to enter the well; and, injection of motor vehicle waste is unlikely based on a facility's compliance history and records showing proper waste disposal. The use of a semi-permanent plug as the means to segregate waste is not sufficient to convert a motor vehicle waste disposal well to another type of Class V well.

[144.25] R18-9-I653: Class V; Requiring a Permit

- A. The Director may require the owner or operator of any Class V injection well authorized by rule under this Article to apply for and obtain an individual or area UIC permit. Cases where individual or area UIC permits may be required include:
 - 1. the injection well is not in compliance with any requirement under this Article or ARS Title 49, Chapter 2, Article 3.3;
 - 2. the injection well is not or no longer is within the category of wells and types of well operations authorized in the rule; or
 - 3. the protection of USDWs requires that the injection operation be regulated by requirements, such as for corrective action, monitoring and reporting, or operation, which are not contained in the rule.
- B. An owner or operator of a well authorized by rule may request to be excluded from the coverage of this Section by applying for an individual or area UIC permit. The owner or operator shall submit an application under R18-9-C616 144.31 with reasons supporting the request to the Director. The Director may grant any such requests.

[144.26; 144.83a] R18-9-I654: Class V; Inventory Requirements for Class V Wells Authorized by Rule

- A. The owner or operator of an injection well authorized by rule under R18-9-I652 shall submit inventory information to the Director. Such an owner or operator is prohibited from injecting into the well upon failure to submit inventory information for the well within the timeframe specified in Subsection (D) of this Section.
- B. As Part of the inventory, the Director shall require and the owner/operator shall provide at least the following information:
 - 1. facility name and location;

2. name and address of legal contact;
 3. ownership of facility;
 4. nature and type of injection well; and
 5. operating status of injection well.
- C. Upon approval of the Arizona UIC Program, the Director shall notify all known owners or operators of injection wells of their duty to submit inventory information in the manner specified by the Director.
- D. The owner or operator of an injection well shall submit inventory information no later than one year after the effective date of the Arizona UIC program. The Director need not require inventory information from any facility with interim status under RCRA.

[144.27; 144.83b] R18-9-I655: Class V; Requiring Other Information

- A. In addition to the inventory requirements under R18-9-I654 144.26, the Director may require the owner or operator of any well authorized by rule under this Article to submit information as deemed necessary by the Director to determine whether a well may be endangering an underground source of drinking water in violation of R18-9-B608 144.12 of this Part.
- B. Such information requirements may include, but are not limited to:
1. performance of ground-water monitoring and the periodic submission of reports of such monitoring;
 2. an analysis of injected fluids, including periodic submission of such analyses; and
 3. a description of the geologic strata through and into which injection is taking place.
- C. Any request for information under this Section shall be made in writing, and include a brief statement of the reasons for requiring the information. An owner and operator shall submit the information within the time period(s) provided in the notice.
- D. An owner or operator of an injection well authorized by rule under this Part is prohibited from injecting into the well upon failure of the owner or operator to comply with a request for information within the time period(s) specified by the Director pursuant to Subsection (C) of this Section. An owner or operator of a well prohibited from injection under this Section shall not resume injection except under a permit issued pursuant to R18-9-I653; R18-9-C616, R18-9-C625, or R18-9-C626 144.25, 144.31, 144.33, or 144.34.

[144.88] R18-9-I656: Class V; Prohibition of Class V Large Capacity Cesspools and Motor Vehicle Waste Disposal Wells

The construction and operation of large-capacity cesspools and motor vehicle waste disposal wells are prohibited.

[144.15] R18-9-I657: Class V; Prohibition of non-experimental Class V wells for geologic sequestration

The construction, operation or maintenance of any non-experimental Class V geologic sequestration well is prohibited.

Part J: Class VI Injection Well Requirements

[146.81] R18-9-J658: Class VI; Applicability

- A. This Part establishes criteria and standards for underground injection control programs to regulate any Class VI carbon dioxide geologic sequestration injection wells.
- B. This Part applies to any well used to inject carbon dioxide specifically for the purpose of geologic sequestration.

- C. **This Part** also applies to owners or operators of permit- or rule-authorized Class V experimental carbon dioxide injection projects who seek to apply for Class VI geologic sequestration permit for their well or wells. Owners or operators seeking to convert existing Class I, Class II, or Class V experimental wells to Class VI geologic sequestration wells must demonstrate to the Director that the wells were engineered and constructed to meet the requirements of R18-9-J663 146.86a and ensure protection of USDWs, in lieu of requirements at R18-9-J663 and R18-9-J664 146.86(b) and 146.87a. A converted well must still meet all other requirements under **Part F of this Article**.
- D. The following definitions apply to this **Part** and govern for Class VI wells to the extent that these definitions conflict with those in R18-9-A602 144.3 or 146.3:
1. “Area of review” means the region surrounding the *geologic sequestration project* where USDWs may be endangered by the injection activity. The *area of review* is delineated using computational modeling that accounts for the physical and chemical properties of all phases of the injected *carbon dioxide stream* and displaced fluids, and is based on available site characterization, monitoring, and operational data as set forth in R18-9-J661 146.84.
 2. “Carbon dioxide plume” means the extent underground, in three dimensions, of an injected *carbon dioxide stream*.
 3. “Carbon dioxide stream” means carbon dioxide that has been captured from an emission source, plus 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. This Part does not apply to any carbon dioxide stream that meets the definition of a *hazardous waste* under ARS 49-921 40 CFR Part 261.
 4. “Confining zone” means a geologic formation, group of formations, or Part of a formation stratigraphically overlying the injection zone(s) that acts as barrier to fluid movement. For Class VI wells operating under an injection depth waiver, *confining zone* means a geologic formation, group of formations, or Part of a formation stratigraphically overlying and underlying the injection zone(s).
 5. “Corrective action” means the use of Director-approved methods to ensure that wells within the *area of review* do not serve as conduits for the movement of fluids into underground sources of drinking water.
 6. “Geologic sequestration” means the long-term containment of a gaseous, liquid, or supercritical *carbon dioxide stream* in subsurface geologic formations. This term does not apply to carbon dioxide capture or transport.
 7. “Geologic sequestration project” means an injection well or wells used to emplace a *carbon dioxide stream* beneath the lowermost formation containing a USDW; or, wells used for *geologic sequestration* of carbon dioxide that have been granted a waiver of the injection depth requirements pursuant to requirements at R18-9-J672 146.95; or, wells used for *geologic sequestration* of carbon dioxide that have received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to R18-9-A605 and R18-9-A606 144.7(d) and 146.4. It includes the subsurface three-dimensional extent of the *carbon dioxide plume*, associated area of elevated pressure, and displaced fluids, as well as the surface area above that delineated region.
 8. “Injection zone” means a geologic formation, group of formations, or Part of a formation that is of sufficient areal extent, thickness, porosity, and permeability to receive carbon dioxide through a well or wells associated with a *geologic sequestration project*.
 9. “Post-injection site care” means appropriate monitoring and other actions, including *corrective action*, needed following cessation of injection to ensure that USDWs are not endangered, as required under R18-9-J670 146.93.

10. “Pressure front” means the zone of elevated pressure that is created by the injection of carbon dioxide into the subsurface. For the purposes of this Part, the pressure front of a *carbon dioxide plume* refers to a zone where there is a pressure differential sufficient to cause the movement of injected fluids or formation fluids into a USDW.
11. “Site closure” means the point/time, as determined by the Director following the requirements under R18-9-J670 146.93, at which the owner or operator of a *geologic sequestration* site is released from post-injection site care responsibilities.
12. “Transmissive fault” or “fracture” means a *fault* or *fracture* that has sufficient permeability and vertical extent to allow fluids to move between formations.

[146.82] R18-9-J659: Class VI; Required Permit Information

- A. This Section sets forth the information which must be considered by the Director in authorizing Class VI wells. For converted Class I, Class II, or Class V experimental wells, certain maps, cross-Sections, tabulations of wells within the area of review and other data may be included in the application by reference provided they are current, readily available to the Director, and sufficiently identified to be retrieved.
- B. Prior to the issuance of a permit for the construction of a new Class VI well or the conversion of an existing Class I, Class II, or Class V well to a Class VI well, the owner or operator shall submit, pursuant to R18-9-J668 146.91(e), and the Director shall consider the following:
 1. Information required in under R18-9-C616(E)(1) through (6) 144.31(e)(1) through (6);
 2. A map showing the injection well for which a permit is sought and the applicable area of review consistent with R18-9-J661 146.84. Within the area of review, the map must show the number or name, and location of all injection wells, producing wells, abandoned wells, plugged wells or dry holes, deep stratigraphic boreholes, State- or EPA-approved subsurface cleanup sites, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells, other pertinent surface features including structures intended for human occupancy, State, Tribal, and Territory boundaries, and roads. The map should also show faults, if known or suspected. Only information of public record is required to be included on this map;
 3. Information on the geologic structure and hydrogeologic properties of the proposed storage site and overlying formations, including:
 - a. maps and cross Sections of the area of review;
 - b. the location, orientation, and properties of known or suspected faults and fractures that may transect the confining zone(s) in the area of review and a determination that they would not interfere with containment;
 - c. data on the depth, areal extent, thickness, mineralogy, porosity, permeability, and capillary pressure of the injection and confining zone(s); including geology/facies changes based on field data which may include geologic cores, outcrop data, seismic surveys, well logs, and names and lithologic descriptions;
 - d. geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone(s);
 - e. information on the seismic history including the presence and depth of seismic sources and a determination that the seismicity would not interfere with containment; and
 - f. geologic and topographic maps and cross Sections illustrating regional geology, hydrogeology, and the geologic structure of the local area.
 4. A tabulation of all wells within the area of review which penetrate the injection or confining zone(s). Such data must include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require;

5. Maps and stratigraphic cross Sections indicating the general vertical and lateral limits of all USDWs, water wells and springs within the area of review, their positions relative to the injection zone(s), and the direction of water movement, where known;
 6. Baseline geochemical data on subsurface formations, including all USDWs in the area of review;
 7. Proposed operating data for the proposed geologic sequestration site:
 - a. average and maximum daily rate and volume and/or mass and total anticipated volume and/or mass of the carbon dioxide stream;
 - b. average and maximum injection pressure;
 - c. the source(s) of the carbon dioxide stream; and
 - d. an analysis of the chemical and physical characteristics of the carbon dioxide stream.
 8. Proposed pre-operational formation testing program to obtain an analysis of the chemical and physical characteristics of the injection zone(s) and confining zone(s) and that meets the requirements at R18-9-J664 146.87;
 9. Proposed stimulation program, a description of stimulation fluids to be used and a determination that stimulation will not interfere with containment;
 10. Proposed procedure to outline steps necessary to conduct injection operation;
 11. Schematics or other appropriate drawings of the surface and subsurface construction details of the well;
 12. injection well construction procedures that meet the requirements of R18-9-J663 146.86;
 13. Proposed area of review and corrective action plan that meets the requirements under R18-9-J661 146.84;
 14. A demonstration, satisfactory to the Director, that the applicant has met the financial responsibility requirements under R18-9-J662 146.85;
 15. Proposed testing and monitoring plan required by R18-9-J667 146.90;
 16. Proposed injection well plugging plan required by R18-9-J669(B) 146.92(b);
 17. Proposed post-injection site care and site closure plan required by R18-9-J670(A) 146.93(a);
 18. At the Director's discretion, a demonstration of an alternative post-injection site care timeframe required by R18-9-J670(C) 146.93(c);
 19. Proposed emergency and remedial response plan required by R18-9-J671 146.94(a);
 20. A list of contacts, submitted to the Director, for those States, Tribes, and Territories identified to be within the area of review of the Class VI project based on information provided in paragraph (B)(2) of this Section; and
 21. Any other information requested by the Director.
- C. The Director shall notify, in writing, any States, Tribes, or Territories within the area of review of the Class VI project based on information provided in Subsections (B)(2) and (B)(20) of this Section of the permit application and pursuant to the requirements of the program description under 40 CFR § 145.23(f)(13).
- D. Prior to granting approval for the operation of a Class VI well, the Director shall consider the following information:
1. The final area of review based on modeling, using data obtained during logging and testing of the well and the formation as required by Subsections (D)(2), (3), (4), (6), (7), and (10) of this Section;
 2. Any relevant updates, based on data obtained during logging and testing of the well and the formation as required by Subsections (D)(3), (4), (6), (7), and (10) of this Section, to the information on the geologic structure and hydrogeologic properties of the proposed storage

site and overlying formations, submitted to satisfy the requirements of Subsection (B)(3) of this Section;

3. Information on the compatibility of the carbon dioxide stream with fluids in the injection zone(s) and minerals in both the injection and the confining zone(s), based on the results of the formation testing program, and with the materials used to construct the well;
 4. The results of the formation testing program required at Subsection (B)(8) of this Section;
 5. Final injection well construction procedures that meet the requirements of R18-9-J663 146.86;
 6. The status of corrective action on wells in the area of review;
 7. All available logging and testing program data on the well required by R18-9-J664 146.87;
 8. A demonstration of mechanical integrity pursuant to R18-9-J666 146.89;
 9. Any updates to the proposed area of review and corrective action plan, testing and monitoring plan, injection well plugging plan, post-injection site care and site closure plan, or the emergency and remedial response plan submitted under Subsection (B) of this Section, which are necessary to address new information collected during logging and testing of the well and the formation as required by all paragraphs of this Section, and any updates to the alternative post-injection site care timeframe demonstration submitted under Subsection (B) of this Section, which are necessary to address new information collected during the logging and testing of the well and the formation as required by all paragraphs of this Section; and
 10. Any other information requested by the Director.
- E. Owners or operators seeking a waiver of the requirement to inject below the lowermost USDW must also refer to R18-9-J672 146.95 and submit a supplemental report, as required at R18-9-J672 146.95(a). The supplemental report is not Part of the permit application.

[146.83] R18-9-J660: Class VI; Minimum Criteria for Siting

- A. Owners or operators of Class VI wells must demonstrate to the satisfaction of the Director that the wells will be sited in areas with a suitable geologic system. The owners or operators must demonstrate that the geologic system comprises:
1. An injection zone(s) of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the carbon dioxide stream.
 2. Confining zone(s) free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zone(s).
- B. The Director may require owners or operators of Class VI wells to identify and characterize additional zones that will impede vertical fluid movement, are free of faults and fractures that may interfere with containment, allow for pressure dissipation, and provide additional opportunities for monitoring, mitigation, and remediation.

[146.84] R18-9-J661: Class VI; Area of Review and Corrective Action

- A. The area of review is the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity. The area of review is delineated using computational modeling that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and is based on available site characterization, monitoring, and operational data.
- B. The owner or operator of a Class VI well must prepare, maintain, and comply with a plan to delineate the area of review for a proposed geologic sequestration project, periodically reevaluate the delineation, and perform corrective action that meets the requirements of this Section and is acceptable

to the Director. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. As a Part of the permit application for approval by the Director, the owner or operator must submit an area of review and corrective action plan that includes the following information:

1. The method for delineating the area of review that meets the requirements of Subsection (C) of this Section, including the model to be used, assumptions that will be made, and the site characterization data on which the model will be based.
 2. A description of:
 - a. the minimum fixed frequency, not to exceed five years, at which the owner or operator proposes to reevaluate the area of review;
 - b. the monitoring and operational conditions that would warrant a reevaluation of the area of review prior to the next scheduled reevaluation as determined by the minimum fixed frequency established in Subsection (B)(2)(a) of this Section.
 - c. how monitoring and operational data will be used to inform an area of review reevaluation; and
 - d. how corrective action will be conducted to meet the requirements of Subsection (D) of this Section, including what corrective action will be performed prior to injection and what, if any, portions of the area of review will have corrective action addressed on a phased basis and how the phasing will be determined; how corrective action will be adjusted if there are changes in the area of review; and how site access will be guaranteed for future corrective action.
- C. Owners or operators of Class VI wells must perform the following actions to delineate the area of review and identify all wells that require corrective action:
1. Predict, using existing site characterization, monitoring and operational data, and computational modeling, the projected lateral and vertical migration of the carbon dioxide plume and formation fluids in the subsurface from the commencement of injection activities until the plume movement ceases, until pressure differentials sufficient to cause the movement of injected fluids or formation fluids into a USDW are no longer present, or until the end of a fixed time period as determined by the Director. The model must:
 - a. be based on detailed geologic data collected to characterize the injection zone(s), confining zone(s) and any additional zones; and anticipated operating data, including injection pressures, rates, and total volumes over the proposed life of the geologic sequestration project;
 - b. take into account any geologic heterogeneities, other discontinuities, data quality, and their possible impact on model predictions; and
 - c. consider potential migration through faults, fractures, and artificial penetrations.
 2. Using methods approved by the Director, identify all penetrations, including active and abandoned wells and underground mines, in the area of review that may penetrate the confining zone(s). Provide a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require; and
 3. Determine which abandoned wells in the area of review have been plugged in a manner that prevents the movement of carbon dioxide or other fluids that may endanger USDWs, including use of materials compatible with the carbon dioxide stream.
- D. Owners or operators of Class VI wells must perform corrective action on all wells in the area of review that are determined to need corrective action, using methods designed to prevent the movement of fluid into or between USDWs, including use of materials compatible with the carbon dioxide stream, where appropriate.

- E. At the minimum fixed frequency, not to exceed five years, as specified in the area of review and corrective action plan, or when monitoring and operational conditions warrant, owners or operators must:
1. reevaluate the area of review in the same manner specified in Subsection (C)(1) of this Section;
 2. identify all wells in the reevaluated area of review that require corrective action in the same manner specified in Subsection (C) of this Section;
 3. perform corrective action on wells requiring corrective action in the reevaluated area of review in the same manner specified in Subsection (C) of this Section; 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 amendment to the area of review and corrective action plan is needed. Any amendments to the area of review and corrective action plan must be approved by the Director, must be incorporated into the permit, and are subject to the permit modification requirements under R18-9-C633 or R18-9-C634 §§ 144.39 or 144.41, as appropriate.
- F. The emergency and remedial response plan and the demonstration of financial responsibility must account for the area of review delineated as specified in Subsection (C)(1) of this Section or the most recently evaluated area of review delineated under Subsection (E) of this Section, regardless of whether or not corrective action in the area of review is phased.
- G. All modeling inputs and data used to support area of review reevaluations under Subsection (E) of this Section shall be retained for ten years.

[146.85] R18-9-J662: Class VI; Financial Responsibility

- A. The owner or operator must demonstrate and maintain financial responsibility as determined by the Director that meets the following conditions:
1. The financial responsibility instrument(s) used must be from the following list of qualifying instruments:
 - a. Trust Funds.
 - b. Surety Bonds.
 - c. Letter of Credit.
 - d. Insurance.
 - e. Self Insurance (i.e., Financial Test and Corporate Guarantee).
 - f. Escrow Account.
 - g. Any other instrument(s) satisfactory to the Director.
 2. The qualifying instrument(s) must be sufficient to cover the cost of:
 - a. corrective action under R18-9-J661 [146.84];
 - b. injection well plugging under R18-9-J669 [146.92];
 - c. post injection site care and site closure under R18-9-J670 [146.93]; and
 - d. emergency and remedial response under R18-9-J671 [146.94].
 3. The financial responsibility instrument(s) must be sufficient to address endangerment of underground sources of drinking water.
 4. The qualifying financial responsibility instrument(s) must comprise protective conditions of coverage.
 - a. Protective conditions of coverage must include at a minimum cancellation, renewal, and continuation provisions, specifications on when the provider becomes liable following a notice of cancellation if there is a failure to renew with a new qualifying financial instrument, and requirements for the provider to meet a minimum rating, minimum capitalization, and ability to pass the bond rating when applicable.

- b. When using a third-Party instrument to demonstrate financial responsibility, the owner or operator must provide a proof that the third-Party providers either have passed financial strength requirements based on credit ratings; or has met a minimum rating, minimum capitalization, and ability to pass the bond rating when applicable.
 - c. An owner or operator using certain types of third-Party instruments must establish a standby trust to enable ADEQ to be Party to the financial responsibility agreement without ADEQ being the beneficiary of any funds. The standby trust fund must be used along with other financial responsibility instruments (e.g., surety bonds, letters of credit, or escrow accounts) to provide a location to place funds if needed.
 - d. An owner or operator may deposit money to an escrow account to cover financial responsibility requirements; this account must segregate funds sufficient to cover estimated costs for Class VI (geologic sequestration) financial responsibility from other accounts and uses.
 - e. An owner or operator or its guarantor may use self insurance to demonstrate financial responsibility for geologic sequestration projects. In order to satisfy this requirement the owner or operator must meet a Tangible Net Worth of an amount approved by the Director, have a Net working capital and tangible net worth each at least six times the sum of the current well plugging, post injection site care and site closure cost, have assets located in the United States amounting to at least 90 percent of total assets or at least six times the sum of the current well plugging, post injection site care and site closure cost, and must submit a report of its bond rating and financial information annually. In addition the owner or operator must either: Have a bond rating test of AAA, AA, A, or BBB as issued by Standard & Poor's or Aaa, Aa, A, or Baa as issued by Moody's; or meet all of the following five financial ratio thresholds: A ratio of total liabilities to net worth less than 2.0; a ratio of current assets to current liabilities greater than 1.5; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; A ratio of current assets minus current liabilities to total assets greater than -0.1; and a net profit (revenues minus expenses) greater than 0.
 - f. An owner or operator who is not able to meet corporate financial test criteria may arrange a corporate guarantee by demonstrating that its corporate parent meets the financial test requirements on its behalf. The parent's demonstration that it meets the financial test requirement is insufficient if it has not also guaranteed to fulfill the obligations for the owner or operator.
 - g. An owner or operator may obtain an insurance policy to cover the estimated costs of geologic sequestration activities requiring financial responsibility. This insurance policy must be obtained from a third Party provider.
- B. The requirement to maintain adequate financial responsibility and resources is directly enforceable regardless of whether the requirement is a condition of the permit.
- 1. The owner or operator must maintain financial responsibility and resources until:
 - a. The Director receives and approves the completed post-injection site care and site closure plan; and
 - b. The Director approves site closure.
 - 2. The owner or operator may be released from a financial instrument in the following circumstances:
 - a. The owner or operator has completed the phase of the geologic sequestration project for which the financial instrument was required and has fulfilled all its financial obligations as determined by the Director, including obtaining financial responsibility for the next phase of the geologic sequestration project, if required; or
 - b. The owner or operator has submitted a replacement financial instrument and received written approval from the Director accepting the new financial

instrument and releasing the owner or operator from the previous financial instrument.

- C. The owner or operator must have a detailed written estimate, in current dollars, of the cost of performing corrective action on wells in the area of review, plugging the injection well(s), post-injection site care and site closure, and emergency and remedial response.
1. The cost estimate must be performed for each phase separately and must be based on the costs to the regulatory agency of hiring a third Party to perform the required activities. A third Party is a Party who is not within the corporate structure of the owner or operator.
 2. During the active life of the geologic sequestration project, the owner or operator must adjust the cost estimate for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s) used to comply with Subsection (A) of this Section and provide this adjustment to the Director. The owner or operator must also provide to the Director written updates of adjustments to the cost estimate within 60 days of any amendments to the area of review and corrective action plan as required under R18-9-J661 [146.84], the injection well plugging plan under R18-9-J669[146.92], the post-injection site care and site closure plan as required under R18-9-J670 [146.93], and the emergency and remedial response plan as required under R18-9-J671 [146.94].
 3. The Director must approve any decrease or increase to the initial cost estimate. During the active life of the geologic sequestration project, the owner or operator must revise the cost estimate no later than 60 days after the Director has approved the request to modify the area of review and corrective action plan as required under R18-9-J661 [146.84], the injection well plugging plan under R18-9-J669 [146.92], the post-injection site care and site closure plan as required under R18-9-J670 [146.93], and the emergency and response plan as required under R18-9-J671 [146.94], if the change in the plan increases the cost. If the change to the plans decreases the cost, any withdrawal of funds must be approved by the Director. Any decrease to the value of the financial assurance instrument must first be approved by the Director. The revised cost estimate must be adjusted for inflation as specified at Subsection (C)(2) of this Section.
 4. Whenever the current cost estimate increases to an amount greater than the face amount of a financial instrument currently in use, the owner or operator, within 60 days after the increase, must either cause the face amount to be increased to an amount at least equal to the current cost estimate and submit evidence of such increase to the Director, or obtain other financial responsibility instruments to cover the increase. Whenever the current cost estimate decreases, the face amount of the financial assurance instrument may be reduced to the amount of the current cost estimate only after the owner or operator has received written approval from the Director.
- D. The owner or operator must notify the Director by certified mail of adverse financial conditions such as bankruptcy that may affect the ability to carry out injection well plugging and post-injection site care and site closure.
1. In the event that the owner or operator or the third Party provider of a financial responsibility instrument is going through a bankruptcy, the owner or operator must notify the Director by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten days after commencement of the proceeding.
 2. A guarantor of a corporate guarantee must make such a notification to the Director if he/she is named as debtor, as required under the terms of the corporate guarantee.

3. An owner or operator who fulfills the requirements of Subsection (A) of this Section by obtaining a trust fund, surety bond, letter of credit, escrow account, or insurance policy will be deemed to be without the required financial assurance in the event of bankruptcy of the trustee or issuing institution, or a suspension or revocation of the authority of the trustee institution to act as trustee of the institution issuing the trust fund, surety bond, letter of credit, escrow account, or insurance policy. The owner or operator must establish other financial assurance within 60 days after such an event.
- E. The owner or operator must provide an adjustment of the cost estimate to the Director within 60 days of notification by the Director, if the Director determines during the annual evaluation of the qualifying financial responsibility instrument(s) that the most recent demonstration is no longer adequate to cover the cost of corrective action as required under R18-9-J661 [146.84], injection well plugging under R18-9-J669 [146.92], post-injection site care and site closure as required under R18-9-J670 [146.93], and emergency and remedial response as required under R18-9-J671 [146.94].
 - F. The Director must approve the use and length of pay-in-periods for trust funds or escrow accounts.

[146.86] R18-9-J663: Class VI; Injection Well Construction Requirements

- A. The owner or operator must ensure that all Class VI wells are constructed and completed to:
 1. prevent the movement of fluids into or between USDWs or into any unauthorized zones;
 2. permit the use of appropriate testing devices and workover tools; and
 3. permit continuous monitoring of the annulus space between the injection tubing and long string casing.
- B. Casing and Cementing of Class VI Wells.
 1. Casing and cement or other materials used in the construction of each Class VI well must have sufficient structural strength and be designed for the life of the geologic sequestration project. All well materials must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director. The casing and cementing program must be designed to prevent the movement of fluids into or between USDWs. In order to allow the Director to determine and specify casing and cementing requirements, the owner or operator must provide the following information:
 - a. depth to the injection zone(s);
 - b. injection pressure, external pressure, internal pressure, and axial loading;
 - c. hole size;
 - d. size and grade of all casing strings (wall thickness, external diameter, nominal weight, length, joint specification, and construction material);
 - e. corrosiveness of the carbon dioxide stream and formation fluids;
 - f. down-hole temperatures;
 - g. lithology of injection and confining zone(s);
 - h. type or grade of cement and cement additives; and
 - i. quantity, chemical composition, and temperature of the carbon dioxide stream.
 2. Surface casing must extend through the base of the lowermost USDW and be cemented to the surface through the use of a single or multiple strings of casing and cement.
 3. At least one long string casing, using a sufficient number of centralizers, must extend to the injection zone and must be cemented by circulating cement to the surface in one or more stages.
 4. Circulation of cement may be accomplished by staging. The 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 does not allow fluid movement behind the well bore.

5. Cement and cement additives must be compatible with the carbon dioxide stream and formation fluids and of sufficient quality and quantity to maintain integrity over the design life of the geologic sequestration project. The integrity and location of the cement shall be verified using technology capable of evaluating cement quality radially and identifying the location of channels to ensure that USDWs are not endangered.

C. Tubing and packer.

1. Tubing and packer materials used in the construction of each Class VI well must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director.
2. All owners or operators of Class VI wells must inject fluids through tubing with a packer set at a depth opposite a cemented interval at the location approved by the Director.
3. In order for the Director to determine and specify requirements for tubing and packer, the owner or operator must submit the following information:
 - a. depth of setting;
 - b. characteristics of the carbon dioxide stream (chemical content, corrosiveness, temperature, and density) and formation fluids;
 - c. maximum proposed injection pressure;
 - d. maximum proposed annular pressure;
 - e. proposed injection rate (intermittent or continuous) and volume and/or mass of the carbon dioxide stream;
 - f. size of tubing and casing; and
 - g. tubing tensile, burst, and collapse strengths.

[146.87] R18-9-J664: Class VI; Logging, Sampling, and Testing Prior to Well Operation

A. During the drilling and construction of a Class VI injection well, the owner or operator must run appropriate logs, surveys and tests to determine or verify the depth, thickness, porosity, permeability, and lithology of, and the salinity of any formation fluids in all relevant geologic formations to ensure conformance with the injection well construction requirements under R18-9-J663 146.86 and to establish accurate baseline data against which future measurements may be compared. The owner or operator must submit to the Director a descriptive report prepared by a knowledgeable log analyst that includes an interpretation of the results of such logs and tests. At a minimum, such logs and tests must include:

1. deviation checks during drilling on all holes constructed by drilling a pilot hole which is enlarged by reaming or another method. Such checks must be at sufficiently frequent intervals to determine the location of the borehole and to ensure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling; and
2. before and upon installation of the surface casing:
 - a. resistivity, spontaneous potential, and caliper logs before the casing is installed; and
 - b. a cement bond and variable density log to evaluate cement quality radially, and a temperature log after the casing is set and cemented.
3. before and upon installation of the long string casing:
 - a. resistivity, spontaneous potential, porosity, caliper, gamma ray, fracture finder logs, and any other logs the Director requires for the given geology before the casing is installed; and

- b. a cement bond and variable density log, and a temperature log after the casing is set and cemented.
 - 4. a series of tests designed to demonstrate the internal and external mechanical integrity of injection wells, which may include:
 - a. a pressure test with liquid or gas;
 - b. a tracer survey such as oxygen-activation logging;
 - c. a temperature or noise log;
 - d. a casing inspection log; and
 - 5. any alternative methods that provide equivalent or better information and that are required by and/or approved of by the Director.
 - B. The owner or operator must take whole cores or sidewall cores of the injection zone and confining system and formation fluid samples from the injection zone(s), and must submit to the Director a detailed report prepared by a log analyst that includes: Well log analyses (including well logs), core analyses, and formation fluid sample information. The Director may accept information on cores from nearby wells if the owner or operator can demonstrate that core retrieval is not possible and that such cores are representative of conditions at the well. The Director may require the owner or operator to core other formations in the borehole.
 - C. The owner or operator must record the fluid temperature, pH, conductivity, reservoir pressure, and static fluid level of the injection zone(s).
 - D. At a minimum, the owner or operator must determine or calculate the following information concerning the injection and confining zone(s):
 - 1. fracture pressure;
 - 2. other physical and chemical characteristics of the injection and confining zone(s); and
 - 3. physical and chemical characteristics of the formation fluids in the injection zone(s).
 - E. Upon completion, but prior to operation, the owner or operator must conduct the following tests to verify hydrogeologic characteristics of the injection zone(s):
 - 1. a pressure fall-off test; and,
 - 2. a pump test; or
 - 3. injectivity tests.
 - F. The owner or operator must provide the Director with the opportunity to witness all logging and testing by this Part. The owner or operator must submit a schedule of such activities to the Director 30 days prior to conducting the first test and submit any changes to the schedule 30 days prior to the next scheduled test.

[146.88] R18-9-J665: Class VI; Injection Well Operating Requirements

- A. Except during stimulation, the owner or operator must ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone(s). In no case may injection pressure initiate fractures in the confining zone(s) or cause the movement of injection or formation fluids that endangers a USDW. Pursuant to requirements at R18-9-J659(B)(9) 146.82(a)(9), all stimulation programs must be approved by the Director as Part of the permit application and incorporated into the permit.
- B. Injection between the outermost casing protecting USDWs and the well bore is prohibited.
- C. The owner or operator must fill the annulus between the tubing and the long string casing with a non-corrosive fluid approved by the Director. The owner or operator must maintain on the annulus a pressure that exceeds the operating injection pressure, unless the Director determines that such requirement might harm the integrity of the well or endanger USDWs.

- D. Other than during periods of well workover (maintenance) approved by the Director in which the sealed tubing-casing annulus is disassembled for maintenance or corrective procedures, the owner or operator must maintain mechanical integrity of the injection well at all times.
- E. The owner or operator must install and use:
 - 1. Continuous recording devices to monitor: The injection pressure; the rate, volume and/or mass, and temperature of the carbon dioxide stream; and the pressure on the annulus between the tubing and the long string casing and annulus fluid volume; and
 - 2. Alarms and automatic surface shut-off systems or, at the discretion of the Director, down-hole shut-off systems for onshore wells or, other mechanical devices that provide equivalent protection.
- F. If a shutdown (such as down-hole or at the surface) is triggered or a loss of mechanical integrity is discovered, the owner or operator must immediately investigate and identify as expeditiously as possible the cause of the shutoff. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under Subsection (E) of this Section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator must:
 - 1. immediately cease injection;
 - 2. take all steps reasonably necessary to determine whether there may have been a release of the injected carbon dioxide stream or formation fluids into any unauthorized zone;
 - 3. notify the Director within 24 hours;
 - 4. restore and demonstrate mechanical integrity to the satisfaction of the Director prior to resuming injection; and
 - 5. notify the Director when injection can be expected to resume.

[146.89] R18-9-J666: Class VI; Mechanical Integrity

- A. A Class VI well has mechanical integrity if:
 - 1. there is no significant leak in the casing, tubing, or packer; and
 - 2. there is no significant fluid movement into a USDW through channels adjacent to the injection well bore.
- B. To evaluate the absence of significant leaks under Subsection (A)(1) of this Section, owners or operators must, following an initial annulus pressure test, continuously monitor injection pressure, rate, injected volumes; pressure on the annulus between tubing and long-string casing; and annulus fluid volume as specified in R18-9-J665 40 CFR §146.88 (e);
- C. At least once per year, the owner or operator must use one of the following methods to determine the absence of significant fluid movement under Subsection (A)(2) of this Section:
 - 1. an approved tracer survey such as an oxygen-activation log; or
 - 2. a temperature or noise log.
- D. If required by the Director, at a frequency specified in the testing and monitoring plan required at R18-9-J667 146.90, the owner or operator must run a casing inspection log to determine the presence or absence of corrosion in the long-string casing.
- E. The Director may require any other test to evaluate mechanical integrity under Subsections (A)(1) or (A)(2) of this Section. Also, the Director may allow the use of a test to demonstrate mechanical integrity other than those listed above with the written approval of the Administrator. To obtain approval for a new mechanical integrity test, the Director must submit a written request to the Administrator setting forth the proposed test and all technical data supporting its use.
- F. In conducting and evaluating the tests enumerated in this Section or others to be allowed by the Director, the owner or operator and the Director must apply methods and standards generally accepted

in the industry. When the owner or operator reports the results of mechanical integrity tests to the Director, he/she shall include a description of the test(s) and the method(s) used. In making his/her evaluation, the Director must review monitoring and other test data submitted since the previous evaluation.

- G. The Director may require additional or alternative tests if the results presented by the owner or operator under Subsections (A) through (F) of this Section are not satisfactory to the Director to demonstrate that there is no significant leak in the casing, tubing, or packer, or to demonstrate that there is no significant movement of fluid into a USDW resulting from the injection activity as stated in Subsections (A)(1) and (A)(2) of this Section.

[146.90] R18-9-J667: Class VI; Testing and Monitoring Requirements

- A. The owner or operator of a Class VI well must prepare, maintain, and comply with a testing and monitoring plan to verify that the geologic sequestration project is operating as permitted and is not endangering USDWs. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The testing and monitoring plan must be submitted with the permit application, for Director approval, and must include a description of how the owner or operator will meet the requirements of this Section, including accessing sites for all necessary monitoring and testing during the life of the project. Testing and monitoring associated with geologic sequestration projects must, at a minimum, include:
1. Analysis of the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics;
 2. installation and use, except during well workovers as defined in R18-9-J665 146.88(d), of continuous recording devices to monitor injection pressure, rate, and volume; the pressure on the annulus between the tubing and the long string casing; and the annulus fluid volume added;
 3. corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion, which must be performed on a quarterly basis to ensure that the well components meet the minimum standards for material strength and performance set forth in R18-9-J663 146.86(b), by:
 - a. analyzing coupons of the well construction materials placed in contact with the carbon dioxide stream; or
 - b. routing the carbon dioxide stream through a loop constructed with the material used in the well and inspecting the materials in the loop; or
 - c. using an alternative method approved by the Director;
 4. Periodic monitoring of the ground water quality and geochemical changes above the confining zone(s) that may be a result of carbon dioxide movement through the confining zone(s) or additional identified zones including:
 - a. The location and number of monitoring wells based on specific information about the geologic sequestration project, including injection rate and volume, geology, the presence of artificial penetrations, and other factors; and
 - b. The monitoring frequency and spatial distribution of monitoring wells based on baseline geochemical data that has been collected under R18-9-J659 146.82(a)(6) and on any modeling results in the area of review evaluation required by R18-9-J661(C) 146.84(c).
 5. A demonstration of external mechanical integrity pursuant to R18-9-J666(C) 146.89(c) at least once per year until the injection well is plugged; and, if required by the Director, a casing inspection log pursuant to requirements under R18-9-J666(D) 146.89(d) at a frequency established in the testing and monitoring plan;

6. A pressure fall-off test at least once every five years unless more frequent testing is required by the Director based on site-specific information;
7. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure (e.g., the pressure front) by using:
 - a. direct methods in the injection zone(s); and,
 - b. indirect methods (e.g., seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools), unless the Director determines, based on site-specific geology, that such methods are not appropriate;
8. The Director may require surface air monitoring and/or soil gas monitoring to detect movement of carbon dioxide that could endanger a USDW.
 - a. Design of Class VI surface air and/or soil gas monitoring must be based on potential risks to USDWs within the area of review;
 - b. The monitoring frequency and spatial distribution of surface air monitoring and/or soil gas monitoring must be decided using baseline data, and the monitoring plan must describe how the proposed monitoring will yield useful information on the area of review delineation and/or compliance with standards under R18-9-B608 144.12;
 - c. If an owner or operator demonstrates that monitoring employed under 40 CFR §§ 98.440 to 98.449 (Clean Air Act, 42 U.S.C. 7401 et seq.) accomplishes the goals of Subsections (A)(8)(a) and (b) of this Section, and meets the requirements pursuant to R18-9-J668(A)(3)(e) § 146.91(c)(5), a Director that requires surface air/soil gas monitoring must approve the use of monitoring employed under 40 CFR §§ 98.440 to 98.449. Compliance with 40 CFR §§ 98.440 to 98.449 pursuant to this provision is considered a condition of the Class VI permit;
9. Any additional monitoring, as required by the Director, necessary to support, upgrade, and improve computational modeling of the area of review evaluation required under R18-9-J661(C) 146.84(c) and to determine compliance with standards under R18-9-B608 144.12;
10. The owner or operator shall periodically review the testing and monitoring plan to incorporate monitoring data collected under this Part, operational data collected under R18-9-J665 40 CFR 146.88, and the most recent area of review reevaluation performed under R18-9-J661(E) 146.84(e). In no case shall the owner or operator review the testing and monitoring plan less often than once every five years. Based on this review, the owner or operator shall submit an amended testing and monitoring plan or demonstrate to the Director that no amendment to the testing and monitoring plan is needed. Any amendments to the testing and monitoring plan must be approved by the Director, must be incorporated into the permit, and are subject to the permit modification requirements under R18-9-C633 or R18-9-C634 §§ 144.39 or 144.41, as appropriate. Amended plans or demonstrations shall be submitted to the Director as follows:
 - a. within one year of an area of review reevaluation;
 - b. following any significant changes to the facility, such as addition of monitoring wells or newly permitted injection wells within the area of review, on a schedule determined by the Director; or
 - c. when required by the Director.
11. A quality assurance and surveillance plan for all testing and monitoring requirements.

[146.91] R18-9-J668: Class VI; Reporting Requirements

- A. The owner or operator must provide at a minimum, the following reports to the Director, and as specified in Subsection (A)(5) of this Section to EPA, for each permitted Class VI well:
 1. Semi-annual reports containing:
 - a. any changes to the physical, chemical, and other relevant characteristics of the carbon dioxide stream from the proposed operating data;

- b. monthly average, maximum, and minimum values for injection pressure, flow rate and volume, and annular pressure;
 - c. a description of any event that exceeds operating parameters for annulus pressure or injection pressure specified in the permit;
 - d. a description of any event which triggers a shut-off device required pursuant to R18-9-J665(E) 146.88(e) and the response taken;
 - e. the monthly volume and/or mass of the carbon dioxide stream injected over the reporting period and the volume injected cumulatively over the life of the project;
 - f. monthly annulus fluid volume added; and
 - g. the results of monitoring prescribed under R18-9-J667 146.90.
2. Report, within 30 days, the results of:
 - a. periodic tests of mechanical integrity;
 - b. any well workover; and,
 - c. any other test of the injection well conducted by the permittee if required by the Director.
3. Report, within 24 hours:
 - a. any evidence that the injected carbon dioxide stream or associated pressure front may cause an endangerment to a USDW;
 - b. any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between USDWs;
 - c. any triggering of a shut-off system (i.e., down-hole or at the surface);
 - d. any failure to maintain mechanical integrity; or
 - e. pursuant to compliance with the requirement at R18-9-J667(A)(8) 146.90(h) for surface air/soil gas monitoring or other monitoring technologies, if required by the Director, any release of carbon dioxide to the atmosphere or biosphere.
4. Owners or operators must notify the Director in writing 30 days in advance of:
 - a. any planned well workover;
 - b. any planned stimulation activities, other than stimulation for formation testing conducted under R18-9-J659 146.82; and
 - c. any other planned test of the injection well conducted by the permittee.
5. Owners or operators must submit all required reports, submittals, and notifications under Part J of this Article to EPA in an electronic format approved by EPA.
6. Records shall be retained by the owner or operator as follows:
 - a. All data collected under R18-9-J659 146.82 for Class VI permit applications shall be retained throughout the life of the geologic sequestration project and for ten years following site closure.
 - b. Data on the nature and composition of all injected fluids collected pursuant to R18-9-J667(A)(1) 146.90(a) shall be retained until ten years after site closure. The Director may require the owner or operator to deliver the records to the Director at the conclusion of the retention period.
 - c. Monitoring data collected pursuant to R18-9-J667(A)(2) through (9) 146.90(b) through (i) shall be retained for ten years after it is collected.
 - d. Well plugging reports, post-injection site care data, including, if appropriate, data and information used to develop the demonstration of the alternative post-injection site care timeframe, and the site closure report collected pursuant to requirements at R18-9-J670(F) and (H) 146.93(f) and (h) shall be retained for ten years following site closure.
 - e. The Director has authority to require the owner or operator to retain any records required in this Part for longer than ten years after site closure.

[146.92] R18-9-J669: Class VI; Injection Well Plugging

- A. Prior to the well plugging, the owner or operator must flush each Class VI injection well with a buffer fluid, determine bottomhole reservoir pressure, and perform a final external mechanical integrity test.
- B. The owner or operator of a Class VI well must prepare, maintain, and comply with a plan that is acceptable to the Director. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. The well plugging plan must be submitted as Part of the permit application and must include the following information:
 - 1. appropriate tests or measures for determining bottomhole reservoir pressure;
 - 2. appropriate testing methods to ensure external mechanical integrity as specified in R18-9-J666 146.89;
 - 3. the type and number of plugs to be used;
 - 4. the placement of each plug, including the elevation of the top and bottom of each plug;
 - 5. the type, grade, and quantity of material to be used in plugging. The material must be compatible with the carbon dioxide stream; and
 - 6. the method of placement of the plugs.
- C. The owner or operator must notify the Director in writing pursuant to R18-9-J668(A)(5) 146.91(e), at least 60 days before plugging of a well. At this time, if any changes have been made to the original well plugging plan, the owner or operator must also provide the revised well plugging plan. The Director may allow for a shorter notice period. Any amendments to the injection well plugging plan must be approved by the Director, must be incorporated into the permit, and are subject to the permit modification requirements at R18-9-C633 or R18-9-C634 144.39 or 144.41, as appropriate.
- D. Within 60 days after plugging, the owner or operator must submit, pursuant to R18-9-J668(A)(5) 146.91(e), a plugging report to the Director. The report must be certified as accurate by the owner or operator and by the person who performed the plugging operation, if other than the owner or operator. The owner or operator shall retain the well plugging report for ten years following site closure.

[146.93] R18-9-J670: Class VI; Post-Injection Site Care and Site Closure

- A. The owner or operator of a Class VI well must prepare, maintain, and comply with a plan for post-injection site care and site closure that meets the requirements of Subsection (A)(2) of this Section and is acceptable to the Director. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.
 - 1. The owner or operator must submit the post-injection site care and site closure plan as a Part of the permit application to be approved by the Director.
 - 2. The post-injection site care and site closure plan must include the following information:
 - a. The pressure differential between pre-injection and predicted post-injection pressures in the injection zone(s);
 - b. The predicted position of the carbon dioxide plume and associated pressure front at site closure as demonstrated in the area of review evaluation required under R18-9-J661(C)(1) 146.84(c)(1);
 - c. A description of post-injection monitoring location, methods, and proposed frequency;
 - d. A proposed schedule for submitting post-injection site care monitoring results to the Director pursuant to R18-9-J668(A)(5) 146.91(e); and
 - e. The duration of the post-injection site care timeframe and, if approved by the Director, the demonstration of the alternative post-injection site care timeframe that ensures non-endangerment of USDWs.
 - 3. Upon cessation of injection, owners or operators of Class VI wells must either submit an amended post-injection site care and site closure plan or demonstrate to the Director through

monitoring data and modeling results that no amendment to the plan is needed. Any amendments to the post-injection site care and site closure plan must be approved by the Director, be incorporated into the permit, and are subject to the permit modification requirements at R18-9-C633 or R18-9-C634 144.39 or 144.41, as appropriate.

4. At any time during the life of the geologic sequestration project, the owner or operator may modify and resubmit the post-injection site care and site closure plan for the Director's approval within 30 days of such change.
- B. The owner or operator shall monitor the site following the cessation of injection to show the position of the carbon dioxide plume and pressure front and demonstrate that USDWs are not being endangered.
1. Following the cessation of injection, the owner or operator shall continue to conduct monitoring as specified in the Director-approved post-injection site care and site closure plan for at least 50 years or for the duration of the alternative timeframe approved by the Director pursuant to requirements in Subsection (C) of this Section, unless he/she makes a demonstration under Subsection (B)(2) of this Section. The monitoring must continue until the geologic sequestration project no longer poses an endangerment to USDWs and the demonstration under Subsection (B)(2) of this Section is submitted and approved by the Director.
 2. If the owner or operator can demonstrate to the satisfaction of the Director before 50 years or prior to the end of the approved alternative timeframe based on monitoring and other site-specific data, that the geologic sequestration project no longer poses an endangerment to USDWs, the Director may approve an amendment to the post-injection site care and site closure plan to reduce the frequency of monitoring or may authorize site closure before the end of the 50-year period or prior to the end of the approved alternative timeframe, where he or she has substantial evidence that the geologic sequestration project no longer poses a risk of endangerment to USDWs.
 3. Prior to authorization for site closure, the owner or operator must submit to the Director for review and approval a demonstration, based on monitoring and other site-specific data, that no additional monitoring is needed to ensure that the geologic sequestration project does not pose an endangerment to USDWs.
 4. If the demonstration in Subsection (B)(3) of this Section cannot be made at the end of the 50-year period or at the end of the approved alternative timeframe, or if the Director does not approve the demonstration, the owner or operator must submit to the Director a plan to continue post-injection site care until a demonstration can be made and approved by the Director.
- C. At the Director's discretion, the Director may approve, in consultation with EPA, an alternative post-injection site care timeframe other than the 50 year default, if an owner or operator can demonstrate during the permitting process that an alternative post-injection site care timeframe is appropriate and ensures non-endangerment of USDWs. The demonstration must be based on significant, site-specific data and information including all data and information collected pursuant to R18-9-J659 or R18-9-J660 146.82 and 146.83, and must contain substantial evidence that the geologic sequestration project will no longer pose a risk of endangerment to USDWs at the end of the alternative post-injection site care timeframe.
1. A demonstration of an alternative post-injection site care timeframe must include consideration and documentation of:

- a. the results of computational modeling performed pursuant to delineation of the area of review under R18-9-J661 146.84;
 - b. the predicted timeframe for pressure decline within the injection zone, and any other zones, such that formation fluids may not be forced into any USDWs; and/or the timeframe for pressure decline to pre-injection pressures;
 - c. the predicted rate of carbon dioxide plume migration within the injection zone, and the predicted timeframe for the cessation of migration;
 - d. a description of the site-specific processes that will result in carbon dioxide trapping including immobilization by capillary trapping, dissolution, and mineralization at the site;
 - e. the predicted rate of carbon dioxide trapping in the immobile capillary phase, dissolved phase, and/or mineral phase;
 - f. the results of laboratory analyses, research studies, and/or field or site-specific studies to verify the information required in Subsection (C)(1)(d) and (C)(1)(e) of this Section;
 - g. a characterization of the confining zone(s) including a demonstration that it is free of transmissive faults, fractures, and micro-fractures and of appropriate thickness, permeability, and integrity to impede fluid movement, such as carbon dioxide and formation fluids;
 - h. the presence of potential conduits for fluid movement including planned injection wells and project monitoring wells associated with the proposed geologic sequestration project or any other projects in proximity to the predicted/modeled, final extent of the carbon dioxide plume and area of elevated pressure;
 - i. a description of the well construction and an assessment of the quality of plugs of all abandoned wells within the area of review;
 - j. the distance between the injection zone and the nearest USDWs above and/or below the injection zone; and
 - k. any additional site-specific factors required by the Director.
2. Information submitted to support the demonstration in Subsection (C)(1) of this Section must meet the following criteria:
- a. all analyses and tests performed to support the demonstration must be accurate, reproducible, and performed in accordance with the established quality assurance standards;
 - b. estimation techniques must be appropriate and EPA-certified test protocols must be used where available;
 - c. predictive models must be appropriate and tailored to the site conditions, composition of the carbon dioxide stream and injection and site conditions over the life of the geologic sequestration project;
 - d. predictive models must be calibrated using existing information where sufficient data are available;
 - e. reasonably conservative values and modeling assumptions must be used and disclosed to the Director whenever values are estimated on the basis of known, historical information instead of site-specific measurements;
 - f. an analysis must be performed to identify and assess aspects of the alternative post-injection site care timeframe demonstration that contribute significantly to uncertainty. The owner or operator must conduct sensitivity analyses to determine the effect that significant uncertainty may contribute to the modeling demonstration;
 - g. an approved quality assurance and quality control plan must address all aspects of the demonstration; and
 - h. any additional criteria required by the Director.
- D. The owner or operator must notify the Director in writing at least 120 days before site closure. At this time, if any changes have been made to the original post-injection site care and site closure plan, the

owner or operator must also provide the revised plan. The Director may allow for a shorter notice period.

- E. After the Director has authorized site closure, the owner or operator must plug all monitoring wells in a manner which will not allow movement of injection or formation fluids that endangers a USDW.
- F. The owner or operator must submit a site closure report to the Director within 90 days of site closure, which must thereafter be retained at a location designated by the Director for ten years. The report must include:
 - 1. documentation of appropriate injection and monitoring well plugging as specified in R18-9-J669 146.92 and Subsection (E) of this Section. The owner or operator must provide a copy of a survey plat which has been submitted to the local zoning authority designated by the Director. The plat must indicate the location of the injection well relative to permanently surveyed benchmarks. The owner or operator must also submit a copy of the plat to the Administrator of the appropriate EPA Regional Office;
 - 2. documentation of appropriate notification and information to such State, local and Tribal authorities that have authority over drilling activities to enable such State, local, and Tribal authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the injection and confining zone(s); and
 - 3. records reflecting the nature, composition, and volume of the carbon dioxide stream.
- G. Each owner or operator of a Class VI injection well must record a notation on the deed to the facility property or any other document that is normally examined during Title search that will in perpetuity provide any potential purchaser of the property the following information:
 - 1. the fact that land has been used to sequester carbon dioxide;
 - 2. the name of the State agency, local authority, and/or Tribe with which the survey plat was filed, as well as the address of the Environmental Protection Agency Regional Office to which it was submitted; and
 - 3. the volume of fluid injected, the injection zone or zones into which it was injected, and the period over which injection occurred.
- H. The owner or operator must retain for ten years following site closure, records collected during the post-injection site care period. The owner or operator must deliver the records to the Director at the conclusion of the retention period, and the records must thereafter be retained at a location designated by the Director for that purpose.

[146.94] R18-9-J671: Class VI; Emergency and Remedial Response

- A. As Part of the permit application, the owner or operator must provide the Director with an emergency and remedial response plan that describes actions the owner or operator must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.
- B. If the owner or operator obtains evidence that the injected carbon dioxide stream and associated pressure front may cause an endangerment to a USDW, the owner or operator must:
 - 1. immediately cease injection;
 - 2. take all steps reasonably necessary to identify and characterize any release;
 - 3. notify the Director within 24 hours; and
 - 4. implement the emergency and remedial response plan approved by the Director.

- C. The Director may allow the operator to resume injection prior to remediation if the owner or operator demonstrates that the injection operation will not endanger USDWs.
- D. The owner or operator shall periodically review the emergency and remedial response plan developed under Subsection (A) of this Section. In no case shall the owner or operator review the emergency and remedial response plan less often than once every five years. Based on this review, the owner or operator shall submit an amended emergency and remedial response plan or demonstrate to the Director that no amendment to the emergency and remedial response plan is needed. Any amendments to the emergency and remedial response plan must be approved by the Director, must be incorporated into the permit, and are subject to the permit modification requirements at R18-9-C633 or R18-9-C634 144.39 or 144.41, as appropriate. Amended plans or demonstrations shall be submitted to the Director as follows:
 - 1. within one year of an area of review reevaluation;
 - 2. following any significant changes to the facility, such as addition of injection or monitoring wells, on a schedule determined by the Director; or
 - 3. when required by the Director.

[146.95] R18-9-J672: Class VI; Injection Depth Waiver Requirements

- A. This Section sets forth information which an owner or operator seeking a waiver of the Class VI injection depth requirements must submit to the Director; information the Director must consider in consultation with all affected Public Water System Supervision Directors; the procedure for Director--Administrator communication and waiver issuance; and the additional requirements that apply to owners or operators of Class VI wells granted a waiver of the injection depth requirements.
- B. In seeking a waiver of the requirement to inject below the lowermost USDW, the owner or operator must submit a supplemental report concurrent with permit application. The supplemental report must include the following:
 - 1. A demonstration that the injection zone(s) is/are laterally continuous, is not a USDW, and is not hydraulically connected to USDWs; does not outcrop; has adequate injectivity, volume, and sufficient porosity to safely contain the injected carbon dioxide and formation fluids; and has appropriate geochemistry.
 - 2. A demonstration that the injection zone(s) is/are bounded by laterally continuous, impermeable confining units above and below the injection zone(s) adequate to prevent fluid movement and pressure buildup outside of the injection zone(s); and that the confining unit(s) is/are free of transmissive faults and fractures. The report shall further characterize the regional fracture properties and contain a demonstration that such fractures will not interfere with injection, serve as conduits, or endanger USDWs.
 - 3. A demonstration, using computational modeling, that USDWs above and below the injection zone will not be endangered as a result of fluid movement. This modeling should be conducted in conjunction with the area of review determination, as described in R18-9-J661 146.84, and is subject to requirements, as described in R18-9-J661(C) 146.84(c), and periodic reevaluation, as described in R18-9-J661(E) 146.84(e).
 - 4. A demonstration that well design and construction, in conjunction with the waiver, will ensure isolation of the injectate in lieu of requirements at R18-9-J663(A)(1) 146.86(a)(1) and will meet well construction requirements in Subsection (G) of this Section.
 - 5. A description of how the monitoring and testing and any additional plans will be tailored to the geologic sequestration project to ensure protection of USDWs above and below the injection zone(s), if a waiver is granted.

6. Information on the location of all the public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review.
 7. Any other information requested by the Director to inform the Administrator's decision to issue a waiver.
- C. To inform the Administrator's decision on whether to grant a waiver of the injection depth requirements at R18-9-A604 and R18-9-J663(A)(1) §§ 144.6 of this Chapter, 146.5(f), and 146.86(a)(1), the Director must submit, to the Administrator, documentation of the following:
1. An evaluation of the following information as it relates to siting, construction, and operation of a geologic sequestration project with a waiver:
 - a. the integrity of the upper and lower confining units;
 - b. the suitability of the injection zone(s), such as lateral continuity, lack of transmissive faults and fractures, knowledge of current or planned artificial penetrations into the injection zone(s), or formations below the injection zone;
 - c. the potential capacity of the geologic formation(s) to sequester carbon dioxide, accounting for the availability of alternative injection sites;
 - d. all other site characterization data, the proposed emergency and remedial response plan, and a demonstration of financial responsibility;
 - e. community needs, demands, and supply from drinking water resources;
 - f. planned needs, potential and/or future use of USDWs and non-USDWs in the area;
 - g. planned or permitted water, hydrocarbon, or mineral resource exploitation potential of the proposed injection formation(s) and other formations both above and below the injection zone to determine if there are any plans to drill through the formation to access resources in or beneath the proposed injection zone(s)/formation(s);
 - h. the proposed plan for securing alternative resources or treating USDW formation waters in the event of contamination related to the Class VI injection activity; and,
 - i. any other applicable considerations or information requested by the Director.
 2. Consultation with the Public Water System Supervision Directors of all States and Tribes having jurisdiction over lands within the area of review of a well for which a waiver is sought.
 3. Any written waiver-related information submitted by the Public Water System Supervision Director(s) to the (UIC) Director.
- D. Pursuant to requirements at R18-9-C621 124.10 and concurrent with the Class VI permit application notice process, the Director shall give public notice that a waiver application has been submitted. The notice shall clearly state:
1. the depth of the proposed injection zone(s);
 2. the location of the injection well(s);
 3. the name and depth of all USDWs within the area of review;
 4. a map of the area of review;
 5. the names of any public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review; and,
 6. the results of UIC-Public Water System Supervision consultation required under Subsection (C)(2) of this Section.
- E. Following public notice, the Director shall provide all information received through the waiver application process to the Administrator. Based on the information provided, the Administrator shall provide written concurrence or non-concurrence regarding waiver issuance.

1. If the Administrator determines that additional information is required to support a decision, the Director shall provide the information. At his or her discretion, the Administrator may require that public notice of the new information be initiated.
 2. In no case shall a Director of a State-approved program issue a waiver without receipt of written concurrence from the Administrator.
- F. If a waiver is issued, within 30 days of waiver issuance, EPA shall post the following information on the Office of Water's Web site:
1. The depth of the proposed injection zone(s);
 2. The location of the injection well(s);
 3. The name and depth of all USDWs within the area of review;
 4. A map of the area of review;
 5. The names of any public water supplies affected, reasonably likely to be affected, or served by USDWs in the area of review; and
 6. The date of waiver issuance.
- G. Upon receipt of a waiver of the requirement to inject below the lowermost USDW for geologic sequestration, the owner or operator of the Class VI well must comply with:
1. All requirements at R18-9-J661, R18-9-J662, R18-9-J664, R18-9-J665, R18-9-J666, R18-9-J668, R18-9-J669, and R18-9-J671 §§ 146.84, 146.85, 146.87, 146.88, 146.89, 146.91, 146.92, and 146.94;
 2. All requirements at R18-9-J663 § 146.86 with the following modified requirements:
 - a. The owner or operator must ensure that Class VI wells with a waiver are constructed and completed to prevent movement of fluids into any unauthorized zones including USDWs, in lieu of requirements at R18-9-J663(A)(1) § 146.86(a)(1).
 - b. The casing and cementing program must be designed to prevent the movement of fluids into any unauthorized zones including USDWs in lieu of requirements at R18-9-J663(B)(1) § 146.86(b)(1).
 - c. The surface casing must extend through the base of the nearest USDW directly above the injection zone and be cemented to the surface; or, at the Director's discretion, another formation above the injection zone and below the nearest USDW above the injection zone.
 3. All requirements at R18-9-J667 146.90 with the following modified requirements:
 - a. The owner or operator shall monitor the groundwater quality, geochemical changes, and pressure in the first USDWs immediately above and below the injection zone(s); and in any other formations at the discretion of the Director.
 - b. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure by using direct methods to monitor for pressure changes in the injection zone(s); and, indirect methods (such as seismic, electrical, gravity, or electromagnetic surveys and/or down-hole carbon dioxide detection tools), unless the Director determines, based on site-specific geology, that such methods are not appropriate.
 4. All requirements at R18-9-J670 146.93 with the following, modified post-injection site care monitoring requirements:
 - a. The owner or operator shall monitor the groundwater quality, geochemical changes and pressure in the first USDWs immediately above and below the injection zone; and in any other formations at the discretion of the Director.
 - b. Testing and monitoring to track the extent of the carbon dioxide plume and the presence or absence of elevated pressure by using direct methods in the injection zone(s); and indirect methods, unless the Director determines based on site-specific geology, that such methods are not appropriate.

5. Any additional requirements requested by the Director designed to ensure protection of USDWs above and below the injection zone(s).

**Table 1: Applicable Standards
National Primary Drinking Water Regulations**

Contaminant	MCL or TT ¹ (mg/L) ²
Acrylamide	TT ⁴
Alachlor	0.002
Alpha/photon emitters	15 picocuries per Liter (pCi/L)
Antimony	0.006
Arsenic	0.010
Asbestos (fibers>10 micrometers)	7 million fibers per Liter (MFL)
Atrazine	0.003
Barium	2
Benzene	0.005
Benzo(a)pyrene (PAHs)	0.0002
Beryllium	0.004
Beta photon emitters	4 millirems per year
Bromate	0.010
Cadmium	0.005
Carbofuran	0.04
Carbon tetrachloride	0.005
Chloramines (as Cl ₂)	MRDL=4.0 ¹
Chlordane	0.002
Chlorine (as Cl ₂)	MRDL=4.0 ¹
Chlorine dioxide (as ClO ₂)	MRDL=0.8 ¹
Chlorite	1.0
Chlorobenzene	0.1
Chromium (total)	0.1
Copper	TT ⁵ , Action Level = 1.3
<i>Cryptosporidium</i>	TT ⁷
Cyanide (as free cyanided)	0.2
2,4-D	0.07
Dalapon	0.2
1,2-Dibromo-3-chloropropane (DBCP)	0.0002
o-Dichlorobenzene	0.6
p-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
Cis-1,2-Dichloroethylene	0.07
Trans-1,2-Dichloroethylene	0.1
Dichloromethane	0.005
1,2-Dichloropropane	0.005
Di(2-ethylhexyl) adipate	0.4
DI(2-ethylhexyl) phthalate	0.006
Dinoseb	0.007
Dioxin (2,3,7,8-TCDD)	0.00000003
Diquat	0.02
Endothall	0.1
Endrin	0.002
Epichlorohydrin	TT ⁴
Ethylbenzene	0.7

Ethylene dibromide	0.00005
Fecal coliform and <i>E. coli</i>	MCL ⁶
Fluoride	4.0
<i>Giardia lamblia</i>	TT ⁷
Glyphosate	0.7
Haloacetic acids (HAA5)	0.060
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Heterotrophic plate count (HPC)	TT ⁷
Hexachlorobenzene	0.001
Hexachlorocyclopentadiene	0.05
Lead	TT ⁵ ; Action Level=0.015
<i>Legionella</i>	TT ⁷
Lindane	0.0002
Mercury (inorganic)	0.002
Methoxychlor	0.04
Nitrate (measured as Nitrogen)	10
Nitrite (measured as Nitrogen)	1
Oxamyl (Vydate)	0.2
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated biphenyls (PCBs)	0.0005
Radium 226 and Radium 228 (combined)	5 pCi/L
Selenium	0.05
Simazine	0.004
Styrene	0.1
Tetrachloroethylene	0.005
Thallium	0.002
Toluene	1
Total Coliforms	5.0 percent ⁸
Total Trihalomethanes (TTHMs)	0.080
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
1,2,4-Trichlorobenzene	0.07
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
Trichloroethylene	0.005
Turbidity	TT ⁷
Uranium	30µg/L
Vinyl chloride	0.002
Viruses (enteric)	TT ⁷
Xylenes (total)	10

NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG) – The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL) – The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

- Maximum Residual Disinfectant Level Goal (MRDLG) – The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL) – The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT) – A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to Parts per million (ppm).

3 Health effects are from long-term exposure unless specified as short-term exposure.

4 Each water system must certify annually, in writing, to the state (using third-Party or manufactures product) of dose and monomer level does not exceed the levels specified, as follow: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

5 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L and for lead is 0.015mg/L.

6 A routine sample that is fecal coliform-positive or *E. coli*-positive triggers repeat samples-if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive, and fecal coliform-negative or *E. coli*-negative triggers repeat samples – if any repeat sample is fecal coliform-positive or *E. coli*-positive, the system has an acute MCL violation. See also Total Coliforms.

7 EPA's surface water treatment rules require system using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- Cryptosporidium: 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.
- Giardia lamblia: 99.9 percent removal/inactivation
- Viruses: 99.99 percent removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated according to the treatment techniques in the surface water treatment rule, *Legionella* will also be controlled.
- Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment; Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, Cryptosporidium removal requirements, updated watershed control requirements for unfiltered systems).
- Long Term 2 Enhanced Surface Water Treatment; This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional Cryptosporidium treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the system maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest system (serving at least 100,000 people) will begin monitoring in October 2006 and the

smallest system (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)

- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

8 No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. coli* or fecal coliforms, system has an acute MCL violation.

9 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

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