UICI - 8 - 4

WDW-4
HAZARDOUS
WASTE
INJECTION

Chavez, Carl J, EMNRD

From:	Holder, Mike <Michael.Holder@hollyfrontier.com>
Sent:	Tuesday, December 12, 2017 1:17 PM
To:	Chavez, Carl J, EMNRD; Griswold, Jim, EMNRD
Cc:	Holder, Mike; Denton, Scott
Subject:	RE: HollyFrontier Navajo Refining LLC WDW-4 (UICI-8-4) Respond to OCD UIC Class I Hazardous Waste Injection Well Survey Documents
Attachments:	HFNR response to 10-26-17 OCD email 121217.pdf
Importance:	High

Carl/Jim – attached is Navajo's response to your request below. A hardcopy has also been sent to your attention. Please review and let me know if this satisfies your request or if additional information is needed. As always, please don't hesitate to contact us with any questions and we appreciate all your assistance. As Scott has indicated, we are on a schedule for the WDW-4 well and hope to have our permit soon – if there is anything we can do to help facilitate this please let me know. Hope you have a great day and look forward to hearing from you!

Thanks,
Mike

From: Chavez, Carl J, EMNRD [mailto:CarlJ.Chavez@state.nm.us]
Sent: Wednesday, December 06, 2017 1:11 PM
To: Denton, Scott; Dade, Lewis (Randy)
Cc: Brancard, Bill, EMNRD
Subject: HollyFrontier Navajo Refining LLC WDW-4 (UICI-8-4) Respond to OCD UIC Class I Hazardous Waste Injection Well Survey Documents

Scott, et al.:

The New Mexico Oil Conservation Division (OCD) is responding to your clarification phone request of 12/5/17 for the above subject OCD request of October 26, 2017 (see attached letter with documents). HollyFrontier Navajo Refining, LLC (Navajo) requested clarification for its response letter to OCD due by 12/29/2017.

In the request, OCD stated the following:

Please review the attached documents and provide a preliminary response to the criteria or survey in the Crosswalk, Deficiencies, Migration, and Feds. Haz. and Waste Injection Well Requirements on or before Friday COB December 29, 2017. Also, provide acknowledgement that Navajo has reviewed all of the additional documents herein and is confident that it meets and/or will comply with the requirements. These documents serve to assist Navajo and OCD in determining the feasibility of a well transition.

Navajo should be aware that there will be Federal and State requirements, and OCD's letter with documents should assist Navajo with its review and response to the OCD letter. Until OCD receives Primacy from EPA for UIC Class I Hazardous Disposal Wells, it is possible that Navajo may be required to deal directly with the US EPA for a hazardous disposal well permit, if it seeks one.

Per the OCD letter of 10/26/2017, please provide a preliminary response to the criteria or survey in the Crosswalk, Deficiencies, Migration, and Feds. Haz. and Waste Injection Well Requirements documents. Also, please acknowledge that Navajo has reviewed all of the additional documents in the letter. It is as I verbally stated during our phone call yesterday.

Thank you.

Mr. Carl J. Chavez, CHMM (#13099)
New Mexico Oil Conservation Division
Energy Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico 87505
Ph. (505) 476-3490
E-mail: CarlJ.Chavez@state.nm.us
"Why not prevent pollution, minimize waste to reduce operating costs, reuse or recycle, and move forward with the rest of the Nation?" (To see how, go to: http://www.emnrd.state.nm.us/OCD **and see "Publications")**

December 12, 2017

Mr. Carl Chavez
Oil Conservation Division
1220 S. St. Francis Dr.
Santa Fe, New Mexico 87505

Re: Permit Application for Proposed Non-Hazardous Class I Injection Well WDW-4 and Potential Conversion to Hazardous Waste Service
HollyFrontier Navajo Refining LLC, Artesia, New Mexico

Dear Mr. Chavez:

HollyFrontier Navajo Refining LLC (Navajo) and its consultant, WSP, have reviewed the documents provided in your October 26, 2017 email correspondence regarding the potential conversion of WDW-4, a proposed Class I non-hazardous waste injection well, to hazardous waste service. The proposed well will serve Navajo's Artesia refinery and has been designed to meet the more stringent requirements of the Underground Injection Control (UIC) regulatory program for hazardous waste service. Additionally, Navajo understands the level of effort needed to pursue No Migration Petition (NMP or "petition") approval from the United States Environmental Protection Agency (EPA). Navajo is confident that the proposed well will comply with the requirements for hazardous waste injection. Should issues arise during the potential transition, Navajo is committed to working through them with the New Mexico Oil Conservation Division (NMOCD) and the EPA.

The operational efficiency of WDW-4 has been evaluated based upon physical characteristics of the subsurface geology of the site and proposed injection rates and volumes, but is currently unknown and cannot be determined fully until the well is installed and placed in operation. Following installation of the well, Navajo intends to operate the well continuously with non-hazardous waste injection into the Silurian-Devonian formation. Continuous injection will provide valid reservoir data from pressure falloff tests and other critical data needed to prepare the NMP. As soon as enough information has been collected, Navajo will prepare and submit the petition.

The purpose of the NMP is to demonstrate, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. The following information relevant to this "no migration" criterion is already known for the site:

- The Confining Zone and the Injection Zone are of sufficient thickness and characteristics to accept non-hazardous and hazardous waste. The Confining Zone overlying the WDW-4 Injection Zone is composed of the upper Devonian Woodford Formation and the overlying undifferentiated Mississippian age strata. The Woodford Formation consists of low permeability shale and the undifferentiated Mississippian age strata are low permeability carbonates. Both formations are laterally continuous throughout the region. The Injection Zone is undifferentiated Silurian-Devonian age strata composed of shallow water carbonates, dolostone and/or limestones. It is anticipated to be approximately 600 feet thick.

- No evidence has been found of any subsurface faulting within or immediately surrounding the Area of Review (AOR) that could provide a hydraulic connection between the Injection Zone and the underground source of drinking water (USDW).

- The southeastern portion of New Mexico is historically an area of low seismicity with naturally occurring earthquakes being rare and of low magnitude. The Artesia refinery and WDW-4 site are located in Eddy County, an area recognized as having a low seismic risk. Note also that this county is not included in 40 CFR Part 264, Appendix VI, as a jurisdiction subject to the seismic standard for hazardous waste management units under the Resource Conservation and Recovery Act [RCRA]. In addition, the proposed injection operations associated with WDW-4 do not have the potential to cause any seismic activity that could alter the confining capability of the Injection Zone and overlying Confining Zone.

- A 1-mile AOR was established for the WDW-4 UIC permit application. Only one (1) of the 91 penetrations reviewed was advanced to a depth to encounter the top of the planned Injection Zone; however, it was properly constructed and appropriately plugged and abandoned. When an NMP is pursued, a 2-mile AOR will be established, and the effects of injection on existing wells in the expanded AOR will be evaluated. “Non-endangerment” of the USDW will be demonstrated by showing that existing wells are constructed to withstand pressure increases caused by injection via WDW-4. “No-migration” will be demonstrated by showing that existing wells will not become pathways for migration of injected hazardous wastes from the Injection Zone for the period of “no migration,” i.e., 10,000 years. Following observation of continuous injection operations, more complete data for WDW-4 will be available to provide these demonstrations through pressure buildup and plume migration modeling.

- The proposed well construction for WDW-4 is designed to meet the more stringent UIC regulatory requirements for hazardous waste service. It is designed with steel lining material and a retrievable injection packer. The long-string (inner) casing will be fully cemented to the surface, protecting the USDW. The proposed hazardous wastewater will remain within a pH range that is compatible with the carbon steel materials used for tubulars, the injection packer, and wetted parts of the wellhead. In addition, the formation fluid contained in the Injection Zone is compatible with well construction components and the characteristics of the non-hazardous and future proposed hazardous waste.

The items in your email communication regarding conversion of WDW-4 to receive hazardous waste are summarized below and a response provided to each. Navajo is aware that additional information will be required for inclusion in the NMP review process and is confident that it can meet the requirements for conversion of the well to hazardous waste use.

- The EPA's "Crosswalk for UIC Land Ban Petition Review" (Crosswalk) will provide quality assurance and quality control (QA/QC) for the administrative and technical completeness of the NMP. Navajo's QA/QC document review process is sufficiently thorough that Navajo anticipates receiving only minimal comments from the EPA. The Crosswalk will serve as a complete cross-check that all required information is contained in the NMP, and will facilitate EPA's review. Some information needed to prepare a complete NMP (e.g., injectivity, transmissivity, effective permeability, porosity, etc.) cannot be fully assessed or developed until completion of installation and continuous operation of the well for non-hazardous fluids. Input parameters will be observed and recorded during the continuous operation so that Navajo can demonstrate "no migration" through pressure buildup and plume migration modeling. The Crosswalk also will be used as an executive summary, not only listing page numbers but providing a brief summary for each item, as recently requested by the EPA to facilitate its review.

- The list of common deficiencies/issues in recent petitions is known to our consultant, WSP. Navajo will submit a stand-alone NMP document. Consistency across the document will be maintained to clarify reference datum (Kelly Bushing [KB] height and mean sea level [msl], scales and significant figures, and regulatory citations are listed correctly). Artificial penetrations (AP) will satisfy the no migration standard, as demonstrated by available well records and geologic information, including cross sections, and all other requested information. In addition, modeling parameters will be clearly listed and described with supporting documentation.

- The EPA Region 6's "UIC Land Ban Petition Application Guideline (Revised February 2007)" will be used to ensure appropriate and requested documentation is provided in the petition. The guideline will be used to help demonstrate, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the Injection Zone for as long as the waste remains hazardous as per 40 Code of Federal Regulations (CFR) §148.20(a).

- The "EPA Region 6 No Migration Petition Reissuance Submittal (January 14, 1998)" will be used as a general list of items to be considered when submitting the petition for review. WSP also is aware that EPA Region 6 prefers the petition to be submitted in stages for review. This submittal guideline will be used to ensure that the staged submittal contains relevant information and demonstration documentation to proceed with minimal comments.

- The well construction requirements of 40 CFR §146.65 through §146.67 were followed in designing the proposed WDW-4, in order to potentially convert the well to hazardous waste service. It is designed with steel lining material and a retrievable injection packer. The long-string (inner) casing will be fully cemented to the surface, protecting the USDW. The proposed hazardous wastewater injectate will remain within a suitable pH range that is compatible with the carbon steel materials used for tubulars, the injection packer, and wetted parts of the wellhead. In addition, the formation fluid contained in the Injection Zone is compatible with the well construction components and the characteristics of the non-hazardous and hazardous injected fluids.

- The suggestion regarding development of a "typical" Class I injection well diagram will be taken into consideration when preparing the NMP; however, the proposed well construction plans for WDW-4 already address well elements required to protect the USDW.

- Information on how the proposed conversion will achieve the requirements of the New Mexico Water Quality Control Commission (WQCC) regulations titled "Ground and Surface Water Protection" (20.6.2.1 *et seq*. New Mexico Administrative Code [NMAC]) will be included in the NMP.

- The provisions of the New Mexico WQCC "Summary of Proposed Water Conservation Rule" (based upon Navajo's Second Amended Petition for a rulemaking change) will be adhered to during preparation of the NMP.

- The EPA's "Requirements for all Class I Wells and Class I Hazardous Waste Wells," which summarize the UIC program requirements, will be addressed during preparation of the WDW-4 petition. The favorable local and regional geology played an important role in siting of the proposed well. Following continuous operation of WDW-4, Navajo will have an expanded understanding of the permeability, porosity, and injectivity at the site. The Artesia refinery and WDW-4 site are located in an area recognized as having a low level of seismic risk; as noted above, Eddy County is not subject to the RCRA siting standards based upon seismic considerations. In addition, the proposed injection operations associated with WDW-4 do not have the potential to cause any seismic activity which could alter the confining capability of the Injection Zone and overlying Confining Zone. Also, a 1-mile AOR was established for the WDW-4 non-hazardous waste injection permit application. Only one (1) of the 91 penetrations reviewed was advanced to a depth to encounter the top of the planned WDW-4 Injection Zone; however, it was properly constructed and appropriately plugged and abandoned. When an NMP is pursued, a 2-mile AOR will be established, and the effects of injection on existing wells in the AOR will be evaluated. "Non-endangerment" of the USDW will be demonstrated by showing that existing wells are constructed to withstand pressure increases caused by injection into WDW-4. Additionally, annual testing, 5-year integrity testing, and reporting/recordkeeping requirements will ensure that there will be ongoing diligence to demonstrate minimal pressure buildup and "no migration."

- Information on how the proposed conversion addresses concerns in the EPA's "Class I Underground Injection Control Program: Study of the Risks Associated with Class I Underground Injection Wells" (March 2001) will be included in the NMP. Navajo will ensure that construction and operation of WDW-4 protects the USDW through compliance with applicable well design, construction, and operational regulatory requirements, and continuous monitoring of injection activities. It is in Navajo's best interest to ensure that potential human health and environmental risks are of highest priority. WDW-4 has been proposed to be sited in a geologically stable area, free of transmissive fractures or faults, and has been designed from the outset as technically and operationally suitable for hazardous waste service.

Navajo appreciates the NMOCD's communication of issues that require resolution going forward, and the opportunity to respond to those issues. If you need additional information, please do not hesitate to contact Mr. Scott Denton at (575) 746-5487 or Scott.Denton@HollyFrontier.com or myself at (575) 308-1115 or Michael.Holder@hollyfrontier.com.

Sincerely,

Michael W. Holder
Environmental Specialist

Cc: Scott Denton (HollyFrontier)
Jim Griswold (NMOCD)

Chavez, Carl J, EMNRD

From:	Chavez, Carl J, EMNRD
Sent:	Thursday, October 26, 2017 11:32 AM
To:	Denton, Scott (Scott.Denton@HollyFrontier.com); Combs, Robert (Robert.Combs@hollyfrontier.com); 'Dade, Lewis (Randy)'
Cc:	Brancard, Bill, EMNRD; Sanchez, Daniel J., EMNRD; Griswold, Jim, EMNRD; Goetze, Phillip, EMNRD
Subject:	HollyFrontier Navajo Refining LLC WDW-4 (UICI-8-4) Respond to OCD UIC Class I Hazardous Waste Injection Well Survey Documents
Attachments:	crosswalk2-27-14.pdf; deficiencies.pdf; feb_2007_petition_outline.pdf; migration.pdf; EPA Well Construction rqts 146.65.pdf; EPA Well Construction rqts 146.66.pdf; Class I Well Diagram.pdf; 20.006.0002.pdf; Item004_FirstAmendedPetitionToAmendNMAC-RequestForHearing11-12-14.pdf; 007H_RobertFVanVoorhees-SummaryOfProposedRule06-15-15.pdf; Fed Haz Waste Injection Well Requirements.pdf; page_uic-class1_summary_class1_reqs.pdf; study_uic-class1_study_risks_class1.pdf

Mr. Denton, et al.:

Good morning.

The New Mexico Oil Conservation Division (OCD) is writing to inform HollyFrontier Navajo Refining LLC (Navajo) of its intent to soon issue the UIC Class I (Non-Hazardous) Injection Well Discharge Permit (DP) for the above subject well.

In addition, OCD is aware of Navajo's interest in eventually modifying the above subject UIC Class I (Non-Hazardous) Injection Well into a Hazardous Injection Well at a future date. It is OCD's objective to ensure when the DP "Modification" request is received by OCD, that there be no deficiencies preventing the well from transitioning into the new well designation, unless Navajo and OCD discover in this process that the well cannot possibly meet the criteria. This correspondence and attached documents along with Navajo's response shall become part of the Administrative Record going forward.

Please review the attached documents and provide a preliminary response to the criteria or survey in the Cross-walk, Deficiencies, Migration, and Feds. Haz. and Waste Injection Well Requirements on or before Friday COB December 29, 2017. Also, provide acknowledgement that Navajo has reviewed all of the additional documents herein and is confident that it meets and/or will comply with the requirements. These documents serve to assist Navajo and OCD in determining the feasibility of a well transition.

If Navajo would like to schedule a meeting to communicate on the attached documents, OCD would be glad to reserve the OCD 3rd Floor Conference Room in Santa Fe or conduct telephone conference calls with meeting agendas. Please contact me if you have questions or wish to communicate further on this important matter.

Thank you in advance.

Mr. Carl J. Chavez, CHMM (#13099)
New Mexico Oil Conservation Division
Energy Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico 87505

Ph. (505) 476-3490
E-mail: CarlJ.Chavez@state.nm.us
"Why not prevent pollution, minimize waste to reduce operating costs, reuse or recycle, and move forward with the rest of the Nation?" (To see how, go to: http://www.emnrd.state.nm.us/OCD **and see "Publications")**

cc: Administrative Record

February 27, 2014

Mr. Joe Brown
Environmental Individual
XYZ Company
123 Highway
Nowhere, TX 12345

Dear Mr. Brown:

As a result of decreasing staff levels and an ongoing workload backlog, the Region is continuing to explore efforts to improve the quality of submitted petitions and reissuances to expedite the review process of Class I No Migration Petitions. To this end, EPA Region 6 has compiled a table establishing a crosswalk based on the February 2007 EPA Region 6 UIC Land Ban Petition Application Guideline and the regulations at 40 CFR parts 146 and 148. The crosswalk table focuses on the 25 elements of the guideline. Some of the requested information is redundant with the requirements in 40 CFR Part 146 Subpart G, but is required by Part 148 or is used by EPA Region 6 to verify no migration of waste from the injection zone. The crosswalk table and the February 2007 EPA Region 6 UIC Land Ban Petition Application Guideline can be found at the following website:
http://www.epa.gov/region6/water/swp/uic/landban.htm

Region 6 is requesting your cooperation in using this table to facilitate the common goal of timely processing of No Migration Petition related applications. The table is set up for applicants to annotate each of the 25 elements with information showing specifically where each element is addressed in the application. Since each No Migration demonstration is site specific, additional information not included in this table may be required. However, the table includes core information normally used in no migration demonstrations. In addition to serving as a review tool for the Region, the table should be used by applicants as an aid to improve the QA/QC of the application and ensure the application is ready for EPA review.

The crosswalk table will be the first item reviewed by the Region for any submission. If all the requested information on the table is not submitted, the review will cease and the operator will be notified. The review will not continue until the missing information is supplied. In addition to the crosswalk table, Region 6 is also requesting that the application text, tables and small scale figures (ones easily viewable on a computer monitor) be provided in a searchable electronic format. These two requested items should enable a more efficient review by EPA. If you have any questions, please contact Brian Graves at (214) 665-7193. Thank you for your consideration in this matter.

Sincerely yours,

Philip Dellinger
Chief
Ground Water/UIC Section

NOTE: When completing the table, please list only the page number(s) specific to each Roman numeral Section. If an item isn't applicable to the submitted application, please list NA and include a brief reason why it isn't applicable.

I. STAND ALONE DOCUMENT DEMONSTRATING THE NO MIGRATION STANDARD		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Region 6 reviews all aspects of the no migration demonstration during the initial petition review and requests for petition reissuance.		
	1. Incorporate any deficiency responses into one document.	
	a. Required for initial petition submissions.	
	b. Recommended for applications for reissuance of a petition.	

II. PETITION TABLE OF CONTENTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Each application should include a Master Table of Contents located in the front of Volume 1.		
	1. Listing should also identify the volume number where the topic is located.	
	2. The subsections contained in each section should be included in the Table of Contents.	
	3. A list of tables, figures, and appendices should be included in the Table of Contents.	
	4. Adding a Table of Contents for the specific section or appendix to the front of that specific section or appendix in the document is suggested for expediting the review process.	
B. Any appendices containing multiple documents should include a content listing to identify the items if they are not individually labeled or tabbed.		

III. ADMINISTRATIVE		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Applicant		
	1. Facility name	
	2. Well numbers and corresponding state UIC permit numbers	
	3. Addresses	
	4. Mailing address	
	5. Facility and well physical address	
	6. Telephone and facsimile numbers	
B. Facility Contact Information		
	1. Person(s) or firm(s) authorized to act on behalf of the applicant during the processing of the application	
	a. Address	
	b. Phone numbers	
	c. E-mail address	
C. Include A Signed Certification Statement As Listed In 40 CFR §148.22(a)(4).		
	1. Must be signed and dated following all final revisions to the document	
	a. Petitioner may wait to submit until the review process is completed	
D. Summary Of Past Petition Related Approvals		
E. Quality Assurance And Quality Control		
	1. Describe processes used to verify that proper quality assurance and quality control plans were followed in preparing the petition demonstration- 40 CFR §148.21(a)(4)	
	a. Confirm all referenced tables, figures, appendices, etc., are included in the document	

III. ADMINISTRATIVE		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
F. Elevations		
	1. Clarify what depth reference elevations are used in the document	
	a. Confirm all depths listed include a reference datum	
	2. List the well elevations to allow depths to be converted to other reference depths	
G. Consistently Reference Specific Gravity Or Density Values Throughout The Petition.		
	1. Use a consistent number of decimal places a. Two decimal places are recommended, but no less than two can be used.	
	2. Always provide a corresponding reference temperature(s)	
	3. Volume weighted density/specific gravity ranges may be requested by facilities that do not inject a significant volume of immiscible fluid	
	4. The timeframe for volume weighted density/specific gravity averaging may consist of any of the following	
	a. Three – whole calendar month	
	b. Running 90 or 91 day (13 week)period	

IV. UPDATED ADJACENT SURFACE LAND OWNER LISTING 40 CFR §124.10(c)(4)	PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Include the names and mailing addresses of the surface owners of the tracts of land adjacent to the plant boundaries.	
B. Provide a map illustrating the location of the adjacent landowner tracts.	
C. Describe surrounding land usage (farming, industry, residential, etc.).	

V. PETITION APPLICATION REQUESTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the specifics of the petition.		
	1. Identify the specific wastes and waste codes requested 40 CFR §148.22(a)(1)	
	2. Specify the well or wells for which the demonstration will be made 40CFR§148.22(a)(1)	
	3. List the specific gravity/density range, injection intervals, end of operations date, injection rates, etc.	
	4. For a reissuance or modification, specify the requested changes from the approved petition	
B. Clarify if application consists of the containment of waste within the defined injection zone - 40CFR§148.20(a)(1)(i), chemical fate demonstration-40CFR§148.20(a)(1)(ii), or a combination of both.		
	1. If a chemical fate demonstration is requested, additional documentation not covered in this outline will be required to satisfy 40CFR Part 148.	

VI. LOCATION MAPS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a USGS topographical map (1:24000 scales, if available) indicating the plant boundaries and well location(s).		
B. Provide a simple schematic with a scale or distances listed illustrating the plant boundary and surface and bottom hole well locations of all facility disposal wells.		
	1. Include facility wells completed in other injection intervals (hazardous and non-hazardous)	

VII. CHARACTERISTICS OF INJECTION FLUID 40CFR §148.22(a)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a brief summary of the operation or process that generates the injection fluids.		
B. Describe the characteristics of the injection waste stream.		
	1. Discuss if the physiochemical nature of the waste streams are such that reliable predictions can be made to satisfy the standards outlined in 40CFR §148.20(a)(1)(i) or 40CFR §148.20(a)(1)(ii)	
C. Include a recent waste analysis.		
	1. Fully describe the chemical and physical characteristics of the subject wastes 40CFR §148.22(a)(2)	
	2. Verify waste codes represent all applicable waste constituents and constituent concentrations do not exceed maximum concentrations used in the demonstration	
D. Describe if waste analysis testing performed is accurate and reproducible 40CFR §148.21(a)(1).		
E. Clarify if estimation techniques used were appropriate and if EPA-certified test protocols were used, where available and appropriate 40CFR §148.21(a)(2).		

VIII. DISPOSAL WELLS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. General		
	1. Differentiate any plant well numbering system and Class I UIC permit numbers used in the document.	
	2. Provide well location description	
	3. Include latitude and longitude	
	a. Provide and reference a copy of the well's Class I hazardous waste UIC permit and summarize the permit limitations	
	4. Provide relevant elevations (Ground	

VIII. DISPOSAL WELLS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	Level(GL) and Kelly Bushing(KB))	
	5. Define the KB depths to the Confining Zone, Injection Zone, and Injection Interval in the well	
B. Disposal well design		
	1. Include a detailed well construction and completion history	
	a. Include sidetracks, abandoned boreholes, or remedial activity	
	2. Include a wellbore schematic for each well	
	a. Consistently reference depths to the referenced elevation	
	b. For legibility, add expanded detail for complex wellbore construction, if needed	
	3. Provide daily drilling log or details on well recompletions	
	a. Summarize historical well work	
	4. List the depths and describe the specifics of tubular, cement, packers, etc. used in the completion of the well	
	5. Provide relevant logs to demonstrate the cement integrity of the well	

IX. MECHANICAL INTEGRITY TESTING-MIT		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Include a copy of the most recent mechanical integrity demonstration (RAT and annulus pressure test) for each well included in the application 40CFR §148.20(a)(2)(iv).		
	1. Demonstrate mechanical integrity of a well's long string casing, injection tubing, annular seal, and bottom hole cement	

IX. MECHANICAL INTEGRITY TESTING-MIT		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	2. Confirm that all injected fluids are entering the approved injection intervals and that no fluids are channeling up out of the injection zone near the wellbore.	
	a. Operators may be required to conduct a radioactive tracer survey (RAT) with multiple slug chases between the packer and injection interval to document casing integrity and no loss of fluid above the completed interval.	

X. OFFSET WELL(S)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a complete list of all facility disposal wells including other well classifications or wells completed in other intervals.		
B. Describe all pressure sinks and sources in the same injection zone located within a minimum 10 mile radial distance from the facility.		
	1. List all offset oil and gas production from the injection interval	
	a. Provide well completion information or general field information	
B. Describe all pressure sinks and sources in the same injection zone located within a minimum 10 mile radial distance from the facility.		
	2. List all offset injection wells completed in the same injection interval (Class I and Class II)	
	a. Provide well completion information and wellbore schematics	
	3. Provide a map illustrating the location of sinks and sources	
	4. Provide cumulative volumes for the sinks and sources completed in the injection	

X. OFFSET WELL(S)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	interval	
	a. Include supporting documentation for reported volumes	
	b. Address oil, gas, or water production from producing wells	
C. Support the general area reviewed for pressure sinks or sources based on volumes and reservoir transmissibility.		
	1. Include any modeling or analytical calculations, if applicable	
D. Identify the source or potential sources of the pressure sink in under pressured injection intervals.		

XI. INJECTION HISTORY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Report and document historical injection into the injection interval to date.		
	1. Site specific	
	2. Offset wells	
	3. Oil and gas injection, enhanced recovery, or disposal wells	
B. Provide and reference a summary table for the volumes injected into each modeled disposal well, including offset wells.		
	1. List the volumes using the timeframes input into the model	
	2. Include a column in cubic feet per day for verification of SWIFT input, if applicable	
C. Based on historical injection, justify the maximum rates modeled during the operational period.		

XII. UNDERGROUND SOURCE OF DRINKING WATER (USDW) DETERMINATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Define the depth to the lowermost USDW.		
	1. Explain how this depth was determined	
	2. Provide logs, equations, and computations, if relevant	

XIII. Regional Geology		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Discuss the regional geology		
	1. Describe the stratigraphy, depositional environments, tectonic history, and structural geology	
	a. Include a geological stratigraphic column	
	b. Include supporting documentation i.e., maps, cross-sections, etc.	
B. Discuss the regional hydrogeology		
	1. Describe aquifers and aquicludes	
C. Seismicity		
	1. Include a listing of historical seismic activity in the regional area (at least a 100 square mile area around the injection well(s)	
	a. Data should include intensity levels (using an international scale) and distances from the injection facility	
	b. Provide a risk assessment of induced seismicity due to injection activities based on a known induced seismicity formula	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Provide a detailed description of the local geology.		
	1. Local geologic area should extend a minimum of 1 mile past the extent of the 10,000 year composite waste plume	
B. Include and reference a type log defining each of the following intervals.		
	1. Confining zone	
	2. Injection zone	
	a. Containment interval	
	b. Injection interval	
C. Include an updated commercial structure map on the most applicable reference datum available.		
	1. Compare with the local geologic interpretation and discuss any anomalies	
	2. Clarify if any geologic features illustrated on the commercial map are relevant to the no migration application	
	a. Address the vertical and horizontal extents of faults, if applicable	
D. Confining Zone		
	1. Define a confining zone located above the injection zone 40CFR §148.21(b)	
	2. Demonstrate the following for the Confining Zone 40CFR §148.21(b)(2)	
	a. Thickness	
	b. Porosity	
	c. Permeability	
	d. Areal extent and lateral continuity	
E. Injection Zone		
	1. Demonstrate each of the following for the various strata in the injection zone 40CFR§148.21(b)(1)	
	a. Thickness	
	b. Porosity	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	c. Permeability	
	(i) Include available core data and core analysis	
	(a) Site specific, offset wells, area wells, or applicable literature references	
	d. Areal extent	
	e. Free of transecting, transmissive faults or fractures to prevent the vertical movement of fluids 40CFR §148.20(b) or (c)	
	2. Provide available seismic lines to delineate the local structure of the injection zone if there is a lack of well data at the required depth	
	3. Containment Interval	
	a. Identify the strata within the containment interval of the injection zone that will confine fluid movement above the injection interval 40CFR §148.20(b)	
	(i) Discuss litho logy and mineralogy	
	b. Show the containment interval is free of known of vertically transmissive faults or fractures 40CFR §148.20(b)	
	4. Injection Interval	
	a. Demonstrate each of the following for the injection interval of the injection zone 40CFR §148.21(b)(1)	
	(i) Areal extent and lateral continuity	
	(ii) Provide appropriate structure and isopach maps	
	b. Thickness	
	(i) Base on several criteria, i.e., logs, isopach, cross-sections	
	5. Porosity	
	a. Base on several criteria, i.e., logs, core	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	data, core analyses, literature, interference tests, etc.	
	6. Permeability	
	a. Include available core data and core analysis	
	(i) Site specific, offset wells, area wells, or applicable literature references	
	(ii) Refer to model input parameters	
	b. Hydraulic gradient 40CFR §148.21(b)(3)	
	(i) Provide appropriate literature references or calculations	
	(a) Reference gradients from pressure tests, if applicable	
F. Geologic Maps		
	1. Include the following general features on structure, isopach, and base maps	
	a. Map scale should be 1” to 2000’	
	b. Outline the facility and AOR boundaries	
	c. Include appropriate legends, title blocks, and labeling	
	(i) Wells not deep enough to penetrate the mapped datum should be designated as such, e.g., NDE	
	(ii) Wells with no logs available should be designated as such, e.g., NA	
	d. Confirm the unique artificial penetration (AP) numbers are legible	
	(i) Expand portions of the map, if needed , for high well density areas	
	2. Structure maps should be based on applicable geologic datum’s	
	3. Isopach maps should show areal extent and continuity of the specified intervals	
	4. Illustrate cross-section lines on all maps or	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	include and reference a separate cross-section index map that illustrates the wells included on all cross-sections	
G. Cross-Sections		
	1. Include a minimum of two structural cross-sections perpendicular to each other that extend beyond the 10,000 year waste plume areas	
	a. Include additional mini-cross-sections over specific regions to demonstrate specific geologic features, i.e., the extent of a fault	
	(i) Include stratigraphic cross-sections based on a reasonable marker, if correlations are difficult	
	2. Include the following on each cross-section	
	a. Legend and title block with date last updated	
	b. Small scale map showing the cross-section line	
	c. Top and bottom of applicable intervals, i.e., injection interval, injection zone, confining zones, USDW, etc.	
	d. Document perforations or completion information, if relevant	
	3. At a minimum, include the well name, artificial penetration (AP) number, operator, well status, total depth, KB elevation for each log posted on the cross-section	
	4. Scale the cross-section so the depth scale is legible	
	5. Include and reference a copy of the actual logs included on the cross-section as an appendix	

XIV. LOCAL GEOLOGY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
H. Reservoir Dip		
	1. Clarify if a variable structure or constant dip will be used for the no migration waste plume demonstrations	
	a. Constant dip	
	(i) Justify the average dip angle used in the demonstration	
	(a) Describe or illustrate on a map where and what depths were used	
	(b) List the equations and variables input to calculate the average dip angles	
	(ii) Variable dip	
	(a) Clarify what structure map was used for the model input	
I. Provide a sufficient number of well logs to document the structural depths and thicknesses on the structure and isopach maps		
	1. More data may be required for certain areas if correlations are difficult or unique geologic features exist	
J. Provide fracture gradient calculations and maximum surface pressure limitation.		

XV. GEOCHEMISTRY AND INJECTED WASTE COMPATIBILITY		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the geochemical conditions of the well site 40CFR §148.21(b)(5).		
	1. Include the physical and chemical characteristics of the injection zone and the formation fluids in the injection zone	
B. Discuss the compatibility of the injected waste with the injection zone.		
C. Provide an analysis to demonstrate if the waste will adversely alter the confining capabilities of the injection and confining zones.		

XV. GEOCHEMISTRY AND INJECTED WASTE COMPATIBILITY	PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
D. Discuss compatibility with well construction.	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Initial and current hydrostatic pressure in the injection zone 40CFR §148.21(b)(4).		
	1. Provide a summary table that lists all historical shut-in pressures for wells completed in the injection interval(s)	
	a. Compare with the initial static pressure assigned for the no migration demonstration	
	2. Discuss how the initial reservoir pressure was selected based on the available data	
	a. Include all reference data needed to verify selected pressure value	
B. Transmissibility		
	1. Provide and summarize available historical pressure transient testing, i.e., drill stem tests, falloffs, injectivity, interference, pulse, etc., to support the injection interval transmissibility values used in the no migration demonstrations	
	a. Provide electronic copy of pressure transient tests for site specific and offset wells, if available	
	b. Include summary report, tables, and figures of pressure transient reports	
	(i) Hard copy of recorded pressure and time data not necessary if plot of data is provided	
	c. High and low end transmissibility used in	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	the demonstrations should be reasonably conservative based on available data	
C. Effective Net Thickness		
	1. Discuss the selection of a conservative net thickness	
	a. Pressure buildup demonstration	
	b. Plume migration demonstrations	
	2. Include and reference copies of all criteria on which the net thickness values are based, i.e., logs, isopachs, cross-sections, historical temperature log summary and plots, seismic lines, literature, well tests, RATs, flow profile surveys, etc.	
	3. Demonstrate how the selected effective net thickness values are conservative based on all available data	
	a. Provide and discuss all historical temperature survey results	
	(i) Include a composite illustration of the temperature logs from the confining zone through the injection zone	
	(ii) Discuss and address any temperature anomalies	
	b. Provide copies of the RAT and flow profile surveys for the past 5 years	
	(i) Discuss how the fill depth and slug chase results were considered in the net thickness determination	
D. Effective Permeability		
	1. Referencing the transmissibility and effective net thickness discussions, identify a low and high range of permeability values	
	a. Discuss the effective permeability used in the pressure buildup demonstration	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	b. Discuss the effective permeability used in the plume migration demonstrations	
	2. Compare selected effective permeability values with available permeability data from pressure transient tests, core data, literature, etc.	
	3. Describe how the selected effective permeability values are conservative based on all available data	
E. Reference Temperatures		
	1. Designate a surface reference temperature for the requested specific gravity or density range of the waste stream	
	2. Specify a reservoir temperature of the injection interval and corresponding reference depth	
	a. Include support documentation to verify the reservoir temperature selection, i.e., a plot of the recorded temperatures versus depth from area well logs, temperature surveys, etc.	
F. Density or specific gravity values		
	1. Density or specific gravity values should have a minimum of two decimal places consistently used throughout the document, including the modeling	
	a. Two decimal places are recommended	
	b. Precision used in the model should be equivalent to the precision of the requested range	
	2. Specific gravity values should have temperature references for both the injectate and reference fluid, e.g., 60°F/60°F	
	3. Density values should have a single	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	temperature reference	
	4. Provide any calculations used to convert density or specific gravity values at surface conditions to reservoir conditions or vice versa	
	5. Provide conversion calculations for input into models, e.g., conversion of density range to lb/ft³ for input into SWIFT	
	6. Formation brine	
	a. Document how the density or specific gravity of the formation brine was selected and state the corresponding reference temp.	
	b. Include copies of all available formation fluid analyses	
	c. Explain how equivalent solutions, i.e., NaCl, etc., were determined, if applicable	
	7. Injectate	
	a. State requested density/specific gravity range of injectate &corresponding reference temps.	
	b. Include/discuss copies of injectate analyses	
	c. Explain how equiv. solns. determined, if applicable	
G. Viscosity Values		
	1. Specify/document the reservoir fluid/injectate viscosities used in the no migration demonstrations	
	a. Explain how equiv. solns. were determined, if applicable	
	b. Include copies of any monographs, tables, or references used	
H. Compressibility		

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	1. Document rock/fluid compressibility used in demo	
	2. Provide appropriate references, interference tests, etc. used to obtain the rock/fluid compressibility	
I. Porosity		
	1. Clarify the porosity value used in the demonstration is conservative based on porosity discussion included in geology portion	
J. Concentration Reduction Factor (CRF)		
	1. Provide a table listing the CAS number, applicable waste codes, health based limit, maximum concentration, resulting CFR for ea. Waste constituent, if applicable	
	2. Use 1×10^{-12} CRF and only include a list the waste constituents w/less than 100% concentration	
K. Background Gradient		
	1. Document the regional background gradient in feet/yr. and direction of movement	
	a. Include any references, calculations etc.	
	2. Clarify background gradients used in no migration demo	
	a. Don't use background gradient when modeling plume movement opposing gradient	
	b. Use max. or reasonably conservative value to est. plume move. in direction of background gradient.	
L. Dispersivity		
	1. State longitude and transverse dispersivities used in demo	
	2. Provide calc. and appropriate references to	

XVI. MODEL INPUT PARAMETERS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	support the values selected	
M. Diffusion Coefficient		
	1. Document diffusion coefficients used to model waste plume move., if applicable	
	a. Include applicable doc., references or portion of references to support the assigned free water diffusivity coefficients	
	2. Provide a table listing the diffusion coefficient for each waste constituent or reasonably conservative value selected for the vertical diffusion demo	
N. Include equations, calc., and reference docs. To justify other model input parameters used in the no migration demo, i.e., well index, hydraulic conductivity, etc.		
	1. Include calc. for SWIFT parameters, e.g., RAQ, DMEFF, etc., if applicable	

XVII. MODEL SELECTION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Keep models as simple as practical		
	1. Analytical calculations can typically be used for the heavy plume demo	
	2. Constant dip and constant thickness models are preferred	
B. Describe the numerical and analytical models used in the no migration demo		
	1. Clarify what model is used for which portion of the demo	
	2. Specify the version of modeling software used, if applicable	
C. Provide verification and validation for any predictive models used in the demo 40CFR §148.21(a)(3)		
	1. Include or reference specific	

XVII. MODEL SELECTION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	documentation	
D. Provide the applicable equations used by any analytical models		
E. Describe how the model is appropriate for the specific site, waste streams, and injection conditions of the facility operations		
F. Describe how the model was calibrated prior to use for predicting pressure buildup or plume movement		
G. Clarify the solution method used by the model and discuss appropriateness of the method selected, if applicable		

XVIII. PRESSURE BUILDUP MODELS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. EPA R6 accepts both analytical soln. models and SWIFT for pressure buildup modeling		
	1. If an analytical soln. model is submitted for pressure buildup demo:	
	a. Include validation/verification discussion satisfying 40CFR §148.21(a)(3) and compare the model w/another widely accepted analytical model such as PanSystem or hand calc. such as those provided in SPE Monograph 5 Appendix C	
	b. If the petition pressure buildup demo involves fault boundaries, the validation/verification info should address this as well	
	2. If the SWIFT model is used, include one of the following:	
	a. Include a SWIFT sensitivity run w/larger grid to confirm the pressure buildup demo result is reasonable or doesn’t change w/larger grid. This would address grid limit concerns	
	b. Include a supporting analytical calc. to	

XVIII. PRESSURE BUILDUP MODELS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	confirm SWIFT results	
Note: The sensitivity model run(s) (SWIFT and/or analytical calc.) would also address requirements for sensitivity analysis under 40CFR §148.21(a)(6)		

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Clarify all timeframes contained in the demo.		
B. Initialization period, if applicable		
	1. Run the model for a sufficient time to show model stability	
	2. Demonstrate no background gradient is generated by the model input for zero background gradient modeling	
	3. Verify the appropriate background gradient exists for the heavy plume model	
	4. Demonstrate background velocities present prior to injection in variable structure or variable thickness models	
	a. Illustrate or map the magnitude background velocities	
C. Historical Period		
	1. Include all historical injection from wells completed in the modeled injection interval	
	2. Include historical production, if applicable	
D. Modeled Operational Life		
E. Run the model for the requested operational life		
	1. Use the maximum requested injection rates	
	a. 10,000 year demo.	
	2. Buoyant plume	
	a. Do not include an opposing regional	

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	background gradient to maximize plume movement	
	3. Heavy plume	
	a. Include background gradient, if in the down dip direction	
	b. Facilities that can demonstrate the lack of potential for future oil and gas development in vicinity of inj. well facility, /geol. environment, lack of structural trap, in area of inj. well facility, Region 6 requires min. 200 yr. heavy waste plume demo w/appropriate background gradient (EPA HDQTRS policy assuming oil/gas production will cease w/i 200yrs)	
	(i) Wells located w/i the heavy plume and outside the cone of influence(COI),lack a mechanism for waste to migrate vertically upward making the shorter demo sufficient to demo that waste will not migrate vertically upward in an abandoned well for 10,000years	
F. Modeled Boundaries		
	1. Clarify what type of outer boundary conditions were implemented on all sides of the model grids and document the appropriateness of the selected boundary	
	2. Describe any no flow boundaries input in the model and what the boundaries represent, i.e., symmetry, fault, pinch-out, etc.	
	a. Describe how no flow boundaries were input in the model	
	(i) Document the number and location of image wells was sufficient, if applicable	
G. Document the modeled injection rates for all wells included in demonstration, including production wells if appropriate		

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	1. Historical period	
	a. Provide qtrly inj. reports for most recent five year history	
	b. Provide annual inj. volumes for six plus year well histories	
	c. More rigorous inj. data can be provided and used, if desired	
	2. Requested operational period	
	3. Area or offset well rates during post-operational period, if applicable	
H. Address any area geologic features		
	1. Clarify what geologic features are included in each demo (pressure buildup, plume, etc.)	
	2. Clarify how the geologic features are included (image wells no flow boundary, etc.)	
	3. Provide sufficient documentation for exclusion of any geologic feature, i.e., analytical calc. showing no impact on pressure buildup	
I. Document the assumptions used in low density waste plume demo		
	1. Low-end of the density range compared to formation fluid	
	2. Exclusion of a background gradient to maximize up dip plume movement	
J. Document the assumptions used in the high density waste plume demo		
	1. High-end of density range compared to formation fluid	
	2. Use of a background gradient to maximize the down dip movement	
K. Document the assumptions used in the vertical diffusion demo		
	1. Describe the depth, w/i the inj. interval, used as the starting point for the max. vertical diffusion movement	
	2. Specify the max. vertical movement used	

XIX. NO MIGRATION DEMONSTRATION		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	for the no migration demo into intact strata and the appropriate mud-filled or brine filled wellbore	
	3. Describe the method selected to determine the max. vertical diffusion	
	a. List the vertical diffusion distances for each waste constituent and calc. used for determining the max. vertical diffusion distances	
	b. Justify use of a worst case constituent and how it was applied in the demo	
	c. Apply a 1000' vertical diffusion distance and do not document the free water diffusivity coefficient for the various constituents	
	(i) Facilities w/brine-filled APs may be required to make additional diffusion calc. if specific circumstances exist	
L. Results-Clarify the movement of waste from inj. operations will not result in the vertical movement of waste from the inj. zone or laterally w/i the inj. zone to a point of discharge or interface w/a USDW		
	1. Total vertical movement of waste from inj. operations and diffusion	
	2. Document the max. pressure buildup	
M. Document any convergence or material balance errors and demonstrate values are insignificant		
N. Document the model grid and cell sizes are appropriate for demonstration		
	1. Discuss how the grid orientation, cell size, etc. was selected	

XX. PLOTS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Document the plotting program used to illustrate model results accurately depicts the model output and does not distort the plume boundary		
B. Provide an outline of the operational plume, up dip and down dip plumes overlain on a structure map of the inj. interval		
	1. Include an outline or overlay of the grid area	

XXI. SENSITIVITY ANALYSIS		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Perform a sensitivity analysis in order to determine the effect of uncertainties associated w/model parameters 40CFR §148.21(a)(6);Preamble to the July 26, 1988, Final Rule for 40CFR Part 148, page 28129		
	1. Identify areas where uncertainty is present in the geologic description or reservoir characterization	
	2. Determine a likely range of values and perform sensitivity analyses which would address the impact of the uncertainty, if applicable	
	a. Assign reasonably conservative parameters to maximize the pressure buildup and waste movement using appropriate estimation techniques and testing protocols 40CFR §148.21(a)(2)	

XXII. CONE OF INFLUENCE (COI)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Define the minimum COI- 40CFR §148.20(a)(2)(i)		
	1. Include all COI eq., calc., and values assigned to the various eq. parameters	
	a. Demonstrate the assigned values are conservative, i.e., brine-filled wells, mud-filled wells, minimum mud weight	
	2. Overlay the COI contour from the max. pressure buildup demo. On a map to illustrate which wells are located w/i COI, if applicable	
	a. Pressure contour frequency should allow reviewer to easily est. the max. pressure buildup at each AP location, if pressure buildup info is not available elsewhere in the document	
B. Skeleton type wellbore schematics should be provided for each AP located w/i the COI. The wellbore schematics should include:		
	1. Unique AP number	
	2. Well name and number	
	3. Well location	
	4. Name of operator	
	5. Well status	
	6. Basic well drilling and construction info. critical to the well's evaluation, e.g., total depth, hole sizes, casing size and setting depth cementing info, plug depths, mud weights, etc.	
	7. Operators may also include additional info to expedite the review. This data may include:	
	a. Reference depths	
	b. Well elevation	
	c. Regulatory interval depths: USDW , confining zone, inj. zone, and inj. interval	

XXIII. AREA OF REVIEW (AOR)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe the AOR used in the demonstration 40CFR §148.20(a)(2)(i)		
	1. At a minimum, use a 2 mile radius around the well(s)	
	2. Specify a larger AOR based on the COI , if necessary	
B. Locate and identify all APs located w/i the larger of the COI or AOR using acceptable protocol 40CFR §148.20(a)(2)(ii)		
	1. Use a unique numbering system so there are no duplicate AP numbers	
	2. Include sidetracked or abandoned wellbores w/i a current completion or plugged well	
C. Ascertain the condition of all APs located w/i the larger of the COI or AOR that penetrate the inj. zone or confining zone 40CFR §148.20(a)(2)(ii)		
	1. Use acceptable protocol	
	2. Identify all wells w/i the AOR and assign a unique AP numbering system	
	a. Document any water wells that penetrate the confining zone	
	3. Verify the well status of any active or temporarily abandoned wells	
D. Demonstrate that all wells are properly constructed or plugged to prevent the migration of waste from the inj. zone based on the max. pressure buildup demo 40CFR §148.20(a)(i)-(iii)		
E. Provide sufficient well records that are grouped and separated for each well (Tabulation of AP well data not required)		
	1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, inj. zone, or inj. interval and if the well is located w/i the COI or waste plume	
	2. Documentation may include scout tickets log headers, etc. to verify the location of plugs, casing, mud weights, etc.	
	3. Identify all wells that are not constructed	

XXIII. AREA OF REVIEW (AOR)		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	or plugged to satisfy the no migration standard	
	a. Provide corrective action plan for any such wells 40CFR §148.20(a)(2)(iii)	
	4. Use tabs to separate blocks of well records to facilitate record review	

XXIV. WASTE PLUME BOUNDARIES		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Locate and identify all APs located w/i the 10,000 year waste plumes (Tabulation of AP well data is not required)		
	1. Overlay the composite plume on a base map	
	2. Use a unique AP numbering system so there are no duplicate AP numbers	
	3. Include sidetracked or abandoned wellbores w/i a current completion or plugged well	
B. Ascertain the condition of all APs located w/i the 10,000 year waste plumes that penetrate the injection zone		
	1. Use acceptable protocol	
	2. All wells outside the AOR, but w/i the composite plume boundaries should be identified and assigned a unique AP number	
	3. Verify the well status of any active or temporarily abandoned wells	
C. Demonstrate these wells are properly plugged or constructed so that no waste would migrate from the inj. zone due to buoyancy or molecular diffusion in an AP – 40CFR §148.20(a)(1)		
	1. Brine filled wellbores do not pass the no migration standard if located w/i a buoyant plume	

XXIV. WASTE PLUME BOUNDARIES		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
D. Provide sufficient well records that are grouped and separated for each well (AP summary tables are not required)		
	1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, inj. zone, or inj. interval and if the well is located w/i the COI or waste plume	
	2. Documentation may include scout tickets, log headers, etc. to verify the location of plugs, casing, mud weights, etc.	
	3. Identify all wells that are not constructed or plugged to satisfy the no migration standard	
	a. Provide corrective action plan for any such wells – 40CFR §148.20(a)(2)(iii)	
	4. Use tabs to separate blocks of well records to facilitate record review	

XXV. Implementation and Compliance Section		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
A. Describe documentation in place at the facility that allows verification of compliance with no migration petition approval conditions		
B. Note: Documentation maintained for UIC permit compliance may not be sufficient for the no migration petition compliance		
	1. Provide a simple waste stream flow diagram	
	a. Illustrate sampling points and metering equipment	
	2. Waste stream density or specific gravity compliance	
	a. Describe how the facility will comply with petition requested range	

XXV. Implementation and Compliance Section		PAGE NUMBER(S) IN DOCUMENT WHERE INFO IS LOCATED
	(i) Records maintained at the facility should list the density/specific gravity range at the referenced temperature	
	b. Describe any temperature compensation or correction methods, if applicable	
	(i) Include an example of the temperature correction process if completed manually	
	3. Describe the instrument and measurement methodology	
	4. List the measuring and metering equipment calibration schedule	

USE OF REASONABLY CONSERVATIVE VALUES

The "reasonably conservative values" term is discussed in the Preamble to the July 26, 1988, Final Rule for 40CFR Part 148, page 28129. Region 6 allows the use of reasonably conservative or estimated values when site specific data is unavailable or limited- 40CFR §148.21(a)(5). The demonstration should include supporting information from literature or other sources to support these values. The reviewers will establish suitable conservative values, resulting in the protection of human health and the environment, during the petition evaluation. Sensitivity analysis or selection of some values may be more sharply defined because of the availability of site specific or field data.

MODIFICATION

The regulations contained in 40CFR §148.20(f) allow for modification to an approved exemption to include additional waste or wastes. The modification application must demonstrate the requested wastes behave hydraulically and chemically in a manner similar to previously included wastes and will not interfere with the containment capability of the injection zone.

REISSUANCE

The regulations contained in 40CFR §148.20(e) allow for reissuance of an approved exemption to modify any conditions placed on the exemption. The reissuance demonstration must also meet the no migration criteria.

PUBLIC NOTICE

EPA will issue a public notice – 40CFR §148.22(b), with a minimum 45 day public comment period required by 40CFR §124.10(b)(1) for all proposed decisions. Should EPA decide to hold a public hearing, a minimum 30 day public notice will be given prior to the hearing- 40CFR§124.10(b)(2).

FINAL DECISION

EPA will publish final decisions in the Federal Register as required by 40CFR §148.22(b)

PETITION CONDITIONS

In accordance with 40CFR §148.20(d)(2), Region 6 typically requires certain annual monitoring placed as a condition of petition approval.

Table of Contents

EPA Region 6 UIC Land Ban Petition Application Guideline
Revised February 2007

Introduction

The following are general requirements for inclusion with no migration petitions submitted to EPA Region 6 to satisfy the requirements in 40 CFR Part 148. Each no migration demonstration is site specific and may therefore require additional information not included in this general outline. To receive approval, the petitioner must demonstrate, to a reasonable degree of certainty, there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous as per 40 CFR §148.20(a). This time period is defined by 40 CFR §148.20(a)(1)(i) as 10,000 years. Some of the requested information is redundant with the requirements in 40 CFR Part 146 Subpart G, but is required by Part 148 or is used by EPA Region 6 to verify no migration of waste from the injection zone.

General Outline for EPA Region 6 Land Ban Petition Applications

I. Stand Alone Document Demonstrating the No Migration Standard

A. Region 6 reviews all aspects of the no migration demonstration during the initial petition review and requests for petition reissuance
   1. Incorporate any deficiency responses into one document
      a. Required for initial petition submissions
      b. Recommended for applications for reissuance of a petition

II. Petition Table of Contents

A. Each application should include a Master Table of Contents located in the front of Volume 1
   1. Listing should also identify the volume number where the topic is located
   2. The subsections contained in each section should be included in the Table of Contents
   3. A list of tables, figures, and appendices should be included in the Table of Contents
   4. Adding a Table of Contents for the specific section or appendix to the front of that specific section or appendix in the document is suggested for expediting the review process

B. Any appendices containing multiple documents should include a content listing to identify the items if they are not individually labeled or tabbed

III. Administrative

A. Applicant
   1. Facility name
   2. Well numbers and corresponding UIC permit numbers
   3. Addresses
   4. Mailing address
   5. Facility and well physical address
   6. Telephone and facsimile numbers

B. Facility contact information
   1. Person(s) or firm(s) authorized to act on behalf of the applicant during the processing of the application
      a. Address

b. Phone numbers
c. E-mail address

C. Include a signed certification statement as listed in 40 CFR §148.22(a)(4)
   1. Must be signed and dated following all final revisions to the document
      a. Petitioner may wait to submit until the review process is completed

D. Summary of past regulatory petition related approvals

E. Quality assurance and quality control
   1. Describe processes used to verify that proper quality assurance and quality control plans were followed in preparing the petition demonstration - 40 CFR §148.21(a)(4)
      a. Confirm all referenced tables, figures, appendices, etc., are included in the document

F. Elevations
   1. Clarify what depth reference elevations are used in the document
      a. Confirm all depths listed include a reference datum
   2. List the plant and well elevations to allow depths to be converted to other reference depths

G. Consistently reference specific gravity or density values throughout the petition
   1. Use a consistent number of decimal places
      a. Two decimal places are recommended, but no less than two can be used
   2. Always provide a corresponding reference temperature(s)
   3. Volume weighted density/specific gravity ranges may be requested by facilities that do not inject a significant volume of immiscible fluid
   4. The timeframe for volume weighted density/specific gravity averaging may consist of any of the following:
      a. Three-whole calendar month
      b. Running 90 or 91 day (13 week) period

IV. Updated Adjacent Surface Land Owner Listing - 40 CFR §124.10(c)(4)

A. Include the names and mailing addresses of the surface owners of the tracts of land adjacent to the plant boundaries

B. Provide a map illustrating the location of the adjacent landowner tracts

C. Describe surrounding land usage (farming, industry, residential, etc.)

V. Petition Application Requests

A. Describe the specifics of the petition
   1. Identify the specific wastes and waste codes requested - 40 CFR §148.22(a)(1)
   2. Specify the well or wells for which the demonstration will be made - 40 CFR §148.22(a)(1)
   3. List the specific gravity/density range, injection intervals, end of operations date, injection rates, etc.
   4. For a reissuance or modification, specify the requested changes from the approved petition

B. Clarify if application consists of the containment of waste within the defined injection zone - 40 CFR §148.20(a)(1)(i), chemical fate demonstration - 40 CFR §148.20(a)(1)(ii), or a combination of both
   1. If a chemical fate demonstrate is requested, additional documentation not covered in this outline will be required to satisfy 40 CFR Part 148

VI. Location Maps

A. Provide a USGS topographical map (1:24000 scale, if available) indicating the plant boundaries and well location(s)

B. Provide a simple schematic with a scale or distances listed illustrating the plant boundary and surface and bottomhole well locations of all facility disposal wells
   1. Include facility wells completed in other injection intervals (hazardous and non-hazardous)

VII. Characteristics of Injection Fluid - 40 CFR §148.22(a)

A. Provide a brief summary of the operation or process that generates the injection fluids

B. Describe the characteristics of the injection wastestream
   1. Discuss if the physiochemical nature of the wastestreams are such that reliable predictions can be made to satisfy the standards outlined in 40 CFR §148.20(a)(1)(i) or 40 CFR §148.20(a)(1)(ii)

C. Include a recent waste analysis
   1. Fully describe the chemical and physical characteristics of the subject wastes - 40 CFR §148.22(a)(2)
   2. Verify waste codes represent all applicable waste constituents and constituent concentrations do not exceed maximum concentrations used in the demonstration

D. Describe if waste analysis testing performed is accurate and reproducible - 40 CFR §148.21(a)(1)

E. Clarify if estimation techniques used were appropriate and if EPA-certified test protocols were used, where available and appropriate - 40 CFR §148.21(a)(2)

VIII. Disposal Well

A. General
   1. Differentiate any plant well numbering system and Class I UIC permit numbers used in the document
   2. Provide well location description
   3. Include latitude and longitude
      a. Provide and reference a copy of the well's Class I hazardous waste UIC permit and summarize the permit limitations
   4. Provide relevant elevations (ground level (GL) and kelly bushing (KB))
   5. Define the KB depths to the Confining Zone, Injection Zone, and Injection Interval in the well

B. Disposal well design
   1. Include a detailed well construction and completion history
      a. Include sidetracks, abandoned boreholes, or remedial activity

2. Include a wellbore schematic for each well
   a. Consistently reference depths to the referenced elevation
   b. For legibility, add expanded detail for complex wellbore construction, if needed
3. Provide daily drilling log or details on well recompletions
   a. Summarize historical wellwork
4. List the depths and describe the specifics of tubulars, cement, packers, etc used in the completion of the well
5. Provide relevant logs to demonstrate the cement integrity of the well

IX. Mechanical Integrity Testing - MIT

A. Include a copy of the most recent mechanical integrity demonstration (RAT and annulus pressure test) for each well included in the application - 40 CFR §148.20(a)(2)(iv)
   1. Demonstrate mechanical integrity of a well's long string casing, injection tubing, annular seal, and bottomhole cement
   2. Confirm that all injected fluids are entering the approved injection intervals and that no fluids are channeling up out of the injection zone near the wellbore
      a. Operators may be required to conduct a radioactive tracer survey (RAT) with multiple slug chases between the packer and injection interval to document casing integrity and no loss of fluid above the completed interval

X. Offset well(s)

A. Provide a complete list all facility disposal wells including other well classifications or wells completed in other intervals

B. Describe all pressure sinks and sources in the same injection zone located within a minimum 10 mile radial distance from the facility
   1. List all offset oil and gas production from the injection interval
      a. Provide well completion information or general field information
   2. List all offset injection wells completed in the same injection interval (Class I and Class II)
      a. Provide well completion information and wellbore schematics
   3. Provide a map illustrating the location of sinks and sources
   4. Provide cumulative volumes for the sinks and sources completed in the injection interval
      a. Include supporting documentation for reported volumes
      b. Address oil, gas, or water production from producing wells

C. Support the general area reviewed for pressure sinks or sources based on volumes and reservoir transmissibility
   1. Include any modeling or analytical calculations, if applicable

D. Identify the source or potential sources of the pressure sink in underpressured injection intervals

XI. Injection History

A. Report and document historical injection into the injection interval to date
   1. Site specific

2. Offset wells
3. Oil and gas injection, enhanced recovery, or disposal wells

B. Provide and reference a summary table for the volumes injected into each modeled disposal well, including offset wells
   1. List the volumes using the timeframes input into the model
   2. Include a column in cubic feet per day for verification of SWIFT input, if applicable

C. Based on historical injection, justify the maximum rates modeled during the operational period

XII. Underground Source of Drinking Water (USDW) Determination

A. Define the depth to the lowermost USDW
   1. Explain how this depth was determined
   2. Provide logs, equations, and computations, if relevant

XIII. Regional Geology

A. Discuss the regional geology
   1. Describe the stratigraphy, depositional environments, tectonic history, and structural geology
      a. Include a geological stratigraphic column
      b. Include supporting documentation, i.e. maps, cross-sections, etc.

B. Discuss the regional hydrogeology
   1. Describe aquifers and aquicludes

C. Seismicity
   1. Include a listing of historical seismic activity in the regional area (at least a 100 square mile area around the injection well(s)
      a. Data should include intensity levels (using an international scale) and distances from the injection facility
      b. Provide a risk assessment of induced seismicity due to injection activities based on a known induced seismicity formula

XIV. Local Geology

A. Provide a detailed description of the local geology
   1. Local geologic area should extend a minimum of 1 mile past the extent of the 10,000 year composite waste plume

B. Include and reference a type log defining each of the following intervals
   1. Confining zone
   2. Injection zone
      a. Containment interval
      b. Injection interval

C. Include an updated commercial structure map on the most applicable reference datum available
   1. Compare with the local geologic interpretation and discuss any anomalies

2. Clarify if any geologic features illustrated on the commercial map are relevant to the no migration application
    a. Address the vertical and horizontal extents of faults, if applicable

D. Confining Zone
1. Define a confining zone located above the injection zone - 40 CFR §148.21(b)
2. Demonstrate the following for the Confining Zone - 40 CFR §148.21(b)(2)
    a. Thickness
    b. Porosity
    c. Permeability
    d. Areal extent and lateral continuity

E. Injection Zone
1. Demonstrate each of the following for the various strata in the injection zone - 40 CFR §148.21(b)(1)
    a. Thickness
    b. Porosity
    c. Permeability
        (i) Include available core data and core analysis
            (a) Site specific, offset wells, area wells, or applicable literature references
    d. Areal extent
    e. Free of transecting, transmissive faults or fractures to prevent the vertical movement of fluids - 40 CFR §148.20 (b) or (c)
2. Provide available seismic lines to delineate the local structure of the injection zone if there is a lack of well data at the required depth
3. Containment Interval
    a. Identify the strata within the containment interval of the injection zone that will confine fluid movement above the injection interval - 40 CFR §148.20(b)
        (i) Discuss lithology and mineralogy
    b. Show the containment interval is free of known of vertically transmissive faults or fractures - 40 CFR §148.20(b)
4. Injection Interval
    a. Demonstrate each of the following for the injection interval of the injection zone - 40 CFR §148.21(b)(1)
        (i) Areal extent and lateral continuity
        (ii) Provide appropriate structure and isopach maps
    b. Thickness
        (i) Base on several criteria, i.e., logs, isopach, cross-sections
5. Porosity
    a. Base on several criteria, i.e., logs, core data, core analyses, literature, interference tests, etc.
6. Permeability
    a. Include available core data and core analysis
        (i) Site specific, offset wells, area wells, or applicable literature references
        (ii) Refer to model input parameters

b. Hydraulic gradient - 40 CFR §148.21(b)(3)
   (i) Provide appropriate literature references or calculations
      (a) Reference gradients from pressure tests, if applicable

F. Geologic maps
1. Include the following general features on structure, isopach, and base maps
   a. Map scale should be 1" to 2000'
   b. Outline the facility and AOR boundaries
   c. Include appropriate legends, title blocks, and labeling
      (i) Wells not deep enough to penetrate the mapped datum should be designated as such, e.g., NDE
      (ii) Wells with no logs available should be designated as such, e.g., NA
   d. Confirm the unique artificial penetration (AP) numbers are legible
      (i) Expand portions of the map, if needed, for high well density areas
2. Structure maps should be based on applicable geologic datums
3. Isopach maps should show areal extent and continuity of the specified intervals
4. Illustrate cross-section lines on all maps or include and reference a separate cross-section index map that illustrates the wells included on all cross-sections

G. Cross-sections
1. Include a minimum of two structural cross-sections perpendicular to each other that extend beyond the 10,000 year waste plume areas
   a. Include additional mini-cross sections over specific regions to demonstrate specific geologic features, i.e., the extent of a fault
      (i) Include stratigraphic cross-sections based on a reasonable marker, if correlations are difficult
2. Include the following on each cross-section
   a. Legend and title block with date last updated
   b. Small scale map showing the cross-section line
   c. Top and bottom of applicable intervals, i.e., injection interval, injection zone, confining zones, USDW, etc.
   d. Document perforations or completion information, if relevant
3. At a minimum, include the well name, artificial penetration (AP) number, operator, well status, total depth, KB elevation for each log posted on the cross-section
4. Scale the cross-section so the depth scale is legible
5. Include and reference a copy of the actual logs included on the cross-section as an appendix

H. Reservoir dip
1. Clarify if a variable structure or constant dip will be used for the no migration waste plume demonstrations
   a. Constant dip
      (i) Justify the average dip angle used in the demonstration
         (a) Describe or illustrate on a map where and what depths were used
         (b) List the equations and variables input to calculate the average dip angles

(ii) Variable dip
(a) Clarify what structure map was used for the model input

I. Provide a sufficient number of well logs to document the structural depths and thicknesses on the structure and isopach maps
   1. More data may be required for certain areas if correlations are difficult or unique geologic features exist

J. Provide fracture gradient calculations and maximum surface pressure limitation

XV. Geochemistry and Injected Waste Compatibility

A. Describe the geochemical conditions of the well site - 40 CFR §148.21(b)(5)
   1. Include the physical and chemical characteristics of the injection zone and the formation fluids in the injection zone

B. Discuss the compatibility of the injected waste with the injection zone

C. Provide an analysis to demonstrate if the waste will adversely alter the confining capabilities of the injection and confining zones

D. Discuss compatibility with well construction

XVI. Model Input Parameters

A. Initial and current hydrostatic pressure in the injection zone - 40 CFR §148.21(b)(4)
   1. Provide a summary table that lists all historical shut-in pressures for wells completed in the injection interval(s)
      a. Compare with the initial static pressure assigned for the no migration demonstration
   2. Discuss how the initial reservoir pressure was selected based on the available data
      a. Include all reference data needed to verify selected pressure value

B. Transmissibility
   1. Provide and summarize available historical pressure transient testing, i.e., drill stem tests, falloffs, injectivity, interference, pulse, etc., to support the injection interval transmissibility values used in the no migration demonstrations
      a. Provide electronic copy of pressure transient tests for site specific and offset wells, if available
      b. Include summary report, tables, and figures of pressure transient reports
         (i) Hard copy of recorded pressure and time data not necessary if plot of data is provided
      c. High and low end transmissibility used in the demonstrations should be reasonably conservative based on available data

C. Effective net thickness
   1. Discuss the selection of a conservative net thickness
      a. Pressure buildup demonstration
      b. Plume migration demonstrations
   2. Include and reference copies of all criteria on which the net thickness values are based, i.e., logs, isopachs, cross-sections, historical temperature log summary and plots, seismic lines, literature, well tests, RATs, flow profile surveys, etc.

3. Demonstrate how the selected effective net thickness values are conservative based on all available data
    a. Provide and discuss all historical temperature survey results
        (i) Include a composite illustration of the temperature logs from the confining zone through the injection zone
        (ii) Discuss and address any temperature anomalies
    b. Provide copies of the RAT and flow profile surveys for the past 5 years
        (i) Discuss how the fill depth and slug chase results were considered in the net thickness determination

D. Effective permeability
1. Referencing the transmissibility and effective net thickness discussions, identify a low and high range of permeability values
    a. Discuss the effective permeability used in the pressure buildup demonstration
    b. Discuss the effective permeability used in the plume migration demonstrations
2. Compare selected effective permeability values with available permeability data from pressure transient tests, core data, literature, etc.
3. Describe how the selected effective permeability values are conservative based on all available data

E. Reference temperatures
1. Designate a surface reference temperature for the requested specific gravity or density range of the wastestream
2. Specify a reservoir temperature of the injection interval and corresponding reference depth
    a. Include support documentation to verify the reservoir temperature selection, i.e., a plot of the recorded temperatures versus depth from area well logs, temperature surveys, etc.

F. Density or specific gravity values
1. Density or specific gravity values should have a minimum of two decimal places consistently used throughout the document, including the modeling
    a. Two decimal places are recommended
    b. Precision used in the model should be equivalent to the precision of the requested range
2. Specific gravity values should have temperature references for both the injectate and reference fluid, e.g., $60^{o}F/60^{o}F$
3. Density values should have a single temperature reference
4. Provide any calculations used to convert density or specific gravity values at surface conditions to reservoir conditions or vice versa
5. Provide conversion calculations for input into models, e.g., conversion of density range to lb/ft^3 for input into SWIFT
6. Formation brine
    a. Document how the density or specific gravity of the formation brine was selected and state the corresponding reference temperature
    b. Include copies of all available formation fluid analyses

   c. Explain how equivalent solutions, i.e., NaCl, etc., were determined, if applicable
7. Injectate
   a. State the requested density or specific gravity range of the injectate and corresponding reference temperature(s)
   b. Include and discuss copies of injectate analyses
   c. Explain how equivalent solutions, i.e., NaCl, etc., were determined, if applicable

G. Viscosity values
   1. Specify and document the reservoir fluid and injectate viscosities used in the no migration demonstrations
      a. Explain how equivalent solutions were determined, if applicable
      b. Include copies of any nomographs, tables, or references used

H. Compressibilities
   1. Document the rock and fluid compressibilities used in the demonstrations
   2. Provide appropriate references, interference tests, etc. used to obtain the rock and fluid compressibilities

I. Porosity
   1. Clarify the porosity value used in the demonstration is conservative based on the porosity discussion included in the geology portion of the petition

J. Concentration reduction factor (CRF)
   1. Provide a table listing the CAS number, applicable waste codes, health based limit, maximum concentration, and resulting CRF for each waste constituent, if applicable
   2. Use 1×10^{-12} CRF and only include a list the waste constituents with less than 100% concentration

K. Background gradient
   1. Document the regional background gradient in feet/year and direction of movement
      a. Include any references, calculations, etc.
   2. Clarify the background gradients used in the no migration demonstrations
      a. Do not use a background gradient when modeling plume movement opposing the gradient
      b. Use the maximum or reasonably conservative value to estimate plume movement in the same direction of the background gradient

L. Dispersivity
   1. State the longitudinal and transverse dispersivities used in the demonstration
   2. Provide calculations and appropriate references to support the values selected

M. Diffusion coefficient
   1. Document the diffusion coefficients used to model waste plume movement, if applicable
      a. Include applicable documentation, references or portion of references to support the assigned free water diffusivity coefficients

2. Provide a table listing the diffusion coefficient for each waste constituent or reasonably conservative value selected for the vertical diffusion demonstration

N. Include equations, calculations, and reference documents to justify other model input parameters used in the no migration demonstration, i.e., well index, hydraulic conductivity, etc.
   1. Include calculations for SWIFT parameters, e.g., RAQ, DMEFF, etc., if applicable

XVII. Model Selection

A. Keep models as simple as practical
   1. Analytical calculations can typically be used for the heavy plume demonstration
   2. Constant dip and constant thickness models are preferred

B. Describe the numerical and analytical models used in the no migration demonstration
   1. Clarify what model is used for which portion of the demonstration
   2. Specify the version of modeling software used, if applicable

C. Provide verification and validation for any predictive models used in the demonstration - 40 CFR §148.21(a)(3)
   1. Include or reference specific documentation

D. Provide the applicable equations used by any analytical models

E. Describe how the model is appropriate for the specific site, wastestreams, and injection conditions of the facility operations

F. Describe how the model was calibrated prior to use for predicting pressure buildup or plume movement

G. Clarify the solution method used by the model and discuss appropriateness of the method selected, if applicable

XVIII. Pressure Buildup Models

A. EPA R6 accepts both analytical solution models and SWIFT for pressure buildup modeling
   1. If an analytical solution model is submitted for the pressure buildup demonstration:
      a. Include validation and verification discussion satisfying 40 CFR §148.21(a)(3) and compare the model with another widely accepted analytical model such as PanSystem or hand calculations such as those provided in SPE Monograph 5 Appendix C
      b. If the petition pressure buildup demonstration involves fault boundaries, the validation and verification information should address this as well
   2. If the SWIFT model is used, include one of the following:
      a. Include a SWIFT sensitivity run with a larger grid to confirm the pressure buildup demonstration result is reasonable or doesn't change with a larger grid. This would address grid limit concerns
      b. Include a supporting analytical calculation to confirm SWIFT results

Note: The sensitivity model run(s) (SWIFT and/or analytical calculations) would also address requirements for sensitivity analysis under 40 CFR §148.21(a)(6)

XIX. No Migration Demonstration

A. Clarify all timeframes contained in the demonstration

B. Initialization period, if applicable
   1. Run the model for a sufficient time to show model stability
   2. Demonstrate no background gradient is generated by the model input for zero background gradient modeling
   3. Verify the appropriate background gradient exists for the heavy plume model
   4. Demonstrate background velocities present prior to injection in variable structure or variable thickness models
      a. Illustrate or map the magnitude background velocities

C. Historical period
   1. Include all historical injection from wells completed in the modeled injection interval
   2. Include historical production, if applicable

D. Modeled operational life

E. Run the model for the requested operational life
   1. Use the maximum requested injection rates
      a. 10,000 year demonstrations
   2. Buoyant plume
      a. Do not include an opposing regional background gradient to maximize plume movement
   3. Heavy plume
      a. Include background gradient, if in the downdip direction
      b. Facilities that can demonstrate the lack of potential for future oil and gas development in the vicinity of the injection well facility, possibly because of the geologic environment, e.g., lack of structural trap, in the area of the injection well facility, Region 6 requires a minimum 200 year heavy waste plume demonstration that incorporates an appropriate background gradient (based on an EPA headquarters policy that oil and gas production will cease within 200 years)
         (i) Wells located within the heavy plume and outside the cone of influence, lack a mechanism for waste to migrate vertically upward making the shorter demonstration sufficient to demonstrate that waste will not migrate vertically upward in an abandoned well for 10,000 years

F. Modeled boundaries
   1. Clarify what type of outer boundary conditions were implemented on all sides of the model grids and document the appropriateness of the selected boundary
   2. Describe any no flow boundaries input in the model and what the boundaries represent, i.e., symmetry, fault, pinch-out, etc.

a. Describe how no flow boundaries were input in the model
   (i) Document the number and location of image wells was sufficient, if applicable

G. Document the modeled injection rates for all wells included in demonstration, including production wells, if appropriate
   1. Historical period
      a. Provide quarterly injection reports for most recent five year history
      b. Provide annual injection volumes for six plus year well histories
      c. More rigorous injection data can be provided and used, if desired
   2. Requested operational period
   3. Area or offset well rates during post-operational period, if applicable

H. Address any area geologic features
   1. Clarify what geologic features are included in each demonstration (pressure buildup, plume, etc.)
   2. Clarify how the geologic features are included (image wells, no flow boundary, etc)
   3. Provide sufficient documentation for exclusion of any geologic feature, i.e., analytical calculation showing no impact on pressure buildup

I. Document the assumptions used in low density waste plume demonstration:
   1. Low-end of the density range compared to formation fluid
   2. Exclusion of a background gradient to maximize updip plume movement

J. Document the assumptions used in the high density waste plume demonstration
   1. High-end of density range compared to formation fluid
   2. Use of a background gradient to maximize the downdip movement

K. Document the assumptions used in the vertical diffusion demonstration
   1. Describe the depth, within the injection interval, used as the starting point for the maximum vertical diffusion movement
   2. Specify the maximum vertical movement used for the no migration demonstration into intact strata and the appropriate mud-filled or brine-filled wellbore
   3. Describe the method selected to determine the maximum vertical diffusion
      a. List the vertical diffusion distances for each waste constituent and calculations used for determining the maximum vertical diffusion distances
      b. Justify use of a worst case constituent and how it was applied in the demonstration
      c. Apply a 1000’ vertical diffusion distance and do not document the free water diffusivity coefficient for the various constituents
         (i) Facilities with brine-filled artificial penetrations (APs) may be required to make additional diffusion calculations if specific circumstances exist

L. Results - Clarify the movement of waste from injection operations will not result in the vertical movement of waste from the injection zone or laterally within the injection zone to a point of discharge or interface with a USDW
   1. Total vertical movement of waste from injection operations and diffusion
   2. Document the maximum pressure buildup

M. Document any convergence or material balance errors and demonstrate values are insignificant

N. Document the model grid and cell sizes are appropriate for the demonstration
   1. Discuss how the grid orientation, cell size, etc was selected

XX. Plots

A. Document the plotting program used to illustrate model results accurately depicts the model output and does not distort the plume boundary

B. Provide an outline of the operational plume, updip and downdip plumes overlain on a structure map of the injection interval
   1. Include an outline or overlay of the grid area

XXI. Sensitivity Analysis

A. Perform a sensitivity analysis in order to determine the effect of uncertainties associated with model parameters - 40 CFR §148.21(a)(6); Preamble to the July 26, 1988, Final Rule for 40 CRF Part 148, page 28129
   1. Identify areas where uncertainty is present in the geologic description or reservoir characterization
   2. Determine a likely range of values and perform sensitivity analyses which would address the impact of the uncertainty, if applicable
      a. Assign reasonably conservative parameters to maximize the pressure buildup and waste movement using appropriate estimation techniques and testing protocols - 40 CFR §148.21(a)(2)

XXII. Cone of Influence

A. Define the minimum cone of influence (COI) - 40 CFR §148.20(a)(2)(i)
   1. Include all COI equations, calculations, and values assigned to the various equation parameters
      a. Demonstrate the assigned values are conservative, i.e., brine-filled wells, mud-filled wells, minimum mud weight
   2. Overlay the COI contour from the maximum pressure buildup demonstration on a map to illustrate which wells are located within COI, if applicable
      a. Pressure contour frequency should allow reviewer to easily estimate the maximum pressure buildup at each artificial penetration location, if the pressure buildup information is not available elsewhere in the document

B. Skeleton type wellbore schematics should be provided for each artificial penetration (AP) located within the cone of influence. The wellbore schematics should include:
   1. Unique AP number
   2. Well name and number
   3. Well location
   4. Name of operator
   5. Well status
   6. Basic well drilling and construction information critical to the well's evaluation, e.g., total depth, hole sizes, casing size and setting depth, cementing information, plug depths, mud weights, etc.

7. Operators may also include additional information to expedite the review. This data may include:
    a. Reference depths
    b. Well elevation
    c. Regulatory interval depths: USDW, confining zone, injection zone, and injection interval

XXIII. Area of Review (AOR)

A. Describe the AOR used in the demonstration - 40 CFR §148.20(a)(2)(i)
    1. At a minimum, use a 2-mile radius around the well(s)
    2. Specify a larger AOR based on the COI, if necessary

B. Locate and identify all artificial penetrations (APs) located within the larger of the COI or AOR using acceptable protocol - 40 CFR §148.20(a)(2)(ii)
    1. Use a unique numbering system so there are no duplicate AP numbers
    2. Include sidetracked or abandoned wellbores within a current completion or plugged well

C. Ascertain the condition of all APs located within the larger of the COI or AOR that penetrate the injection zone or confining zone - 40 CFR §148.20(a)(2)(ii)
    1. Use acceptable protocol
    2. Identify all wells within the AOR and assign a unique AP numbering system
        a. Document any water wells that penetrate the confining zone
    3. Verify the well status of any active or temporarily abandoned wells

D. Demonstrate that all wells are properly constructed or plugged to prevent the migration of waste from the injection zone based on the maximum pressure buildup demonstration - 40 CFR §148.20(a)(2)(i)-(iii)

E. Provide sufficient well records that are grouped and separated for each well (Tabulation of AP well data is not required)
    1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, injection zone, or injection interval and if the well is located within the cone of influence or waste plume
    2. Documentation may include scout tickets, log headers, etc. to verify the location of plugs, casing, mud weights, etc.
    3. Identify all wells that are not constructed or plugged to satisfy the no migration standard
        a. Provide corrective action plan for any such wells - 40 CFR §148.20(a)(2)(iii)
    4. Use tabs to separate blocks of well records to facilitate record review

XXIV. Waste Plume Boundaries

A. Locate and identify all artificial penetrations (APs) located within the 10,000 year waste plumes (Tabulation of AP well data is not required)
    1. Overlay the composite plume on a base map
    2. Use a unique AP numbering system so there are no duplicate AP numbers
    3. Include sidetracked or abandoned wellbores within a current completion or plugged well

B. Ascertain the condition of all APs located within the 10,000 year waste plumes that penetrate the injection zone

1. Use acceptable protocol
2. All wells outside the AOR, but within the composite plume boundaries should be identified and assigned a unique AP number
3. Verify the well status of any active or temporarily abandoned wells

C. Demonstrate these wells are properly plugged or constructed so that no waste would migrate from the injection zone due to buoyancy or molecular diffusion in an AP - 40 CFR §148.20(a)(1)

1. Brine filled wellbores do not pass the no migration standard if located within a buoyant plume

D. Provide sufficient well records that are grouped and separated for each well (AP summary tables are not required)

1. Level of documentation required for each well is dependent on whether the well penetrates the confining zone, injection zone, or injection interval and if the well is located within the cone of influence or waste plume
2. Documentation may include scout tickets, log headers, etc. to verify the location of plugs, casing, mud weights, etc.
3. Identify all wells that are not constructed or plugged to satisfy the no migration standard
    a. Provide corrective action plan for any such wells - 40 CFR §148.20(a)(2)(iii)
4. Use tabs to separate blocks of well records to facilitate record review

XXV. <u>Implementation and Compliance Section</u>

A. Describe documentation in place at the facility that allows verification of compliance with no migration petition approval conditions

B. Note: Documentation maintained for UIC permit compliance may not be sufficient for the no migration petition compliance

1. Provide a simple wastestream flow diagram
    a. Illustrate sampling points and metering equipment
2. Wastestream density or specific gravity compliance
    a. Describe how the facility will comply with petition requested range
        (i) Records maintained at the facility should list the density/specific gravity range at the referenced temperature
    b. Describe any temperature compensation or correction methods, if applicable
        (i) Include an example of the temperature correction process if completed manually
3. Describe the instrument and measurement methodology
4. List the measuring and metering equipment calibration schedule

<u>Use of Reasonably Conservative Values</u>

The “reasonably conservative values” term is discussed in the Preamble to the July 26, 1988, Final Rule for 40 CRF Part 148, page 28129. Region 6 allows the use of reasonably conservative or estimated values when site specific data is unavailable or limited - 40 CFR §148.21(a)(5). The demonstration should include supporting information from literature or other sources to support these values. The reviewers will establish suitably conservative values, resulting in the protection of human health and the environment, during the petition evaluation. Sensitivity analysis or selection of some values may be more sharply defined because of the availability of site specific or field data.

Modification

The regulations contained in 40 CFR §148.20(f) allow for modification to an approved exemption to include additional waste or wastes. The modification application must demonstrate the requested wastes behave hydraulically and chemically in a manner similar to previously included wastes and will not interfere with the containment capability of the injection zone.

Reissuance

The regulations contained in 40 CFR §148.20(e) allow for reissuance of an approved exemption to modify any conditions placed on the exemption. The reissuance demonstration must also meet the no migration criteria.

Public Notice

EPA will issue a public notice - 40 CFR §148.22(b), with a minimum 45 day public comment period required by 40 CFR §124.10(b)(1) for all proposed decisions. Should EPA decide to hold a public hearing, a minimum 30 day public notice will be given prior to the hearing - 40 CFR §124.10(b)(2).

Final Decision

EPA will publish final decisions in the *Federal Register* as required by 40 CFR §148.22(b).

Petition Conditions

In accordance with 40 CFR §148.20(d)(2), Region 6 typically requires certain annual monitoring placed as a condition of petition approval.

- A stand-alone document is recommended.

- Where material from an old petition is utilized, incorporate the material including data into the discussion text or as copy in a referenced appendix.

- The Master Table of Contents should include the Volume Number in which the Appendices can be located.

- Consistently request either a specific gravity range or density range, or consistently list equivalent ranges for both specific gravity and density values. If equivalent values are used, the reissuance should include a demonstration justifying that the density range and specific gravity range requested are equivalent at the referenced temperature. For conversion from bottomhole to surface values, a reservoir temperature reference should be provided for each injection interval.

  Note: Even though the modeling may require a value of density as input into the model, the request should be for the type of measurement and reference temperature in which petition compliance can be easily demonstrated. It is recommended that the operator consult their lab personnel to determine the lab's standard measurement temperature and equipment calibration temperature. The reissuance demonstration should contain a discussion justifying that the waste density range modeled is equivalent to the waste density or specific gravity range requested in the petition reissuance. (See EPA letter dated 1-14-99)

- Confirm that a reference datum accompanies the depth, i.e., clarify that the depths listed for the injection interval and injection zone are log depths referenced to the kelly bushing (KB) or provide the datum for the depth measurements.

- Provide elevations for each injection well so corrections can be made for various datums if used.

- Confirm all referenced tables, figures, and plates are included in the document.

- Update the adjacent landowners listing.

- Make sure any regulations are quoted correctly.

- EPA Region 6 does require a 10,000 year demonstration for the heavy waste plume since the regulations require this 10,000 year demonstration. For this demonstration, EPA Region 6 requires a minimum 200 year heavy waste plume demonstration that incorporates an appropriate background gradient. This is based on an EPA headquarters policy that oil and gas production will cease within 200 years. Facilities also need to show the lack of potential for future oil and gas development during that period. Wells located within the heavy plume and outside the cone of influence, lack a mechanism for waste to migrate vertically upward. Therefore, after 200 years, EPA Region 6 considers this demonstration to be sufficient to demonstrate that waste will not migrate vertically upward in an abandoned well for 10,000 years. Operators must justify the statement that there are no potential impacts of future oil and gas production in the vicinity of the injection well facility, possibly because of the geologic environment, e.g., lack of structural trap, in the area of the injection well facility.

- Remember that all artificial penetrations (AP) must satisfy the no migration standard. State UIC permits are based on a non-endangerment standard.

- Update the search for new wells within the area of review (AOR) and defined waste plume. Verify the status of any active or temporarily abandoned wells to see if a well's status has changed since the last demonstration.

- Include a geological stratigraphic column in the geology section.

- In general, structure, isopach, and base maps should include the following features:

  a. The map scale should be 1"=2000'.
  b. For wells not deep enough to use as control points, label them as "NDE" or if the log is not available, label as "NA."
  c. All maps should show cross-section lines, a facility outline, the AOR boundary, and contain a legend.
  d. The AP numbers (facilities' unique numbering system) for the wells should be included on a base map.

- All cross-sections should include the following features:

  a. Provide a legend, title block, and small scale map showing the cross-section line.
  b. Include the actual electrical logs with the "log headers" if possible and not "tracings" of the logs.
  c. For each electrical log posted, include the operator's name, AP number, status (dry, oil, gas, etc.), total depth, and the KB elevation if not given on the log header.
  d. The injection interval and injection zone should be illustrated on the cross-section along with the completed interval. I.e., perforations, screened interval or open hole.
  e. Logs should not be reduced so much that the depth track can't be read.

- Discuss the historic seismic activity in the area of the facility.

- Include scout tickets, well schematics, and a representative sample of well logs for wells located within the AOR and outside the AOR but within the 10,000 year plume. This information should be consolidated and included in the appendix under the corresponding AP numbers.

- Provide a tabulation for all wells located within the AOR and outside the AOR but within the 10,000 year plume, which will show the Map AP number, well name, operator, status, total depth (TD), location of cement plugs, casing, plugging mud weights, and if it meets the no migration requirement.

- Abandoned portions of sidetracked injection wells should be treated as APs and the operator must demonstrate that they are properly plugged to withstand pressure buildup at the injection well.

- Well records should contain sufficient information to confirm that each AP passes the no migration standard. Log headers should be provided to verify the mud weight behind the casing or in the hole (if there is no long string casing in the hole) if the mud weight is used to make the no migration demonstration. I.e., there are no cement plugs.

- Brine filled boreholes will not pass the no migration standard within the light waste plume.

- Provide an updated commercial structure map. The map will be used for verification of well locations and regional structural geology. Make sure any added text or legends do not cover up the information on wells located within the AOR, cone of influence (COI), or waste plume.

- Provide a discussion on regional geology, hydrology and determination of USDWs (underground sources of drinking water).

- A 1" type log that specifically identifies the individual injection intervals and injection zone should be provided. Interval depths should be legible on the log.

- Provide a well construction section which contains a detailed drilling, workover, and completion history of the well including sidetracking and remedial activity. Provide supporting logs such as cement bond logs and cementing records as necessary.

- Confirm the well construction discussion is consistent with the illustration on the wellbore schematics. Reference depths should be noted. Operators often mix KB and below ground level (BGL) depths so make sure depths are correctly referenced. Provide both KB and GL elevations, if needed.

- List the reference datum depth when defining the confining zone, injection zone, and injection interval.

- When referencing an appendix, include the volume number where the appendix is located.
- Confirm that all necessary waste constituents are requested in the demonstration.

- Provide a summary table for the volumes injected into the well and any offset wells. The table should list the volumes using the timeframe input into the modeling, and also include a column in ft^3/d for verification of the injection volumes input into the SWIFT models.

- List the version of SWIFT utilized in the modeling and include a brief discussion of the computing environment used to run the program.

- Include a SWIFT model run that contains no injection for an extended period of time to verify there is limited or no background gradient in the low density lateral plume model. List the velocities for various time increments to determine the minimum time the model will need to be run for stabilization. For a variable structure grid, a Surfer type map with arrows indicating the magnitude of the velocities must be provided.

- Dip angle justification should include the angles used in both the updip and downdip lateral plume demonstrations.

- The number of decimal places used for the density and specific gravity values should be consist with density values used in the modeling and the values which the facility can measure for compliance.

- Justify all model input values for the reservoir and include supporting documentation for parameter verification.
  a. Justify the rock compressibility in addition to the fluid compressibility value.
  b. A range for the formation fluid density may need to be used if the supporting documentation does justify the use of a single value.
  c. Provide a copy of the portion of any text referenced for determining the density of the wastestream.
  d. Provide the depths for each injection interval and justify the temperature assigned for each depth.
  e. Include the reference temperature used to determine the viscosity values.
  f. Provide justification of the permeability and hydraulic conductivity values used in the demonstration. These values are usually based on the results of the falloff tests conducted in the injection wells. Include the equation used to convert permeability to hydraulic conductivity.

g. Provide the parameters and calculations used to determine the well index in SWIFT.

- Confirm a conservative initial reservoir pressure is used based on historical measured static pressures.

- Provide a table that contains all the available bottomhole pressure measurements.

- Grid effects may distort the waste plume modeled. The waste plume illustrated on the maps should be circular, if no boundaries are present. The circular plume outline at the end of operations should be used for purposes of the no migration demonstration and well record search.

- Include any sinks or sources within a radial distance of at least 10 miles of the facility. Address the impact, if any, of the sink or source. Underpressured reservoirs should identify the source of the pressure sink.

- List the solution method used for a SWIFT model. Both direct and L2SOR methods are accepted. Check for convergence/iteration errors when using the L2SOR method.

Common Deficiencies/Issues in Recent Petitions 12-5-02

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  Note: Even though the modeling may require a value of density as input into the model, the request should be for the type of measurement and reference temperature in which petition compliance can be easily demonstrated. It is recommended that the operator consult their lab personnel to determine the lab's standard measurement temperature and equipment calibration temperature. The reissuance demonstration should contain a discussion justifying that the waste density range modeled is equivalent to the waste density or specific gravity range requested in the petition reissuance. (See EPA letter dated 1-14-99)

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- Provide elevations for each injection well so corrections can be made for various datums if used.

- Confirm all referenced tables, figures, and plates are included in the document.

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- Make sure any regulations are quoted correctly.

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- Provide a well construction section which contains a detailed drilling, workover, and completion history of the well including sidetracking and remedial activity. Provide supporting logs such as cement bond logs and cementing records as necessary.

- Confirm the well construction discussion is consistent with the illustration on the wellbore schematics. Reference depths should be noted. Operators often mix KB and below ground level (BGL) depths so make sure depths are correctly referenced. Provide both KB and GL elevations, if needed.

- List the reference datum depth when defining the confining zone, injection zone, and injection interval.

- When referencing an appendix, include the volume number where the appendix is located.
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- Provide a summary table for the volumes injected into the well and any offset wells. The table should list the volumes using the timeframe input into the modeling, and also include a column in ft^3/d for verification of the injection volumes input into the SWIFT models.

- List the version of SWIFT utilized in the modeling and include a brief discussion of the computing environment used to run the program.

- Include a SWIFT model run that contains no injection for an extended period of time to verify there is limited or no background gradient in the low density lateral plume model. List the velocities for various time increments to determine the minimum time the model will need to be run for stabilization. For a variable structure grid, a Surfer type map with arrows indicating the magnitude of the velocities must be provided.

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- Justify all model input values for the reservoir and include supporting documentation for parameter verification.
  a. Justify the rock compressibility in addition to the fluid compressibility value.
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  f. Provide justification of the permeability and hydraulic conductivity values used in the demonstration. These values are usually based on the results of the falloff tests conducted in the injection wells. Include the equation used to convert permeability to hydraulic conductivity.

g. Provide the parameters and calculations used to determine the well index in SWIFT.

- Confirm a conservative initial reservoir pressure is used based on historical measured static pressures.

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- List the solution method used for a SWIFT model. Both direct and L2SOR methods are accepted. Check for convergence/iteration errors when using the L2SOR method.

EPA REGION 6
NO MIGRATION PETITION REISSUANCE SUBMITTAL
January 14, 1998

The following is a general list of items that an operator should submit or consider when submitting a petition reissuance to EPA Region 6 for review. Because each site is unique and computer models vary, the listing is only a general guide. The complexity of the site and/or the complexity of the petition request will impact the information needed for the no migration demonstration. Operators are encouraged to schedule a meeting with Region 6 prior to the initiation of work on a reissuance submittal to ensure a clear understanding by both sides of the issues that should be addressed. Region 6 has found that stand alone petition reissuance documents improve the efficiency of EPA′s review time because of the ease in locating supporting documentation. If the reissuance document relies on previously submitted documentation, a reference to the specific document in addition to the location of the information within the document should be included. Demonstrations relying on special considerations, e.g., chemical fate, may require longer review times, especially if the Agency sends it to an outside contractor for review.

GENERAL

1. Summarize the specifics of the reissuance request in the early portion of the document. (e.g. injection interval, rates, new wells, operational life, etc.)

2. Include a master table of contents at the front of the document. Provide other table of contents as needed including a table of contents for appendices containing several different items.

3. Each table and figure should be uniquely identified within the reissuance document and reference documents.

4. Entire document should be checked for consistency. For example, if the density value is changed in one location, confirm that it is changed globally within the document.

5. Include a signed certification identical to 40 CFR §148.22(a)(4).

6. Update the adjacent landowners listing.

7. Include the current UIC State permit for each well.

8. Provide a discussion on the injection wells. Include past and present completions, well schematics, logs, etc. Identify any changes since the last approved petition submittal. If documentation is not provided in the reissuance, include the specific location of this information in the reissuance document. Provide proposed construction and completion information for undrilled wells.

9. The information contained in the NOD responses should be integrated into the appropriate portions of the text, figures, tables, and appendices.

GEOLOGY

1. Include latest MITs for all injection wells.

2. Update the well search for the AOR, plume areas, and COI. Provide appropriate information for new wells or any changes to existing wells. Include information for old wells or specifically reference where the information for wells is located. Provide revised map(s) with additional wells. Include updated tables summarizing wells withing the AOR and plume areas. Make sure well ID numbers are consistent within all documentation.

3. Confirm net sand isopachs for each injection interval are included. These should be reviewed to ensure the modeled thicknesses are conservative.

4. In geology section of the reissuance, if the complete geology section, maps, logs, cross-sections, etc. are not provided, provide a reference naming the document and location in the document where the information is located. Include a Table of Contents from original petition if appropriate. Review the geology discussions and provide adequate documentation defining any geologic features that impact the modeling, especially if a geologic feature was included in the modeling.

5. Demonstrate that the requested changes to the no migration petition do not induce seismicity in the area that will alter the confining capability of the confining strata in the injection zone and confining zone.

6. Update pressure sinks and sources.

7. If modeling results in an increased plume area, expand maps and cross-sections as necessary.

8. Demonstrate that the injection interval does not interface with a USDW throughout the area of the 10,000 year plumes.

9. All depths should be referenced to a datum (KB, GL, etc.).

MODELING

1. Thoroughly discuss the modeling strategy, outlining the model(s) employed, assumptions made, integration of the geology into the model, how boundaries were handled, how modeling satisfies the no migration standard, etc.

2. All input parameters for both the waste transport and pressure buildup modeling runs, should be summarized in a table. Indicate which of these parameters have changed from the last approved petition demonstration. Provide documentation for all reservoir parameters and historical injection rates used in the model. If documentation is not provided in the reissuance, reference the specific location of the documentation. Identify any parameters that have changed, document the new value and provide an explanation for the change. Provide injection reports to support injection rate history.

3. Integrate the past falloff testing into the parameter assignments for both the pressure buildup and waste transport modeling. Include a tabulation of all falloff test results in the modeling section. Provide a hard copy of the report summary and the data on diskette in the reissuance document. The modeling section should include a discussion relating the falloff test results with the parameters assigned in the modeling demonstrations. If necessary, the reservoir parameters should be modified and the modeling revised.

4. All reference data such as pressure and temperature should be listed with each appropriate reservoir parameter. Any calculations, references, nomographs, etc., necessary to support the fluid density and viscosity values should be supplied. Density values should be provided at both downhole and surface conditions.

5. Update the waste constituents and waste code listings. Remove any waste codes that were not finalized and update concentrations based on the most current Region 6 HBL table.

6. Provide a waste analysis to demonstrate no constituent exceeds the maximum concentration. Explain how current waste analysis plan or testing procedures will allow measurement of constituents with low maximum concentrations.

7. Address compatibility if changes are made to waste constituents or waste codes.

8. Any boundary (e.g. fault or pinchout) should be addressed. A discussion should explain if and how the boundary was included in the model. Provide a boundary map to illustrate location of model boundary.

9. Summarize all the modeling results in one location within the reissuance document.

10. Provide a detailed explanation of the input and output files for <u>all</u> computer simulations used in the demonstration. This may be done by annotating the input and output files for each type of model employed. Insert tabbed divider sheets imprinted with the title and description of the run/file.

11. Identify and document <u>any</u> changes made in the code to vary parameters.

12. Provide calculations justifying each multiplying factor, if applicable.

13. If demonstrating a maximum injection rate per injection interval instead of per well, inject the total requested volume into one well. Take the output results and apply to all existing and proposed well locations to determine a worse case COI and operational plume.

14. Maximize pressure buildup in the injection interval. Do not allow bleedoff of pressure into overlying sands.

15. No background gradient should be used to model the lowest density waste scenario. A stabilized zero background velocity should be demonstrated prior to injection for the SWIFT model.

16. The Region is no longer requiring full lateral waste transport modeling outside of the cone of influence for cases in which the injectate is more dense than that of the resident formation fluid. The 10,000 year requirements of 40 CFR §148.20 must still be addressed. However, instead of modeling the heavy waste plume for 10,000 years, operators may demonstrate there is no force to drive the waste stream out of the injection zone. Specifically, 10,000 year modeling would not be required if the following criteria are met.

    a) The specific gravity of the waste stream is greater than that of the injection interval formation fluid;

    b) The dense waste plume is modeled (numerically or analytically) within the worst case cone of influence or 2 mile area of review, whichever is greater, and;

    c) Potential impacts (if any) of future oil and gas production wells in the vicinity of the facility are addressed.

    This decision is based on the assumption there is no upward force acting on the waste stream once it is beyond the cone of influence, provided the density of the waste is greater than that of the resident formation fluid, and no production wells exist or will exist which would cause waste migration out of the injection zone. Both buoyant 10,000 year waste plume modeling and worst-case pressure buildup calculations will still be required.

Requirements for all Class I Wells and Class I Hazardous Waste Wells

SITING – Fluids must be injected into a formation that is below the lowermost formation containing, within ¼ mile of the well, a USDW. To demonstrate this, owners and operators are required to provide the following information:

Requirements for All Class I Wells	**Additional Requirements for Hazardous Waste Wells**
Geologic Studies of the injection and confining zones to determine that: • The receiving formations are sufficiently permeable, porous, homogeneous, and thick enough to receive the fluids at the proposed injection rate without requiring excessive pressure • Formations are large enough to prevent pressure buildup and injected fluid would not reach aquifer recharge areas • There is a low-permeability confining zone to prevent vertical migration of injection fluids • Injected fluids are compatible with well materials and with rock and fluid in injection zone • The area is geologically stable • The injection zone has no economic value	Additional **structural** studies to demonstrate: • Injection and confining formations are free of vertically transmissive fissures or faults • Low seismicity and probability of earthquakes • Proposed injection will not induce earthquakes or increase the frequency of naturally occurring earthquakes
Area Of Review (AoR) analysis of the surrounding area to identify artificial penetrations, such as other wells, that might allow fluid to move out of the injection zone • Minimum area of review is ¼ mile • Can be a fixed radius around the well or mathematically calculated • Includes a corrective action plan to address improperly completed or plugged wells within the AoR	Additional **review** required: • Minimum AoR of 2 miles • No-migration petition demonstrating that fluids will remain in the injection zone for as long as they are hazardous (modeling conducted to show either the waste will remain in the injection zone for 10,000 years or it will be rendered non-hazardous before migration)

CONSTRUCTION – Wells must have a multilayered design to prevent fluids from entering USDWs.

Requirements for All Class I Wells	**Additional Requirements for Hazardous Waste Wells**

• Approved engineering schematics and subsurface construction details
• At least 2 layers of concentric casing and cement
• Outer (or surface) casing cemented to the surface
• Tubing and packer design based on
  o well depth
  o characteristics of the injected fluid
  o injection and annular pressure
  o injection rate
  o temperature and volume of injected fluid
  o size of well casing
  o cementing requirements
• Tests during drilling to ensure no vertical migration of fluid
	• Detailed requirements for tubing and packer
	• Long-string (inner) casing fully cemented to surface
	• UIC Program approval of casing, cement, tubing, and packer prior to construction

OPERATION – Provides multiple safeguards to ensure the injected wastewater is fully confined.

Requirements for All Class I Wells	**Additional Requirements for Hazardous Waste Wells**
• Maintain injection at pressures that will not initiate new fractures or propagate existing fractures • Approved fluids and permitted pressures must be maintained in the annular space • Continuous monitoring and recording devices	• Automatic alarms and shutdown devices • Notify permitting authority within 24 hours if problem occurs • Cease injection and resume only with UIC Program Director's permission

MONITORING AND TESTING – Ensures that there are no leaks in the casing, tubing, or packer and the injected fluid is contained within the injection zone.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells

• Continuously monitor:
  o Annulus pressure (to detect leaks in the casing, tubing, or packer; and any fluid movement into a USDW)
  o Containment in the injection zone
  o Characteristics of injected waste
  o Monitor for fluid movement into USDWs within the AoR
• Internal and external mechanical integrity test (MIT) every 5 years
	• Explicit procedures for reporting and correcting problems due to lack of mechanical integrity
	• Develop and follow a waste analysis plan
	• Analyze wastewaters as specified in the plan
	• Internal MIT every year
	• Test cement at base of well annually

REPORTING AND RECORD KEEPING – Informs the UIC Program about the operation of the well and all testing results.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
• Quarterly on injection and injected fluids and monitoring of USDW in the area of review • Every 5 years on internal and external MITs • Changes to the facility, progress on compliance schedule, loss of mechanical integrity (MI), or noncompliance with permit conditions	• Results from the waste analysis program and geochemical compatibility • Internal MIT yearly • Maximum injection pressure quarterly • Volume of fluid injected

CLOSURE –Ensures that the well is safely and properly abandoned when injection is completed.

Requirements for All Class I Wells	**Additional Requirements for Hazardous Waste Wells**
• Submit plugging and abandonment report	• Conduct pressure fall off and mechanical integrity tests • Continue ground water monitoring until injection zone pressure cannot influence USDW • Flush well with non-reactive fluid • Inform authorities about the well, its location, and zone of influence

§ 146.65 Construction requirements.

(a) *General*. All existing and new Class I hazardous waste injection wells shall be 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 injection tubing and long string casing as required pursuant to §146.67(f).

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

(c) *Casing and Cementing of New Wells*. (1) Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period. The casing and cementing program shall be designed to prevent the movement of fluids into or between USDWs, and to prevent potential leaks of fluids from the well. In determining and specifying casing and cementing requirements, the Director shall consider the following information as required by § 146.70:

(i) Depth to the injection zone;

(ii) Injection pressure, external pressure, internal pressure and axial loading;

(iii) Hole size;

(iv) Size and grade of all casing strings (well thickness, diameter, nominal weight, length, joint specification and construction material);

(v) Corrosiveness of injected fluid, formation fluids and temperature;

(vi) Lithology of injection and confining zones;

(vii) Type or grade of cement; and

(viii) Quantity and chemical composition of the injected fluid.

(2) One surface casing string shall, at a minimum, extend into the confining bed below the lowest formation that contains a USDW and be cemented by circulating cement from the base of the casing to the surface, using a minimum of 120% of the calculated annual volume. The Director may require more than 120% when the geology or other circumstances warrant it.

(3) At least one long string casing, using a sufficient number of centralizers, shall extend to the injection zone and shall be cemented by circulating cement to the surface in one or more stages:

(i) Of sufficient quantity and quality to withstand the maximum operating pressure; and

(ii) In a quantity no less than 120% of the calculated volume necessary to fill the annular space. The Director may require more than 120% when the geology or other circumstances warrant it.

(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 is continuous and does not allow fluid movement behind the well bore.

(5) Casings, including any casing connections, must be rated to have sufficient structural strength to withstand, for the design life of the well:

(i) The maximum burst and collapse pressures which may be experienced during the construction, operation and closure of the well; and

(ii) The maximum tensile stress which may be experienced at any point along the length of the casing during the construction, operation, and closure of the well.

(6) At a minimum, cement and cement additivies must be of sufficient quality and quantity to maintain integrity over the design life of the well.

(d) *Tubing and packer*. (1) All Class I hazardous waste injection wells shall inject fluids through tubing with a packer set at a point specified by the Director.

(2) In determining and specifying requirements for tubing and packer, the following factors shall be considered:

(i) Depth of setting;

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

(iii) Injection pressure;

(iv) Annular pressure;

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

(vi) Size of casing; and

(vii) Tubing tensile, burst, and collapse strengths.

(3) The Director may approve the use of a fluid seal if he determines that the following conditions are met:

(i) The operator demonstrates that the seal will provide a level of protection comparable to a packer;

(ii) The operator demonstrates that the staff is, and will remain, adequately trained to operate and maintain the well and to identify and interpret variations in parameters of concern;

(iii) The permit contains specific limitations on variations in annular pressure and loss of annular fluid;

(iv) The design and construction of the well allows continuous monitoring of the annular pressure and mass balance of annular fluid; and

(v) A secondary system is used to monitor the interface between the annulus fluid and the injection fluid and the permit contains requirements for testing the system every three months and recording the results.

§ 146.66 Logging, sampling, and testing prior to new well operation.

(a) During the drilling and construction of a new Class I hazardous waste injection well, appropriate logs and tests shall be run to determine or verify the depth, thickness, porosity, permeability, and rock type of, and the salinity of any entrained fluids in, all relevant geologic units to assure conformance with performance standards in § 146.65, and to establish accurate baseline data against which future measurements may be compared. A descriptive report interpreting 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 during drilling on all holes constructed by drilling a pilot hole which are enlarged by reaming or another method. Such checks shall be at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling; and

(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. At a minimum, the following logs shall be required in the following situations:

(i) 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, and a temperature log after the casing is set and cemented.

(ii) Upon installation of the long string casing:

(A) Resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs 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.

(iii) The Director may allow the use of an alternative to the above logs when an alternative will provide equivalent or better information; and

(3) A mechanical integrity test consisting of:

(i) A pressure test with liquid or gas;

(ii) A radioactive tracer survey;

(iii) A temperature or noise log;

(iv) A casing inspection log, if required by the Director; and

(v) Any other test required by the Director.

(b) Whole cores or sidewall cores of the confining and injection zones and formation fluid samples from the injection zone shall be taken. The Director may accept 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 fluid temperature, pH, conductivity, pressure and the static fluid level of the injection zone must be recorded.

(d) At a minimum, the following information concerning the injection and

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

(vi) Size of casing; and

(vii) Tubing tensile, burst, and collapse strengths.

(3) The Director may approve the use of a fluid seal if he determines that the following conditions are met:

(i) The operator demonstrates that the seal will provide a level of protection comparable to a packer;

(ii) The operator demonstrates that the staff is, and will remain, adequately trained to operate and maintain the well and to identify and interpret variations in parameters of concern;

(iii) The permit contains specific limitations on variations in annular pressure and loss of annular fluid;

(iv) The design and construction of the well allows continuous monitoring of the annular pressure and mass balance of annular fluid; and

(v) A secondary system is used to monitor the interface between the annulus fluid and the injection fluid and the permit contains requirements for testing the system every three months and recording the results.

§ 146.66 Logging, sampling, and testing prior to new well operation.

(a) During the drilling and construction of a new Class I hazardous waste injection well, appropriate logs and tests shall be run to determine or verify the depth, thickness, porosity, permeability, and rock type of, and the salinity of any entrained fluids in, all relevant geologic units to assure conformance with performance standards in § 146.65, and to establish accurate baseline data against which future measurements may be compared. A descriptive report interpreting 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 during drilling on all holes constructed by drilling a pilot hole which are enlarged by reaming or another method. Such checks shall be at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling; and

(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. At a minimum, the following logs shall be required in the following situations:

(i) 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, and a temperature log after the casing is set and cemented.

(ii) Upon installation of the long string casing:

(A) Resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs 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.

(iii) The Director may allow the use of an alternative to the above logs when an alternative will provide equivalent or better information; and

(3) A mechanical integrity test consisting of:

(i) A pressure test with liquid or gas;

(ii) A radioactive tracer survey;

(iii) A temperature or noise log;

(iv) A casing inspection log, if required by the Director; and

(v) Any other test required by the Director.

(b) Whole cores or sidewall cores of the confining and injection zones and formation fluid samples from the injection zone shall be taken. The Director may accept 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 fluid temperature, pH, conductivity, pressure and the static fluid level of the injection zone must be recorded.

(d) At a minimum, the following information concerning the injection and confining zones shall be determined or calculated for Class I hazardous waste injection wells:

(1) Fracture pressure;

(2) Other physical and chemical characteristics of the injection and confining zones; and

(3) Physical and chemical characteristics of the formation fluids in the injection zone.

(e) Upon completion, but prior to operation, the owner or operator shall conduct the following tests to verify hydrogeologic characteristics of the injection zone:

(1) A pump test; or

(2) Injectivity tests.

(f) The Director shall have the opportunity to witness all logging and testing by this subpart. The owner or operator shall submit a schedule of such activities to the Director 30 days prior to conducting the first test.

§ 146.67 Operating requirements.

(a) Except during stimulation, the owner or operator shall assure that injection pressure at the wellhead does 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. The owner or operator shall assure that the injection pressure does not initiate fractures or propagate existing fractures in the confining zone, nor cause the movement of injection or formation fluids into a USDW.

(b) Injection between the outermost casing protecting USDWs and the well bore is prohibited.

(c) The owner or operator shall maintain an annulus pressure that exceeds the operating injection pressure, unless the Director determines that such a requirement might harm the integrity of the well. The fluid in the annulus shall be noncorrosive, or shall contain a corrosion inhibitor.

(d) The owner or operator shall maintain mechanical integrity of the injection well at all times.

(e) Permit requirements for owners or operators of hazardous waste wells which inject wastes which have the potential to react with the injection formation to generate gases shall include:

(1) Conditions limiting the temperature, pH or acidity of the injected waste; and

(2) Procedures necessary to assure that pressure imbalances which might cause a backflow or blowout do not occur.

(f) The owner or operator shall install and use continuous recording devices to monitor: the injection pressure; the flow rate, volume, and temperature of injected fluids; and the pressure on the annulus between the tubing and the long string casing, and shall install and use:

(1) Automatic alarm and automatic shut-off systems, designed to sound and shut-in the well when pressures and flow rates or other parameters approved by the Director exceed a range and/or gradient specified in the permit; or

(2) Automatic alarms, designed to sound when the pressures and flow rates or other parameters approved by the Director exceed a rate and/or gradient specified in the permit, in cases where the owner or operator certifies that a trained operator will be on-site at all times when the well is operating.

(g) If an automatic alarm or shutdown is triggered, the owner or operator shall immediately investigate and identify as expeditiously as possible the cause of the alarm or shutoff. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under paragraph (f) of this section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator shall:

(1) Cease injection of waste fluids unless authorized by the Director to continue or resume injection.

(2) Take all necessary steps to determine the presence or absence of a leak; and

(3) Notify the Director within 24 hours after the alarm or shutdown.

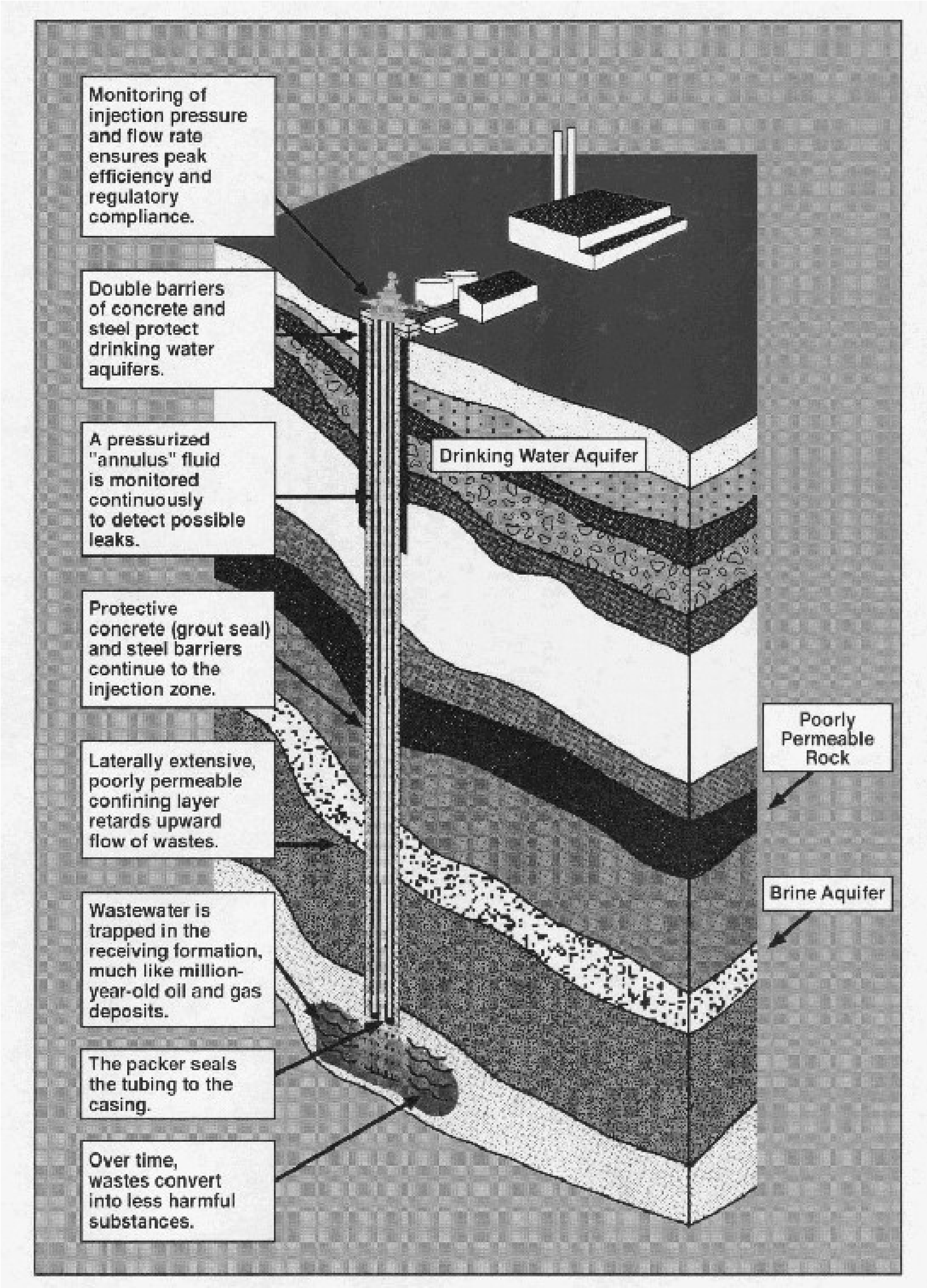
(h) If a loss of mechanical integrity is discovered pursuant to paragraph (g) of this section or during periodic mechanical integrity testing, the owner or operator shall:

(1) Immediately cease injection of waste fluids;

(2) Take all steps reasonably necessary to determine whether there may

Exhibit 3

A Typical Class I Injection Well



TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 6 WATER QUALITY
PART 2 GROUND AND SURFACE WATER PROTECTION

20.6.2.1 ISSUING AGENCY: Water Quality Control Commission
[12-1-95; 20.6.2.1 NMAC - Rn, 20 NMAC 6.2.I.1000, 1-15-01]

20.6.2.2 SCOPE: All persons subject to the Water Quality Act, NMSA 1978, Sections 74-6-1 et seq.
[12-1-95; 20.6.2.2 NMAC - Rn, 20 NMAC 6.2.I.1001, 1-15-01]

20.6.2.3 STATUTORY AUTHORITY: Standards and Regulations are adopted by the commission under the authority of the Water Quality Act, NMSA 1978, Sections 74-6-1 through 74-6-17.
[2-18-77, 9-20-82, 12-1-95; 20.6.2.3 NMAC - Rn, 20 NMAC 6.2.I.1002, 1-15-01]

20.6.2.4 DURATION: Permanent.
[12-1-95; 20.6.2.4 NMAC - Rn, 20 NMAC 6.2.I.1003, 1-15-01]

20.6.2.5 EFFECTIVE DATE: December 1, 1995 unless a later date is cited at the end of a section.
[12-1-95, 11-15-96; 20.6.2.5 NMAC - Rn, 20 NMAC 6.2.I.1004, 1-15-01; A, 1-15-01]

20.6.2.6 OBJECTIVE: The objective of this Part is to implement the Water Quality Act, NMSA 1978, Sections 74-6-1 et seq.
[12-1-95; 20.6.2.6 NMAC - Rn, 20 NMAC 6.2.I.1005, 1-15-01]

20.6.2.7 DEFINITIONS: Terms defined in the Water Quality Act, but not defined in this part, will have the meaning given in the act. As used in this part:

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 rehabilitated for its intended purpose or other purposes including monitoring and observation;

B. **"abate" or "abatement"** means the investigation, containment, removal or other mitigation of water pollution;

C. **"abatement plan"** means a description of any operational, monitoring, contingency and closure requirements and conditions for the prevention, investigation and abatement of water pollution, and includes Stage 1, Stage 2, or Stage 1 and 2 of the abatement plan, as approved by the secretary;

D. **"adjacent properties"** means properties that are contiguous to the discharge site or property that would be contiguous to the discharge site but for being separated by a public or private right of way, including roads and highways.

E. **"background"** means, for purposes of ground-water abatement plans only and for no other purposes in this part or any other regulations including but not limited to surface-water standards, the amount of ground-water contaminants naturally occurring from undisturbed geologic sources or water contaminants which the responsible person establishes are occurring from a source other than the responsible person's facility; this definition shall not prevent the secretary from requiring abatement of commingled plumes of pollution, shall not prevent responsible persons from seeking contribution or other legal or equitable relief from other persons, and shall not preclude the secretary from exercising enforcement authority under any applicable statute, regulation or common law;

F. **"casing"** means pipe or tubing of appropriate material, diameter and weight used to support the sides of a well hole and thus prevent the walls from caving, to prevent loss of drilling mud into porous ground, or to prevent fluid from entering or leaving the well other than to or from the injection zone;

G. **"cementing"** means the operation whereby a cementing slurry is pumped into a drilled hole and/or forced behind the casing;

H. **"cesspool"** means a **"drywell"** that receives untreated domestic liquid waste containing human excreta, and which sometimes has an open bottom and/or perforated sides; a large capacity cesspool means a cesspool that receives liquid waste greater than that regulated by 20.7.3 NMAC;

I. **"collapse"** means the structural failure of overlying materials caused by removal of underlying materials;

J. **"commission"** means:

(1) the New Mexico water quality control commission or
(2) the department, when used in connection with any administrative and enforcement activity;

K. **“confining zone”** means a geological formation, group of formations, or part of a formation that is capable of limiting fluid movement from an injection zone;

L. **“conventional mining”** means the production of minerals from an open pit or underground excavation; underground excavations include mine shafts, workings and air vents, but does not include excavations primarily caused by in situ extraction activities;

M. **“daily composite sample”** means a sample collected over any twenty-four hour period at intervals not to exceed one hour and obtained by combining equal volumes of the effluent collected, or means a sample collected in accordance with federal permit conditions where a permit has been issued under the national pollutant discharge elimination system or for those facilities which include a waste stabilization pond in the treatment process where the retention time is greater than twenty (20) days, means a sample obtained by compositing equal volumes of at least two grab samples collected within a period of not more than twenty-four (24) hours;

N. **“department”, “agency”,** or **“division”** means the New Mexico environment department or a constituent agency designated by the commission;

O. **“discharge permit”** means a discharge plan approved by the department;

P. **“discharge permit modification”** means a change to the requirements of a discharge permit that result from a change in the location of the discharge, a significant increase in the quantity of the discharge, a significant change in the quality of the discharge; or as required by the secretary;

Q. **“discharge permit renewal”** means the re-issuance of a discharge permit for the same, previously permitted discharge;

R. **“discharge plan”** means a description of any operational, monitoring , contingency, and closure requirements and conditions for any discharge of effluent or leachate which may move directly or indirectly into ground water;

S. **“discharge site”** means the entire site where the discharge and associated activities will take place;

T. **“disposal”** means to abandon, deposit, inter or otherwise discard a fluid as a final action after its use has been achieved;

U. **“domestic liquid waste”** means human excreta and water-carried waste from typical residential plumbing fixtures and activities, including but not limited to waste from toilets, sinks, bath fixtures, clothes or dishwashing machines and floor drains;

V. **“domestic liquid waste treatment unit”** means a watertight unit designed, constructed and installed to stabilize only domestic liquid waste and to retain solids contained in such domestic liquid waste, including but not limited to aerobic treatment units and septic tanks;

W. **“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;

X. **“experimental technology”** means a technology which has not been proven feasible under the conditions in which it is being tested;

Y. **“fluid”** means material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state;

Z. **“ground water”** means interstitial water which occurs in saturated earth material and which is capable of entering a well in sufficient amounts to be utilized as a water supply;

AA. **“hazard to public health”** exists when water which is used or is reasonably expected to be used in the future as a human drinking water supply exceeds at the time and place of such use, one or more of the numerical standards of Subsection A of 20.6.2.3103 NMAC, or the naturally occurring concentrations, whichever is higher, or if any toxic pollutant affecting human health is present in the water; in determining whether a discharge would cause a hazard to public health to exist, the secretary shall investigate and consider the purification and dilution reasonably expected to occur from the time and place of discharge to the time and place of withdrawal for use as human drinking water;

BB. **“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;

CC. **“injection”** means the subsurface emplacement of fluids through a well;

DD. **“injection zone”** means a geological formation, group of formations, or part of a formation receiving fluids through a well;

EE. **“motor vehicle waste disposal well”** means a well which receives or has received fluids from vehicular repair or maintenance activities;

FF. **“non-aqueous phase liquid”** means an interstitial body of liquid oil, petroleum product, petrochemical, or organic solvent, including an emulsion containing such material;

GG. **“operational area”** means a geographic area defined in a project discharge permit where a group of wells or well fields in close proximity comprise a single class III well operation;

HH. **“owner of record”** means an owner of property according to the property records of the tax assessor in the county in which the discharge site is located at the time the application was deemed administratively complete;

II. **“packer”** means a device lowered into a well to produce a fluid-tight seal within the casing;

JJ. **“person”** means an individual or any other entity including partnerships, corporation, associations, responsible business or association agents or officers, the state or a political subdivision of the state or any agency, department or instrumentality of the United States and any of its officers, agents or employees;

KK. **“petitioner”** means a person seeking a variance from a regulation of the commission pursuant to Section 74-6-4(G) NMSA 1978;

LL. **“plugging”** means the act or process of stopping the flow of water, oil or gas into or out of a geological formation, group of formations or part of a formation through a borehole or well penetrating these geologic units;

MM. **“project discharge permit”** means a discharge permit which describes the operation of similar class III wells or well fields within one or more individual operational areas;

NN. **“refuse”** includes food, swill, carrion, slops and all substances from the preparation, cooking and consumption of food and from the handling, storage and sale of food products, the carcasses of animals, junked parts of automobiles and other machinery, paper, paper cartons, tree branches, yard trimmings, discarded furniture, cans, oil, ashes, bottles, and all unwholesome material;

OO. **“responsible person”** means a person who is required to submit an abatement plan or who submits an abatement plan pursuant to this part;

PP. **“secretary”** or **“director”** means the secretary of the New Mexico department of environment or the director of a constituent agency designated by the commission;

QQ. **“sewer system”** means pipelines, conduits, pumping stations, force mains, or other structures, devices, appurtenances or facilities used for collecting or conducting wastes to an ultimate point for treatment or disposal;

RR. **“sewerage system”** means a system for disposing of wastes, either by surface or underground methods, and includes sewer systems, treatment works, disposal wells and other systems;

SS. **“significant modification of Stage 2 of the abatement plan”** means a change in the abatement technology used excluding design and operational parameters, or re-location of 25 percent or more of the compliance sampling stations, for any single medium, as designated pursuant to Paragraph (4) of Subsection E of 20.6.2.4106 NMAC;

TT. **“subsurface fluid distribution system”** means an assemblage of perforated pipes, drain tiles, or other mechanisms intended to distribute fluids below the surface of the ground;

UU. **“subsurface water”** means ground water and water in the vadose zone that may become ground water or surface water in the reasonably foreseeable future or may be utilized by vegetation;

VV. **“TDS”** means total dissolved solids as determined by the "calculation method" (sum of constituents), by the "residue on evaporation method at 180 degrees" of the "*U.S. geological survey techniques of water resource investigations*," or by conductivity, as the secretary may determine;

WW. **“toxic pollutant”** means a water contaminant or combination of water contaminants in concentration(s) which, upon exposure, ingestion, or assimilation either directly from the environment or indirectly by ingestion through food chains, will unreasonably threaten to injure human health, or the health of animals or plants which are commonly hatched, bred, cultivated or protected for use by man for food or economic benefit; as used in this definition injuries to health include death, histopathologic change, clinical symptoms of disease, behavioral abnormalities, genetic mutation, physiological malfunctions or physical deformations in such organisms or their offspring; in order to be considered a toxic pollutant a contaminant must be one or a combination of the potential toxic pollutants listed below and be at a concentration shown by scientific information currently available to the public to have potential for causing one or more of the effects listed above; any water contaminant or combination of the water contaminants in the list below creating a lifetime risk of more than one cancer per 100,000 exposed persons is a toxic pollutant:

(1) acrolein

(2) acrylonitrile
(3) aldrin
(4) benzene
(5) benzidine
(6) carbon tetrachloride
(7) chlordane
(8) chlorinated benzenes
- **(a)** monochlorobenzene
- **(b)** hexachlorobenzene
- **(c)** pentachlorobenzene

(9) 1,2,4,5-tetrachlorobenzene
(10) chlorinated ethanes
- **(a)** 1,2-dichloroethane
- **(b)** hexachloroethane
- **(c)** 1,1,2,2-tetrachloroethane
- **(d)** 1,1,1-trichloroethane
- **(e)** 1,1,2-trichloroethane

(11) chlorinated phenols
- **(a)** 2,4-dichlorophenol
- **(b)** 2,4,5-trichlorophenol
- **(c)** 2,4,6-trichlorophenol

(12) chloroalkyl ethers
- **(a)** bis (2-chloroethyl) ether
- **(b)** bis (2-chloroisopropyl) ether
- **(c)** bis (chloromethyl) ether

(13) chloroform
(14) DDT
(15) dichlorobenzene
(16) dichlorobenzidine
(17) 1,1-dichloroethylene
(18) dichloropropenes
(19) dieldrin
(20) diphenylhydrazine
(21) endosulfan
(22) endrin
(23) ethylbenzene
(24) halomethanes
- **(a)** bromodichloromethane
- **(b)** bromomethane
- **(c)** chloromethane
- **(d)** dichlorodifluoromethane
- **(e)** dichloromethane
- **(f)** tribromomethane
- **(g)** trichlorofluoromethane

(25) heptachlor
(26) hexachlorobutadiene
(27) hexachlorocyclohexane (HCH)
- **(a)** alpha-HCH
- **(b)** beta-HCH
- **(c)** gamma-HCH
- **(d)** technical HCH

(28) hexachlorocyclopentadiene
(29) high explosives (HE)
- **(a)** 2,4-dinitrotoluene (2,4,DNT)
- **(b)** 2,6-dinitrotoluene (2,6,DNT)
- **(c)** octrahydro-1,3,5,7-tetranitro-1,3,5,7 tetrazocine (HMX)

(d) hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
(e) 2,4,6-trinitrotoluene (TNT)
(30) isophorone
(31) methyl tertiary butyl ether
(32) nitrobenzene
(33) nitrophenols
(a) 2,4-dinitro-o-cresol
(b) dinitrophenols
(34) nitrosamines
(a) N-nitrosodiethylamine
(b) N-nitrosodimethylamine
(c) N-nitrosodibutylamine
(d) N-nitrosodiphenylamine
(e) N-nitrosopyrrolidine
(35) pentachlorophenol
(36) perchlorate
(37) phenol
(38) phthalate esters
(a) dibutyl phthalate
(b) di-2-ethylhexyl phthalate
(c) diethyl phthalate
(d) dimethyl phthalate
(39) polychlorinated biphenyls (PCB's)
(40) polynuclear aromatic hydrocarbons (PAH)
(a) anthracene
(b) 3,4-benzofluoranthene
(c) benzo (k) fluoranthene
(d) fluoranthene
(e) fluorene
(f) phenanthrene
(g) pyrene
(41) tetrachloroethylene
(42) toluene
(43) toxaphene
(44) trichloroethylene
(45) vinyl chloride
(46) xylenes
(a) o-xylene
(b) m-xylene
(c) p-xylene
(47) 1,1-dichloroethane
(48) ethylene dibromide (EDB)
(49) cis-1,2-dichloroethylene
(50) trans-1,2-dichloroethylene
(51) naphthalene
(52) 1-methylnaphthalene
(53) 2-methylnaphthalene
(54) benzo-a-pyrene

XX. **"vadose zone"** means earth material below the land surface and above ground water, or in between bodies of ground water;

YY. **"wastes"** means sewage, industrial wastes, or any other liquid, gaseous or solid substance which will pollute any waters of the state;

ZZ. **"water"** means all water including water situated wholly or partly within or bordering upon the state, whether surface or subsurface, public or private, except private waters that do not combine with other surface or subsurface water;

AAA. **"water contaminant"** means any substance that could alter if discharged or spilled the physical, chemical, biological or radiological qualities of water; "water contaminant" does not mean source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954;

BBB. **"watercourse"** means any river, creek, arroyo, canyon, draw, or wash, or any other channel having definite banks and beds with visible evidence of the occasional flow of water;

CCC. **"water pollution"** means introducing or permitting the introduction into water, either directly or indirectly, of one or more water contaminants in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or to unreasonably interfere with the public welfare or the use of property;

DDD. **"well"** means: (1) A bored, drilled, or driven shaft; (2) A dug hole whose depth is greater than the largest surface dimension; (3) An improved sinkhole; or (4) A subsurface fluid distribution system;

EEE. **"well stimulation"** means a process used to clean the well, enlarge channels, and increase pore space in the interval to be injected, thus making it possible for fluids to move more readily into the injection zone; well stimulation includes, but is not limited to, (1) surging, (2) jetting, (3) blasting, (4) acidizing, (5) hydraulic fracturing.

[1-4-68, 4-20-68, 11-27-70, 9-3-72, 4-11-74, 8-13-76, 2-18-77, 6-26-80, 7-2-81, 1-29-82, 9-20-82, 11-17-84, 3-3-86, 8-17-91, 8-19-93, 12-1-95; 20.6.2.7 NMAC - Rn, 20 NMAC 6.2.I.1101, 1-15-01; A, 1-15-01; A, 12-1-01; A, 9-15-02; A, 9-26-04; A, 7-16-06; A, 8-1-14]

20.6.2.8 SEVERABILITY: If any section, subsection, individual standard or application of these standards or regulations is held invalid, the remainder shall not be affected.
[2-18-77, 12-1-95; 20.6.2.8 NMAC - Rn, 20 NMAC 6.2.I.1007, 1-15-01]

20.6.2.9 DOCUMENTS: Documents referenced in the part may be viewed at the New Mexico environment department, ground water quality bureau, Harold Runnels building, 1190 St. Francis Drive, Santa Fe, New Mexico 87503.
[12-1-95; 20.6.2.9 NMAC - Rn, 20 NMAC 6.2.I.1006, 1-15-01; A, 12-1-01]

20.6.2.10 - 20.6.2.1199: [RESERVED]
[12-1-95; 20.6.2.10 - 20.6.2.1199 NMAC - Rn, 20 NMAC 6.2.I.1008-1100, 1102-1199, 1-15-01]

20.6.2.1200 PROCEDURES:
[12-1-95; 20.6.2.1200 NMAC - Rn, 20 NMAC 6.2.I.1200, 1-15-01]

20.6.2.1201 NOTICE OF INTENT TO DISCHARGE:

A. Any person intending to make a new water contaminant discharge or to alter the character or location of an existing water contaminant discharge, unless the discharge is being made or will be made into a community sewer system or subject to the Liquid Waste Disposal Regulations adopted by the New Mexico environmental improvement board, shall file a notice with the ground water quality bureau of the department for discharges that may affect ground water, and/ or the surface water quality bureau of the department for discharges that may affect surface water. However, notice regarding discharges from facilities for the production, refinement, pipeline transmission of oil and gas or products thereof, the oil field service industry, oil field brine production wells, geothermal installations and carbon dioxide facilities shall be filed instead with the oil conservation division.

B. Any person intending to inject fluids into a well, including a subsurface distribution system, unless the injection is being made subject to the Liquid Waste Disposal Regulations adopted by the New Mexico environmental improvement board, shall file a notice with the ground water quality bureau of the department. However notice regarding injection to wells associated with oil and gas facilities as described in Subsection A of Section 20.6.2.1201 NMAC shall be filed instead with the oil conservation division.

C. Notices shall state:

(1) the name of the person making the discharge;

(2) the address of the person making the discharge;

(3) the location of the discharge;

(4) an estimate of the concentration of water contaminants in the discharge; and

(5) the quantity of the discharge.

D. Based on information provided in the notice of intent, the department will notify the person proposing the discharge as to which of the following apply:

(1) a discharge permit is required;
(2) a discharge permit is not required;
(3) the proposed injection well will be added to the department's underground injection well inventory;
(4) the proposed injection activity or injection well is prohibited pursuant to 20.6.2.5004 NMAC.
[1-4-68, 9-5-69, 9-3-72, 2-17-74, 2-20-81, 12-1-95; 20.6.2.1201 NMAC - Rn, 20 NMAC 6.2.I.1201, 1-15-01; A, 12-1-01]

20.6.2.1202 FILING OF PLANS AND SPECIFICATIONS--SEWERAGE SYSTEMS:
A. Any person proposing to construct a sewerage system or proposing to modify any sewerage system in a manner that will change substantially the quantity or quality of the discharge from the system shall file plans and specifications of the construction or modification with ground water quality bureau of the department for discharges that may affect ground water, and/or the surface water quality bureau of the department for discharges that may affect surface water. Modifications having a minor effect on the character of the discharge from sewerage systems shall be reported as of January 1 and June 30 of each year to the ground water quality bureau of the department for discharges that may affect ground water, or the surface water quality bureau of the department for discharges that may affect surface water.
B. Plans, specifications and reports required by this section, if related to facilities for the production, refinement and pipeline transmission of oil and gas, or products thereof, shall be filed instead with the oil conservation division.
C. Plans and specifications required to be filed under this section must be filed prior to the commencement of construction.
[1-4-68, 9-3-72, 2-20-81, 12-1-95; 20.6.2.1202 NMAC - Rn, 20 NMAC 6.2.I.1202, 1-15-01; A, 12-1-01]

20.6.2.1203 NOTIFICATION OF DISCHARGE-REMOVAL:
A. With respect to any discharge from any facility of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, the following notifications and corrective actions are required:
(1) As soon as possible after learning of such a discharge, but in no event more than twenty-four (24) hours thereafter, any person in charge of the facility shall orally notify the chief of the ground water quality bureau of the department, or his counterpart in any constituent agency delegated responsibility for enforcement of these rules as to any facility subject to such delegation. To the best of that person's knowledge, the following items of information shall be provided:
(a) the name, address, and telephone number of the person or persons in charge of the facility, as well as of the owner and/or operator of the facility;
(b) the name and address of the facility;
(c) the date, time, location, and duration of the discharge;
(d) the source and cause of discharge;
(e) a description of the discharge, including its chemical composition;
(f) the estimated volume of the discharge; and
(g) any actions taken to mitigate immediate damage from the discharge.
(2) When in doubt as to which agency to notify, the person in charge of the facility shall notify the chief of the ground water quality bureau of the department. If that department does not have authority pursuant to commission delegation, the department shall notify the appropriate constituent agency.
(3) Within one week after the discharger has learned of the discharge, the facility owner and/or operator shall send written notification to the same department official, verifying the prior oral notification as to each of the foregoing items and providing any appropriate additions or corrections to the information contained in the prior oral notification.
(4) The oral and written notification and reporting requirements contained in this Subsection A are not intended to be duplicative of discharge notification and reporting requirements promulgated by the oil conservation commission (OCC) or by the oil conservation division (OCD); therefore, any facility which is subject to OCC or OCD discharge notification and reporting requirements need not additionally comply with the notification and reporting requirements herein.

(5) As soon as possible after learning of such a discharge, the owner/operator of the facility shall take such corrective actions as are necessary or appropriate to contain and remove or mitigate the damage caused by the discharge.

(6) If it is possible to do so without unduly delaying needed corrective actions, the facility owner/operator shall endeavor to contact and consult with the chief of the ground water quality bureau of the department or appropriate counterpart in a delegated agency, in an effort to determine the department's views as to what further corrective actions may be necessary or appropriate to the discharge in question. In any event, no later than fifteen (15) days after the discharger learns of the discharge, the facility owner/operator shall send to said Bureau Chief a written report describing any corrective actions taken and/or to be taken relative to the discharge. Upon a written request and for good cause shown, the bureau chief may extend the time limit beyond fifteen (15) days.

(7) The bureau chief shall approve or disapprove in writing the foregoing corrective action report within thirty (30) days of its receipt by the department. In the event that the report is not satisfactory to the department, the bureau chief shall specify in writing to the facility owner/operator any shortcomings in the report or in the corrective actions already taken or proposed to be taken relative to the discharge, and shall give the facility owner/operator a reasonable and clearly specified time within which to submit a modified corrective action report. The bureau chief shall approve or disapprove in writing the modified corrective action report within fifteen (15) days of its receipt by the department.

(8) In the event that the modified corrective action report also is unsatisfactory to the department, the facility owner/operator has five (5) days from the notification by the bureau chief that it is unsatisfactory to appeal to the department secretary. The department secretary shall approve or disapprove the modified corrective action report within five (5) days of receipt of the appeal from the bureau chief's decision. In the absence of either corrective action consistent with the approved corrective action report or with the decision of the secretary concerning the shortcomings of the modified corrective action report, the department may take whatever enforcement or legal action it deems necessary or appropriate.

(9) If the secretary determines that the discharge causes or may with reasonable probability cause water pollution in excess of the standards and requirements of Section 20.6.2.4103 NMAC, and the water pollution will not be abated within one hundred and eighty (180) days after notice is required to be given pursuant to Paragraph (1) of Subsection A of Section 20.6.2.1203 NMAC, the secretary may notify the facility owner/operator that he is a responsible person and that an abatement plan may be required pursuant to Section 20.6.2.4104 and Subsection A of Section 20.6.2.4106 NMAC.

B. Exempt from the requirements of this section are continuous or periodic discharges which are made:

(1) in conformance with regulations of the commission and rules, regulations or orders of other state or federal agencies; or

(2) in violation of regulations of the commission, but pursuant to an assurance of discontinuance or schedule of compliance approved by the commission or one of its duly authorized constituent agencies.

C. As used in this section and in Sections 20.6.2.4100 through 20.6.2.4115 NMAC, but not in other sections of this part:

(1) “discharge” means spilling, leaking, pumping, pouring, emitting, emptying, or dumping into water or in a location and manner where there is a reasonable probability that the discharged substance will reach surface or subsurface water;

(2) “facility” means any structure, installation, operation, storage tank, transmission line, motor vehicle, rolling stock, or activity of any kind, whether stationary or mobile;

(3) “oil” means oil of any kind or in any form including petroleum, fuel oil, sludge, oil refuse and oil mixed with wastes;

(4) “operator” means the person or persons responsible for the overall operations of a facility; and

(5) “owner’ means the person or persons who own a facility, or part of a facility.

D. Notification of discharge received pursuant to this part or information obtained by the exploitation of such notification shall not be used against any such person in any criminal case, except for perjury or for giving a false statement.

E. Any person who has any information relating to any discharge from any facility of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, is urged to

notify the chief of the ground water quality bureau of the department. Upon such notification, the secretary may require an owner/operator or a responsible person to perform corrective actions pursuant to Paragraphs (5) and (9) of Subsection A of Section 20.6.2.1203 NMAC.
[2-17-74, 2-20-81, 12-24-87, 12-1-95; 20.6.2.1203 NMAC - Rn, 20 NMAC 6.2.I.1203, 1-15-01; A, 12-1-01]

20.6.2.1204 - 20.6.2.1209 [RESERVED]
[12-1-95; 20.6.2.1204 - 20.6.2.1209 NMAC - Rn, 20 NMAC 6.2.I.1204-1209, 1-15-01]

20.6.2.1210 VARIANCE PETITIONS:

A. Any person seeking a variance pursuant to Section 74-6-4 (G) NMSA 1978, shall do so by filing a written petition with the commission. The petitioner may submit with his petition any relevant documents or material which the petitioner believes would support his petition. Petitions shall:

(1) state the petitioner's name and address;
(2) state the date of the petition;
(3) describe the facility or activity for which the variance is sought;
(4) state the address or description of the property upon which the facility is located;
(5) describe the water body or watercourse affected by the discharge;
(6) identify the regulation of the commission from which the variance is sought;
(7) state in detail the extent to which the petitioner wishes to vary from the regulation;
(8) state why the petitioner believes that compliance with the regulation will impose an unreasonable burden upon his activity; and
(9) state the period of time for which the variance is desired.

B. The variance petition shall be reviewed in accordance with the adjudicatory procedures of 20 NMAC 1.3.

C. The commission may grant the requested variance, in whole or in part, may grant the variance subject to conditions, or may deny the variance. The commission shall not grant a variance for a period of time in excess of five years.

D. An order of the commission is final and bars the petitioner from petitioning for the same variance without special permission from the commission. The commission may consider, among other things, the development of new information and techniques to be sufficient justification for a second petition. If the petitioner, or his authorized representative, fails to appear at the public hearing on the variance petition, the commission shall proceed with the hearing on the basis of the petition. A variance may not be extended or renewed unless a new petition is filed and processed in accordance with the procedures established by this section.
[7-19-68, 11-27-70, 9-3-72, 2-20-81, 11-15-96; 20.6.2.1210 NMAC - Rn, 20 NMAC 6.2.I.1210, 1-15-01]

20.6.2.1211 - 20.6.2.1219: [RESERVED]
[12-1-95; 20.6.2.1211 - 20.6.2.1219 NMAC - Rn, 20 NMAC 6.2.I.1211-1219, 1-15-01]

20.6.2.1220 PENALTIES ENFORCEMENT, COMPLIANCE ORDERS, PENALTIES, ASSURANCE OF DISCONTINUANCE.: Failure to comply with the Water Quality Act, or any regulation or standard promulgated pursuant to the Water Quality Act is a prohibited act. If the secretary determines that a person has violated or is violating a requirement of the Water Quality Act or any regulation promulgated thereunder or is exceeding any water quality standard or ground water standard contained in commission regulations, or is not complying with a condition or provision of an approved or modified abatement plan, discharge plan, or permit issued pursuant to the Water Quality Act, the secretary may issue a compliance order, assess a penalty, commence a civil action in district court, or accept an assurance of discontinuance in accordance with NMSA 1978, Section 74-6-10 of the Water Quality Act.
[12-1-95; 20.6.2.1220 NMAC - Rn, 20 NMAC 6.2.I.1220, 1-15-01]

20.6.2.1221 - 20.6.2.1999: [RESERVED]
[12-1-95; 20.6.2.1221 - 20.6.2.1999 NMAC - Rn, 20 NMAC 6.2.I.1221-2099, 1-15-01]

20.6.2.2000 SURFACE WATER PROTECTION:
[12-1-95; 20.6.2.2000 NMAC - Rn, 20 NMAC 6.2.II, 1-15-01]

20.6.2.2001 PROCEDURES FOR CERTIFICATION OF FEDERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS:

A. This section applies to the state certification of draft national pollutant discharge elimination system (NPDES) permits under Section 401 of the federal Clean Water Act. The purpose of such certification is to reasonably ensure that the permitted activities will be conducted in a manner that will comply with applicable water quality standards, including the antidegradation policy, and the statewide water quality management plan.

B. After review of a draft permit, the department will either: (1) certify that the discharge will comply with the applicable provisions of Sections 208(e), 301, 302, 303, 306 and 307 of the federal Clean Water Act and with appropriate requirements of state law; (2) certify that the discharge will comply with the applicable provisions of Sections 208(e), 301, 302, 303, 306 and 307 of the Clean Water Act and with appropriate requirements of state law upon inclusion of specified conditions in the permit and include the justification for the conditions; or (3) deny certification and include reasons for the denial. If the department does not act on the certification within the time prescribed by the federal permitting agency for such action, the authority to do so shall be waived.

C. Pursuant to federal regulations at 40 CFR 124.10(c), the U.S. environmental protection agency provides notice of draft NPDES permits to the applicant (except for general permits); various local, state, federal, tribal and pueblo government agencies; and other interested parties, and it allows at least 30 days of public comment. To the extent practicable, the department will provide public notice that the department is reviewing a draft NPDES permit for the purpose of preparing a state certification or denial pursuant to Section 401 of the federal Clean Water Act jointly with the notice provided by the U.S. environmental protection agency. The department will also post notice on its website.

D. When joint notice is impractical, the department shall provide notice that the department is reviewing a draft NPDES permit for purpose of preparing a state certification or denial pursuant to Section 401 of the federal Clean Water Act as follows:

(1) for general permits by:

(a) posting notice on the department's website;

(b) publishing notice in at least one newspaper of general circulation;

(c) mailing or e-mailing notice to those persons on the general mailing list maintained by the department who have requested such notice; and

(d) mailing or e-mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department; or

(2) for individual permits by:

(a) posting notice on the department's website;

(b) publishing notice in a newspaper of general circulation in the location of the discharge;

(c) mailing notice to the applicant;

(d) mailing or e-mailing notice to those persons on the general and facility-specific mailing list maintained by the department who have requested such notice; and

(e) mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department.

E. Public notices may describe more than one permit or permit action. The notice provided under Subsections C and D of 20.6.2.2001 NMAC shall include:

(1) for general permits:

(a) a statement that the department will accept written comments on the draft permit during the comment period including the address where comments may be submitted;

(b) a brief description of the activities that produce the discharge; and

(c) a description of the geographic area to be covered by the permit; or

(2) for individual permits:

(a) a statement that the department will accept written comments on the draft permit during the comment period including the address where comments may be submitted;

(b) the name and address of the permittee or permit applicant and, if different, of the facility or activity regulated by the permit;

(c) a brief description of the activities that produce the discharge; and

(d) a general description of the location of the discharge and the name of the receiving water.

F. Following the public notice provided under Subsections C or D of 20.6.2.2001 NMAC, there shall be a period of at least 30 days during which interested persons may submit written comments to the department.

The 30-day comment period shall begin on the date of the public notice provided under Subsections C or D of 20.6.2.2001 NMAC. The department shall consider all pertinent comments.

G. Following the public comment period provided under Subsection F of 20.6.2.2001 NMAC, the department shall issue a final permit certification including any conditions that the department places on the certification, or issue a statement of denial including the reasons for the denial. The final certification will generally be issued within 45 days from the date a request to grant, deny or waive certification is received by the department, unless the department in consultation with the U.S. environmental protection agency regional administrator finds that unusual circumstances require a longer time. The department shall send a copy of the final permit certification or denial to the U.S. environmental protection agency, the applicant (except for general permits), and those members of the public who submitted comments to the department.

(1) The permit certification shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the NPDES permit number;

(b) a statement that the department has examined the application or other relevant information and bases its certification upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards;

(d) a statement of any conditions which the department deems necessary or desirable with respect to the discharge of the activity;

(e) identification of any condition more stringent than that in the draft permit required to assure compliance with the applicable provisions of Sections 208(e), 301, 302, 303, 306 and 307 of the Clean Water Act and with appropriate requirements of state law citing the Clean Water Act or state law upon which the condition is based;

(f) a statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of state law, including water quality standards; and

(g) such other information as the department may determine to be appropriate.

(2) With justification, including any of the reasons listed in the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(E), the department may deny permit certification. Denial of permit certification shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the NPDES permit number;

(b) a statement that the department has examined the application or other relevant information and bases its denial upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement of denial including the reasons for the denial; and

(d) such other information as the department may determine to be appropriate.

H. Any person who is adversely affected by the certification or denial of a specific permit may appeal such certification or denial by filing a petition for review with the secretary within 30 days after the department issues the final permit certification or statement of denial. Such petition shall be in writing and shall include a concise statement of the reasons for the appeal and the relief requested. The secretary may hold a hearing on the appeal. In any such appeal hearing, the procedures of 20.1.4 NMAC shall not apply. The department shall give notice of the appeal hearing at least 30 days prior to the hearing. The notice shall state the date, time, and location of the appeal hearing and shall include the pertinent information listed in Subparagraphs (b), (c), and (d) of Paragraph (2) of Subsection E of 20.6.2.2001 NMAC. The secretary shall appoint a hearing officer to preside over the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information on the permit certification or denial during the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information in rebuttal of that presented by another person. Reasonable time limits may be placed on oral statements, and the submission of written statements may be required. The hearing officer may question persons presenting oral testimony. Cross examination of persons presenting oral statements shall not otherwise be allowed. Within 30 days after the completion of the hearing, or such other time as the secretary may order given the complexities of the case, the hearing officer shall submit recommendations to the secretary. The secretary shall issue a final decision on the appeal within 30 days after receiving the recommendation, or such other time as the secretary may order given the complexities of the case.

I. Pursuant to the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(O), any person who is adversely affected by the secretary's final decision may file with the commission a petition for review of that decision based on the administrative record.
[20.6.2.2001 NMAC - N, 5-18-11]

20.6.2.2002 PROCEDURES FOR CERTIFICATION OF FEDERAL PERMITS FOR DISCHARGE OF DREDGED OR FILL MATERIAL:

A. This section applies to the state certification of draft permits or permit applications for the discharge of dredged or fill material under Section 401 of the federal Clean Water Act. The purpose of such certification is to reasonably ensure that the permitted activities will be conducted in a manner that will comply with applicable water quality standards, including the antidegradation policy, and the statewide water quality management plan.

B. After review of a draft permit or permit application, the department will either: (1) certify that the discharge will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the federal Clean Water Act and with appropriate requirements of state law; (2) certify that the discharge will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act and with appropriate requirements of state law upon inclusion of specified conditions in the permit and include the justification for the conditions; or (3) deny certification and include reasons for the denial. If the department does not act on the certification within the time prescribed by the federal permitting agency for such action, the authority to do so shall be waived.

C. Pursuant to federal regulations at 33 CFR 325.3 and 33 CFR 330.5, the U.S. army corps of engineers provides notice of draft dredged or fill permits and permit applications to the applicant (except for general or nationwide permits); various local, state, federal, tribal and pueblo government agencies; and other interested parties, and it allows at least 15 days of public comment. To the extent practicable, the department will provide public notice that the department is reviewing a draft permit or permit application for the purpose of preparing a state certification or denial pursuant to Section 401 of the federal Clean Water Act jointly with the notice provided by the U.S. army corps of engineers. The department will also post notice on its website.

D. When joint notice is impractical, the department shall provide notice that the department is reviewing a draft dredged or fill permit or permit application for purpose of preparing a state certification or denial pursuant to Section 401 of the federal Clean Water Act as follows:

(1) for general permits by:

(a) posting notice on the department's website;

(b) publishing notice in at least one newspaper of general circulation;

(c) mailing or e-mailing notice to those persons on the general mailing list maintained by the department who have requested such notice; and

(d) mailing or e-mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department; or

(2) for individual permit applications by:

(a) posting notice on the department's website;

(b) publishing notice in a newspaper of general circulation in the location of the discharge;

(c) mailing notice to the applicant;

(d) mailing or e-mailing notice to those persons on the general and facility-specific mailing list maintained by the department who have requested such notice; and

(e) mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department.

E. Public notices may describe more than one permit or permit action. The notice provided under Subsections C and D of 20.6.2.2002 NMAC shall include:

(1) for general permits:

(a) a statement that the department will accept written comments on the draft permit during the comment period including the address where comments may be submitted;

(b) a brief description of the activities that produce the discharge; and

(c) a description of the geographic area to be covered by the permit; or

(2) for individual permit applications:

(a) a statement that the department will accept written comments on the permit application during the comment period including the address where comments may be submitted;

(b) the name and address of the permittee or permit applicant and, if different, of the facility or activity regulated by the permit;

(c) a brief description of the activities that produce the discharge; and

(d) a general description of the location of the discharge and the name of the receiving water.

F. Following the public notice provided under Subsections C or D of 20.6.2.2002 NMAC, there shall be a period of at least 30 days during which interested persons may submit written comments to the department. The 30-day comment period shall begin on the date of the public notice provided under Subsections C or D of 20.6.2.2002 NMAC. The department shall consider all pertinent comments.

G. The public notice provisions in Subsection C and D of Section 20.6.2.2002 NMAC and the public comment provisions in Subsection F of Section 20.6.2.2002 NMAC shall not apply to permits issued using emergency procedures under 33 CFR 325.2(e)(4). However, even in emergency situations, reasonable efforts shall be made to receive comments from interested state and local agencies and the affected public.

H. Following the public comment period provided under Subsection F of 20.6.2.2002 NMAC, the department shall issue a final permit certification including any conditions that the department places on the certification, or issue a statement of denial including the reasons for the denial. The final certification will generally be issued within 60 days from the date a request to grant, deny or waive certification is received by the department, unless the department in consultation with the U.S. army corps of engineers district engineer finds that unusual circumstances require a longer time. The department shall send a copy of the final permit certification or denial to the army corps of engineers, the applicant (except for general or nationwide permits), and those members of the public who submitted comments to the department.

(1) The permit certification or denial shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the permit number;

(b) a statement that the department has examined the application or other relevant information and bases its certification upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards;

(d) a statement of any conditions which the department deems necessary or desirable with respect to the discharge of the activity; and

(e) such other information as the department may determine to be appropriate.

(2) With justification, including any of the reasons listed in the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(E), the department may deny permit certification. Denial of permit certification shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the permit number;

(b) a statement that the department has examined the application or other relevant information and bases its denial upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement of denial including the reasons for the denial; and

(d) such other information as the department may determine to be appropriate.

I. Any person who is adversely affected by the certification or denial of a specific permit may appeal such certification or denial by filing a petition for review with the secretary within 30 days after the department issues the final permit certification or statement of denial. Such petition shall be in writing and shall include a concise statement of the reasons for the appeal and the relief requested. The secretary may hold a hearing on the appeal. In any such appeal hearing, the procedures of 20.1.4 NMAC shall not apply. The department shall give notice of the appeal hearing at least 30 days prior to the hearing. The notice shall state the date, time, and location of the appeal hearing and shall include the pertinent information listed in Subparagraphs (b), (c), and (d) of Paragraph (2) of Subsection E of 20.6.2.2002 NMAC. The secretary shall appoint a hearing officer to preside over the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information on the permit certification or denial during the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information in rebuttal of that presented by another person. Reasonable time limits may be placed on oral statements, and the submission of written statements may be required. The hearing officer may question persons presenting oral testimony. Cross examination of persons presenting oral statements shall not otherwise be allowed. Within 30 days after the completion of the hearing, or such other time as the secretary may order given the complexities of the case, the hearing officer shall submit recommendations to the secretary. The secretary shall issue a final decision on the appeal within 30 days after receiving the recommendation, or such other time as the secretary may order given the complexities of the case.

J. Pursuant to the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(O), any person who is adversely affected by the secretary's final decision may file with the commission a petition for review of that decision based on the administrative record.
[20.6.2.2002 NMAC - N, 5-18-11]

20.6.2.2003 PROCEDURES FOR CERTIFICATION OF OTHER FEDERAL PERMITS:

A. This section applies to the state certification of draft federal permits, permit applications or licenses under Section 401 of the federal Clean Water Act, except for NPDES permits or permits for the discharge of dredged or fill material. For example, this section applies to certification of permits or licenses issued by the federal energy regulatory commission (FERC) and to permits or licenses issued under the Rivers and Harbors Act of 1899. The purpose of such certification is to reasonably ensure that the permitted activities will be conducted in a manner that will comply with applicable water quality standards, including the antidegradation policy, and the statewide water quality management plan.

B. After review of a draft permit, permit application or license, the department will either: (1) certify that the activity will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the federal Clean Water Act and with appropriate requirements of state law; (2) certify that the activity will comply with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act and with appropriate requirements of state law upon inclusion of specified conditions in the permit and include the justification for the conditions; or (3) deny certification and include reasons for the denial. If the department does not act on the certification within the time prescribed by the federal permitting agency for such action, the authority to do so shall be waived.

C. To the extent practicable, the department will provide public notice that the department is reviewing a draft federal permit, permit application or license for the purpose of preparing a state certification or denial jointly with the notice provided by the federal permitting or licensing agency. The department will also post notice on its website.

D. When joint notice is impractical, the department shall provide notice that the department is reviewing a draft federal permit, permit application or license for purpose of preparing a state certification or denial pursuant to Section 401 of the federal Clean Water Act as follows:

(1) for general permits or licenses by:

(a) posting notice on the department's website;

(b) publishing notice in at least one newspaper of general circulation;

(c) mailing or e-mailing notice to those persons on the general mailing list maintained by the department who have requested such notice; and

(d) mailing or e-mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department; or

(2) for individual permits or licenses by:

(a) posting notice on the department's website;

(b) publishing notice in a newspaper of general circulation in the location of the permitted or licensed activity;

(c) mailing notice to the applicant;

(d) mailing or e-mailing notice to those persons on the general and facility-specific mailing list maintained by the department who have requested such notice; and

(e) mailing notice to any affected local, state, federal, tribal, or pueblo government agency, as identified by the department.

E. Public notices may describe more than one license, permit or permit action. The notice provided under Subsections C and D of 20.6.2.2003 NMAC shall include:

(1) for general permits or licenses:

(a) a statement that the department will accept written comments on the permit or license during the comment period including the address where comments may be submitted; and

(b) a brief description of the permitted or licensed activities; and

(c) a description of the geographic area to be covered by the permit; or

(2) for individual permits or licenses:

(a) a statement that the department will accept written comments on the permit or license during the comment period including the address where comments may be submitted;

(b) the name and address of the licensee, permittee or permit or license applicant and, if different, of the facility or activity regulated by the permit or license;

(c) a brief description of the permitted or licensed activities; and

(d) a general description of the location of the permitted or licensed activities and the name of the receiving water.

F. Following the public notice provided under Subsections C or D of 20.6.2.2003 NMAC, there shall be a period of at least 30 days during which interested persons may submit written comments to the department. The 30-day comment period shall begin on the date of the public notice provided under Subsections C or D of 20.6.2.2003 NMAC. The department shall consider all pertinent comments.

G. Following the public comment period provided under Subsection F of 20.6.2.2003 NMAC, the department shall issue a final certification including any conditions that the department places on the certification, or issue a statement of denial including the reasons for the denial. The final certification will generally be issued within 60 days from the date a request to grant or deny certification is received by the department, unless the department in consultation with the federal permitting or licensing agency finds that unusual circumstances require a longer time. The department shall send a copy of the final certification or denial to the federal permitting or licensing agency, the applicant (except for general permits), and those members of the public who submitted comments to the department.

(1) The certification or denial shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the permit or license number;

(b) a statement that the department has examined the application or other relevant information and bases its certification upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards;

(d) a statement of any conditions which the department deems necessary or desirable with respect to the discharge of the activity;

(e) identification of any condition more stringent than that in the draft permit or license required to assure compliance with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act and with appropriate requirements of state law citing the Clean Water Act or state law upon which the condition is based;

(f) a statement of the extent to which each condition of the draft permit or license can be made less stringent without violating the requirements of state law, including water quality standards; and

(g) Such other information as the department may determine to be appropriate.

(2) With justification, including any of the reasons listed in the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(E), the department may deny certification. Denial of certification shall be in writing and shall include:

(a) the name of the applicant (except for general permits) and the permit or license number;

(b) a statement that the department has examined the application or other relevant information and bases its denial upon an evaluation of the information contained in such application or other information which is relevant to water quality considerations;

(c) a statement of denial including the reasons for the denial; and

(d) such other information as the department may determine to be appropriate.

H. Any person who is adversely affected by the certification or denial of a specific permit or license may appeal such certification or denial by filing a petition for review with the secretary within 30 days after the department issues the final certification or statement of denial. Such petition shall be in writing and shall include a concise statement of the reasons for the appeal and the relief requested. The secretary may hold a hearing on the appeal. In any such appeal hearing, the procedures of 20.1.4 NMAC shall not apply. The department shall give notice of the appeal hearing at least 30 days prior to the hearing. The notice shall state the date, time, and location of the appeal hearing and shall include the pertinent information listed in Subparagraphs (b), (c), and (d) of Paragraph (2) of Subsection E of 20.6.2.2003 NMAC. The secretary shall appoint a hearing officer to preside over the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information on the certification or denial during the appeal hearing. Any person may present oral or written statements, data, technical information, legal arguments, or other information in rebuttal of that presented by another person. Reasonable time limits may be placed on oral statements, and the submission of written statements may be required. The hearing officer may question persons presenting oral testimony. Cross examination of persons presenting oral statements shall not otherwise be allowed. Within 30 days after the completion of the hearing, or such other time as the secretary may order given the complexities of the case, the hearing officer shall submit recommendations to the secretary. The secretary shall issue a final decision on the appeal within 30 days after receiving the recommendation, or such other time as the secretary may order given the complexities of the case.

I. Pursuant to the New Mexico Water Quality Act, NMSA 1978, Section 74-6-5(O), any person who is adversely affected by the secretary's final decision may file with the commission a petition for review of that decision based on the administrative record.

[20.6.2.2003 NMAC - N, 5-18-11]

20.6.2.2004 - 20.6.2.2099: [RESERVED]

[12-1-95; 20.6.2.2001 - 20.6.2.2099 NMAC - Rn, 20 NMAC 6.2.I.1221-2099, 1-15-01; A, 5-18-11]

20.6.2.2100 APPLICABILITY: The requirements of Section 20.6.2.2101 and 20.6.2.2102 NMAC shall not apply to any discharge which is subject to a permit under the National Pollutant Discharge Elimination System of P. L. 92-500; provided that any discharger who is given written notice of National Pollutant Discharge Elimination System permit violation from the Administrator of the Environmental Protection Agency and who has not corrected the violation within thirty days of receipt of said notice shall be subject to Section 20.6.2.2101 and 20.6.2.2102 NMAC until in compliance with the National Pollution Discharge Elimination System permit conditions; provided further that nothing in this Part shall be construed as a deterrent to action under Section 74-6-11 NMSA, 1978.

[8-13-76; 20.6.2.2100 NMAC - Rn, 20 NMAC 6.2.II.2100, 1-15-01]

20.6.2.2101 GENERAL REQUIREMENTS:

A. Except as otherwise provided in Sections 20.6.2.2000 through 20.6.2.2201 NMAC, no person shall cause or allow effluent to discharge to a watercourse if the effluent as indicated by:

(1) any two consecutive daily composite samples;

(2) more than one daily composite sample in any thirty-day period (in which less than ten (10) daily composite samples are examined);

(3) more than ten percent (10%) of the daily composite samples in any thirty-day period (in which ten (10) or more daily composite samples are examined); or

(4) a grab sample collected during flow from an intermittent or infrequent discharge does not conform to the following:

(a) Bio-chemical Oxygen Demand (BOD)—Less than 30 mg/l

(b) Chemical Oxygen Demand (COD) Less than 125 mg/l

(c) Settleable Solids Less than 0.5 mg/l

(d) Fecal Coliform Bacteria Less than 500 organisms per 100 ml

(e) pH Between 6.6 and 8.6

B. Upon application, the secretary may eliminate the pH requirement for any effluent source that the secretary determines does not unreasonably degrade the water into which the effluent is discharged.

C. Subsection A of this Section does not apply to the weight of constituents in the water diverted.

D. Samples shall be examined in accordance with the most current edition of Standard Methods for the Examination of Water and Wastewater published by the American Public Health Association or the most current edition of Methods for Chemical Analysis of Water and Wastes published by the Environmental Protection Agency, where applicable.

[4-20-68, 3-14-71, 10-8-71, 8-13-76, 2-20-81, 12-1-95; 20.6.2.2101 NMAC - Rn, 20 NMAC 6.2.II.2101, 1-15-01]

20.6.2.2102 RIO GRANDE BASIN--COMMUNITY SEWERAGE SYSTEMS:

A. No person shall cause or allow effluent from a community sewerage system to discharge to a watercourse in the Rio Grande Basin between the headwaters of Elephant Butte Reservoir and Angostura Diversion Dam as described in Subsection E of this Section if the effluent, as indicated by:

(1) any two consecutive daily composite samples;

(2) more than one daily composite sample in any thirty-day period (in which less than ten (10) daily composite samples are examined);

(3) more than ten percent (10%) of the daily composite samples in any thirty-day period (in which ten (10) or more daily composite samples are examined); or

(4) a grab sample collected during flow from an intermittent or infrequent discharge does not conform to the following:

(a)	Bio-chemical Oxygen Demand (BOD)	Less than 30 mg/l
(b)	Chemical Oxygen Demand (COD)	Less than 80 mg/l
(c)	Settleable Solids	Less than 0.1 mg/l
(d)	Fecal Coliform Bacteria	Less than 500 organisms per 100 ml
(e)	pH	Between 6.6 and 8.6

B. Upon application, the secretary may eliminate the pH requirement for any effluent source that the secretary determines does not unreasonably degrade the water into which the effluent is discharged.

C. Subsection A of this Section does not apply to the weight of constituents in the water diverted.

D. Samples shall be examined in accordance with the most current edition of Standard Methods for the Analysis of Water and Wastewater published by the American Public Health Association or the most current edition of Methods for Chemical Analysis of Water and Wastes published by the Environmental Protection Agency, where applicable.

E. The following is a description of the Rio Grande Basin from the headwaters of Elephant Butte Reservoir to Angostura Diversion Dam as used in this Section. Begin at San Marcial USGS gauging station, which is the headwaters of Elephant Butte Reservoir Irrigation Project, thence northwest to U.S. Highway 60, nine miles + west of Magdalena; thence west along the northeast edge of the San Agustin Plains closed basin; thence north along the east side of the north plains closed basin to the Continental Divide; thence northly along the Continental Divide to the community of Regina on State Highway 96; thence southeasterly along the crest of the San Pedro Mountains to Cerro Toledo Peak; thence southwesterly along the Sierra de Los Valles ridge and the Borrego Mesa to Bodega Butte; thence southerly to Angostura Diversion Dam which is the upper reach of the Rio Grande in this basin; thence southeast to the crest and the crest of the Manzano Mountains and the Los Pinos Mountains; thence southerly along the divide that contributes to the Rio Grande to San Marcial gauging station to the point and place of beginning; excluding all waters upstream of Jemez Pueblo which flow into the Jemez River drainage and the Bluewater Lake. Counties included in the basin are:

(1) north portion of Socorro County;
(2) northeast corner of Catron County;
(3) east portion of Valencia County;
(4) west portion of Bernalillo County;
(5) east portion of McKinley County; and
(6) most of Sandoval County.

[3-14-71, 9-3-72, 8-13-76, 2-20-81, 12-1-95; 20.6.2.2102 NMAC - Rn, 20 NMAC 6.2.II.2102, 1-15-01]

20.6.2.2103 - 20.6.2.2199: [RESERVED]
[12-1-95; 20.6.2.2103 - 20.6.2.2199 NMAC - Rn, 20 NMAC 6.2.II.2103-2199, 1-15-01]

20.6.2.2200 WATERCOURSE PROTECTION:
[12-1-95; 20.6.2.2200 NMAC - Rn, 20 NMAC 6.2.II.2200, 1-15-01]

20.6.2.2201 DISPOSAL OF REFUSE: No person shall dispose of any refuse in a natural watercourse or in a location and manner where there is a reasonable probability that the refuse will be moved into a natural watercourse by leaching or otherwise. Solids diverted from the stream and returned thereto are not subject to abatement under this Section.
[4-20-68, 9-3-72; 20.6.2.2201 NMAC - Rn, 20 NMAC 6.2.II.2201, 1-15-01]

20.6.2.2202 - 20.6.2.2999: [RESERVED]
[12-1-95; 20.6.2.2202 - 20.6.2.2999 NMAC - Rn, 20 NMAC 6.2.II.2202-3100, 1-15-01]

20.6.2.3000 PERMITTING AND GROUND WATER STANDARDS:
[12-1-95; 20.6.2.3000 NMAC - Rn, 20 NMAC 6.2.III, 1-15-01]

20.6.2.3001 - 20.6.2.3100: [RESERVED]
[12-1-95; 20.6.2.3001 - 20.6.2.3100 NMAC - Rn, 20 NMAC 6.2.II.2202-3100, 1-15-01]

20.6.2.3101 PURPOSE:

A. The purpose of Sections 20.6.2.3000 through 20.6.2.3114 NMAC controlling discharges onto or below the surface of the ground is to protect all ground water of the state of New Mexico which has an existing concentration of 10,000 mg/l or less TDS, for present and potential future use as domestic and agricultural water supply, and to protect those segments of surface waters which are gaining because of ground water inflow, for uses designated in the New Mexico Water Quality Standards. Sections 20.6.2.3000 through 20.6.2.3114 NMAC are written so that in general:

(1) if the existing concentration of any water contaminant in ground water is in conformance with the standard of 20.6.2.3103 NMAC, degradation of the ground water up to the limit of the standard will be allowed; and

(2) if the existing concentration of any water contaminant in ground water exceeds the standard of Section 20.6.2.3103 NMAC, no degradation of the ground water beyond the existing concentration will be allowed.

B. Ground water standards are numbers that represent the pH range and maximum concentrations of water contaminants in the ground water which still allow for the present and future use of ground water resources.

C. The standards are not intended as maximum ranges and concentrations for use, and nothing herein contained shall be construed as limiting the use of waters containing higher ranges and concentrations.

[2-18-77; 20.6.2.3101 NMAC - Rn, 20 NMAC 6.2.III.3101, 1-15-01]

20.6.2.3102: [RESERVED]

[12-1-95; 20.6.2.3102 NMAC - Rn, 20 NMAC 6.2.III.3102, 1-15-01]

20.6.2.3103 STANDARDS FOR GROUND WATER OF 10,000 mg/l TDS CONCENTRATION OR LESS: The following standards are the allowable pH range and the maximum allowable concentration in ground water for the contaminants specified unless the existing condition exceeds the standard or unless otherwise provided in Subsection D of Section 20.6.2.3109 NMAC. Regardless of whether there is one contaminant or more than one contaminant present in ground water, when an existing pH or concentration of any water contaminant exceeds the standard specified in Subsection A, B, or C of this section, the existing pH or concentration shall be the allowable limit, provided that the discharge at such concentrations will not result in concentrations at any place of withdrawal for present or reasonably foreseeable future use in excess of the standards of this section. These standards shall apply to the dissolved portion of the contaminants specified with a definition of dissolved being that given in the publication "*methods for chemical analysis of water and waste of the U.S. environmental protection agency*," with the exception that standards for mercury, organic compounds and non-aqueous phase liquids shall apply to the total unfiltered concentrations of the contaminants.

A. **Human Health Standards**-Ground water shall meet the standards of Subsection A and B of this section unless otherwise provided. If more than one water contaminant affecting human health is present, the toxic pollutant criteria as set forth in the definition of toxic pollutant in Section 20.6.2.1101 NMAC for the combination of contaminants, or the Human Health Standard of Subsection A of Section 20.6.2.3103 NMAC for each contaminant shall apply, whichever is more stringent. Non-aqueous phase liquid shall not be present floating atop of or immersed within ground water, as can be reasonably measured.

(1) Arsenic (As)…………………………………………….……………0.1 mg/l
(2) Barium (Ba)…………………………………………...…………...1.0 mg/l
(3) Cadmium (Cd)……………………………………….…………...0.01 mg/l
(4) Chromium (Cr)……………………………………...…………0.05 mg/l
(5) Cyanide (CN)……………………………………….. …………..0.2 mg/l
(6) Fluoride (F)…………………………………………….. ………1.6 mg/l
(7) Lead (Pb)…………………………………………………………0.05 mg/l
(8) Total Mercury (Hg)……………………………………………...0.002 mg/l
(9) Nitrate (NO_3 as N)…………………………………………………...10.0 mg/l
(10) Selenium (Se)……………………………………………………0.05 mg/l
(11) Silver (Ag)………………………………………………………0.05 mg/l
(12) Uranium (U)…………………………………………………....0.03 mg/l
(13) Radioactivity: Combined Radium-226 & Radium-228…………….30 pCi/l
(14) Benzene…..……………………………………………………...0.01 mg/l
(15) Polychlorinated biphenyls (PCB's)……………………………..0.001 mg/l
(16) Toluene…………………………………………………………...0.75 mg/l

(17) Carbon Tetrachloride……………………………………………..0.01 mg/l
(18) 1,2-dichloroethane (EDC) ……………………………………..…0.01 mg/l
(19) 1,1-dichloroethylene (1,1-DCE) …………………………………...0.005 mg/l
(20) 1,1,2,2-tetrachloroethylene (PCE) ………………………………..0.02 mg/l
(21) 1,1,2-trichloroethylene (TCE) ……………………………………...0.1 mg/l
(22) ethylbenzene…………………………………………………..……0.75 mg/l
(23) total xylenes…………………………………………….……......0.62 mg/l
(24) methylene chloride…………………….……………………………0.1 mg/l
(25) chloroform……………………….……………………………………0.1 mg/l
(26) 1,1-dichloroethane……………………….………………………0.025 mg/l
(27) ethylene dibromide (EDB) ……………………………………..…0.0001 mg/l
(28) 1,1,1-trichloroethane……………………….………………….....…0.06 mg/l
(29) 1,1,2-trichloroethane……………………….……………………...0.01 mg/l
(30) 1,1,2,2-tetrachloroethane…………………………..………………….0.01 mg/l
(31) vinyl chloride………………………..…………………………………0.001 mg/l
(32) PAHs: total naphthalene plus monomethylnaphthalenes……………….0.03 mg/l
(33) benzo-a-pyrene……………………….…………………………0.0007 mg/l

B. **Other Standards for Domestic Water Supply**
(1) Chloride (Cl) ………………………….……………………………...250.0 mg/l
(2) Copper (Cu) ………………………….…………………………….....1.0 mg/l
(3) Iron (Fe) …………………………..…………………………….....…1.0 mg/l
(4) Manganese (Mn) …………………………..…………………………….…0.2 mg/l
(6) Phenols…………………………..…………………………………….…0.005 mg/l
(7) Sulfate (SO_4) …………………………...…………………………..600.0 mg/l
(8) Total Dissolved Solids (TDS) ……………………………..…...………1000.0 mg/l
(9) Zinc (Zn) ………………………….………………………….....…………10.0 mg/l
(10) pH……………………………..…………………………….………between 6 and 9

C. **Standards for Irrigation Use - Ground water shall meet the standards of Subsection A, B, and C of this section unless otherwise provided.**
(1) Aluminum (Al)……...……………………….……………………….…5.0 mg/l
(2) Boron (B) ………………………….……………………………………...0.75 mg/l
(3) Cobalt (Co) ………………………….……………………………………0.05 mg/l
(4) Molybdenum (Mo) ………………………….…………………………...1.0 mg/l
(5) Nickel (Ni) ………………………….……………………………………....0.2 mg/l

[2-18-77, 1-29-82, 11-17-83, 3-3-86, 12-1-95; 20.6.2.3103 NMAC - Rn, 20 NMAC 6.2.III.3103, 1-15-01; A, 9-26-04]
[Note: For purposes of application of the amended numeric uranium standard to past and current water discharges (as of 9-26-04), the new standard will not become effective until June 1, 2007. For any new water discharges, the uranium standard is effective 9-26-04.]

20.6.2.3104 **DISCHARGE PERMIT REQUIRED:** Unless otherwise provided by this Part, no person shall cause or allow effluent or leachate to discharge so that it may move directly or indirectly into ground water unless he is discharging pursuant to a discharge permit issued by the secretary. When a permit has been issued, discharges must be consistent with the terms and conditions of the permit. In the event of a transfer of the ownership, control, or possession of a facility for which a discharge permit is in effect, the transferee shall have authority to discharge under such permit, provided that the transferee has complied with Section 20.6.2.3111 NMAC, regarding transfers.
[2-18-77, 12-24-87, 12-1-95; Rn & A, 20.6.2.3104 NMAC - 20 NMAC 6.2.III.3104, 1-15-01; A, 12-1-01]

20.6.2.3105 **EXEMPTIONS FROM DISCHARGE PERMIT REQUIREMENT:** Sections 20.6.2.3104 and 20.6.2.3106 NMAC do not apply to the following:

A. Effluent or leachate which conforms to all the listed numerical standards of Section 20.6.2.3103 NMAC and has a total nitrogen concentration of 10 mg/l or less, and does not contain any toxic pollutant. To determine conformance, samples may be taken by the agency before the effluent or leachate is discharged so that it may move directly or indirectly into ground water; provided that if the discharge is by seepage through non-natural or altered natural materials, the agency may take samples of the solution before or after seepage. If for any reason the agency does not have access to obtain the appropriate samples, this exemption shall not apply;

B. Effluent which is regulated pursuant to 20.7.3 NMAC, “Liquid Waste Disposal and Treatment” regulations;

C. Water used for irrigated agriculture, for watering of lawns, trees, gardens or shrubs, or for irrigation for a period not to exceed five years for the revegetation of any disturbed land area, unless that water is received directly from any sewerage system;

D. Discharges resulting from the transport or storage of water diverted, provided that the water diverted has not had added to it after the point of diversion any effluent received from a sewerage system, that the source of the water diverted was not mine workings, and that the secretary has not determined that a hazard to public health may result;

E. Effluent which is discharged to a watercourse which is naturally perennial; discharges to dry arroyos and ephemeral streams are not exempt from the discharge permit requirement, except as otherwise provided in this section;

F. Those constituents which are subject to effective and enforceable effluent limitations in a National Pollutant Discharge Elimination System (NPDES) permit, where discharge onto or below the surface of the ground so that water contaminants may move directly or indirectly into ground water occurs downstream from the outfall where NPDES effluent limitations are imposed, unless the secretary determines that a hazard to public health may result. For purposes of this subsection, monitoring requirements alone do not constitute effluent limitations;

G. Discharges resulting from flood control systems;

H. Leachate which results from the direct natural infiltration of precipitation through disturbed materials, unless the secretary determines that a hazard to public health may result;

I. Leachate which results entirely from the direct natural infiltration of precipitation through undisturbed materials;

J. Leachate from materials disposed of in accordance with the Solid Waste Management Regulations (20 NMAC 9.1) adopted by the New Mexico Environmental Improvement Board;

K. Natural ground water seeping or flowing into conventional mine workings which re-enters the ground by natural gravity flow prior to pumping or transporting out of the mine and without being used in any mining process; this exemption does not apply to solution mining;

L. Effluent or leachate discharges resulting from activities regulated by a mining plan approved and permit issued by the New Mexico Coal Surface Mining Commission, provided that this exemption shall not be construed as limiting the application of appropriate ground water protection requirements by the New Mexico Coal Surface Mining Commission;

M. Effluent or leachate discharges which are regulated by the Oil Conservation Commission and the regulation of which by the Water Quality Control Commission would interfere with the exclusive authority granted under Section 70-2-12 NMSA 1978, or under other laws, to the Oil Conservation Commission.
[2-18-77, 6-26-80, 7-2-81, 12-24-87, 12-1-95; 20.6.2.3105 NMAC - Rn, 20 NMAC 6.2.III.3105, 1-15-01; A, 12-1-01; A, 8-1-14]

20.6.2.3106 APPLICATION FOR DISCHARGE PERMITS AND RENEWALS:

A. Any person who, before or on June 18, 1977, is discharging any of the water contaminants listed in 20.6.2.3103 NMAC or any toxic pollutant so that they may move directly or indirectly into ground water shall, within 120 days of receipt of written notice from the secretary that a discharge permit is required, or such longer time as the secretary shall for good cause allow, submit a discharge plan to the secretary for approval; such person may discharge without a discharge permit until 240 days after written notification by the secretary that a discharge permit is required or such longer time as the secretary shall for good cause allow.

B. Any person who intends to begin, after June 18, 1977, discharging any of the water contaminants listed in 20.6.2.3103 NMAC or any toxic pollutant so that they may move directly or indirectly into ground water shall notify the secretary giving the information enumerated in Subsection B of 20.6.2.1201 NMAC; the secretary shall, within 60 days, notify such person if a discharge permit is required; upon submission, the secretary shall review the discharge plan pursuant to 20.6.2.3108 and 20.6.2.3109 NMAC. For good cause shown the secretary may allow such person to discharge without a discharge permit for a period not to exceed 120 days.

C. A proposed discharge plan shall set forth in detail the methods or techniques the discharger proposes to use or processes expected to naturally occur which will ensure compliance with this part. At least the following information shall be included in the plan:

(1) quantity, quality and flow characteristics of the discharge;

(2) location of the discharge and of any bodies of water, watercourses and ground water discharge sites within one mile of the outside perimeter of the discharge site, and existing or proposed wells to be used for monitoring;

(3) depth to and TDS concentration of the ground water most likely to be affected by the discharge;

(4) flooding potential of the site;

(5) location and design of site(s) and method(s) to be available for sampling, and for measurement or calculation of flow;

(6) depth to and lithological description of rock at base of alluvium below the discharge site if such information is available;

(7) any additional information that may be necessary to demonstrate that the discharge permit will not result in concentrations in excess of the standards of 20.6.2.3103 NMAC or the presence of any toxic pollutant at any place of withdrawal of water for present or reasonably foreseeable future use; detailed information on site geologic and hydrologic conditions may be required for a technical evaluation of the applicant's proposed discharge plan; and

(8) additional detailed information required for a technical evaluation of underground injection control wells as provided in 20.6.2.5000 through 20.6.2.5399 NMAC.

D. An applicant for a discharge permit shall pay fees as specified in 20.6.2.3114 and 20.6.2.5302 NMAC.

E. An applicant for a permit to dispose of or use septage or sludge, or within a source category designated by the commission, may be required by the secretary to file a disclosure statement as specified in 74-6-5.1 of the Water Quality Act.

F. If the holder of a discharge permit submits an application for discharge permit renewal at least 120 days before the discharge permit expires, and the discharger is not in violation of the discharge permit on the date of its expiration, then the existing discharge permit for the same activity shall not expire until the application for renewal has been approved or disapproved. A discharge permit continued under this provision remains fully effective and enforceable. An application for discharge permit renewal must include and adequately address all of the information necessary for evaluation of a new discharge permit. Previously submitted materials may be included by reference provided they are current, readily available to the secretary and sufficiently identified to be retrieved.
[2-18-77, 6-26-80, 7-2-81, 9-20-82, 8-17-91, 12-1-95; 20.6.2.3106 NMAC - Rn, 20 NMAC 6.2.III.3106, 1-15-01; A, 12-1-01; A, 9-15-02; A, 8-31-15]

20.6.2.3107 MONITORING, REPORTING, AND OTHER REQUIREMENTS:

A. Each discharge plan shall provide for the following as the secretary may require:

(1) the installation, use, and maintenance of effluent monitoring devices;

(2) the installation, use, and maintenance of monitoring devices for the ground water most likely to be affected by the discharge;

(3) monitoring in the vadose zone;

(4) continuation of monitoring after cessation of operations;

(5) periodic submission to the secretary of results obtained pursuant to any monitoring requirements in the discharge permit and the methods used to obtain these results;

(6) periodic reporting to the secretary of any other information that may be required as set forth in the discharge permit;

(7) the discharger to retain for a period of at least five years any monitoring data required in the discharge permit;

(8) a system of monitoring and reporting to verify that the permit is achieving the expected results;

(9) procedures for detecting failure of the discharge system;

(10) contingency plans to cope with failure of the discharge permit or system;

(11) a closure plan to prevent the exceedance of standards of 20.6.2.3103 NMAC or the presence of a toxic pollutant in ground water after the cessation of operation which includes: a description of closure measures, maintenance and monitoring plans, post-closure maintenance and monitoring plans, financial assurance, and other measures necessary to prevent or abate such contamination; the obligation to implement the closure plan as well as the requirements of the closure plan, if any is required, survives the termination or expiration of the permit; a closure plan for any underground injection control well must also incorporate the applicable requirements of 20.6.2.5005, 20.6.2.5209, and 20.6.2.5361 NMAC.

B. Sampling and analytical techniques shall conform with the following references unless otherwise specified by the secretary:

(1) standard methods for the examination of water and wastewater, latest edition, American public health association; or

(2) methods for chemical analysis of water and waste, and other publications of the analytical quality laboratory, EPA; or

(3) techniques of water resource investigations of the U.S. geological survey; or

(4) annual book of ASTM standards; Part 31; water, latest edition, American society for testing and materials; or

(5) federal register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations; or

(6) national handbook of recommended methods for water-data acquisition, latest edition, prepared cooperatively by agencies of the United States government under the sponsorship of the U.S. geological survey.

C. The discharger shall notify the secretary of any facility expansion, production increase or process modification that would result in any significant modification in the discharge of water contaminants.

D. Any discharger of effluent or leachate shall allow any authorized representative of the secretary to:

(1) inspect and copy records required by a discharge permit;

(2) inspect any treatment works, monitoring and analytical equipment;

(3) sample any effluent before or after discharge;

(4) use monitoring systems and wells installed pursuant to a discharge permit requirement in order to collect samples from ground water or the vadose zone.

E. Each discharge permit for an underground injection control well shall incorporate the applicable requirements of 20.6.2.5000 through 20.6.2.5399 NMAC.

[2-18-77, 9-20-82, 11-17-83, 12-1-95; 20.6.2.3107 NMAC - Rn, 20 NMAC 6.2.III.3107, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.3108 PUBLIC NOTICE AND PARTICIPATION:

A. Within 15 days of receipt of an application for a discharge permit, modification or renewal, the department shall review the application for administrative completeness. To be deemed administratively complete, an application shall provide all of the information required by Paragraphs (1) through (5) of Subsection F of 20.6.2.3108 NMAC and shall indicate, for department approval, the proposed locations and newspaper for providing notice required by Paragraphs (1) and (4) of Subsection B or Paragraph (2) of Subsection C of 20.6.2.3108 NMAC. The department shall notify the applicant in writing when the application is deemed administratively complete. If the department determines that the application is not administratively complete, the department shall notify the applicant of the deficiencies in writing within 15 days of receipt of the application and state what additional information is necessary.

B. Within 30 days of the department deeming an application for discharge permit or discharge permit modification administratively complete, the applicant shall provide notice, in accordance with the requirements of Subsection F of 20.6.2.3108 NMAC, to the general public in the locale of the proposed discharge in a form provided by the department by each of the methods listed below:

(1) for each 640 contiguous acres or less of a discharge site, prominently posting a synopsis of the public notice at least 2 feet by 3 feet in size, in English and in Spanish, at a place conspicuous to the public, approved by the department, at or near the proposed facility for 30 days; one additional notice, in a form approved by and may be provided by the department, shall be posted at a place located off the discharge site, at a place conspicuous to the public and approved by the department; the department may require a second posting location for more than 640 contiguous acres or when the discharge site is not located on contiguous properties;

(2) providing written notice of the discharge by mail, to owners of record of all properties within a 1/3 mile distance from the boundary of the property where the discharge site is located; if there are no properties other than properties owned by the discharger within a 1/3 mile distance from the boundary of property where the discharge site is located, the applicant shall provide notice to owners of record of the next nearest adjacent properties not owned by the discharger;

(3) providing notice by certified mail, return receipt requested, to the owner of the discharge site if the applicant is not the owner; and

(4) publishing a synopsis of the notice in English and in Spanish, in a display ad at least three inches by four inches not in the classified or legal advertisements section, in a newspaper of general circulation in the location of the proposed discharge.

C. Within 30 days of the department deeming an application for discharge permit renewal administratively complete, the applicant shall provide notice, in accordance with the requirements of Subsection F of 20.6.2.3108 NMAC, to the general public in the locale of the proposed discharge in a form provided by the department by each of the methods listed below:

(1) providing notice by certified mail to the owner of the discharge site if the applicant is not the owner; and

(2) publishing a synopsis of the notice, in English and in Spanish, in a display ad at least two inches by three inches, not in the classified or legal advertisements section, in a newspaper of general circulation in the location of the discharge.

D. Within 15 days of completion of the public notice requirements in Subsections B or C of 20.6.2.3108 NMAC, the applicant shall submit to the department proof of notice, including an affidavit of mailing(s) and the list of property owner(s), proof of publication, and an affidavit of posting, as appropriate.

E. Within 30 days of determining an application for a discharge permit, modification or renewal is administratively complete, the department shall post a notice on its website and shall mail notice to any affected local, state, federal, tribal or pueblo governmental agency, political subdivisions, ditch associations and land grants, as identified by the department. The department shall also mail or e-mail notice to those persons on a general and facility-specific list maintained by the department who have requested notice of discharge permit applications. The notice shall include the information listed in Subsection F of 20.6.2.3108 NMAC.

F. The notice provided under Subsection B, C and E of 20.6.2.3108 NMAC shall include:

(1) the name and address of the proposed discharger;

(2) the location of the discharge, including a street address, if available, and sufficient information to locate the facility with respect to surrounding landmarks;

(3) a brief description of the activities that produce the discharge described in the application;

(4) a brief description of the expected quality and volume of the discharge;

(5) the depth to and total dissolved solids concentration of the ground water most likely to be affected by the discharge;

(6) the address and phone number within the department by which interested persons may obtain information, submit comments, and request to be placed on a facility-specific mailing list for future notices; and

(7) a statement that the department will accept comments and statements of interest regarding the application and will create a facility-specific mailing list for persons who wish to receive future notices.

G. All persons who submit comments or statements of interest to the department or previously participated in a public hearing and who provide a mail or e-mail address shall be placed on a facility-specific mailing list and the department shall send those persons the public notice issued pursuant to Subsection H of 20.6.2.3108 NMAC, and notice of any public meeting or hearing scheduled on the application. All persons who contact the department to inquire about a specific facility shall be informed of the opportunity to be placed on the facility-specific mailing list.

H. Within 60 days after the department makes its administrative completeness determination and all required technical information is available, the department shall make available a proposed approval or disapproval of the application for a discharge permit, modification or renewal, including conditions for approval proposed by the department or the reasons for disapproval. The department shall mail by certified mail a copy of the proposed approval or disapproval to the applicant, and shall provide notice of the proposed approval or disapproval of the application for a discharge permit, modification or renewal by:

(1) posting on the department's website;

(2) publishing notice in a newspaper of general circulation in this state and a newspaper of general circulation in the location of the facility;

(3) mailing or e-mailing to those persons on a facility-specific mailing list;

(4) mailing to any affected local, state, or federal governmental agency, ditch associations and land grants, as identified by the department; and

(5) mailing to the governor, chairperson, or president of each Indian tribe, pueblo or nation within the state of New Mexico, as identified by the department.

I. The public notice issued under Subsection H shall include the information in Subsection F of 20.6.2.3108 NMAC and the following information:

(1) a brief description of the procedures to be followed by the secretary in making a final determination;

(2) a statement of the comment period and description of the procedures for a person to request a hearing on the application; and

(3) the address and telephone number at which interested persons may obtain a copy of the proposed approval or disapproval of an application for a discharge permit, modification or renewal.

J. In the event that the proposed approval or disapproval of an application for a discharge permit, modification or renewal is available for review within 30 days of deeming the application administratively complete, the department may combine the public notice procedures of Subsections E and H of 20.6.2.3108 NMAC.

K. Following the public notice of the proposed approval or disapproval of an application for a discharge permit, modification or renewal, and prior to a final decision by the secretary, there shall be a period of at least 30 days during which written comments may be submitted to the department and/or a public hearing may be requested in writing. The 30-day comment period shall begin on the date of publication of notice in the newspaper. All comments will be considered by the department. Requests for a hearing shall be in writing and shall set forth the reasons why a hearing should be held. A public hearing shall be held if the secretary determines there is substantial public interest. The department shall notify the applicant and any person requesting a hearing of the decision whether to hold a hearing and the reasons therefore in writing.

L. If a hearing is held, pursuant to Subsection K of 20.6.2.3108 NMAC, notice of the hearing shall be given by the department at least 30 days prior to the hearing in accordance with Subsection H of 20.6.2.3108 NMAC. The notice shall include the information identified in Subsection F of 20.6.2.3108 NMAC in addition to the time and place of the hearing and a brief description of the hearing procedures. The hearing shall be held pursuant to 20.6.2.3110 NMAC.

[2-18-77, 12-24-87, 12-1-95, 11-15-96; 20.6.2.3108 NMAC - Rn, 20 NMAC 6.2.III.3108, 1-15-01; A, 12-1-01; A, 9-15-02; A, 7-16-06]

20.6.2.3109 SECRETARY APPROVAL, DISAPPROVAL, MODIFICATION OR TERMINATION OF DISCHARGE PERMITS, AND REQUIREMENT FOR ABATEMENT PLANS:

A. The department shall evaluate the application for a discharge permit, modification or renewal based on information contained in the department's administrative record. The department may request from the discharger, either before or after the issuance of any public notice, additional information necessary for the evaluation of the application. The administrative record shall consist of the application, any additional information required by the department, any information submitted by the discharger or the general public, other information considered by the department, the proposed approval or disapproval of an application for a discharge permit, modification or renewal prepared pursuant to Subsection G of 20.6.2.3108 NMAC, and, if a public hearing is held, all of the documents filed with the hearing clerk, all exhibits offered into evidence at the hearing, the written transcript or tape recording of the hearing, any hearing officer report, and any post hearing submissions.

B. The secretary shall, within 30 days after the administrative record is complete and all required information is available, approve, approve with conditions or disapprove the proposed discharge permit, modification or renewal based on the administrative record. The secretary shall give written notice of the action taken to the applicant or permittee and any other person who participated in the permitting action who requests a copy in writing.

C. Provided that the other requirements of this part are met and the proposed discharge plan, modification or renewal demonstrates that neither a hazard to public health nor undue risk to property will result, the secretary shall approve the proposed discharge plan, modification or renewal if the following requirements are met:

(1) ground water that has a TDS concentration of 10,000 mg/l or less will not be affected by the discharge; or

(2) the person proposing to discharge demonstrates that approval of the proposed discharge plan, modification or renewal will not result in either concentrations in excess of the standards of 20.6.2.3103 NMAC or the presence of any toxic pollutant at any place of withdrawal of water for present or reasonably foreseeable future use, except for contaminants in the water diverted as provided in Subsection D of 20.6.2.3109 NMAC; or

(3) the proposed discharge plan conforms to either Subparagraph (a) or (b) below and Subparagraph (c) below:

(a) municipal, other domestic discharges, and discharges from sewerage systems handling only animal wastes: the effluent is entirely domestic, is entirely from a sewerage system handling only animal wastes or is from a municipality and conforms to the following:

(i) the discharge is from an impoundment or a leach field existing on February 18, 1977 which receives less than 10,000 gallons per day and the secretary has not found that the discharge may cause a hazard to public health; or

(ii) the discharger has demonstrated that the total nitrogen in effluent that enters the subsurface from a leach field or surface impoundment will not exceed 200 pounds per acre per year and that the effluent will meet the standards of 20.6.2.3103 NMAC except for nitrates and except for contaminants in the water diverted as provided in Subsection D of 20.6.2.3109 NMAC; or

(iii) the total nitrogen in effluent that is applied to a crop which is harvested shall not exceed by more than 25 percent the maximum amount of nitrogen reasonably expected to be taken up by the crop and the effluent shall meet the standards of 20.6.2.3103 NMAC except for nitrates and except for contaminants in the water diverted as provided in Subsection D of 20.6.2.3109 NMAC;

(b) discharges from industrial, mining or manufacturing operations:

(i) the discharger has demonstrated that the amount of effluent that enters the subsurface from a surface impoundment will not exceed 0.5 acre-feet per acre per year; or

(ii) the discharger has demonstrated that the total nitrogen in effluent that enters the subsurface from a leach field or surface impoundment shall not exceed 200 pounds per acre per year and the effluent shall meet the standards of 20.6.2.3103 NMAC except for nitrate and contaminants in the water diverted as provided in Subsection D of 20.6.2.3109 NMAC; or

(iii) the total nitrogen in effluent that is applied to a crop that is harvested shall not exceed by more than 25 percent the maximum amount of nitrogen reasonably expected to be taken up by the crop and the effluent shall meet the standards of 20.6.2.3103 NMAC except for nitrate and contaminants in the water diverted as provided in Subsection D of 20.6.2.3109 NMAC;

(c) all discharges:

(i) the monitoring system proposed in the discharge plan includes adequate provision for sampling of effluent and adequate flow monitoring so that the amount being discharged onto or below the surface of the ground can be determined;

(ii) the monitoring data is reported to the secretary at a frequency determined by the secretary.

D. The secretary shall allow the following unless he determines that a hazard to public health may result:

(1) the weight of water contaminants in water diverted from any source may be discharged provided that the discharge is to the aquifer from which the water was diverted or to an aquifer containing a greater concentration of the contaminants than contained in the water diverted; and provided further that contaminants added as a result of the means of diversion shall not be considered to be part of the weight of water contaminants in the water diverted;

(2) the water contaminants leached from undisturbed natural materials may be discharged provided that:

(a) the contaminants were not leached as a product or incidentally pursuant to a solution mining operation; and

(b) the contaminants were not leached as a result of direct discharge into the vadose zone from municipal or industrial facilities used for the storage, disposal, or treatment of effluent;

(3) the water contaminants leached from undisturbed natural materials as a result of discharge into ground water from lakes used as a source of cooling water.

E. If data submitted pursuant to any monitoring requirements specified in the discharge permit or other information available to the secretary indicates that this part is being or may be violated or that the standards of 20.6.2.3103 NMAC are being or will be exceeded, or a toxic pollutant as defined in 20.6.2.7 NMAC is present, in ground water at any place of withdrawal for present or reasonably foreseeable future use, or that the water quality standards for interstate and intrastate streams in New Mexico are being or may be violated in surface water, due to the discharge, except as provided in Subsection D of 20.6.2.3109 NMAC.

(1) The secretary may require a discharge permit modification within the shortest reasonable time so as to achieve compliance with this part and to provide that any exceeding of standards in ground water at any place of withdrawal for present or reasonably foreseeable future use, or in surface water, due to the discharge except as provided in Subsection D of 20.6.2.3109 NMAC will be abated or prevented. If the secretary requires a discharge permit modification to abate water pollution:

(a) the abatement shall be consistent with the requirements and provisions of 20.6.2.4101, 20.6.2.4103, Subsections C and E of 20.6.2.4106, 20.6.2.4107, 20.6.2.4108 and 20.6.2.4112 NMAC; and

(b) the discharger may request of the secretary approval to carry out the abatement under 20.6.2.4000 through 20.6.2.4115 NMAC, in lieu of modifying the discharge permit; the discharger shall make the request in writing and shall include the reasons for the request.

(2) The secretary may terminate a discharge permit when a discharger fails to modify the permit in accordance with Paragraph (1) of Subsection E of 20.6.2.3109 NMAC.

(3) The secretary may require modification, or may terminate a discharge permit for a Class I well, a Class III well or other type of well specified in Subsection A of 20.6.2.5101 NMAC, pursuant to the requirements of Subsection I of 20.6.2.5101 NMAC.

F. If a discharge permit expires or is terminated for any reason and the standards of 20.6.2.3103 NMAC are being or will be exceeded, or a toxic pollutant as defined in 20.6.2.7 NMAC is present in ground water, or that the water quality standards for interstate and intrastate streams in New Mexico are being or may be violated, the secretary may require the discharger to submit an abatement plan pursuant to 20.6.2.4104 and Subsection A of 20.6.2.4106 NMAC.

G. At the request of the discharger, a discharge permit may be modified in accordance with 20.6.2.3000 through 20.6.2.3114 NMAC.

H. The secretary shall not approve a proposed discharge plan, modification, or renewal for:

(1) any discharge for which the discharger has not provided a site and method for flow measurement and sampling;

(2) any discharge that will cause any stream standard to be violated;

(3) the discharge of any water contaminant which may result in a hazard to public health; or

(4) a period longer than five years, except that for new discharges, the term of the discharge permit approval shall commence on the date the discharge begins, but in no event shall the term of the approval exceed seven years from the date the permit was issued; for those permits expiring more than five years from the date of issuance, the discharger shall give prior written notification to the department of the date the discharge is to commence; the term of the permit shall not exceed five years from that date.

[2-18-77, 6-26-80, 9-20-82, 7-2-81, 3-3-86, 12-1-95, 11-15-96; 20.6.2.3109 NMAC - Rn, 20 NMAC 6.2.III.3109, 1-15-01; A, 12-1-01; A, 9-15-02; A, 7-16-06; A, 8-31-15]

20.6.2.3110 PUBLIC HEARING PARTICIPATION:

A. The secretary may appoint an impartial hearing officer to preside over the hearing. The hearing officer may be a department employee other than an employee of the bureau evaluating the application.

B. The hearing shall be at a place in the area affected by the facility for which the discharge permit proposal, modification or renewal is sought.

C. Any person who wishes to present technical evidence at the hearing shall, no later than ten (10) days prior to the hearing, file with the department, and if filed by a person who is not the applicant, serve on the applicant, a statement of intent to present evidence. A person who does not file a statement of intent to present evidence may present a general non-technical statement in support of or in opposition to the proposed discharge plan, modification or renewal. The statement of intent to present technical evidence shall include:

(1) the name of the person filing the statement;

(2) indication of whether the person filing the statement supports or opposes the proposed discharge plan proposal, modification or renewal;

(3) the name of each witness;

(4) an estimate of the length of the direct testimony of each witness;

(5) a list of exhibits, if any, to be offered into evidence at the hearing; and

(6) a summary or outline of the anticipated direct testimony of each witness.

D. At the hearing, the New Mexico Rules of Civil Procedure, SCRA 1986, 1-001 to 1-102 and the New Mexico Rules of Evidence, SCRA 1986, 11-101 to 11-1102 shall not apply. At the discretion of the hearing officer, the rules may be used as guidance. Any reference to the Rules of Civil Procedure and the Rules of Evidence shall not be construed to extend or otherwise modify the authority and jurisdiction of the department under the Act.

E. The hearing officer shall conduct a fair and impartial proceeding, assure that the facts are fully elicited, and avoid delay. The hearing officer shall have authority to take all measures necessary for the maintenance of order and for the efficient, fair and impartial adjudication of issues arising in the proceedings.

F. At the hearing, all persons shall be given a reasonable chance to submit data, views or arguments orally or in writing and to examine witnesses testifying at the hearing.

G. Unless otherwise allowed by the hearing officer, testimony shall be presented in the following order:

(1) testimony by and examination of the applicant or permittee proving the facts relied upon to justify the proposed discharge plan, renewal or modification and meeting the requirements of the regulations;

(2) testimony by and examination of technical witnesses supporting or opposing approval, approval subject to conditions, or disapproval of the proposed discharge plan, renewal or modification, in any reasonable order;

(3) testimony by the general public; and

(4) rebuttal testimony, if appropriate.

H. The secretary may provide translation service at a public hearing conducted in a locale where the Department can reasonably expect to receive testimony from non-English speaking people.

I. If determined useful by the hearing officer, within thirty (30) days after conclusion of the hearing, or within such time as may be fixed by the hearing officer, the hearing officer may allow proposed findings of fact and conclusions of law and closing argument. All such submissions, if allowed, shall be in writing, shall be served upon the applicant or permittee, the department and all persons who request copies in advance in writing, and shall contain adequate references to the record and authorities relied on. No new evidence shall be presented unless specifically allowed by the hearing officer.

J. The department shall make an audio recording of the hearing. If the applicant or permittee, or a participant requests a written transcript or certified copy of the audio recording, the requestor shall pay the cost of the transcription or audio copying.

K. The hearing officer shall issue a report within thirty (30) days after the close of the hearing record. The report may include findings of fact, conclusions regarding all material issues of law or discretion, as well as reasons therefore. The report shall be served on the applicant or permittee, the department, and all persons who request copies in advance in writing. The report will be available for public inspection at the department's office in Santa Fe and at the field office closest to the point of the proposed discharge.

L. The secretary shall issue a decision in the matter no later than thirty (30) days of receipt of the hearing report. The decision shall be served and made available for inspection pursuant to Subsection K of this section.

M. Any person who testifies at the hearing or submits a written statement for the record will be considered a participant for purposes of Subsection 20.6.2.3113 NMAC and NMSA 1978, Section 74-6-5.N.
[2-18-77, 12-1-95, 11-15-96; 20.6.2.3110 NMAC - Rn, 20 NMAC 6.2.III.3110, 1-15-01; A, 12-1-01]

20.6.2.3111 TRANSFER OF DISCHARGE PERMIT: No purported transfer of any discharge permit shall be effective to create, alter or extinguish any right or responsibility of any person subject to this Part, unless the following transfer requirements are met:

A. Prior to any transfer of ownership, control, or possession (whether by lease, conveyance or otherwise) of a facility with a discharge permit, the transferror shall notify the transferee in writing of the existence of the discharge permit, and shall deliver or send by certified mail to the department a copy of such written notification, together with a certification or other proof that such notification has in fact been received by the transferee.

B. Upon receipt of such notification, the transferee shall have the duty to inquire into all of the provisions and requirements contained in such discharge permit, and the transferee shall be charged with notice of all such provisions and requirements as they appear of record in the department's file or files concerning such discharge permit.

C. Until both ownership and possession of the facility have been transferred to the transferee, the transferor shall continue to be responsible for any discharge from the facility.

D. Upon assuming either ownership or possession of the facility, the transferee shall have the same rights and responsibilities under the discharge permit as were applicable to the transferor.

E. Nothing in this section or in this part shall be construed to relieve any person of responsibility or liability for any act or omission which occurred while that person owned, controlled or was in possession of the facility.

[2-18-77, 12-24-87, 12-1-95, 11-15-96; 20.6.2.3111 NMAC - Rn, 20 NMAC 6.2.III.3111, 1-15-01; A, 12-1-01]

20.6.2.3112 APPEALS OF SECRETARY'S DECISIONS:

A. If the secretary approves, approves subject to conditions, or disapproves a proposed discharge plan, renewal or modification, or modifies or terminates a discharge permit, appeal therefrom shall be in accordance with the provisions of Sections 74-6-5(N), (O) and (P), NMSA 1978. The filing of an appeal does not act as a stay of any provision of the Act, the regulations, or any permit issued pursuant to the Act, unless otherwise ordered by the secretary or the commission.

B. If the secretary determines that a discharger is not exempt from obtaining a discharge permit, or that the material to be discharged contains any toxic pollutant as defined in 20.6.2.7 NMAC, which is not included in the numerical standards of 20.6.2.3103 NMAC, then the discharger may appeal such determination by filing with the commission's secretary a notice of appeal to the commission within thirty days after receiving the secretary's written determination, and the appeal therefrom and any action of the commission thereon shall be in accordance with the provisions of Sections 74-6-5(O), (P), (Q), (R) and (S) NMSA 1978.

C. Proceedings before the commission shall be conducted in accordance with the commission's adjudicatory procedures, 20 NMAC 1.3.

[2-18-77, 7-2-81, 12-1-95, 11-15-96; 20.6.2.3112 NMAC - Rn, 20 NMAC 6.2.III.3112, 1-15-01; A, 12-1-01; A, 7-16-06]

20.6.2.3113 APPEALS OF COMMISSION DECISIONS: An applicant, permittee or a person who participated in a permitting action and who is adversely affected by such action may appeal the decision of the commission in accordance with the provisions of Section 74-6-7(A), NMSA 1978.

[2-18-77, 12-1-95, 11-15-96; 20.6.2.3113 NMAC - Rn, 20 NMAC 6.2.III.3113, 1-15-01; A, 12-1-01]

20.6.2.3114 FEES:

A. FEE AMOUNT AND SCHEDULE OF PAYMENT - Every facility submitting a discharge permit application for approval or renewal shall pay the permit fees specified in Table 1 of this section and shall pay a filing fee as specified in Table 2 of this section to the Water Quality Management Fund. Every facility submitting a request for temporary permission to discharge pursuant to Subsection B of Section 20.6.2.3106 NMAC, or financial assurance pursuant to Paragraph 11 of Subsection A of Section 20.6.2.3107 NMAC shall pay the fees specified in Table 2 of this section to the Water Quality Management Fund.

B. Facilities applying for discharge permits which are subsequently withdrawn or denied shall pay one-half of the permit fee at the time of denial or withdrawal.

C. Every facility submitting an application for discharge permit modification will be assessed a filing fee plus one-half of the permit fee. Applications for both renewal and modification will pay the filing fee plus the permit fee.

D. If the secretary requires a discharge permit modification as a component of an enforcement action, the facility shall pay the applicable discharge permit modification fee. If the secretary requires a discharge permit modification outside the context of an enforcement action, the facility shall not be assessed a fee.

E. The secretary may waive or reduce fees for discharge permit modifications or renewals which require little or no cost for investigation or issuance.

F. Facilities shall pay the filing fee at the time of discharge permit application. The filing fee is nonrefundable. The required permit fees may be paid in a single payment at the time of discharge permit approval or in equal installments over the term of the discharge permit. Installment payments shall be remitted yearly, with the first installment due on the date of discharge permit approval. Subsequent installment payments shall be remitted yearly thereafter. The discharge permit or discharge permit application review of any facility shall be suspended or terminated if the facility fails to submit an installment payment by its due date.

G. Every three years beginning in 2004, the department shall review the fees specified in Table 1 and 2 of this section and shall provide a report to the commission. The department shall revise the fees as necessary in accordance with Section 74-6-5(J), NMSA 1978.

20.6.2.3114 TABLE 1 (gpd=gallons per day)	**Permit Fee**
Agriculture <10,000 gpd	$ 1,150
Agriculture 10,000 to 49,999 gpd	$ 2,300
Agriculture 50,000 to 99,999 gpd	$ 3,450

Agriculture 100,000 gpd or greater	$ 4,600
Domestic Waste <10,000 gpd	$ 1,150
Domestic Waste 10,000 to 49,999 gpd	$ 2,300
Domestic Waste 50,000 to 99,999 gpd	$ 3,450
Domestic Waste 100,000 to 999,999 gpd	$ 4,600
Domestic Waste 1,000,000 to 9,999,999 gpd	$ 7,000
Domestic Waste 10,000,000 gpd or greater	$ 9,200
Food Processing <10,000 gpd	$ 1,150
Food Processing 10,000 to 49,999 gpd	$ 2,300
Food Processing 50,000 to 99,999 gpd	$ 3,450
Food Processing 100,000 to 999,999 gpd	$ 4,600
Food Processing 1,000,000 or greater	$ 7,000
Grease/Septage surface disposal <10,000 gpd	$ 1,725
Grease/Septage surface disposal 10,000 gpd or greater	$ 3,450
Industrial <10,000 gpd; or <10,000 yd^3 of contaminated solids	$ 1,725
Industrial 10,000 to 99,999 gpd; or 10,000 to 99,999 yd^3 of contaminated solids	$ 3,450
Industrial 100,000 to 999,999 gpd; or 100,000 to 999,999 yd^3 of contaminated solids or greater	$ 6,900
Industrial 1,000,000 gpd or greater; or 1,000,000 yd^3 of contaminated solids or greater	$10,350
Discharge of remediation system effluent - remediation plan approved under separate regulatory authority	$ 1,600
Mining dewatering	$ 3,250
Mining leach dump	$13,000
Mining tailings	$13,000
Mining waste rock	$13,000
Mining in-situ leach (except salt) and old stope leaching	$13,000
Mining other (mines with minimal environmental impact, post closure operation and maintenance, evaporation lagoons and land application at uranium mines)	$ 4,750
Gas Compressor Stations 0 to 1000 Horsepower	$ 400
Gas Compressor Stations >1001 Horsepower	$ 1,700
Gas Processing Plants	$ 4,000
Injection Wells: Class I	$ 4,500
Injection Wells: Class III and Geothermal	$ 1,700
Oil and Gas Service Companies	$ 1,700
Refineries	$ 8,400
Crude Pump Station	$ 1,200
Underground Gas Storage	$ 1,700
Abatement of ground water and vadose zone contamination at oil and gas Sites	$ 2,600
General permit	$ 600

20.6.2.3114 Table 2

	Fee Amount
Filing fee	$

	100
Temporary permission	$ 150
Financial assurance: approval of instrument	greater of $250 or .01%
Financial assurance: annual review	greater of $100 or .001%

[8-17-91, 12-1-95; 20.6.2.3114, Rn & A, 20 NMAC 6.2.III.3114, 01-01-01]

20.6.2.3115 - 20.6.2.3999: [RESERVED]
[12-1-95; 20.6.2.3115 - 20.6.2.3999 NMAC - Rn, 20 NMAC 6.2.III.3115-4100, 1-15-01]

20.6.2.4000 PREVENTION AND ABATEMENT OF WATER POLLUTION:
[12-1-95; 20.6.2.4000 NMAC - Rn, 20 NMAC 6.2.IV, 1-15-01]

20.6.2.4001 - 20.6.2.4100: [RESERVED]
[12-1-95; 20.6.2.4001 - 20.6.2.4100 NMAC - Rn, 20 NMAC 6.2.III.3115-4100, 1-15-01]

20.6.2.4101 PURPOSE:
A. The purposes of Sections 20.6.2.4000 through 20.6.2.4115 NMAC are to:
(1) Abate pollution of subsurface water so that all ground water of the State of New Mexico which has a background concentration of 10,000 mg/L or less TDS, is either remediated or protected for use as domestic and agricultural water supply, and to remediate or protect those segments of surface waters which are gaining because of subsurface-water inflow, for uses designated in the Water Quality Standards for Interstate and Intrastate Streams in New Mexico (20.6.4 NMAC); and
(2) Abate surface-water pollution so that all surface waters of the State of New Mexico are remediated or protected for designated or attainable uses as defined in the Water Quality Standards for Interstate and Intrastate Streams in New Mexico (20.6.4 NMAC).
B. If the background concentration of any water contaminant exceeds the standard or requirement of Subsections A, B and C of Section 20.6.2.4103 NMAC, pollution shall be abated by the responsible person to the background concentration.
C. The standards and requirements set forth in Section 20.6.2.4103 NMAC are not intended as maximum ranges and concentrations for use, and nothing herein contained shall be construed as limiting the use of waters containing higher ranges and concentrations.
[12-1-95; 20.6.2.4101 NMAC - Rn, 20 NMAC 6.2.IV.4101, 1-15-01]

20.6.2.4102: [RESERVED]
[12-1-95; 20.6.2.4102 NMAC - Rn, 20 NMAC 6.2.IV.4102, 1-15-01]

20.6.2.4103 ABATEMENT STANDARDS AND REQUIREMENTS:
A. The vadose zone shall be abated so that water contaminants in the vadose zone shall not be capable of contaminating ground water or surface water, in excess of the standards in Subsections B and C below, through leaching, percolation or as the water table elevation fluctuates.
B. Ground-water pollution at any place of withdrawal for present or reasonably foreseeable future use, where the TDS concentration is 10,000 mg/L or less, shall be abated to conform to the following standards:
(1) toxic pollutant(s) as defined in Section 20.6.2.1101 NMAC shall not be present; and
(2) the standards of Section 20.6.2.3103 NMAC shall be met.
C. Surface-water pollution shall be abated to conform to the Water Quality Standards for Interstate and Intrastate Streams in New Mexico (20.6.4 NMAC).
D. Subsurface-water and surface-water abatement shall not be considered complete until a minimum of eight (8) consecutive quarterly samples from all compliance sampling stations approved by the secretary meet the abatement standards of Subsections A, B and C of this section. Abatement of water contaminants measured in solid-matrix samples of the vadose zone shall be considered complete after one-time sampling from compliance stations approved by the secretary.
E. Technical Infeasibility.
(1) If any responsible person is unable to fully meet the abatement standards set forth in Subsections A and B of this section using commercially accepted abatement technology pursuant to an approved

abatement plan, he may propose that abatement standards compliance is technically infeasible. Technical infeasibility proposals involving the use of experimental abatement technology shall be considered at the discretion of the secretary. Technical infeasibility may be demonstrated by a statistically valid extrapolation of the decrease in concentration(s) of any water contaminant(s) over the remainder of a twenty (20) year period, such that projected future reductions during that time would be less than 20 percent of the concentration(s) at the time technical infeasibility is proposed. A statistically valid decrease cannot be demonstrated by fewer than eight (8) consecutive quarters. The technical infeasibility proposal shall include a substitute abatement standard(s) for those contaminants that is/are technically feasible. Abatement standards for all other water contaminants not demonstrated to be technically infeasible shall be met.

(2) In no event shall a proposed technical infeasibility demonstration be approved by the secretary for any water contaminant if its concentration is greater than 200 percent of the abatement standard for that contaminant.

(3) If the secretary cannot approve any or all portions of a proposed technical infeasibility demonstration because the water contaminant concentration(s) is/are greater than 200 percent of the abatement standard(s) for each contaminant, the responsible person may further pursue the issue of technical infeasibility by filing a petition with the commission seeking:

(a) approval of alternate abatement standard(s) pursuant to Subsection F of this section; or

(b) granting of a variance pursuant to Section 20.6.2.1210 NMAC.

F. Alternative Abatement Standards.

(1) At any time during or after the submission of a Stage 2 abatement plan, the responsible person may file a petition seeking approval of alternative abatement standard(s) for the standards set forth in Subsections A and B of this section. The commission may approve alternative abatement standard(s) if the petitioner demonstrates that:

(a) compliance with the abatement standard(s) is/are not feasible, by the maximum use of technology within the economic capability of the responsible person; OR there is no reasonable relationship between the economic and social costs and benefits (including attainment of the standard(s) set forth in Section 20.6.2.4103 NMAC) to be obtained;

(b) the proposed alternative abatement standard(s) is/are technically achievable and cost-benefit justifiable; and

(c) compliance with the proposed alternative abatement standard(s) will not create a present or future hazard to public health or undue damage to property.

(2) The petition shall be in writing, filed with the secretary. The petition shall specify, in addition to the information required by Subsection A of Section 20.6.2.1210 NMAC, the water contaminant(s) for which alternative standard(s) is/are proposed, the alternative standard(s) proposed, the three-dimensional body of water pollution for which approval is sought, and the extent to which the abatement standard(s) set forth in Section 20.6.2.4103 NMAC is/are now, and will in the future be, violated. The petition may include a transport, fate and risk assessment in accordance with accepted methods, and other information as the petitioner deems necessary to support the petition.

(3) The commission shall review a petition for alternative abatement standards in accordance with the procedures for review of a variance petition provided in the commission's adjudicatory procedures, 20.1.3 NMAC.

[12-1-95, 11-15-96; 20.6.2.4103 NMAC - Rn, 20 NMAC 6.2.IV.4103, 1-15-01]

20.6.2.4104 ABATEMENT PLAN REQUIRED:

A. Unless otherwise provided by this Part, all responsible persons who are abating, or who are required to abate, water pollution in excess of the standards and requirements set forth in Section 20.6.2.4103 NMAC of this Part shall do so pursuant to an abatement plan approved by the secretary. When an abatement plan has been approved, all actions leading to and including abatement shall be consistent with the terms and conditions of the abatement plan.

B. In the event of a transfer of the ownership, control or possession of a facility for which an abatement plan is required or approved, where the transferor is a responsible person, the transferee also shall be considered a responsible person for the duration of the abatement plan, and may jointly share the responsibility to conduct the actions required by this Part with other responsible persons. The transferor shall notify the transferee in writing, at least thirty (30) days prior to the transfer, that an abatement plan has been required or approved for the facility, and shall deliver or send by certified mail to the secretary a copy of such notification together with a certificate or other proof that such notification has in fact been received by the transferee. The transferor and transferee may agree to a designated responsible person who shall assume the responsibility to conduct the actions required by this Part. The responsible persons shall notify the secretary in writing if a designated responsible person is agreed upon. If the secretary determines that the designated responsible person has failed to conduct the actions required by this Part, the secretary shall notify all responsible persons of this failure in writing and allow them thirty (30) days, or longer for good cause shown, to conduct the required actions before issuing a compliance order pursuant to Section 20.6.2.1220 NMAC.

C. If the source of the water pollution to be abated is a facility that operated under a discharge plan, the secretary may require the responsible person(s) to submit a financial assurance plan which covers the estimated costs to conduct the actions required by the abatement plan. Such a financial assurance plan shall be consistent with any financial assurance requirements adopted by the commission.

[12-1-95; 20.6.2.4104 NMAC - Rn, 20 NMAC 6.2.IV.4104, 1-15-01]

20.6.2.4105 EXEMPTIONS FROM ABATEMENT PLAN REQUIREMENTS:

A. Except as provided in Subsection B of this Section, Sections 20.6.2.4104 and 20.6.2.4106 NMAC do not apply to a person who is abating water pollution:

(1) from a storage tank, under the authority of the Petroleum Storage Tank Regulations (20.5 NMAC) adopted by the New Mexico Environmental Improvement Board, or in accordance with the New Mexico Ground Water Protection Act;

(2) under the authority of the U.S. Environmental Protection Agency pursuant to either the federal Comprehensive Environmental Response, Compensation and Liability Act, and amendments, or the Resource Conservation and Recovery Act;

(3) under the authority of the secretary pursuant to the Hazardous Waste Management Regulations (20.4.1 NMAC) adopted by the New Mexico Environmental Improvement Board;

(4) under the authority of the U.S. Nuclear Regulatory Commission or the U.S. Department of Energy pursuant to the Atomic Energy Act;

(5) from a solid waste landfill, under the authority of the secretary pursuant to the Solid Waste Management Regulations (20.9.1 NMAC) adopted by the N.M. Environmental Improvement Board;

(6) under the authority of a ground-water discharge plan approved by the secretary, provided that such abatement is consistent with the requirements and provisions of Sections 20.6.2.4101, 20.6.2.4103, Subsections C and E of Section 20.6.2.4106, Sections 20.6.2.4107 and 20.6.2.4112 NMAC;

(7) under the authority of a Letter of Understanding, Settlement Agreement or Administrative Order on Consent signed by the secretary prior to December 1, 1995, provided that abatement is being performed in full compliance with the terms of the Letter of Understanding, Settlement Agreement or Administrative Order on Consent; and

(8) on an emergency basis, or while abatement plan approval is pending, or in a manner that will result in compliance with the standards and requirements set forth in Section 20.6.2.4103 NMAC within one hundred and eighty (180) days after notice is required to be given pursuant to Paragraph (1) of Subsection A of Section 20.6.2.1203 NMAC, provided that the delegated agency does not object to the abatement action pursuant to Paragraphs (6) and (7) of Subsection A of Section 20.6.2.1203 NMAC.

B. If the secretary determines that abatement of water pollution subject to Subsection A of this section will not meet the standards of Subsections B and C of Section 20.6.2.4103 NMAC, or that additional action is necessary to protect health, welfare, environment or property, the secretary may notify a responsible person, by certified mail, to submit an abatement plan pursuant to Section 20.6.2.4104 and Subsection A of Section 20.6.2.4106 NMAC. The notification shall state the reasons for the secretary's determination. In any appeal of the secretary's determination under this Section, the secretary shall have the burden of proof.

C. Sections 20.6.2.4104 and 20.6.2.4106 NMAC do not apply to the following activities:

(1) Discharges subject to an effective and enforceable National Pollutant Discharge Elimination System (NPDES) permit;

(2) Land application of ground water contaminated with nitrogen originating from human or animal waste and not otherwise exceeding the standards of Subsection A of Section 20.6.2.3103 NMAC and not containing a toxic pollutant as defined in Section 20.6.2.1101 NMAC, provided that it is done in compliance with a discharge plan approved by the secretary;

(3) Abatement of water pollution resulting from the withdrawal and decontamination or blending of polluted water for use as a public or private drinking-water supply, by any person other than a responsible person, unless the secretary determines that a hazard to public health may result; and

(4) Reasonable operation and maintenance of irrigation and flood control facilities.
[12-1-95; 20.6.2.4105 NMAC - Rn, 20 NMAC 6.2.IV.4105, 1-15-01; A, 10/15/03]

20.6.2.4106 ABATEMENT PLAN PROPOSAL:

A. Except as provided for in Section 20.6.2.4105 NMAC, a responsible person shall, within sixty (60) days of receipt of written notice from the secretary that an abatement plan is required, submit an abatement plan proposal to the secretary for approval. For good cause shown, the secretary may allow for a total of one hundred and twenty (120) days to prepare and submit the abatement plan proposal.

B. Voluntary Abatement:

(1) Any person wishing to abate water pollution in excess of the standards and requirements set forth in Section 20.6.2.4103 NMAC may submit a Stage 1 abatement plan proposal to the secretary for approval. Following approval by the secretary of a final site investigation report prepared pursuant to Stage 1 of an abatement plan, any person may submit a Stage 2 abatement plan proposal to the secretary for approval.

(2) Following approval of a Stage 1 or Stage 2 abatement plan proposal under Paragraph (1) of Subsection B of this Section, the person submitting the approved plan shall be a responsible person under Sections 20.6.2.4000 through 20.6.2.4115 NMAC for the purpose of performing the approved Stage 1 or Stage 2 abatement plan. Nothing in this Section shall preclude the secretary from applying Paragraph (9) of Subsection A of Section 20.6.2.1203 NMAC to a responsible person if applicable.

C. Stage 1 Abatement Plan: The purpose of Stage 1 of the abatement plan shall be to design and conduct a site investigation that will adequately define site conditions, and provide the data necessary to select and design an effective abatement option. Stage 1 of the abatement plan may include, but not necessarily be limited to, the following information depending on the media affected, and as needed to select and implement an expeditious abatement option:

(1) Descriptions of the site, including a site map, and of site history including the nature of the discharge that caused the water pollution, and a summary of previous investigations;

(2) Site investigation workplan to define:

(a) site geology and hydrogeology, the vertical and horizontal extent and magnitude of vadose-zone and ground-water contamination, subsurface hydraulic parameters including hydraulic conductivity, transmissivity, storativity, and rate and direction of contaminant migration, inventory of water wells inside and within one (1) mile from the perimeter of the three-dimensional body where the standards set forth in Subsection B of Section 20.6.2.4103 NMAC are exceeded, and location and number of such wells actually or potentially affected by the pollution; and

(b) surface-water hydrology, seasonal stream flow characteristics, ground-water/surface-water relationships, the vertical and horizontal extent and magnitude of contamination and impacts to surface water and stream sediments. The magnitude of contamination and impacts on surface water may be, in part, defined by conducting a biological assessment of fish, benthic macroinvertebrates and other wildlife populations. Seasonal variations should be accounted for when conducting these assessments.

(3) Monitoring program, including sampling stations and frequencies, for the duration of the abatement plan that may be modified, after approval by the secretary, as additional sampling stations are created;

(4) Quality assurance plan, consistent with the sampling and analytical techniques listed in Subsection B of Section 20.6.2.3107 NMAC and with Section 20.6.4.10 NMAC of the Water Quality Standards for Interstate and Intrastate Streams in New Mexico (20.6.4 NMAC), for all work to be conducted pursuant to the abatement plan;

(5) Site health and safety plan for all work to be performed pursuant to the abatement plan;

(6) A schedule for all Stage 1 abatement plan activities, including the submission of summary quarterly progress reports, and the submission, for approval by the secretary, of a detailed final site investigation report; and

(7) Any additional information that may be required to design and perform an adequate site investigation.

D. Stage 2 Abatement Plan: Any responsible person shall submit a Stage 2 abatement plan proposal to the secretary for approval within sixty (60) days, or up to one hundred and twenty (120) days for good cause shown, after approval by the secretary of the final site investigation report prepared pursuant to Stage 1 of the abatement plan.

E. The purpose of Stage 2 of the abatement plan shall be to select and design, if necessary, an abatement option that, when implemented, will result in attainment of the abatement standards and requirements set forth in Section 20.6.2.4103 NMAC, including post-closure maintenance activities. Stage 2 of the abatement plan should include, at a minimum, the following information:

(1) Brief description of the current situation at the site;

(2) Development and assessment of abatement options;

(3) Description, justification and design, if necessary, of preferred abatement option;

(4) Modification, if necessary, of the monitoring program approved pursuant to Stage 1 of the abatement plan, including the designation of pre and post abatement-completion sampling stations and sampling frequencies to be used to demonstrate compliance with the standards and requirements set forth in Section 20.6.2.4103 NMAC;

(5) Site maintenance activities, if needed, proposed to be performed after termination of abatement activities;

(6) A schedule for the duration of abatement activities, including the submission of summary quarterly progress reports;

(7) A public notification proposal designed to satisfy the requirements of Subsections B and C of Sections 20.6.2.4108 and 20.6.2.4108 NMAC; and

(8) Any additional information that may be reasonably required to select, describe, justify and design an effective abatement option.

[12-1-95; 20.6.2.4106 NMAC - Rn, 20 NMAC 6.2.IV.4106, 1-15-01]

20.6.2.4107 OTHER REQUIREMENTS:

A. Any responsible person shall allow any authorized representative of the secretary to:

(1) upon presentation of proper credentials, enter the facility at reasonable times;

(2) inspect and copy records required by an abatement plan;

(3) inspect any treatment works, monitoring and analytical equipment;

(4) sample any wastes, ground water, surface water, stream sediment, plants, animals, or vadose-zone material including vadose-zone vapor;

(5) use monitoring systems and wells under such responsible person's control in order to collect samples of any media listed in Paragraph (4) of Subsection A of this section; and

(6) gain access to off-site property not owned or controlled by such responsible person, but accessible to such responsible person through a third-party access agreement, provided that it is allowed by the agreement.

B. Any responsible person shall provide the secretary, or a representative of the secretary, with at least four (4) working days advance notice of any sampling to be performed pursuant to an abatement plan, or any well plugging, abandonment or destruction at any facility where an abatement plan has been required.

C. Any responsible person wishing to plug, abandon or destroy a monitoring or water supply well within the perimeter of the 3-dimensional body where the standards set forth in Subsection B of Section 20.6.2.4103 NMAC are exceeded, at any facility where an abatement plan has been required, shall propose such action by certified mail to the secretary for approval, unless such approval is required from the State Engineer. The proposed action shall be designed to prevent water pollution that could result from water contaminants migrating through the well or borehole. The proposed action shall not take place without written approval from the secretary, unless written approval or disapproval is not received by the responsible person within thirty (30) days of the date of receipt of the proposal.

[12-1-95; 20.6.2.4107 NMAC - Rn, 20 NMAC 6.2.IV.4107, 1-15-01]

20.6.2.4108 PUBLIC NOTICE AND PARTICIPATION:

A. Within thirty (30) days of filing of a Stage 1 abatement plan proposal, the secretary shall issue a news release summarizing:

(1) the source, extent, magnitude and significance of water pollution, as known at that time;

(2) the proposed Stage 1 abatement plan investigation; and

(3) the name and telephone number of an agency contact who can provide additional information.

B. Within thirty (30) days of filing of a Stage 2 abatement plan proposal, or proposed significant modification of Stage 2 of the abatement plan, any responsible person shall provide to the secretary proof of public notice of the abatement plan to the following persons:

(1) the public, who shall be notified through publication of a notice in newspapers of general circulation in this state and in the county where the abatement will occur and, in areas with large percentages of non-

English speaking people, through the mailing of the public notice in English to a bilingual radio station serving the area where the abatement will occur with a request that it be aired as a public service announcement in the predominant non-English language of the area;

(2) those persons, as identified by the secretary, who have requested notification, who shall be notified by mail;

(3) the New Mexico Trustee for Natural Resources, and any other local, state or federal governmental agency affected, as identified by the secretary, which shall be notified by certified mail;

(4) owners and residents of surface property located inside, and within one (1) mile from, the perimeter of the geographic area where the standards and requirements set forth in Section 20.6.2.4103 NMAC are exceeded who shall be notified by a means approved by the secretary; and

(5) the Governor or President of each Indian Tribe, Pueblo or Nation within the state of New Mexico, as identified by the secretary, who shall be notified by mail.

C. The public notice shall include, as approved in advance by the secretary:

(1) name and address of the responsible person;

(2) location of the proposed abatement;

(3) brief description of the nature of the water pollution and of the proposed abatement action;

(4) brief description of the procedures followed by the secretary in making a final determination;

(5) statement on the comment period;

(6) statement that a copy of the abatement plan can be viewed by the public at the department's main office or at the department field office for the area in which the discharge occurred;

(7) statement that written comments on the abatement plan, and requests for a public meeting or hearing that include the reasons why a meeting or hearing should be held, will be accepted for consideration if sent to the secretary within sixty (60) days after the determination of administrative completeness; and

(8) address and phone number at which interested persons may obtain further information.

D. A public meeting or hearing may be held if the secretary determines there is significant public interest. Notice of the time and place of the meeting or hearing shall be given at least thirty (30) days prior to the meeting or hearing pursuant to Subsections A and B above. The secretary may appoint a meeting facilitator or hearing officer. The secretary may require the responsible person to prepare for approval by the secretary a fact sheet, to be distributed at the public meeting or hearing and afterwards upon request, written in English and Spanish, describing site history, the nature and extent of water pollution, and the proposed abatement. The record of the meeting or hearing, requested under this Section, consists of a tape recorded or transcribed session, provided that the cost of a court recorder shall be paid by the person requesting the transcript. If requested by the secretary, the responsible person will provide a translator approved by the secretary at a public meeting or hearing conducted in a locale where testimony from non-English speaking people can reasonably be expected. At the meeting or hearing, all interested persons shall be given a reasonable chance to submit data, views or arguments orally or in writing, and to ask questions of the secretary or the secretary's designee and of the responsible person, or their authorized representatives.

[12-1-95; 20.6.2.4108 NMAC - Rn, 20 NMAC 6.2.IV.4108, 1-15-01]

20.6.2.4109 SECRETARY APPROVAL OR NOTICE OF DEFICIENCY OF SUBMITTALS:

A. The secretary shall, within sixty (60) days of receiving a Stage 1 abatement plan proposal, a site investigation report, a technical infeasibility demonstration, or an abatement completion report, approve the document, or notify the responsible person of the document's deficiency, based upon the information available.

B. The secretary shall, within thirty (30) days of receiving a fact sheet, approve or notify the responsible person of the document's deficiency, based upon the information available.

C. If no public meeting or hearing is held pursuant to Subsection D of Section 20.6.2.4108 NMAC, then the secretary shall, within ninety (90) days of receiving a Stage 2 abatement plan proposal, approve the plan, or notify the responsible person of the plan's deficiency, based upon the information available.

D. If a public meeting or hearing is held pursuant to Subsection D of Section 20.6.2.4108, then the secretary shall, within sixty (60) days of receipt of all required information, approve Stage 2 of the abatement plan proposal, or notify the responsible person of the plan's deficiency, based upon the information contained in the plan and information submitted at the meeting or hearing.

E. If the secretary notifies a responsible person of any deficiencies in a site investigation report, or in a Stage 1 or Stage 2 abatement plan proposal, the responsible person shall submit a modified document to cure the deficiencies specified by the secretary within thirty (30) days of receipt of the notice of deficiency. The responsible person shall be in violation of Sections 20.6.2.4000 through 20.6.2.4115 NMAC if he fails to submit a modified document within the required time, or if the modified document does not make a good faith effort to cure the deficiencies specified by the secretary.

F. Provided that the other requirements of this Part are met and provided further that Stage 2 of the abatement plan, if implemented, will result in the standards and requirements set forth in Section 20.6.2.4103 NMAC being met within a schedule that is reasonable given the particular circumstances of the site, the secretary shall approve the plan.

[12-1-95; 20.6.2.4109 NMAC - Rn, 20 NMAC 6.2.IV.4109, 1-15-01]

20.6.2.4110 INVESTIGATION AND ABATEMENT: Any responsible person who receives approval for Stage 1 and/or Stage 2 of an abatement plan shall conduct all investigation, abatement, monitoring and reporting activity in full compliance with Sections 20.6.2.4000 through 20.6.2.4115 NMAC and according to the terms and schedules contained in the approved abatement plans.

[12-1-95; 20.6.2.4110 NMAC - Rn, 20 NMAC 6.2.IV.4110, 1-15-01]

20.6.2.4111 ABATEMENT PLAN MODIFICATION:

A. Any approved abatement plan may be modified, at the written request of the responsible person, in accordance with Sections 20.6.2.4000 through 20.6.2.4115 NMAC, and with written approval of the secretary.

B. If data submitted pursuant to any monitoring requirements specified in the approved abatement plan or other information available to the secretary indicates that the abatement action is ineffective, or is creating unreasonable injury to or interference with health, welfare, environment or property, the secretary may require a responsible person to modify an abatement plan within the shortest reasonable time so as to effectively abate water pollution which exceeds the standards and requirements set forth in Section 20.6.2.4103 NMAC, and to abate and prevent unreasonable injury to or interference with health, welfare, environment or property.

[12-1-95; 20.6.2.4111 NMAC - Rn, 20 NMAC 6.2.IV.4111, 1-15-01]

20.6.2.4112 COMPLETION AND TERMINATION:

A. Abatement shall be considered complete when the standards and requirements set forth in Section 20.6.2.4103 NMAC are met. At that time, the responsible person shall submit an abatement completion report, documenting compliance with the standards and requirements set forth in Section 20.6.2.4103 NMAC, to the secretary for approval. The abatement completion report also shall propose any changes to long term monitoring and site maintenance activities, if needed, to be performed after termination of the abatement plan.

B. Provided that the other requirements of this Part are met and provided further that the standards and requirements set forth in Section 20.6.2.4103 NMAC have been met, the secretary shall approve the abatement completion report. When the secretary approves the abatement completion report, he shall also notify the responsible person in writing that the abatement plan is terminated.

[12-1-95; 20.6.2.4112 NMAC - Rn, 20 NMAC 6.2.IV.4112, 1-15-01]

20.6.2.4113 DISPUTE RESOLUTION: In the event of any technical dispute regarding the requirements of Paragraph (9) of Subsection A and Subsection E of Section 20.6.2.1203, Sections 20.6.2.4103, 20.6.2.4105, 20.6.2.4106, 20.6.2.4111 or 20.6.2.4112 NMAC, including notices of deficiency, the responsible person may notify the secretary by certified mail that a dispute has arisen, and desires to invoke the dispute resolution provisions of this Section, provided that such notification must be made within thirty (30) days after receipt by the responsible person of the decision of the secretary that causes the dispute. Upon such notification, all deadlines affected by the technical dispute shall be extended for a thirty (30) day negotiation period, or for a maximum of sixty (60) days if approved by the secretary for good cause shown. During this negotiation period, the secretary or his/her designee and the responsible person shall meet at least once. Such meeting(s) may be facilitated by a mutually agreed upon third party, but the third party shall assume no power or authority granted or delegated to the secretary by the Water Quality Act or by the commission. If the dispute remains unresolved after the negotiation period, the decision of secretary shall be final.

[12-1-95; 20.6.2.4113 NMAC - Rn, 20 NMAC 6.2.IV.4113, 1-15-01]

20.6.2.4114 APPEALS FROM SECRETARY'S DECISIONS:

A. If the secretary determines that an abatement plan is required pursuant to Paragraph (9) of Subsection A of 20.6.2.1203, Paragraph (4) of Subsection E of 20.6.2.3109, or Subsection B of 20.6.2.4105 NMAC, approves or provides notice of deficiency of a proposed abatement plan, technical infeasibility demonstration or abatement completion report, or modifies or terminates an approved abatement plan, he shall provide written notice of such action by certified mail to the responsible person and any person who participated in the action.

B. Any person who participated in the action before the secretary and who is adversely affected by the action listed in Subsection A of 20.6.2.4114 NMAC may file a petition requesting a review before the commission.

C. The petition shall be made in writing to the commission and shall be filed with the commission's secretary within thirty (30) days after receiving notice of the secretary's action. The petition shall specify the portions of the action to which the petitioner objects, certify that a copy of the petition has been mailed or hand-delivered to the secretary, and to the applicant or permittee if the petitioner is not the applicant or permittee, and attach a copy of the action for which review is sought. Unless a timely petition for hearing is made, the secretary's action is final.

D. The proceedings before the commission shall be conducted as provided in the commission's adjudicatory procedures, 20 NMAC 1.3.

E. The cost of the court reporter for the hearing shall be paid by the petitioner.

F. The appeal provisions do not relieve the owner, operator or responsible person of their obligations to comply with any federal or state laws or regulations.

[12-1-95, 11-15-96; 20.6.2.4114 NMAC - Rn, 20 NMAC 6.2.IV.4114, 1-15-01; A, 7-16-06]

20.6.2.4115 COURT REVIEW OF COMMISSION DECISIONS: Court review of commission decisions shall be as provided by law.

[12-1-95; 20.6.2.4115 NMAC - Rn, 20 NMAC 6.2.IV.4115, 1-15-01]

20.6.2.4116 - 20.6.2.4999: [RESERVED]

[12-1-95; 20.6.2.4116 - 20.6.2.4999 NMAC - Rn, 20 NMAC 6.2.IV.4116-5100, 1-15-01]

20.6.2.5000 UNDERGROUND INJECTION CONTROL:

[12-1-95; 20.6.2.5000 NMAC - Rn, 20 NMAC 6.2.V, 1-15-01]

20.6.2.5001 PURPOSE: The purpose of 20.6.2.5000 through 20.6.2.5399 NMAC controlling discharges from underground injection control wells is to protect all ground water of the state of New Mexico which has an existing concentration of 10,000 mg/l or less TDS, for present and potential future use as domestic and agricultural water supply, and to protect those segments of surface waters which are gaining because of ground water inflow for uses designated in the New Mexico water quality standards. 20.6.2.5000 through 20.6.2.5399 NMAC include notification requirements, and requirements for discharges directly into the subsurface through underground injection control wells.

[20.6.2.5001 NMAC - N, 12-1-01; A, 8-31-15]

20.6.2.5002 UNDERGROUND INJECTION CONTROL WELL CLASSIFICATIONS:

A. Underground injection control wells include the following.

(1) Any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is emplacement of fluids.

(2) Any septic tank or cesspool used by generators of hazardous waste, or by owners or operators of hazardous waste management facilities, to dispose of fluids containing hazardous waste.

(3) Any subsurface distribution system, cesspool or other well which is used for the injection of wastes.

B. Underground injection control wells are classified as follows:

(1) Class I wells inject fluids beneath the lowermost formation that contains 10,000 milligrams per liter or less TDS. Class I hazardous or radioactive waste injection wells inject fluids containing any hazardous or radioactive waste as defined in 74-4-3 and 74-4A-4 NMSA 1978 or 20.4.1.200 NMAC (incorporating 40 C.F.R. Section 261.3), including any combination of these wastes. Class I non-hazardous waste injection wells inject non-hazardous and non-radioactive fluids, and they inject naturally-occurring radioactive material (NORM) as provided by 20.3.1.1407 NMAC.

(2) Class II wells inject fluids associated with oil and gas recovery;

(3) Class III wells inject fluids for extraction of minerals or other natural resources, including sulfur, uranium, metals, salts or potash by in situ extraction. This classification includes only in situ production from ore bodies that have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V.

(4) Class IV wells inject fluids containing any radioactive or hazardous waste as defined in 74-4-3 and 74-4A-4 NMSA 1978, including any combination of these wastes, above or into a formation that contains 10,000 mg/l or less TDS.

(5) Class V wells inject a variety of fluids and are those wells not included in Class I, II, III or IV. Types of Class V wells include, but are not limited to, the following:

(a) domestic liquid waste injection wells:

(i) domestic liquid waste disposal wells used to inject liquid waste volumes greater than that regulated by 20.7.3 NMAC through subsurface fluid distribution systems or vertical wells;

(ii) septic system wells used to emplace liquid waste volumes greater than that regulated by 20.7.3 NMAC into the subsurface, which are comprised of a septic tank and subsurface fluid distribution system;

(iii) large capacity cesspools used to inject liquid waste volumes greater than that regulated by 20.7.3 NMAC, including drywells that sometimes have an open bottom or perforated sides;

(b) industrial waste injection wells:

(i) air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling;

(ii) dry wells used for the injection of wastes into a subsurface formation;

(iii) geothermal energy injection wells associated with the recovery of geothermal energy for heating, aquaculture and production of electrical power;

(iv) stormwater drainage wells used to inject storm runoff from the surface into the subsurface;

(v) motor vehicle waste disposal wells that receive or have received fluids from vehicular repair or maintenance activities;

(vi) car wash waste disposal wells used to inject fluids from motor vehicle washing activities;

(c) mining injection wells:

(i) stopes leaching wells used for solution mining of conventional mines;

(ii) brine injection wells used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts;

(iii) backfill wells used to inject a mixture of water and sand, mill tailings or other solids into mined out portions of subsurface mines whether water injected is a radioactive waste or not;

(iv) injection wells used for in situ recovery of lignite, coal, tar sands, and oil shale;

(d) ground water management injection wells:

(i) ground water remediation injection wells used to inject contaminated ground water that has been treated to ground water quality standards;

(ii) in situ ground water remediation wells used to inject a fluid that facilitates vadose zone or ground water remediation.

(iii) recharge wells used to replenish the water in an aquifer, including use to reclaim or improve the quality of existing ground water;

(iv) barrier wells used to inject fluids into ground water to prevent the intrusion of saline or contaminated water into ground water of better quality;

(v) subsidence control wells (not used for purposes of oil or natural gas production) used to inject fluids into a non-oil or gas producing zone to reduce or eliminate subsidence associated with the overdraft of fresh water;

(vi) wells used in experimental technologies;

(e) agricultural injection wells - drainage wells used to inject fluids into ground water to prevent the intrusion of saline or contaminated water into ground water of better quality.

[20.6.2.5002 NMAC - N, 12-1-01; A, 8-1-14; A, 8-31-15]

20.6.2.5003 NOTIFICATION AND GENERAL OPERATION REQUIREMENTS FOR ALL UNDERGROUND INJECTION CONTROL WELLS: All operators of underground injection control wells, except those wells regulated under the Oil and Gas Act, the Geothermal Resources Conservation Act, and the Surface Mining Act, shall:

A. for existing underground injection control wells, submit to the secretary the information enumerated in Subsection C of 20.6.2.1201 NMAC of this part; provided, however, that if the information in Subsection C of 20.6.2.1201 NMAC has been previously submitted to the secretary and acknowledged by him, the information need not be resubmitted; and

B. operate and continue to operate in conformance with 20.6.2.1 through 20.6.2.5399 NMAC;

C. for new underground injection control wells, submit to the secretary the information enumerated in Subsection C of 20.6.2.1201 NMAC of this part at least 120 days prior to well construction.

[9-20-82, 12-1-95; 20.6.2.5300 NMAC - Rn, 20 NMAC 6.2.V.5300, 1-15-01; 20.6.2.5003 NMAC - Rn, 20.6.2.5300 NMAC, 12-1-01; A, 12-1-01; A, 9-15-02; A, 8-31-15]

20.6.2.5004 PROHIBITED UNDERGROUND INJECTION CONTROL ACTIVITIES AND WELLS:

A. No person shall perform the following underground injection activities nor operate the following underground injection control wells.

(1) The injection of fluids into a motor vehicle waste disposal well is prohibited. Motor vehicle waste disposal wells are prohibited. Any person operating a new motor vehicle waste disposal well (for which construction began after April 5, 2000) must close the well immediately. Any person operating an existing motor vehicle waste disposal well must cease injection immediately and must close the well by December 31, 2002, except as provided in this subsection.

(2) The injection of fluids into a large capacity cesspool is prohibited. Large capacity cesspools are prohibited. Any person operating a new large capacity cesspool (for which construction began after April 5, 2000) must close the cesspool immediately. Any person operating an existing large capacity cesspool must cease injection immediately and must close the cesspool by December 31, 2002.

(3) The injection of any hazardous or radioactive waste into a well is prohibited, except as provided in 20.6.2.5300 through 20.6.2.5399 NMAC or this subsection.

(a) Class I radioactive waste injection wells are prohibited, except naturally-occurring radioactive material (NORM) regulated under 20.3.1.1407 NMAC is allowed as a Class I non-hazardous waste injection well pursuant to Paragraph (1) of Subsection B of 20.6.2.5002 NMAC.

(b) Class IV wells are prohibited, except for wells re-injecting treated ground water into the same formation from which it was drawn as part of a removal or remedial action if the injection has prior approval from the environmental protection agency (EPA) or the department under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Resource Conservation and Recovery Act (RCRA).

(4) Barrier wells, drainage wells, recharge wells, return flow wells, and motor vehicle waste disposal wells are prohibited, except when the discharger can demonstrate that the discharge will not adversely affect the health of persons, and

(a) the injection fluid does not contain a contaminant which may cause an exceedance at any place of present or reasonable foreseeable future use of any primary state drinking water maximum contaminant level as specified in the water supply regulations, “Drinking Water” (20.7.10 NMAC), adopted by the environmental improvement board under the Environmental Improvement Act or the standard of 20.6.2.3103 NMAC, whichever is more stringent;

(b) the discharger can demonstrate that the injection will result in an overall or net improvement in water quality as determined by the secretary.

B. Closure of prohibited underground injection control wells shall be in accordance with 20.6.2.5005 and 20.6.2.5209 NMAC.

[20.6.2.5004 NMAC - N, 12-1-01; A, 8-31-15]

20.6.2.5005 PRE-CLOSURE NOTIFICATION AND CLOSURE REQUIREMENTS:

A. Any person proposing to close a Class I, III, IV or V underground injection control well must submit pre-closure notification to the department at least 30 days prior to closure. Pre-closure notification must include the following information:

(1) Name of facility.
(2) Address of facility.
(3) Name of Owner/Operator.
(4) Address of Owner/Operator.
(5) Contact Person.
(6) Phone Number.

(7) Type of Well(s).
(8) Number of Well(s).
(9) Well Construction (e.g. drywell, improved sinkhole, septic tank, leachfield, cesspool, other…).
(10) Type of Discharge.
(11) Average Flow (gallons per day).
(12) Year of Well Construction.
(13) Proposed Well Closure Activities (e.g. sample fluids/sediment, appropriate disposal of remaining fluids/sediments, remove well and any contaminated soil, clean out well, install permanent plug, conversion to other type well, ground water and vadose zone investigation, other).
(14) Proposed Date of Well Closure.
(15) Name of Preparer.
(16) Date.

B. Proposed well closure activities must be approved by the department prior to implementation.
[20.6.2.5005 NMAC - N, 12-1-01]

20.6.2.5006 DISCHARGE PERMIT REQUIREMENTS FOR CLASS V INJECTION WELLS: Class V injection wells must meet the requirements of Sections 20.6.2.3000 through 20.6.2.3999 NMAC and Sections 20.6.2.5000 through 20.6.2.5006 NMAC.
[20.6.2.5006 NMAC - N, 12-1-01]

20.6.2.5007 - 20.6.2.5100: [RESERVED]
[12-1-95; 20.6.2.5001 - 20.6.2.5100 NMAC - Rn, 20 NMAC 6.2.IV.4116-5100, 1-15-01; 20.6.2.5007 -20.6.2.5100 NMAC - Rn 20.6.2.5001 - 20.6.2.5100 NMAC, 12-1-01]

20.6.2.5101 DISCHARGE PERMIT AND OTHER REQUIREMENTS FOR CLASS I WELLS AND CLASS III WELLS:

A. Class I wells and Class III wells must meet the requirements of 20.6.2.5000 through 20.6.2.5399 NMAC in addition to other applicable requirements of the commission regulations. The secretary may also require that some Class IV and Class V wells comply with the requirements for Class I wells in 20.6.2.5000 through 20.6.2.5399 NMAC if the secretary determines that the additional requirements are necessary to prevent the movement of water contaminants from a specified injection zone into ground water having 10,000 mg/l or less TDS. No Class I well or Class III well may be approved which allows for movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to 20.6.2.5103 NMAC, or pursuant to a temporary designation as provided in Paragraph (2) of Subsection C of 20.6.2.5101 NMAC.

B. Operation of a Class I well or Class III well must be pursuant to a discharge permit meeting the requirements of 20.6.2.3000 through 20.6.2.3999 NMAC and 20.6.2.5000 through 20.6.2.5399 NMAC.

C. Discharge permits for Class I wells, or Class III wells affecting ground water of 10,000 mg/l or less TDS submitted for secretary approval shall:

(1) receive an aquifer designation if required in 20.6.2.5103 NMAC prior to discharge permit issuance; or

(2) for Class III wells only, address the methods or techniques to be used to restore ground water so that upon final termination of operations including restoration efforts, ground water at any place of withdrawal for present or reasonably foreseeable future use will not contain either concentrations in excess of the standards of 20.6.2.3103 NMAC or any toxic pollutant; issuance of a discharge permit or project discharge permit for Class III wells that provides for restoration of ground water in accordance with the requirements of this subsection shall substitute for the aquifer designation provisions of 20.6.2.5103 NMAC; the approval shall constitute a temporary aquifer designation for a mineral bearing or producing aquifer, or portion thereof, to allow injection as provided for in the discharge permit; such temporary designation shall expire upon final termination of operations including restoration efforts.

D. The exemptions from the discharge permit requirement listed in 20.6.2.3105 NMAC do not apply to underground injection control wells except as provided below:

(1) wells regulated by the oil conservation division under the exclusive authority granted under Section 70-2-12 NMSA 1978 or under other sections of the “Oil and Gas Act”;

(2) wells regulated by the oil conservation division under the “Geothermal Resources Act”;

(3) wells regulated by the New Mexico coal surface mining bureau under the “Surface Mining Act”;

(4) wells for the disposal of effluent from systems which are regulated under the "Liquid Waste Disposal and Treatment” regulations (20.7.3 NMAC) adopted by the environmental improvement board under the “Environmental Improvement Act”.

E. Project permits for Class III wells.

(1) The secretary may consider a project discharge permit for Class III wells, if the wells are:

(a) within the same well field, facility site or similar unit;

(b) within the same aquifer and ore deposit;

(c) of similar construction;

(d) of the same purpose; and

(e) operated by a single owner or operator.

(2) A project discharge permit does not allow the discharger to commence injection in any individual operational area until the secretary approves an application for injection in that operational area (operational area approval).

(3) A project discharge permit shall:

(a) specify the approximate locations and number of wells for which operational area approvals are or will be sought with approximate time frames for operation and restoration (if restoration is required) of each area; and

(b) provide the information required under the following sections of this part, except for such additional site-specific information as needed to evaluate applications for individual operational area approvals: Subsection C of 20.6.2.3106, 20.6.2.3107, 20.6.2.5204 through 20.6.2.5209, and Subsection B of 20.6.2.5210 NMAC.

(4) Applications for individual operational area approval shall include the following:

(a) site-specific information demonstrating that the requirements of this part are met; and

(b) information required under 20.6.2.5202 through 20.6.2.5210 NMAC and not previously provided pursuant to Subparagraph (b) of Paragraph (3) of Subsection E of this section.

(5) Applications for project discharge permits and for operational area approval shall be processed in accordance with the same procedures provided for discharge permits under 20.6.2.3000 through 20.6.2.3114 NMAC, allowing for public notice on the project discharge permit and on each application for operational area approval pursuant to 20.6.2.3108 NMAC with opportunity for public hearing prior to approval or disapproval.

(6) The discharger shall comply with additional requirements that may be imposed by the secretary pursuant to this part on wells in each new operational area.

F. If the holder of a discharge permit for a Class I well, or Class III well submits an application for discharge permit renewal at least 120 days before discharge permit expiration, and the discharger is in compliance with his discharge permit on the date of its expiration, then the existing discharge permit for the same activity shall not expire until the application for renewal has been approved or disapproved. An application for discharge permit renewal must include and adequately address all of the information necessary for evaluation of a new discharge permit. Previously submitted materials may be included by reference provided they are current, readily available to the secretary and sufficiently identified to be retrieved.

G. Discharge permit signatory requirements: No discharge permit for a Class I well or Class III well may be issued unless:

(1) the application for a discharge permit has been signed as follows:

(a) for a corporation: by a principal executive officer of at least the level of vice-president, or a representative who performs similar policy-making functions for the corporation who has authority to sign for the corporation; or

(b) for a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(c) for a municipality, state, federal, or other public agency: by either a principal executive officer who has authority to sign for the agency, or a ranking elected official; and

(2) all reports required by Class I hazardous waste injection well permits and other information requested by the director pursuant to a Class I hazardous waste injection well permit shall be signed by a person described in Paragraph (1) of this subsection, or by a duly authorized representative of that person; a person is a duly authorized representative only if:

(a) the authorization is made in writing by a person described in Paragraph (1) of this subsection;

(b) 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; (a duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(c) the written authorization is submitted to the director.

(3) *Changes to authorization.* If an authorization under Paragraph (2) of this subsection 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 Paragraph (2) of this subsection must be submitted to the director prior to or together with any reports, information, or applications to be signed by an authorized representative.

(4) The signature on an application, report or other information requested by the director must be directly preceded by the following certification: "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment."

H. Transfer of Class I non-hazardous waste injection well and Class III well discharge permits.

(1) The transfer provisions of 20.6.2.3111 NMAC do not apply to a discharge permit for a Class I non-hazardous waste injection well or Class III well.

(2) A Class I non-hazardous waste injection well or Class III well discharge permit may be transferred if:

(a) the secretary receives written notice 30 days prior to the transfer date; and

(b) the secretary does not object prior to the proposed transfer date; the secretary may require modification of the discharge permit as a condition of transfer, and may require demonstration of adequate financial responsibility.

(3) The written notice required by Subparagraph (a) of Paragraph (2) of Subsection H above shall:

(a) have been signed by the discharger and the succeeding discharger, including an acknowledgement that the succeeding discharger shall be responsible for compliance with the discharge permit upon taking possession of the facility; and

(b) set a specific date for transfer of discharge permit responsibility, coverage and liability; and

(c) include information relating to the succeeding discharger's financial responsibility required by Paragraph (17) of Subsection B of 20.6.2.5210 NMAC.

I. Modification or termination of a discharge permit for a Class I well or Class III well: If data submitted pursuant to any monitoring requirements specified in the discharge permit or other information available to the secretary indicate that this part are being or may be violated, the secretary may require modification or, if it is determined by the secretary that the modification may not be adequate, may terminate a discharge permit for a Class I well, or Class III well or well field, that was approved pursuant to the requirements of this under 20.6.2.5000 through 20.6.2.5399 NMAC for the following causes:

(1) noncompliance by the discharger with any condition of the discharge permit; or

(2) the discharger's failure in the discharge permit application or during the discharge permit review process to disclose fully all relevant facts, or the discharger's misrepresentation of any relevant facts at any time; or

(3) a determination that the permitted activity may cause a hazard to public health or undue risk to property and can only be regulated to acceptable levels by discharge permit modification or termination.

[9-20-82, 12-1-95, 11-15-96; 20.6.2.5101 NMAC - Rn, 20 NMAC 6.2.V.5101, 1-15-01; A, 12-1-01; A, 9-15-02; A, 8-1-14; A, 8-31-15]

20.6.2.5102 PRE-CONSTRUCTION REQUIREMENTS FOR CLASS I WELLS AND CLASS III WELLS:

A. Discharge permit requirement for Class I wells.

(1) Prior to construction of a Class I well or conversion of an existing well to a Class I well, an approved discharge permit is required that incorporates the requirements of 20.6.2.5000 through 20.6.2.5399

NMAC, except Subsection C of 20.6.2.5210 NMAC. As a condition of discharge permit issuance, the operation of the Class I well under the discharge permit will not be authorized until the secretary has:

(a) reviewed the information submitted for his consideration pursuant to Subsection C of 20.6.2.5210 NMAC; and

(b) determined that the information submitted demonstrates that the operation will be in compliance with this part and the discharge permit.

(2) If conditions encountered during construction represent a substantial change which could adversely impact ground water quality from those anticipated in the discharge permit, the secretary shall require a discharge permit modification or may terminate the discharge permit pursuant to Subsection I of 20.6.2.5101 NMAC, and the secretary shall publish public notice and allow for comments and hearing in accordance with 20.6.2.3108 NMAC.

B. Notification requirement for Class III wells.

(1) The discharger shall notify the secretary in writing prior to the commencement of drilling or construction of wells which are expected to be used for in situ extraction, unless the discharger has previously received a discharge permit or project discharge permit for the Class III well operation.

(a) Any person proposing to drill or construct a new Class III well or well field, or convert an existing well to a Class III well, shall file plans, specifications and pertinent documents regarding such construction or conversion, with the ground water quality bureau of the environment department.

(b) Plans, specifications, and pertinent documents required by this section, if pertaining to geothermal installations, carbon dioxide facilities, or facilities for the exploration, production, refinement or pipeline transmission of oil and natural gas, shall be filed instead with the oil conservation division.

(c) Plans, specifications and pertinent documents required to be filed under this section must be filed 90 days prior to the planned commencement of construction or conversion.

(d) The following plans, specifications and pertinent documents shall be provided with the notification:

(i) information required in Subsection C of 20.6.2.3106 NMAC;

(ii) a map showing the Class III wells which are to be constructed; the map must also show, in so far as is known or is reasonably available from the public records, the number, name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells and other pertinent surface features, including residences and roads, that are within the expected area of review (20.6.2.5202 NMAC) of the Class III well or well field perimeter;

(iii) maps and cross-sections indicating the general vertical and lateral limits of all ground water having 10,000 mg/l or less TDS within one mile of the site, the position of such ground water within this area relative to the injection formation, and the direction of water movement, where known, in each zone of ground water which may be affected by the proposed injection operation;

(iv) maps and cross-sections detailing the geology and geologic structure of the local area, including faults, if known or suspected;

(v) the proposed formation testing program to obtain an analysis or description, whichever the secretary requires, of the chemical, physical, and radiological characteristics of, and other information on, the receiving formation;

(vi) the proposed stimulation program;

(vii) the proposed injection procedure;

(viii) schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(ix) proposed construction procedures, including a cementing and casing program, logging procedures, deviation checks, and a drilling, testing, and coring program;

(x) information, as described in Paragraph (17) of Subsection B of 20.6.2.5210 NMAC, showing the ability of the discharger to undertake measures necessary to prevent groundwater contamination; and

(xi) a plugging and abandonment plan showing that the requirements of Subsections B, C and D of 20.6.2.5209 NMAC will be met.

(2) Prior to construction, the discharger shall have received written notice from the secretary that the information submitted under item 10 of Subparagraph (d) of Paragraph (1) of Subsection B of 20.6.2.5102 NMAC is acceptable. Within 30 days of submission of the above information the secretary shall notify the discharger that the information submitted is acceptable or unacceptable.

(3) Prior to construction, the secretary shall review said plans, specifications and pertinent documents and shall comment upon their adequacy of design for the intended purpose and their compliance with pertinent sections of this part. Review of plans, specifications and pertinent documents shall be based on the criteria contained in 20.6.2.5205, Subsection E of 20.6.2.5209, and Subparagraph (d) of Paragraph (1) of Subsection B of 20.6.2.5102 NMAC.

(4) Within 30 days of receipt, the secretary shall issue public notice, consistent with Subsection B of 20.6.2.3108 NMAC, that notification was submitted pursuant to Subsection B of 20.6.2.5102 NMAC. The secretary shall allow a period of at least 30 days during which comments may be submitted. The public notice shall include:

(a) name and address of the proposed discharger;

(b) location of the discharge;

(c) brief description of the proposed activities;

(d) statement of the public comment period; and

(e) address and telephone number at which interested persons may obtain further information.

(5) The secretary shall comment in writing upon the plans and specifications within 60 days of their receipt by the secretary.

(6) Within 30 days after completion, the discharger shall submit written notice to the secretary that the construction or conversion was completed in accordance with submitted plans and specifications, or shall submit as-built plans detailing changes from the originally submitted plans and specifications.

(7) In the event a discharge permit application is not submitted or approved, all wells which may cause groundwater contamination shall be plugged and abandoned by the applicant pursuant to the plugging and abandonment plan submitted in the notification; these measures shall be consistent with any comments made by the secretary in his review. If the wells are not to be permanently abandoned and the discharger demonstrates that plugging at this time is unnecessary to prevent groundwater contamination, plugging pursuant to the notification is not required. Financial responsibility established pursuant to 20.6.2.5000 through 20.6.2.5299 NMAC will remain in effect until the discharger permanently abandons and plugs the wells in accordance with the plugging and abandonment plan.

[9-20-82, 12-24-87, 12-1-95; 20.6.2.5102 NMAC - Rn, 20 NMAC 6.2.V.5102, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5103 DESIGNATED AQUIFERS FOR CLASS I WELLS AND CLASS III WELLS:

A. Any person may file a written petition with the secretary seeking commission consideration of certain aquifers or portions of aquifers as “designated aquifers”. The purpose of aquifer designation is:

(1) for Class I wells, to allow as a result of injection, the addition of water contaminants into ground water, which before initiation of injection has a concentration between 5,000 and 10,000 mg/l TDS; or

(2) for Class III wells, to allow as a result of injection, the addition of water contaminants into ground water, which before initiation of injection has a concentration between 5,000 and 10,000 mg/l TDS, and not provide for restoration or complete restoration of that ground water pursuant to Paragraph (2) of Subsection C of 20.6.2.5101 NMAC.

B. The applicant shall identify (by narrative description, illustrations, maps or other means) and describe such aquifers, in geologic and geometric terms (such as vertical and lateral limits and gradient) which are clear and definite.

C. An aquifer or portion of an aquifer may be considered for aquifer designation under Subsection A of this section, if the applicant demonstrates that the following criteria are met:

(1) it is not currently used as a domestic or agricultural water supply; and

(2) there is no reasonable relationship between the economic and social costs of failure to designate and benefits to be obtained from its use as a domestic or agricultural water supply because:

(a) it is situated at a depth or location which makes recovery of water for drinking or agricultural purposes economically or technologically impractical at present and in the reasonably foreseeable future; or

(b) it is already so contaminated that it would be economically or technologically impractical to render that water fit for human consumption or agricultural use at present and in the reasonably foreseeable future.

D. The petition shall state the extent to which injection would add water contaminants to ground water and why the proposed aquifer designation should be approved. For Class III wells, the applicant shall state whether and to what extent restoration will be carried out.

E. The secretary shall either transmit the petition to the commission within 60 recommending that a public hearing be held, or refuse to transmit the petition and notify the applicant in writing citing reasons for such refusal.

F. If the secretary transmits the petition to the commission, the commission shall review the petition and determine to either grant or deny a public hearing on the petition. If the commission grants a public hearing, it shall issue a public notice, including the following information:

(1) name and address of the applicant;

(2) location, depth, TDS, areal extent, general description and common name or other identification of the aquifer for which designation is sought;

(3) nature of injection and extent to which the injection will add water contaminants to ground water; and

(4) address and telephone number at which interested persons may obtain further information.

G. If the secretary refuses to transmit the petition to the commission, then the applicant may appeal the secretary's disapproval of the proposed aquifer designation to the commission within 30 days, and address the issue of whether the proposed aquifer designation meets the criteria of Subsections A, B, C, and D of this section.

H. If the commission grants a public hearing, the hearing shall be held in accordance with the provisions of Section 74-6-6 NMSA 1978.

I. If the commission does not grant a public hearing on the petition, the aquifer designation shall not be approved.

J. After public hearing and consideration of all facts and circumstances included in Section 74-6-4(D) NMSA 1978, the commission may authorize the secretary to approve a proposed designated aquifer if the commission determines that the criteria of Subsections A, B, C, and D of this section are met.

K. Approval of a designated aquifer petition does not alleviate the applicant from complying with other sections of 20.6.2.5000 through 20.6.2.5399 NMAC, or of the responsibility for protection, pursuant to this part, of other nondesignated aquifers containing ground water having 10,000 mg/l or less TDS.

L. Persons other than the petitioner may add water contaminants as a result of injection into an aquifer designated for injection, provided the person receives a discharge permit pursuant to the requirements of 20.6.2.5000 through 20.6.2.5399 NMAC. Persons, other than the original petitioner or his designee, requesting addition of water contaminants as a result of injection into aquifers previously designated only for injection with partial restoration shall file a petition with the commission pursuant to the requirements of Subsections A, B, C, and D of this section.

[9-20-82, 12-1-95; 20.6.2.5103 NMAC - Rn, 20 NMAC 6.2.V.5103, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5104 WAIVER OF REQUIREMENT BY SECRETARY FOR CLASS I WELLS AND CLASS III WELLS:

A. Where a Class I well or a Class III well or well field, does not penetrate, or inject into or above, and which will not affect, ground water having 10,000 mg/l of less TDS, the secretary may:

(1) issue a discharge permit for a well or well field with less stringent requirements for area of review, construction, mechanical integrity, operation, monitoring, and reporting than required by 20.6.2.5000 through 20.6.2.5399 NMAC; or

(2) for Class III wells only, issue a discharge permit pursuant to the requirements of 20.6.2.3000 through 20.6.2.3114 NMAC.

B. Authorization of a reduction in requirements under Subsection A of this section shall be granted only if injection will not result in an increased risk of movement of fluids into ground water having 10,000 mg/l or less TDS, except for fluid movement approved pursuant to 20.6.2.5103 NMAC.

[9-20-82, 12-1-95; 20.6.2.5104 NMAC - Rn & A, 20 NMAC 6.2.V.5104, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5105 - 20.6.2.5199: [RESERVED]

[12-1-95; 20.6.2.5105 - 20.6.2.5199 NMAC - Rn, 20 NMAC 6.2.V.5105-5199, 1-15-01]

20.6.2.5200 TECHNICAL CRITERIA AND PERFORMANCE STANDARDS FOR CLASS I WELLS AND CLASS III WELLS:

[12-1-95; 20.6.2.5200 NMAC - Rn, 20 NMAC 6.2.V.5200, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5201 **PURPOSE:** 20.6.2.5200 through 20.6.2.5210 NMAC provide the technical criteria and performance standards for Class I wells and Class III wells. (20.6.2.5300 through 20.6.2.5399 NMAC provide certain additional technical and performance standards for Class I hazardous waste injection wells.)
[9-20-82; 20.6.2.5201 NMAC - Rn, 20 NMAC 6.2.V.5201, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5202 **AREA OF REVIEW:**

A. The area of review is the area surrounding a Class I non-hazardous waste injection well or Class III well or the area within and surrounding a well field that is to be examined to identify possible fluid conduits, including the location of all known wells and fractures which may penetrate the injection zone.

B. The area of review for each Class I non-hazardous waste injection well, or each Class III well or well field shall be an area which extends:

(1) two and one half (2 1/2) miles from the well, or well field; or

(2) one-quarter (1/4) mile from a well or well field where the area of review is calculated to be zero pursuant to Paragraph (3) of Subsection B below, or where the well field production at all times exceeds injection to produce a net withdrawal; or

(3) a suitable distance, not less than one-quarter (1/4) mile, proposed by the discharger and approved by the secretary, based upon a mathematical calculation to determine the area of review; computations to determine the area of review may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the Class I non-hazardous waste injection well, or Class III well or well field; the following modified Theis equation illustrates one form which the mathematical model may take to compute the area of review; the discharger must demonstrate that any equation or simulation used to compute the area of review applies to the hydrogeologic conditions in the area of review.

$$r = \left(\frac{2.25\, K\, H\, t}{S\, 10^{x}} \right)^{1/2}$$

Where:

$$x = \frac{4BKH\,(H_w - H_{bo})\,x\, S_pG_b}{2.3\, Q}$$

r = Radius of the area of review for a Class I non-hazardous waste injection well or Class III 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 lowest aquifer containing ground water of 10,000 mg/l or less TDS

H_w = Hydrostatic head of underground source of drinking water (length) measured from the base of the lowest aquifer containing ground water of 10,000 mg/l or less TDS

S_pG_b = Specific gravity of fluid in the injection zone (dimensionless)

B = 3.142 (dimensionless)

(4) The above equation is based on the following assumptions:

(a) the injection zone is homogenous and isotropic;

(b) the injection zone has infinite areal extent;

(c) the Class I non-hazardous waste injection well or Class III well penetrates the entire thickness of the injection zone;

(d) the well diameter is infinitesimal compared to "r" when injection time is longer than a few minutes; and

(e) the emplacement of fluid into the injection zone creates an instantaneous increase in pressure.

C. The secretary shall require submittal by the discharger of information regarding the area of review including the information to be considered by the secretary in Subsection B of Section 20.6.2.5210 NMAC.
[9-20-82, 12-1-95; 20.6.2.5202 NMAC - Rn, 20 NMAC 6.2.V.5202, 1-15-01; A, 12-1-01]

20.6.2.5203 CORRECTIVE ACTION FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:

A. Persons applying for approval of a Class I non-hazardous waste injection well, or a Class III well or well field shall identify the location of all known wells, drill holes, shafts, stopes and other conduits within the area of review which may penetrate the injection zone, in so far as is known or is reasonably available from the public records. For such wells or other conduits which are improperly sealed, completed, or abandoned, or otherwise provide a pathway for the migration of contaminants, the discharger shall address in the proposed discharge plan such steps or modifications (corrective action) as are necessary to prevent movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC.

B. Prior to operation, or continued operation of a well for which corrective action is required pursuant to Subsections A or D of Section 20.6.2.5203 NMAC, the discharger must demonstrate that:

(1) all required corrective action has been taken; or

(2) injection pressure is to be limited so that pressure in the injection zone does not cause fluid movement through any well or other conduit within the area of review into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC; this pressure limitation may be removed after all required corrective action has been taken.

C. In determining the adequacy of corrective action proposed in the discharge permit application, the following factors will be considered by the secretary:

(1) chemical nature and volume of the injected fluid;

(2) chemical nature of native fluids and by-products of injection;

(3) geology and hydrology;

(4) history of the injection and production operation;

(5) completion and plugging records;

(6) abandonment procedures in effect at the time a well, drill hole, or shaft was abandoned; and

(7) hydraulic connections with waters having 10,000 mg/l or less TDS

D. In the event that, after approval for a Class I non-hazardous waste injection well or Class III well has been granted, additional information is submitted or it is discovered that a well or other conduit within the applicable area of review might allow movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC, the secretary may require action in accordance with Subsection I of Section 20.6.2.5101 and Subsection B Section 20.6.2.5203 NMAC.
[9-20-82, 12-1-95; 20.6.2.5203 NMAC - Rn, 20 NMAC 6.2.V.5203, 1-15-01; A, 12-1-01]

20.6.2.5204 MECHANICAL INTEGRITY FOR CLASS I WELLS AND CLASS III WELLS:

A. A Class I well or Class III well has mechanical integrity if there is no detectable leak in the casing, tubing or packer which the secretary considers to be significant at maximum operating temperature and pressure; and no detectable conduit for fluid movement out of the injection zone through the well bore or vertical channels adjacent to the well bore which the secretary considers to be significant.

B. Prior to well injection and at least once every five years or more frequently as the secretary may require for good cause during the life of the well, the discharger must demonstrate that a Class I well or Class III well has mechanical integrity. The demonstration shall be made through use of the following tests:

(1) for evaluation of leaks:

(a) monitoring of annulus pressure (after an initial pressure test with liquid or gas before operation commences); or

(b) pressure test with liquid or gas;

(2) for determination of conduits for fluid movement:

(a) the results of a temperature or noise log; or

(b) where the nature of the casing used for Class III wells precludes use of these logs, cementing records and an appropriate monitoring program as the secretary may require which will demonstrate the presence of adequate cement to prevent such movement;

(3) other appropriate tests as the secretary may require.

C. The secretary may consider the use by the discharger of equivalent alternative test methods to determine mechanical integrity. The discharger shall submit information on the proposed test and all technical data supporting its use. The secretary may approve the request if it will reliably demonstrate the mechanical integrity of wells for which its use is proposed. For Class III wells this demonstration may be made by submission of adequate monitoring data after the initial mechanical integrity tests.

D. In conducting and evaluating the tests enumerated in this section or others to be allowed by the secretary, the discharger and the secretary shall apply methods and standards generally accepted in the affected industry. When the discharger reports the results of mechanical integrity tests to the secretary, he shall include a description of the test(s), the method(s) used, and the test results. In making an evaluation, the secretary's review shall include monitoring and other test data submitted since the previous evaluation.

[9-20-82, 12-1-95; 20.6.2.5204 NMAC - Rn, 20 NMAC 6.2.V.5204, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5205 CONSTRUCTION REQUIREMENTS FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:

A. General Construction Requirements Applicable to Class I non-hazardous waste injection wells and Class III wells.

(1) Construction of all Class I non-hazardous waste injection wells and all new Class III wells shall include casing and cementing. Prior to well injection, the discharger shall demonstrate that the construction and operation of:

(a) Class I non-hazardous waste injection wells will not cause or allow movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC;

(b) Class III wells will not cause or allow movement of fluids out of the injection zone into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC.

(2) The construction of each newly drilled well shall be designed for the proposed life expectancy of the well.

(3) In determining if the discharger has met the construction requirements of this section and has demonstrated adequate construction, the secretary shall consider the following factors:

(a) depth to the injection zone;

(b) injection pressure, external pressure, annular pressure, axial loading, and other stresses that may cause well failure;

(c) hole size;

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

(e) type and grade of cement;

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

(g) chemical and physical characteristics of the injected fluid, including corrosiveness, density, and temperature;

(h) chemical and physical characteristics of the formation fluids including pressure and temperature;

(i) chemical and physical characteristics of the receiving formation and confining zones including lithology and stratigraphy, and fracture pressure; and

(j) **d**epth, thickness and chemical characteristics of penetrated formations which may contain ground water.

(4) To demonstrate adequate construction, appropriate logs and other tests shall be conducted during the drilling and construction of new Class I non-hazardous waste injection wells or Class III wells or during work-over of existing wells in preparation for reactivation or for change to injection use. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the secretary for review prior to well injection. The logs and tests appropriate to each type of injection well shall be 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.

(a) The discharger shall demonstrate through use of sufficiently frequent deviation checks, or another equivalent method, that a Class I non-hazardous waste injection well or Class III well drilled using a pilot hole then enlarged by reaming or another method, does not allow a vertical avenue for fluid migration in the form of diverging holes created during drilling.

(b) The secretary may require use by the discharger of the following logs to assist in characterizing the formations penetrated and to demonstrate the integrity of the confining zones and the lack of vertical avenues for fluid migration:

(i) for casing intended to protect ground water having 10,000 mg/l or less TDS: resistivity, spontaneous potential, and caliper logs before the casing is installed; and a cement bond, or temperature log after the casing is set and cemented.

(ii) **f**or intermediate and long strings of casing intended to facilitate injection: resistivity, spontaneous potential, porosity, and gamma ray logs before the casing is installed; and fracture finder or spectral logs; and a cement bond or temperature log after the casing is set and cemented.

(5) In addition to the requirements of Section 20.6.2.5102 NMAC, the discharger shall provide notice prior to commencement of drilling, cementing and casing, well logging, mechanical integrity tests, and any well work-over to allow opportunity for on-site inspection by the secretary or his representative.

B. Additional construction requirements for Class I non-hazardous waste injection wells.

(1) All Class I non-hazardous waste injection wells shall be sited in such a manner that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, ground water having 10,000 mg/l TDS or less except as approved pursuant to Section 20.6.2.5103 NMAC.

(2) All Class I non-hazardous waste injection wells shall be cased and cemented by circulating cement to the surface.

(3) All Class I non-hazardous waste injection wells, except those municipal wells injecting noncorrosive wastes, shall inject fluids through tubing with a packer set in the annulus 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 length of service.

(a) The use of other alternatives to a packer may be allowed with the written approval of the secretary. To obtain approval, the operator shall submit a written request to the secretary which shall set forth the proposed alternative and all technical data supporting its use. The secretary may approve the request if the alternative method will reliably provide a comparable level of protection to ground water. The secretary may approve an alternative method solely for an individual well or for general use.

(b) In determining the adequacy of the specifications proposed by the discharger for tubing and packer, or a packer alternative, the secretary shall consider the following factors:

(i) depth of setting;

(ii) characteristics of injection fluid (chemical nature or characteristics, corrosiveness, and density);

(iii) injection pressure;

(iv) annular pressure;

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

(vi) size of casing.

C. Additional construction requirements for Class III wells.

(1) Where injection is into a formation containing ground water having 10,000 mg/l or less TDS, monitoring wells shall be completed into the injection zone and into the first formation above the injection zone containing ground water having 10,000 mg/l or less TDS which could be affected by the extraction operation. If ground water having 10,000 mg/l or less TDS below the injection zone could be affected by the extraction operation, monitoring of such ground water may be required. These wells shall be of sufficient number, located and constructed so as to detect any excursion of injection fluids, process byproducts, or formation fluids outside the extraction area or injection zone. The requirement for monitoring wells in aquifers designated pursuant to Section 20.6.2.5103 NMAC may be waived by the secretary, provided that the absence of monitoring wells does not result in an increased risk of movement of fluids into protected ground waters having 10,000 mg/l or less TDS.

(2) Where injection is into a formation which does not contain ground water having 10,000 mg/l or less TDS, no monitoring wells are necessary in the injection zone. However, monitoring wells may be necessary in adjoining zones with ground water having 10,000 mg/l or less TDS that could be affected by the extraction operation.

(3) In an area that the secretary determines is subject to subsidence or collapse, the required monitoring wells may be required to be located outside the physical influence of that area.

(4) In determining the adequacy of monitoring well location, number, construction and frequency of monitoring proposed by the discharger, the secretary shall consider the following factors:

(a) the local geology and hydrology;

(b) the operating pressures and whether a negative pressure gradient to the monitor well is being maintained;

(c) the nature and volume of injected fluid, formation water, and process by-products; and

(d) the number and spacing of Class III wells in the well field.

[9-20-82, 12-1-95; 20.6.2.5205 NMAC - Rn, 20 NMAC 6.2.V.5205, 1-15-01; A, 12-1-01]

20.6.2.5206 OPERATING REQUIREMENTS FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:

A. General operating requirements applicable to Class I non-hazardous waste injection wells and Class III wells.

(1) The maximum injection pressure at the wellhead shall not initiate new fractures or propagate existing fractures in the confining zone, or cause the movement of injection or formation fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC.

(2) Injection between the outermost casing and the well bore is prohibited in a zone other than the authorized injection zone.

B. Additional operating requirements for Class I non-hazardous waste injection wells.

(1) Except during well stimulation, the maximum injection pressure shall not initiate new fractures or propagate existing fractures in the injection zone.

(2) Unless an alternative to a packer has been approved under Subparagraph (c) of Paragraph (3) of Subsection B of Section 20.6.2.5205 NMAC, the annulus between the tubing and the long string of casing shall be filled with a fluid approved by the secretary and a pressure, also approved by the secretary shall be maintained on the annulus.

C. Additional operating requirements for Class III wells: Initiation of new fractures or propagation of existing fractures in the injection zone will not be approved by the secretary as part of a discharge permit unless it is done during well stimulation and the discharger demonstrates:

(1) that such fracturing will not cause movement of fluids out of the injection zone into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC; and

(2) that the provisions of Subsection C of Section 20.6.2.3109 and Subsection C of Section 20.6.2.5101 NMAC for protection of ground water are met.

[9-20-82, 12-1-95; 20.6.2.5206 NMAC - Rn, 20 NMAC 6.2.V.5206, 1-15-01; A, 12-1-01]

20.6.2.5207 MONITORING REQUIREMENTS FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:

A. The discharger shall demonstrate mechanical integrity for each Class I non-hazardous waste injection well or Class III well at least once every five years during the life of the well pursuant to Section 20.6.2.5204 NMAC.

B. Additional monitoring requirements for Class I non-hazardous waste injection wells.

(1) The discharger shall provide analysis of the injected fluids at least quarterly or, if necessary, more frequently to yield data representative of their characteristics.

(2) Continuous monitoring devices shall be used to provide a record of injection pressure, flow rate, flow volume, and pressure on the annulus between the tubing and the long string of casing.

(3) The discharger shall provide wells within the area of review as required by the discharge permit to be used by the discharger to monitor pressure in, and possible fluid movement into, ground water having 10,000 mg/l or less TDS except for such ground waters designated pursuant to Section 20.6.2.5103 NMAC. This Section does not require monitoring wells for Class I non-hazardous waste injection wells unless monitoring wells are necessary due to possible flow paths within the area of review.

C. Additional monitoring requirements for Class III wells.

(1) The discharger shall provide an analysis or description, whichever the secretary requires, of the injected fluids at least quarterly or, if necessary, more frequently to yield representative data.

(2) The discharger shall perform:

(a) appropriate monitoring of injected and produced fluid volumes by whichever of the following methods the secretary requires:

(i) recording injection pressure and either flow rate or volume every two weeks; or

(ii) metering and daily recording of fluid volumes;

(b) monitoring every two weeks, or more frequently as the secretary determines, of the monitor wells, required in Subsection C of Section 20.6.2.5205 NMAC for:

(i) water chemistry parameters used to detect any migration from the injection zone;

(ii) fluid levels adjacent to the injection zone; and

(c) other necessary monitoring as the secretary for good cause may require to detect movement of fluids from the injection zone into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to Section 20.6.2.5103 NMAC.

(3) With the approval of the secretary, all Class III wells may be monitored on a well field basis by manifold monitoring rather than on an individual well basis. Manifold monitoring to determine the quality, pressure, and flow rate of the injected fluid may be approved in cases of facilities consisting of more than one Class III well, operating with a common manifold, provided that the discharger demonstrates that manifold monitoring is comparable to individual well monitoring.

[9-20-82, 12-1-95; 20.6.2.5207 NMAC - Rn, 20 NMAC 6.2.V.5207, 1-15-01; A, 12-1-01]

20.6.2.5208 REPORTING REQUIREMENTS FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:

A. Reporting requirements for Class I non-hazardous waste injection wells.

(1) If a Class I non-hazardous waste injection well is found to be discharging or is suspected of discharging fluids into a zone or zones other than the permitted or authorized injection zone, the discharger shall within 24 hours notify the secretary of the circumstances and action taken. The discharger shall provide subsequent written reports as required by the secretary.

(2) The discharger shall provide reports quarterly to the secretary 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 of Section 20.6.2.5207 NMAC.

(3) The discharger shall report, no later than the first quarterly report after completion, the results of:

(a) periodic tests of mechanical integrity as required in Sections 20.6.2.5204 and 20.6.2.5207 NMAC;

(b) any other test of the Class I non-hazardous waste injection well conducted by the discharger if required by the secretary;

(c) any well work-over; and

(d) any changes within the area of review which might impact subsurface conditions.

B. Reporting requirements for Class III wells.

(1) The discharger shall notify the secretary within 48 hours of the detection or suspected detection of a leachate excursion, and provide subsequent reports as required by the secretary.

(2) The discharger shall provide to the secretary:

(a) reports on required monitoring quarterly, or more frequently as required by the secretary; and

(b) results of mechanical integrity testing as required in Sections 20.6.2.5204 and 20.6.2.5207 NMAC and any other periodic tests required by the secretary; these results are to be reported no later than the first regular report after the completion of the test.

(3) Where manifold monitoring is permitted, monitoring results may be reported on a well field basis, rather than individual well basis.

C. Report signatory requirements.

(1) All reports submitted pursuant to this sction shall be signed and certified as provided in Subsection G of Section 20.6.2.5101 NMAC, or by a duly authorized representative.

(2) For a person to be a duly authorized representative, authorization must:

(a) be made in writing by a signatory described in Paragraph (1) of Subsection G of Section 20.6.2.5101 NMAC;

(b) specify either an individual or a position having responsibility for the overall operation of that regulated facility or activity, such as the position of plant manager, operator of a well or well field, superintendent, or position of equivalent responsibility; and

(c) have been submitted to the secretary.

[9-20-82, 12-1-95; 20.6.2.5208 NMAC - Rn, 20 NMAC 6.2.V.5208, 1-15-01; A, 12-1-01]

20.6.2.5209 PLUGGING AND ABANDONMENT FOR CLASS I WELLS AND CLASS III WELLS:

A. The discharger shall submit as part of the discharge permit application, a plan for plugging and abandonment of a Class I well or a Class III well that meets the requirements of Subsection C of 20.6.2.3109, Subsection C of 20.6.2.5101, and 20.6.2.5005 NMAC for protection of ground water. If requested, a revised or updated abandonment plan shall be submitted for approval prior to closure. The obligation to implement the plugging and abandonment plan as well as the requirements of the plan survives the termination or expiration of the permit.

B. Prior to abandonment of a well used in a Class I well or Class III well operation, the well shall be plugged in a manner which will not allow the movement of fluids through the well bore out of the injection zone or between other zones of ground water. Cement plugs shall be used unless a comparable method has been approved by the secretary for the plugging of Class III wells at that site.

C. Prior to placement of the plugs, 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 approved by the secretary.

D. Placement of the plugs shall be accomplished by one of the following:

(1) the balance method; or

(2) the dump bailer method; or

(3) the two-plug method; or

(4) an equivalent method with the approval of the secretary.

E. The following shall be considered by the secretary in determining the adequacy of a plugging and abandonment plan:

(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 cementing slurry to be used;

(4) the method of placement of the plugs;

(5) the procedure to be used to plug and abandon the well; and

(6) such other factors that may affect the adequacy of the plan.

F. The discharger shall retain all records concerning the nature and composition of injected fluids until five years after completion of any plugging and abandonment procedures.

[9-20-82, 12-1-95; 20.6.2.5209 NMAC - Rn, 20 NMAC 6.2.V.5209, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5210 INFORMATION TO BE CONSIDERED BY THE SECRETARY FOR CLASS I WELLS AND CLASS III WELLS:

A. This section sets forth the information to be considered by the secretary in authorizing construction and use of a Class I well or Class III well or well field. Certain maps, cross-sections, tabulations of all wells within the area of review, and other data may be included in the discharge permit application submittal by reference provided they are current, readily available to the secretary and sufficiently identified to be retrieved.

B. Prior to the issuance of a discharge permit or project discharge permit allowing construction of a new Class I well, operation of an existing Class I well, or operation of a new or existing Class III well or well field, or conversion of any well to injection use, the secretary shall consider the following:

(1) information required in Subsection C of 20.6.2.3106 NMAC;

(2) a map showing the Class I well, or Class III well or well fields, for which approval is sought and the applicable area of review; within the area of review, the map must show, in so far as is known or is reasonably available from the public records, the number, name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells and other pertinent surface features, including residences and roads;

(3) a tabulation of data on all wells within the area of review which may penetrate into the proposed injection zone; such data shall include, as available, a description of each well's type, the distance and direction to the injection well or well field, construction, date drilled, location, depth, record of plugging or completion, and any additional information the secretary may require;

(4) 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 20.6.2.5203 NMAC;

(5) maps and cross-sections indicating the general vertical and lateral limits of all ground water having 10,000 mg/l or less TDS within the area of review, the position of such ground water within the area of review relative to the injection formation, and the direction of water movement, where known, in each zone of ground water which may be affected by the proposed injection operation;

(6) maps and cross-sections detailing the geology and geologic structure of the local area, including faults, if known or suspected;

(7) generalized maps and cross-sections illustrating the regional geologic setting;

(8) proposed operating data, including:

(a) average and maximum daily flow rate and volume of the fluid to be injected;

(b) average and maximum injection pressure;

(c) source of injection fluids and an analysis or description, whichever the secretary requires, of their chemical, physical, radiological and biological characteristics;

(9) results of the formation testing program to obtain an analysis or description, whichever the secretary requires, of the chemical, physical, and radiological characteristics of, and other information on, the receiving formation, provided that the secretary may issue a conditional approval of a discharge permit if he finds that further formation testing is necessary for final approval;

(10) expected pressure changes, native fluid displacement, and direction of movement of the injected fluid;

(11) proposed stimulation program;

(12) proposed or actual injection procedure;

(13) schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(14) construction procedures, including a cementing and casing program, logging procedures, deviation checks, and a drilling, testing, and coring program;

(15) contingency plans to cope with all shut-ins or well failures so as to prevent movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to 20.6.2.5103 NMAC;

(16) plans, including maps, for meeting the monitoring requirements of 20.6.2.5207 NMAC; and

(17) the ability of the discharger to undertake measures necessary to prevent contamination of ground water having 10,000 mg/l or less TDS after the cessation of operation, including the proper closing, plugging and abandonment of a well, ground water restoration if applicable, and any post-operational monitoring as may be needed; methods by which the discharger shall demonstrate the ability to undertake these measures shall include submission of a surety bond or other adequate assurances, such as financial statements or other materials acceptable to the secretary, such as: (1) a surety bond; (2) a trust fund with a New Mexico bank in the name of the state of New Mexico, with the state as beneficiary; (3) a non-renewable letter of credit made out to the state of New Mexico; (4) liability insurance specifically covering the contingencies listed in this paragraph; or (5) a performance bond, generally in conjunction with another type of financial assurance; such bond or materials shall be approved and executed prior to discharge permit issuance and shall become effective upon commencement of construction; if an adequate bond is posted by the discharger to a federal or another state agency, and this bond covers all of the measures referred to above, the secretary shall consider this bond as satisfying the bonding requirements of 20.6.2.5000 through 20.6.2.5299 NMAC wholly or in part, depending upon the extent to which such bond is adequate to ensure that the discharger will fully perform the measures required hereinabove.

C. Prior to the secretary's approval that allows the operation of a new or existing Class I well or Class III well or well field, the secretary shall consider the following:

(1) update of pertinent information required under Subsection B of 20.6.2.5210 NMAC;

(2) all available logging and testing program data on the well;

(3) the demonstration of mechanical integrity pursuant to 20.6.2.5204 NMAC;

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

(5) the results of the formation testing program;

(6) the physical, chemical, and biological interactions between the injected fluids and 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.

[9-20-82, 12-24-87, 12-1-95; 20.6.2.5210 NMAC - Rn, 20 NMAC 6.2.V.5210, 1-15-01; A, 12-1-01; A, 8-31-15]

20.6.2.5211 - 20.6.2.5299: [RESERVED]
[12-1-95; 20.6.2.5211 - 20.6.2.5299 NMAC - Rn, 20 NMAC 6.2.V.5211-5299, 1-15-01]

20.6.2.5300 REQUIREMENTS FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided for in 20.6.2.5300 through 20.6.2.5399 NMAC, Class I hazardous waste wells are subject to the minimum permit requirements for all Class I wells in 20.6.2.5000 through 20.6.2.5299 NMAC, in addition to the requirements of 20.6.2.5300 through 20.6.2.5399 NMAC. To the extent any requirement in 20.6.2.5300 through 20.6.2.5399 NMAC conflicts with a requirement of 20.6.2.5000 through 20.6.2.5299 NMAC, Class I hazardous waste injection wells must comply with 20.6.2.5300 through 20.6.2.5399 NMAC.

B. Class I hazardous waste injection wells are only authorized for use by petroleum refineries for the waste generated by the refinery ("generator").

C. The New Mexico energy, minerals and natural resources department, oil conservation division will administer and oversee all permitting of Class I hazardous waste wells pursuant to 20.6.2.5300 through 20.6.2.5399 NMAC.

[20.6.2.5300 NMAC - N, 8-31-15]

20.6.2.5301 DEFINITIONS: As used in 20.6.2.5300 through 20.6.2.5399 NMAC:

A. "**cone of influence**" means that area around the well within which increased injection zone pressures caused by injection into the hazardous waste injection well would be sufficient to drive fluids into groundwater of the state of New Mexico;

B. "**director**" means the director of the New Mexico energy, minerals and natural resources department, oil conservation division or his/her designee;

C. "**existing well**" means a Class I hazardous waste injection well which has become a Class I hazardous waste injection well as a result of a change in the definition of the injected waste which would render the waste hazardous under 20.4.1.200 NMAC (incorporating 40 C.F.R. Section 261.3);

D. "**groundwater of the state of New Mexico**" means, consistent with 20.6.2.5001 NMAC, an aquifer that contains ground water having a TDS concentration of 10,000 mg/l or less;

E. "**injection interval**" means that part of the injection zone in which the well is screened, or in which the waste is otherwise directly emplaced;

F. "**new well**" means any Class I hazardous waste injection well which is not an existing well;

G. "**transmissive fault or fracture**" is a fault or fracture that has sufficient permeability and vertical extent to allow fluids to move between formations.

[20.6.2.5301 NMAC - N, 8-31-15]

20.6.2.5302 FEES FOR CLASS I HAZARDOUS WASTE INJECTION WELLS: For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of 20.6.2.3114 NMAC.

A. *Filing Fee.* Every facility submitting a discharge permit application for approval of a Class I hazardous waste injection well shall pay a filing fee of $100 to the water quality management fund at the time the permit application is submitted. The filing fee is nonrefundable.

B. *Permit fee.*

(1) Every facility submitting a discharge permit application for approval of a Class I hazardous waste injection well shall pay a permit fee of $30,000 to the water quality management fund. The permit fee may be paid in a single payment at the time of permit approval or in equal installments over the term of the permit. Installment payments shall be remitted yearly, with the first installment due on the date of permit approval. Subsequent installments shall be remitted yearly thereafter. The permit or permit application review of any facility shall be suspended or terminated if the facility fails to submit an installment payment by its due date.

(2) Facilities applying for permits which are subsequently withdrawn or denied shall pay one-half of the permit fee at the time of denial or withdrawal.

C. *Annual administration fee.* Every facility that receives a Class I hazardous waste injection well permit shall pay an annual administrative fee of $20,000 to the water quality management fund. The initial administrative fee shall be remitted one year after commencement of disposal operations pursuant to the permit. Subsequent administrative fees shall be remitted annually thereafter.

D. *Renewal fee.*

(1) Every facility submitting a discharge permit application for renewal of a Class I hazardous waste injection well shall pay a renewal fee of $10,000 to the water quality management fund. The renewal fee may be paid in a single payment at the time of permit renewal or in equal installments over the term of the permit. Installment payments shall be remitted yearly, with the first installment due on the date of permit renewal. Subsequent installments shall be remitted yearly thereafter. The permit or permit renewal review of any facility shall be suspended or terminated if the facility fails to submit an installment payment by its due date.

(2) The director may waive or reduce fees for discharge permit renewals which require little or no cost for investigation or issuance.

E. *Modification fees.*

(1) Every facility submitting an application for a discharge permit modification of a Class I hazardous waste injection well will be assessed a filing fee plus a modification fee of $10,000 to the water quality management fund.

(2) Every facility submitting an application for other changes to a Class I hazardous waste injection well discharge permit will be assessed a filing fee plus a minor modification fee of $1,000 to the water quality management fund.

(3) Applications for both renewal and modification shall pay a filing fee plus renewal fee.

(4) If the director requires a discharge permit change as a component of an enforcement action, the facility shall pay the applicable modification fee. If the director requires a discharge permit change outside the context of an enforcement action, the facility shall not be assessed a fee.

(5) The director may waive or reduce fees for discharge permit changes which require little or no cost for investigation or issuance.

F. *Financial assurance fees.*

(1) Facilities with approved Class I hazardous waste injection well permits shall pay the financial assurance fees specified in Table 2 of 20.6.2.3114 NMAC.

(2) Facilities relying on the corporate guarantee for financial assurance shall pay an additional fee of $5,000 to the water quality management fund.

[20.6.2.5302 NMAC - N, 8-31-15]

20.6.2.5303 CONVERSION OF EXISTING INJECTION WELLS: An existing Class I non-hazardous waste injection well may be converted to a Class I hazardous waste injection well provided the well meets the modeling, design, compatibility, and other requirements set forth in 20.6.2.5300 through 20.6.2.5399 NMAC and the permittee receives a Class I hazardous waste permit pursuant to those sections.

[20.6.2.5303 NMAC - N, 8-31-15]

20.6.2.5304 - 20.6.2.5309: [RESERVED]

20.6.2.5310 REQUIREMENTS FOR WELLS INJECTING HAZARDOUS WASTE REQUIRED TO BE ACCOMPANIED BY A MANIFEST:

A. *Applicability*. The regulations in this section apply to all generators of hazardous waste, and to the owners or operators of all hazardous waste management facilities, using any class of well to inject hazardous wastes accompanied by a manifest. (See also Subparagraph (b) of Paragraph (3) of Subsection A of 20.6.2.5004 NMAC.)

B. *Authorization*. The owner or operator of any well that is used to inject hazardous waste required to be accompanied by a manifest or delivery document shall apply for authorization to inject as specified in 20.6.2.5102 NMAC within six months after the approval or promulgation of the state UIC program.

C. *Requirements*. In addition to complying with the applicable requirements of this part, the owner or operator of each facility meeting the requirements of Subsection B of this section, shall comply with the following.

(1) *Notification*. The owner or operator shall comply with the notification requirements of 42 U.S.C. Section 6930.

(2) *Identification number*. The owner or operator shall comply with the requirements of 20.4.1.500 NMAC (incorporating 40 CFR Section 264.11).

(3) *Manifest system*. The owner or operator shall comply with the applicable recordkeeping and reporting requirements for manifested wastes in 20.4.1.500 NMAC (incorporating 40 CFR Section 264.71).

(4) *Manifest discrepancies*. The owner or operator shall comply with 20.4.1.500 NMAC (incorporating 40 CFR Section 264.72).

(5) *Operating record*. The owner or operator shall comply with 20.4.1.500 NMAC (incorporating 40 CFR Sections 264.73(a), (b)(1), and (b)(2)).

(6) *Annual report*. The owner or operator shall comply with 20.4.1.500 NMAC (incorporating 40 CFR Section 264.75).

(7) *Unmanifested waste report*. The owner or operator shall comply with 20.4.1.500 NMAC (incorporating 40 CFR Section 264.75).

(8) *Personnel training*. The owner or operator shall comply with the applicable personnel training requirements of 20.4.1.500 NMAC (incorporating 40 CFR Section 264.16).

(9) *Certification of closure*. When abandonment is completed, the owner or operator must submit to the director certification by the owner or operator and certification by an independent registered professional engineer that the facility has been closed in accordance with the specifications in 20.6.2.5209 NMAC.
[20.6.2.5310 NMAC - N, 8-31-15]

20.6.2.5311 - 20.6.2.5319: [RESERVED]

20.6.2.5320 ADOPTION OF 40 CFR PART 144, SUBPART F (FINANCIAL RESPONSIBILITY: CLASS I HAZARDOUS WASTE INJECTION WELLS): Except as otherwise provided, the regulations of the United States environmental protection agency set forth in 40 CFR Part 144, Subpart F are hereby incorporated by reference.
[20.6.2.5320 NMAC - N, 8-31-15]

20.6.2.5321 MODIFICATIONS, EXCEPTIONS, AND OMISSIONS: Except as otherwise provided, the following modifications, exceptions, and omissions are made to the incorporated federal regulations.

A. The following term defined in 40 CFR Section 144.61 has the meaning set forth herein, in lieu of the meaning set forth in 40 CFR Section 144.61: "plugging and abandonment plan" means the plan for plugging and abandonment prepared in accordance with the requirements of 20.6.2.5341 NMAC.

B. The following terms not defined in 40 CFR Part 144, Subsection F have the meanings set forth herein when the terms are used in this part:

(1) "administrator," "regional administrator" and other similar variations means the director of the New Mexico energy, minerals and natural resources department, oil conservation division or his/her designee;

(2) "United States environmental protection agency" or "EPA" means New Mexico energy, minerals and natural resources department, oil conservation division or OCD, except when used in 40 CFR Section 144.70(f).

C. The following provisions of 40 CFR Part 144, Subpart F are modified in 20.6.2.5321 NMAC:

(1) cross references to 40 CFR Part 144 shall be replaced by cross references to 20.6.2.5300 through 20.6.2.5399 NMAC;

(2) the cross reference to Sections 144.28 and 144.51 in Section 144.62(a) shall be replaced by a cross reference to 20.6.2.5341 NMAC;

(3) the cross references to 40 CFR Parts 264, Subpart H and 265, Subpart H shall be modified to include cross references to 40 CFR Parts 264, Subpart H and 265, Subpart H and 20.4.1.500 and 20.4.1.600 NMAC;

(4) references to EPA identification numbers in financial assurance documents shall be replaced by references to API well numbers (US well numbers);

(5) the first sentence of 40 CFR Section 144.63(f)(1) shall be replaced with the following sentence: "An owner or operator may satisfy the requirements of this section by obtaining a guarantee from a corporate parent that meets the requirements of 40 CFR Section 144.63(f)(10), including the guarantor meeting the requirements for the owner or operator under the financial test specified in this paragraph.";

(6) trust agreements prepared in accordance with 40 CFR Section 144.70(a) must state that they will be administered, construed, and enforced according to the laws of New Mexico;

(7) surety companies issuing bonds prepared in accordance with 40 CFR Section 144, Subpart F must be registered with the New Mexico office of superintendent of insurance;

D. The following provisions of 40 CFR Part 144, Subpart F are omitted from 20.6.2.5320 NMAC:

(1) Section 144.65;

(2) Section 144.66;

(3) the third sentence in 40 CFR Section 144.63(h).

[20.6.2.5321 NMAC - N, 8-31-15]

20.6.2.5322 - 20.6.2.5340 [RESERVED]

20.6.2.5341 CONDITIONS APPLICABLE TO ALL PERMITS: The following conditions apply to all Class I hazardous permits. All conditions applicable to all permits shall be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to these regulations must be given in the permit.

A. *Duty to comply.* The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the New Mexico Water Quality Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the permittee need not comply with the provisions of this permit to the extent and for the duration such noncompliance is authorized in a variance issued under 20.6.2.1210 NMAC.

B. *Duty to reapply.* If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a permit renewal pursuant to Subsection F of 20.6.2.3106 NMAC.

C. *Need to halt or reduce activity not a defense.* 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.

D. *Duty to mitigate.* The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

E. *Proper operation and maintenance.* The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which 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.

F. *Permit actions.* 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.

G. *Property rights.* This permit does not convey any property rights of any sort, or any exclusive privilege.

H. *Duty to provide information.* 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.

I. *Duty to provide notice.* Public notice, when required, shall be provided as set forth in 20.6.2.3108 NMAC except that the following notice shall be provided in lieu of the notice required by Paragraph (2) of Subsection B of 20.6.2.3108 NMAC: a written notice must be sent by certified mail, return receipt requested, to all surface and mineral owners of record within a ½ mile radius of the proposed well or wells.

J. *Inspection and entry.* 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:

(1) 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;

(2) have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(3) inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(4) sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the 20.6.2.5300 through 20.6.2.5399 NMAC, any substances or parameters at any location.

K. *Monitoring and records.*

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) The permittee shall retain records of all monitoring information, including the following:

(a) 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

(b) the nature and composition of all injected fluids until three years after the completion of any plugging and abandonment procedures specified under 20.6.2.5351 through 20.6.2.5363 NMAC; the director may require the owner or operator to deliver the records to the director at the conclusion of the retention period.

(3) Records of monitoring information shall include:

(a) the date, exact place, and time of sampling or measurements;

(b) the individual(s) who performed the sampling or measurements;

(c) the date(s) analyses were performed;

(d) the individual(s) who performed the analyses;

(e) the analytical techniques or methods used; and

(f) the results of such analyses.

L. *Signatory requirement.* All applications, reports, or information submitted to the director shall be signed and certified. (See Subsection G of 20.6.2.5101 NMAC.)

M. *Reporting requirements.*

(1) *Planned changes.* The permittee shall give notice to the director as soon as possible of any planned physical alterations or additions to the permitted facility.

(2) *Anticipated noncompliance.* The permittee shall give advance notice to the director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(3) *Monitoring reports.* Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(4) *Compliance schedules.* 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.

(5) *Twenty-four hour reporting.* The permittee shall report any noncompliance which may endanger health or the environment, including:

(a) any monitoring or other information which indicates that any contaminant may cause an endangerment to groundwater of the state of New Mexico; or

(b) any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between groundwater of the state of New Mexico; 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 area affected by the noncompliance, including any groundwater of the state of New Mexico; 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; the date and time the permittee became aware of the noncompliance; and steps taken or planned to reduce, remediate, eliminate, and prevent reoccurrence of the noncompliance.

(6) *Other noncompliance.* The permittee shall report all instances of noncompliance not reported under Paragraphs (3), (4), and (5) of Subsection M of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph (5) of Subsection M of this section.

(7) *Other information.* 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.

N. *Requirements prior to commencing injection.* A new injection well may not commence injection until construction is complete; and

(1) the permittee has submitted notice of completion of construction to the director; and

(2) the director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the permit; or 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 in Paragraph (1) of Subsection N 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.

O. The permittee shall notify the director at such times as the permit requires before conversion or abandonment of the well.

P. The permittee shall meet the requirements of 20.6.2.5209 NMAC.

Q. *Plugging and abandonment report.* 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:

(1) a statement that the well was plugged in accordance with the plan previously submitted to the director; or

(2) 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.

R. *Duty to establish and maintain mechanical integrity.*

(1) The permittee shall meet the requirements of 20.6.2.5204 NMAC.

(2) When the director determines that a Class I hazardous well lacks mechanical integrity pursuant to 20.6.2.5204 NMAC, the director shall give written notice of the director's 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 20.6.2.5209 NMAC 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 groundwater of the state of New Mexico 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 20.6.2.5204 and 20.6.2.5358 NMAC.

(3) The director may allow the owner or operator of a well which lacks mechanical integrity pursuant to Subsection A of 20.6.2.5204 NMAC 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 groundwater of the state of New Mexico.

S. *Transfer of a permit.* The operator shall not transfer a permit without the director's prior written approval. A request for transfer of a permit shall identify officers, directors and owners of 25% or greater in the transferee. Unless the director otherwise orders, public notice or hearing are not required for the transfer request's approval. If the director denies the transfer request, it shall notify the operator and the proposed transferee of the denial by certified mail, return receipt requested, and either the operator or the proposed transferee may request a hearing with 10 days after receipt of the notice. Until the director approves the transfer and the required financial assurance is in place, the director shall not release the transferor's financial assurance.
[20.6.2.5341 NMAC - N, 8-31-15]

20.6.2.5342 ESTABLISHING PERMIT CONDITIONS:

A. In addition to conditions required in 20.6.2.5341 NMAC, the director shall establish conditions, as required on a case-by-case basis under Subsection H of 20.6.2.3109 NMAC, Subsection A of 20.6.2.5343 NMAC, and 20.6.2.5344 NMAC. Permits for owners or operators of hazardous waste injection wells shall also include conditions meeting the requirements of 20.6.2.5310 NMAC, Paragraphs (1) and (2) of Subsection A of this section, and 20.6.2.5351 through 20.6.2.5363 NMAC.

(1) *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 Subsection P of 20.6.2.5341 NMAC, and 20.6.2.5209 NMAC, and submitted a plugging and abandonment report pursuant to Subsection Q of 20.6.2.5341 NMAC; or

(ii) the well has been converted in compliance with the requirements of Subsection O of 20.6.2.5341 NMAC; or

(iii) the transferor of a permit has received notice from the director that the transfer has been approved and that the transferee's required financial assurance is in place.

(b) The owner or operator of a well injecting hazardous waste must comply with the financial responsibility requirements of 20.6.2.5320 NMAC.

(2) *Additional conditions.* The director shall impose on a case-by-case basis such additional conditions as are necessary to prevent the migration of fluids into groundwater of the state of New Mexico.

B. *Applicable requirements.*

(1) 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 part.

(2) An applicable requirement is a state statutory or regulatory requirement which takes effect prior to final administrative disposition of the permit. An applicable requirement is also any requirement which takes effect prior to the modification or revocation and reissuance of a permit.

(3) New or renewed permits, and to the extent allowed under 20.6.2.3109 NMAC modified or terminated permits, shall incorporate each of the applicable requirements referenced in 20.6.2.5342 NMAC.

C. *Incorporation.* 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.

[20.6.2.5342 NMAC - N, 8-31-15]

20.6.2.5343 SCHEDULE OF COMPLIANCE:

A. *General.* The permit may, when appropriate, specify a schedule of compliance leading to compliance with this part.

(1) *Time for compliance.* Any schedules of compliance shall require compliance as soon as possible, and in no case later than three years after the effective date of the permit.

(2) *Interim dates.* Except as provided in Subparagraph (b) of Paragraph (1) of Subsection B of this section, if a permit establishes a schedule of compliance which 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) *Reporting.* The permit shall be written to require that if Paragraph (1) of Subsection A 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. *Alternative schedules of compliance.* A permit applicant or permittee may cease conducting regulated activities (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 which will ensure timely compliance with 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 which 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 regulated activities by a date which will ensure timely compliance with applicable requirements;

(d) each permit containing two schedules shall include a requirement that after the permittee has made a final decision under Subparagraph (a) of Paragraph (3) of Subsection B of this section it shall follow the schedule leading to compliance if the decision is to continue conducting 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.

[20.6.2.5343 NMAC - N, 8-31-15]

20.6.2.5344 REQUIERMENTS FOR RECORDING AND REPORTING OF MONITORING RESULTS: All permits shall specify:

A. requirements concerning the proper use, maintenance, and installation, when appropriate, of monitoring equipment or methods (including biological monitoring methods when appropriate);

B. required monitoring including type, intervals, and frequency sufficient to yield data which are representative of the monitored activity including when appropriate, continuous monitoring;

C. applicable reporting requirements based upon the impact of the regulated activity and as specified in 20.6.2.5359 NMAC; reporting shall be no less frequent than specified in the above regulations.

[20.6.2.5344 NMAC - N, 8-31-15]

20.6.2.5345 - 20.6.2.5350: [RESERVED]

20.6.2.5351 APPLICABILITY: 20.6.2.5351 through 20.6.2.5363 NMAC establish criteria and standards for underground injection control programs to regulate Class I hazardous waste injection wells. Unless otherwise noted, these sections supplement the requirements of 20.6.2.5000 through 20.6.2.5299 NMAC and apply instead of any inconsistent requirements for Class I non-hazardous waste injection wells.

[20.6.2.5351 NMAC - N, 8-31-15]

20.6.2.5352 MINIMUM CRITERIA FOR SITING:

A. All Class I hazardous waste injection wells shall be sited such that they inject into a formation that is beneath the lowermost formation containing within one quarter mile of the well bore groundwater of the state of New Mexico.

B. The siting of Class I hazardous waste injection wells shall be limited to areas that are geologically suitable. The director shall determine geologic suitability based upon:

(1) an analysis of the structural and stratigraphic geology, the hydrogeology, and the seismicity of the region;

(2) an analysis of the local geology and hydrogeology of the well site, including, at a minimum, detailed information regarding stratigraphy, structure and rock properties, aquifer hydrodynamics and mineral resources; and

(3) a determination that the geology of the area can be described confidently and that limits of waste fate and transport can be accurately predicted through the use of models.

C. Class I hazardous waste injection wells shall be sited such that:

(1) the injection zone has sufficient permeability, porosity, thickness and areal extent to prevent migration of fluids into groundwater of the state of New Mexico; and

(2) the confining zone:

(a) is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent the movement of fluids into groundwater of the state of New Mexico; and

(b) contains at least one formation of sufficient thickness and with lithologic and stress characteristics capable of preventing vertical propagation of fractures.

D. The owner or operator shall demonstrate to the satisfaction of the director that:

(1) the confining zone is separated from the base of the lowermost groundwater of the state of New Mexico by at least one sequence of permeable and less permeable strata that will provide an added layer of protection for groundwater of the state of New Mexico in the event of fluid movement in an unlocated borehole or transmissive fault; or

(2) within the area of review, the piezometric surface of the fluid in the injection zone is less than the piezometric surface of the lowermost groundwater of the state of New Mexico, considering density effects, injection pressures and any significant pumping in the overlying groundwater of the state of New Mexico; or

(3) there is no groundwater of the state of New Mexico present.

(4) The director may approve a site which does not meet the requirements in Paragraphs (1), (2), or (3) of Subsections D of this section if the owner or operator can demonstrate to the director that because of the geology, nature of the waste, or other considerations, abandoned boreholes or other conduits would not cause endangerment of groundwater of the state of New Mexico.

[20.6.2.5352 NMAC - N, 8-31-15]

20.6.2.5353 AREA OF REVIEW: For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of 20.6.2.5202 NMAC. The area of review for Class I hazardous waste injection wells shall be a two-mile radius around the well bore. The director may specify a larger area of review based on the calculated cone of influence of the well.

[20.6.2.5353 NMAC - N, 8-31-15]

20.6.2.5354 CORRECTIVE ACTION FOR WELLS IN THE AREA OF REVIEW: For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of 20.6.2.5203 NMAC.

A. The owner or operator of a Class I hazardous waste well shall as part of the permit application submit a plan to the director outlining the protocol used to:

(1) identify all wells penetrating the confining zone or injection zone within the area of review; and

(2) determine whether wells are adequately completed or plugged.

B. The owner or operator of a Class I hazardous waste well shall identify the location of all wells within the area of review that penetrate the injection zone or the confining zone and shall submit as required in Subsection A of 20.6.2.5360 NMAC:

(1) a tabulation of all wells within the area of review that penetrate the injection zone or the confining zone; and

(2) a description of each well or type of well and any records of its plugging or completion.

C. For wells that the director determines are improperly plugged, completed, or abandoned, or for which plugging or completion information is unavailable, the applicant shall also submit a plan consisting of such steps or modification as are necessary to prevent movement of fluids into or between groundwater of the state of New Mexico. 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 (based at a minimum on the factors in Subsection E of this section), the director shall:

(1) require the applicant to revise the plan;

(2) prescribe a plan for corrective action as a condition of the permit; or

(3) deny the application.

D. Requirements.

(1) Existing injection wells. Any permit issued for an existing Class I hazardous waste injection well requiring corrective action other than pressure limitations shall include a compliance schedule requiring any corrective action accepted or prescribed under Subsection C of this section. Any such compliance schedule shall provide for compliance no later than two years following issuance of the permit and shall require observance of appropriate pressure limitations under Paragraph (3) of Subsection D until all other corrective action measures have been implemented.

(2) New injection wells. No owner or operator of a new Class I hazardous waste injection well may begin injection until all corrective actions required under this section have been taken.

(3) The director may require pressure limitations in lieu of plugging. If pressure limitations are used in lieu of plugging, the director shall require as a permit condition that injection pressure be so limited that pressure in the injection zone at the site of any improperly completed or abandoned well within the area of review would not be sufficient to drive fluids into or between groundwater of the state of New Mexico. This pressure limitation shall satisfy the corrective action requirement. Alternatively, such injection pressure limitation may be made part of a compliance schedule and may be required to be maintained until all other required corrective actions have been implemented.

E. In determining the adequacy of corrective action proposed by the applicant under Subsection C of this section and in determining the additional steps needed to prevent fluid movement into and between groundwater of the state of New Mexico, the following criteria and factors shall be considered by the director:

(1) nature and volume of injected fluid;

(2) nature of native fluids or byproducts of injection;

(3) geology;

(4) hydrology;

(5) history of the injection operation;

(6) completion and plugging records;

(7) closure procedures in effect at the time the well was closed;

(8) hydraulic connections with groundwater of the state of New Mexico;

(9) reliability of the procedures used to identify abandoned wells; and

(10) any other factors which might affect the movement of fluids into or between groundwater of the state of New Mexico.

[20.6.2.5354 NMAC - N, 8-31-15]

20.6.2.5355 CONSTRUCTION REQUIREMENTS:

A. *General.* All existing and new Class I hazardous waste injection wells shall be constructed and completed to:

(1) prevent the movement of fluids into or between groundwater of the state of New Mexico or into any unauthorized zones;

(2) permit the use of appropriate testing devices and workover tools; and

(3) permit continuous monitoring of injection tubing and long string casing as required pursuant to Subsection F of 20.6.2.5357 NMAC.

B. *Compatibility.* All well materials must be compatible with fluids with which the materials may be expected to come into contact. A well shall be deemed to have compatibility as long as the materials used in the construction of the well meet or exceed standards developed for such materials by the American petroleum institute, ASTM, or comparable standards acceptable to the director.

C. *Casing and cementing of new wells.*

(1) Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period. The casing and cementing program shall be designed to prevent the movement of fluids into or between groundwater of the state of New Mexico, and to prevent potential leaks of fluids from the well. In determining and specifying casing and cementing requirements, the director shall consider the following information as required by 20.6.2.5360 NMAC:

(a) depth to the injection zone;

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

(c) hole size;

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

(e) corrosiveness of injected fluid, formation fluids and temperature;

(f) lithology of injection and confining zones;

(g) type or grade of cement; and

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

(2) One surface casing string shall, at a minimum, extend into the confining bed below the lowest formation that contains groundwater of the state of New Mexico and be cemented by circulating cement from the base of the casing to the surface, using a minimum of 120% of the calculated annual volume. The director may require more than 120% when the geology or other circumstances warrant it.

(3) At least one long string casing, using a sufficient number of centralizers, shall extend to the injection zone and shall be cemented by circulating cement to the surface in one or more stages:

(a) of sufficient quantity and quality to withstand the maximum operating pressure; and

(b) in a quantity no less than 120% of the calculated volume necessary to fill the annular space; the director may require more than 120% when the geology or other circumstances warrant it.

(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 is continuous and does not allow fluid movement behind the well bore.

(5) Casings, including any casing connections, must be rated to have sufficient structural strength to withstand, for the design life of the well:

(a) the maximum burst and collapse pressures which may be experienced during the construction, operation and closure of the well; and

(b) the maximum tensile stress which may be experienced at any point along the length of the casing during the construction, operation, and closure of the well.

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

D. *Tubing and packer.*

(1) All Class I hazardous waste injection wells shall inject fluids through tubing with a packer set at a point specified by the director.

(2) In determining and specifying requirements for tubing and packer, the following factors shall be considered:

(a) depth of setting;

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

(c) injection pressure;

(d) annular pressure;

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

(f) size of casing; and

(g) tubing tensile, burst, and collapse strengths.

(3) The director may approve the use of a fluid seal if he determines that the following conditions are met:

(a) the operator demonstrates that the seal will provide a level of protection comparable to a packer;

(b) the operator demonstrates that the staff is, and will remain, adequately trained to operate and maintain the well and to identify and interpret variations in parameters of concern;

(c) the permit contains specific limitations on variations in annular pressure and loss of annular fluid;

(d) the design and construction of the well allows continuous monitoring of the annular pressure and mass balance of annular fluid; and

(e) a secondary system is used to monitor the interface between the annulus fluid and the injection fluid and the permit contains requirements for testing the system every three months and recording the results.

[20.6.2.5355 NMAC - N, 8-31-15]

20.6.2.5356 LOGGING, SAMPLING, AND TESTING PRIOR TO NEW WELL OPERATION:

A. During the drilling and construction of a new Class I hazardous waste injection well, appropriate logs and tests shall be run to determine or verify the depth, thickness, porosity, permeability, and rock type of, and the salinity of any entrained fluids in, all relevant geologic units to assure conformance with performance standards in 20.6.2.5355 NMAC, and to establish accurate baseline data against which future measurements may be compared. A descriptive report interpreting 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 during drilling on all holes constructed by drilling pilot holes which are enlarged by reaming or another method; such checks shall be at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling; and

(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; at a minimum, the following logs shall be required in the following situations:

(a) upon installation of the surface casing:

(i) resistivity, spontaneous potential, and caliper logs before the casing is installed; and

(ii) a cement bond and variable density log, and a temperature log after the casing is set and cemented;

(b) upon installation of the long string casing:

(i) resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs before the casing is installed; and

(ii) a cement bond and variable density log, and a temperature log after the casing is set and cemented;

(c) the director may allow the use of an alternative to the above logs when an alternative will provide equivalent or better information; and

(3) a mechanical integrity test consisting of:

(a) a pressure test with liquid or gas;

(b) a radioactive tracer survey;

(c) a temperature or noise log;

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

(e) any other test required by the director.

B. Whole cores or sidewall cores of the confining and injection zones and formation fluid samples from the injection zone shall be taken. The director may accept 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 fluid temperature, pH, conductivity, pressure and the static fluid level of the injection zone must be recorded.

D. At a minimum, the following information concerning the injection and confining zones shall be determined or calculated for Class I hazardous waste injection wells:

(1) fracture pressure;

(2) other physical and chemical characteristics of the injection and confining zones; and

(3) physical and chemical characteristics of the formation fluids in the injection zone.

E. Upon completion, but prior to operation, the owner or operator shall conduct the following tests to verify hydrogeologic characteristics of the injection zone:

(1) a pump test; or

(2) injectivity tests.

F. The director shall have the opportunity to witness all logging and testing required by 20.6.2.5351 through 20.6.2.5363 NMAC. The owner or operator shall submit a schedule of such activities to the director 30 days prior to conducting the first test.

[20.6.2.5356 NMAC - N, 8-31-15]

20.6.2.5357 OPERATING REQUIREMENTS:

A. Except during stimulation, the owner or operator shall assure that injection pressure at the wellhead does 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. The owner or operator shall assure that the injection pressure does not initiate fractures or propagate existing fractures in the confining zone, nor cause the movement of injection or formation fluids into groundwater of the state of New Mexico.

B. Injection between the outermost casing protecting groundwater of the state of New Mexico and the well bore is prohibited.

C. The owner or operator shall maintain an annulus pressure that exceeds the operating injection pressure, unless the director determines that such a requirement might harm the integrity of the well. The fluid in the annulus shall be noncorrosive, or shall contain a corrosion inhibitor.

D. The owner or operator shall maintain mechanical integrity of the injection well at all times.

E. Permit requirements for owners or operators of hazardous waste wells which inject wastes which have the potential to react with the injection formation to generate gases shall include:

(1) conditions limiting the temperature, pH or acidity of the injected waste; and

(2) procedures necessary to assure that pressure imbalances which might cause a backflow or blowout do not occur.

F. The owner or operator shall install and use continuous recording devices to monitor: the injection pressure; the flow rate, volume, and temperature of injected fluids; and the pressure on the annulus between the tubing and the long string casing, and shall install and use:

(1) automatic alarm and automatic shut-off systems, designed to sound and shut-in the well when pressures and flow rates or other parameters approved by the director exceed a range or gradient specified in the permit; or

(2) automatic alarms, designed to sound when the pressures and flow rates or other parameters approved by the director exceed a rate or gradient specified in the permit, in cases where the owner or operator certifies that a trained operator will be on-site at all times when the well is operating.

G. If an automatic alarm or shutdown is triggered, the owner or operator shall immediately investigate and identify as expeditiously as possible the cause of the alarm or shutoff. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under Subsection F of this section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator shall:

(1) cease injection of waste fluids unless authorized by the director to continue or resume injection;

(2) take all necessary steps to determine the presence or absence of a leak; and

(3) notify the director within 24 hours after the alarm or shutdown.

H. If a loss of mechanical integrity is discovered pursuant to Subsection G of this section or during periodic mechanical integrity testing, the owner or operator shall:

(1) immediately cease injection of waste fluids;

(2) take all steps reasonably necessary to determine whether there may have been a release of hazardous wastes or hazardous waste constituents into any unauthorized zone;

(3) notify the director within 24 hours after loss of mechanical integrity is discovered;

(4) notify the director when injection can be expected to resume; and

(5) restore and demonstrate mechanical integrity to the satisfaction of the director prior to resuming injection of waste fluids.

I. Whenever the owner or operator obtains evidence that there may have been a release of injected wastes into an unauthorized zone:

(1) the owner or operator shall immediately case injection of waste fluids, and:

(a) notify the director within 24 hours of obtaining such evidence;

(b) take all necessary steps to identify and characterize the extent of any release;

(c) comply with any remediation plan specified by the director;

(d) implement any remediation plan approved by the director; and

(e) where such release is into groundwater of the state of New Mexico currently serving as a water supply, place a notice in a newspaper of general circulation.

(2) The director may allow the operator to resume injection prior to completing cleanup action if the owner or operator demonstrates that the injection operation will not endanger groundwater of the state of New Mexico.

J. The owner or operator shall notify the director and obtain his approval prior to conducting any well workover.

[20.6.2.5357 NMAC - N, 8-31-15]

20.6.2.5358 TESTING AND MONITORING REQUIREMENTS: Testing and monitoring requirements shall at a minimum include.

A. Monitoring of the injected wastes.

(1) The owner or operator shall develop and follow an approved written waste analysis plan that describes the procedures to be carried out to obtain a detailed chemical and physical analysis of a representative sample of the waste, including the quality assurance procedures used. At a minimum, the plan shall specify:

(a) the parameters for which the waste will be analyzed and the rationale for the selection of these parameters;

(b) the test methods that will be used to test for these parameters; and

(c) the sampling method that will be used to obtain a representative sample of the waste to be analyzed.

(2) The owner or operator shall repeat the analysis of the injected wastes as described in the waste analysis plan at frequencies specified in the waste analysis plan and when process or operating changes occur that may significantly alter the characteristics of the waste stream.

(3) The owner or operator shall conduct continuous or periodic monitoring of selected parameters as required by the director.

(4) The owner or operator shall assure that the plan remains accurate and the analyses remain representative.

B. Hydrogeologic compatibility determination. The owner or operator shall submit information demonstrating to the satisfaction of the director that the waste stream and its anticipated reaction products will not alter the permeability, thickness or other relevant characteristics of the confining or injection zones such that they would no longer meet the requirements specified in 20.6.2.5352 NMAC.

C. Compatibility of well materials.

(1) The owner or operator shall demonstrate that the waste stream will be compatible with the well materials with which the waste is expected to come into contact, and submit to the director a description of the methodology used to make that determination. Compatibility for purposes of this requirement is established if contact with injected fluids will not cause the well materials to fail to satisfy any design requirement imposed under Subsection B of 20.6.2.5355 NMAC.

(2) The director shall require continuous corrosion monitoring of the construction materials used in the well for wells injecting corrosive waste, and may require such monitoring for other waste, by:

(a) placing coupons of the well construction materials in contact with the waste stream; or

(b) routing the waste stream through a loop constructed with the material used in the well; or

(c) using an alternative method approved by the director.

(3) If a corrosion monitoring program is required:

(a) the test shall use materials identical to those used in the construction of the well, and such materials must be continuously exposed to the operating pressures and temperatures (measured at the well head) and flow rates of the injection operation; and

(b) the owner or operator shall monitor the materials for loss of mass, thickness, cracking, pitting and other signs of corrosion on a quarterly basis to ensure that the well components meet the minimum standards for material strength and performance set forth in Subsection B of 20.6.2.5355 NMAC.

D. Periodic mechanical integrity testing. In fulfilling the requirements of 20.6.2.5204 NMAC, the owner or operator of a Class I hazardous waste injection well shall conduct the mechanical integrity testing as follows:

(1) the long string casing, injection tube, and annular seal shall be tested by means of an approved pressure test with a liquid or gas annually and whenever there has been a well workover;

(2) the bottom-hole cement shall be tested by means of an approved radioactive tracer survey annually;

(3) an approved temperature, noise, or other approved log shall be run at least once every five years to test for movement of fluid along the borehole; the director may require such tests whenever the well is worked over;

(4) casing inspection logs shall be run whenever the owner or operator conducts a workover in which the injection string is pulled, unless the director waives this requirement due to well construction or other factors which limit the test's reliability, or based upon the satisfactory results of a casing inspection log run within the previous five years; the director may require that a casing inspection log be run every five years, if he has reason to believe that the integrity of the long string casing of the well may be adversely affected by naturally-occurring or man-made events;

(5) any other test approved by the director in accordance with the procedures in 40 CFR Section 146.8(d) may also be used.

E. 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 groundwater of the state of New Mexico; and

(e) any additional monitoring necessary to determine whether fluids are moving into or between groundwater of the state of New Mexico.

F. The director may require seismicity monitoring when he has reason to believe that the injection activity may have the capacity to cause seismic disturbances.

[20.6.2.5358 NMAC - N, 8-31-15]

20.6.2.5359 REPORTING REQUIREMENTS: Reporting requirements shall, at a minimum, include:

A. quarterly reports to the director containing:

(1) the maximum injection pressure;

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

(3) a description of any event which triggers an alarm or shutdown device required pursuant to Subsection F of 20.6.2.5357 NMAC and the response taken;

(4) the total volume of fluid injected;

(5) any change in the annular fluid volume;

(6) the physical, chemical and other relevant characteristics of injected fluids; and

(7) the results of monitoring prescribed under 20.6.2.5358 NMAC;

B. reporting, within 30 days or with the next quarterly report whichever comes later, the results of:

(1) periodic tests of mechanical integrity;

(2) any other test of the injection well conducted by the permittee if required by the director; and

(3) any well workover.

[20.6.2.5359 NMAC - N, 8-31-15]

20.6.2.5360 INFORMATION TO BE EVALUATED BY THE DIRECTOR: This section sets forth the information which must be evaluated by the director in authorizing Class I hazardous waste injection wells. For a new Class I hazardous waste injection well, the owner or operator shall submit all the information listed below as part of the permit application. For an existing or converted Class I hazardous waste injection well, the owner or operator shall submit all information listed below as part of the permit application except for those items of information which are current, accurate, and available in the existing permit file. For both existing and new Class I hazardous waste injection 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 and readily available to the director (for example, in the permitting agency's files) and sufficiently identifiable to be retrieved.

A. Prior to the issuance of a permit for an existing Class I hazardous waste injection well to operate or the construction or conversion of a new Class I hazardous waste injection well, the director shall review the following to assure that the requirements of 20.6.2.5000 through 20.6.2.5399 NMAC are met:

(1) information required in 20.6.2.5102 NMAC;

(2) a map showing the injection well 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 (surface and subsurface), quarries, water wells and other pertinent surface features, including residences and roads; the map should also show faults, if known or suspected;

(3) a tabulation of all wells within the area of review which penetrate the proposed injection zone or confining zone; such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging or completion and any additional information the director may require;

(4) the protocol followed to identify, locate and ascertain the condition of abandoned wells within the area of review which penetrate the injection or the confining zones;

(5) maps and cross-sections indicating the general vertical and lateral limits of all groundwater of the state of New Mexico within the area of review, their position relative to the injection formation and the direction of water movement, where known, in each groundwater of the state of New Mexico which may be affected by the proposed injection;

(6) maps and cross-sections detailing the geologic structure of the local area;

(7) maps and cross-sections illustrating the regional geologic setting;

(8) proposed operating data:

(a) average and maximum daily rate and volume of the fluid to be injected; and

(b) average and maximum injection pressure;

(9) proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the injection formation and the confining zone;

(10) proposed stimulation program;

(11) proposed injection procedure;

(12) schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(13) contingency plans to cope with all shut-ins or well failures so as to prevent migration of fluids into any groundwater of the state of New Mexico;

(14) plans (including maps) for meeting monitoring requirements of 20.6.2.5358 NMAC;

(15) for wells within the area of review which penetrate the injection zone or the confining zone but are not properly completed or plugged, the corrective action to be taken under 20.6.2.5354 NMAC;

(16) construction procedures including a cementing and casing program, well materials specifications and their life expectancy, logging procedures, deviation checks, and a drilling, testing and coring program; and

(17) a demonstration pursuant to 20.6.2.5320 NMAC, that the applicant has the resources necessary to close, plug or abandon the well and for post-closure care.

B. Prior to the director's granting approval for the operation of a Class I hazardous waste injection well, the owner or operator shall submit and the director shall review the following information, which shall be included in the completion report:

(1) all available logging and testing program data on the well;

(2) a demonstration of mechanical integrity pursuant to 20.6.2.5358 NMAC;

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

(4) the results of the injection zone and confining zone testing program as required in Paragraph (9) of Subsection A of 20.6.2.5360 NMAC;

(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 with the materials used to construct the well;

(7) the calculated area of review based on data obtained during logging and testing of the well and the formation, and where necessary revisions to the information submitted under Paragraphs (2) and (3) of Subsection A of 20.6.2.5360 NMAC;

(8) the status of corrective action on wells identified in Paragraph (15) of Subsection A of 20.6.2.5360 NMAC; and

(9) evidence that the permittee has obtained an exemption under 40 C.F.R. Part 148, Subpart C for the hazardous wastes permitted for disposal through underground injection.

C. Prior to granting approval for the plugging and abandonment (*i.e.*, closure) of a Class I hazardous waste injection well, the director shall review the information required in Paragraph (4) of Subsection A of 20.6.2.5361 NMAC and Subsection A of 20.6.2.5362 NMAC.

D. Any permit issued for a Class I hazardous waste injection well for disposal on the premises where the waste is generated shall contain a certification by the owner or operator that:

(1) the generator of the hazardous waste has a program to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable; and

(2) injection of the waste is that practicable method of disposal currently available to the generator which minimizes the present and future threat to human health and the environment.

[20.6.2.5360 NMAC - N, 8-31-15]

20.6.2.5361 CLOSURE:

A. *Closure plan.* The owner or operator of a Class I hazardous waste injection well shall prepare, maintain, and comply with a plan for closure of the well that meets the requirements of Subsection D of this section and is acceptable to the director. The obligation to implement the closure plan survives the termination of a permit or the cessation of injection activities. 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 shall submit the plan as a part of the permit application and, upon approval by the director, such plan shall be a condition of any permit issued.

(2) The owner or operator shall submit any proposed significant revision to the method of closure reflected in the plan for approval by the director no later than the date on which notice of closure is required to be submitted to the director under Subsection B of this section.

(3) The plan shall assure financial responsibility as required in Paragraph (1) of Subsection A of 20.6.2.5342 NMAC.

(4) The plan shall include the following information:

(a) the type and number of plugs to be used;

(b) the placement of each plug including the elevation of the top and bottom of each plug;

(c) the type and grade and quantity of material to be used in plugging;

(d) the method of placement of the plugs;

(e) any proposed test or measure to be made;

(f) the amount, size, and location (by depth) of casing and any other materials to be left in the well;

(g) the method and location where casing is to be parted, if applicable;

(h) the procedure to be used to meet the requirements of Paragraph (5) of Subsection D of this section;

(i) the estimated cost of closure; and

(j) any proposed test or measure to be made.

(5) The director may modify a closure plan following the procedures of 20.6.2.3109 NMAC.

(6) An owner or operator of a Class I hazardous waste injection well who ceases injection temporarily, may keep the well open provided he:

(a) has received authorization from the director; and

(b) has described actions or procedures, satisfactory to the director, that the owner or operator will take to ensure that the well will not endanger groundwater of the state of New Mexico during the period of temporary disuse; these actions and procedures shall include compliance with the technical requirements applicable to active injection wells unless waived by the director.

(7) The owner or operator of a well that has ceased operations for more than two years shall notify the director 30 days prior to resuming operation of the well.

B. *Notice of intent to close.* The owner or operator shall notify the director at least 60 days before closure of a well. At the discretion of the director, a shorter notice period may be allowed.

C. *Closure report.* Within 60 days after closure or at the time of the next quarterly report (whichever is less) the owner or operator shall submit a closure report to the director. If the quarterly report is due less than 15 days after completion of closure, then the report shall be submitted within 60 days after closure. The report shall be certified as accurate by the owner or operator and by the person who performed the closure operation (if other than the owner or operator). Such report shall consist of either:

(1) a statement that the well was closed in accordance with the closure plan previously submitted and approved by the director; or

(2) where actual closure differed from the plan previously submitted, a written statement specifying the differences between the previous plan and the actual closure.

D. *Standards for well closure.*

(1) Prior to closing the well, the owner or operator shall observe and record the pressure decay for a time specified by the director. The director shall analyze the pressure decay and the transient pressure observations conducted pursuant to Paragraph (1) of Subsection E of 20.6.2.5358 NMAC and determine whether the injection activity has conformed with predicted values.

(2) Prior to well closure, appropriate mechanical integrity testing shall be conducted to ensure the integrity of that portion of the long string casing and cement that will be left in the ground after closure. Testing methods may include:

(a) pressure tests with liquid or gas;

(b) radioactive tracer surveys;
(c) noise, temperature, pipe evaluation, or cement bond logs; and
(d) any other test required by the director.
(3) Prior to well closure, the well shall be flushed with a buffer fluid.
(4) Upon closure, a Class I hazardous waste well shall be plugged with cement in a manner that will not allow the movement of fluids into or between groundwater of the state of New Mexico.
(5) 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 alternate method, approved by the director, that will reliably provide a comparable level of protection.
(6) Each plug used shall be appropriately tagged and tested for seal and stability before closure is completed.
(7) The well to be closed 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).
[20.6.2.5361 NMAC - N, 8-31-15]

20.6.2.5362 POST-CLOSURE CARE:
A. The owner or operator of a Class I hazardous waste well shall prepare, maintain, and comply with a plan for post-closure care that meets the requirements of Subsection B of this section and is acceptable to the director. The obligation to implement the post-closure plan survives the termination of a permit or the cessation of injection activities. The requirement to maintain an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.
(1) The owner or operator shall submit the plan as a part of the permit application and, upon approval by the director, such plan shall be a condition of any permit issued.
(2) The owner or operator shall submit any proposed significant revision to the plan as appropriate over the life of the well, but no later than the date of the closure report required under Subsection C of 20.6.2.5361 NMAC.
(3) The plan shall assure financial responsibility as required in 20.6.2.5363 NMAC.
(4) The plan shall include the following information:
(a) the pressure in the injection zone before injection began;
(b) the anticipated pressure in the injection zone at the time of closure;
(c) the predicted time until pressure in the injection zone decays to the point that the well's cone of influence no longer intersects the base of the lowermost groundwater of the state of New Mexico;
(d) predicted position of the waste front at closure;
(e) the status of any cleanups required under 20.6.2.5354 NMAC; and
(f) the estimated cost of proposed post-closure care.
(5) At the request of the owner or operator, or on his own initiative, the director may modify the post-closure plan after submission of the closure report following the procedures in 20.6.2.3109 NMAC.
B. The owner or operator shall:
(1) continue and complete any cleanup action required under 20.6.2.5354 NMAC, if applicable;
(2) continue to conduct any groundwater monitoring required under the permit until pressure in the injection zone decays to the point that the well's cone of influence no longer intersects the base of the lowermost groundwater of the state of New Mexico; the director may extend the period of post-closure monitoring if he determines that the well may endanger groundwater of the state of New Mexico;
(3) submit a survey plat to the local zoning authority designated by the director; the plat shall indicate the location of the well relative to permanently surveyed benchmarks; a copy of the plat shall be submitted to the director;
(4) provide appropriate notification and information to such state and local authorities as have cognizance over drilling activities to enable such state and local authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the well's confining or injection zone;
(5) retain, for a period of three years following well closure, records reflecting the nature, composition and volume of all injected fluids; the director shall require the owner or operator to deliver the records

to the director at the conclusion of the retention period, and the records shall thereafter be retained at a location designated by the director for that purpose.

C. Each owner of a Class I hazardous waste injection well, and the owner of the surface or subsurface property on or in which a Class I hazardous waste injection well is located, must record a notation on the deed to the facility property or on some other instrument which 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 manage hazardous waste;

(2) the name of the state agency or local authority with which the plat was filed, as well as the address of the director;

(3) the type and volume of waste injected, the injection interval or intervals into which it was injected, and the period over which injection occurred.

[20.6.2.5362 NMAC - N, 8-31-15]

20.6.2.5363 FINANCIAL RESPONSIBILITY FOR POST-CLOSURE CARE: The owner or operator shall demonstrate and maintain financial responsibility for post-closure by using a trust fund, surety bond, letter of credit, financial test, insurance or corporate guarantee that meets the specifications for the mechanisms and instruments revised as appropriate to cover closure and post-closure care in 20.6.2.5320 NMAC. The amount of the funds available shall be no less than the amount identified in Subparagraph (f) of Paragraph (4) of Subsection A of 20.6.2.5362 NMAC. The obligation to maintain financial responsibility for post-closure care survives the termination of a permit or the cessation of injection. The requirement to maintain financial responsibility is enforceable regardless of whether the requirement is a condition of the permit.

[20.6.2.5363 NMAC - N, 8-31-15]

20.6.2.5364 - 20.6.2.5399: [RESERVED]

HISTORY of 20.6.2 NMAC:

Pre-NMAC History:

Material in this Part was derived from that previously filed with the commission of public records - state records center and archives:

WQC 67-2, Regulations Governing Water Pollution Control in New Mexico, filed 12-5-67, effective 1-4-68
WQC 72-1, Water Quality Control Commission Regulations, filed 8-4-72, effective 9-3-72
WQC 77-1, Amended Water Quality Control Commission Regulations, filed 1-18-77, effective 2-18-77
WQC 81-2, Water Quality Control Commission Regulations, filed 6-2-81, effective 7-2-81
WQC 82-1, Water Quality Control Commission Regulations, filed 8-19-82, effective 9-20-82

History of Repealed Material: [Reserved]

Other History:

20 NMAC 6.2, Water Quality - Ground and Surface Water Protection, filed 10-27-95, effective 12-1-95
20 NMAC 6.2, Water Quality - Ground and Surface Water Protection, filed 10-15-96, effective 11-15-96
20 NMAC 6.2, Water Quality - Ground and Surface Water Protection, filed 11-30-00, effective 1-15-01
20 NMAC 6.2, Water Quality - Ground and Surface Water Protection, filed 9-16-01, effective 12-1-01
20 NMAC 6.2, Water Quality - Ground and Surface Water Protection, filed 8-1-02, effective 9-15-02

Requirements for all Class I Wells and Class I Hazardous Waste Wells

SITING – Fluids must be injected into a formation that is below the lowermost formation containing, within ¼ mile of the well, a USDW. To demonstrate this, owners and operators are required to provide the following information:

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
Geologic Studies of the injection and confining zones to determine that: • The receiving formations are sufficiently permeable, porous, homogeneous, and thick enough to receive the fluids at the proposed injection rate without requiring excessive pressure • Formations are large enough to prevent pressure buildup and injected fluid would not reach aquifer recharge areas • There is a low-permeability confining zone to prevent vertical migration of injection fluids • Injected fluids are compatible with well materials and with rock and fluid in injection zone • The area is geologically stable • The injection zone has no economic value	Additional **structural** studies to demonstrate: • Injection and confining formations are free of vertically transmissive fissures or faults • Low seismicity and probability of earthquakes • Proposed injection will not induce earthquakes or increase the frequency of naturally occurring earthquakes
Area Of Review (AoR) analysis of the surrounding area to identify artificial penetrations, such as other wells, that might allow fluid to move out of the injection zone • Minimum area of review is ¼ mile • Can be a fixed radius around the well or mathematically calculated • Includes a corrective action plan to address improperly completed or plugged wells within the AoR	Additional **review** required: • Minimum AoR of 2 miles • No-migration petition demonstrating that fluids will remain in the injection zone for as long as they are hazardous (modeling conducted to show either the waste will remain in the injection zone for 10,000 years or it will be rendered non-hazardous before migration)

CONSTRUCTION – Wells must have a multilayered design to prevent fluids from entering USDWs.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells

• Approved engineering schematics and subsurface construction details
• At least 2 layers of concentric casing and cement
• Outer (or surface) casing cemented to the surface
• Tubing and packer design based on
  o well depth
  o characteristics of the injected fluid
  o injection and annular pressure
  o injection rate
  o temperature and volume of injected fluid
  o size of well casing
  o cementing requirements
• Tests during drilling to ensure no vertical migration of fluid
	• Detailed requirements for tubing and packer
	• Long-string (inner) casing fully cemented to surface
	• UIC Program approval of casing, cement, tubing, and packer prior to construction

OPERATION – Provides multiple safeguards to ensure the injected wastewater is fully confined.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
• Maintain injection at pressures that will not initiate new fractures or propagate existing fractures • Approved fluids and permitted pressures must be maintained in the annular space • Continuous monitoring and recording devices	• Automatic alarms and shutdown devices • Notify permitting authority within 24 hours if problem occurs • Cease injection and resume only with UIC Program Director's permission

MONITORING AND TESTING – Ensures that there are no leaks in the casing, tubing, or packer and the injected fluid is contained within the injection zone.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
• Continuously monitor: o Annulus pressure (to detect leaks in the casing, tubing, or packer; and any fluid movement into a USDW) o Containment in the injection zone o Characteristics of injected waste o Monitor for fluid movement into USDWs within the AoR • Internal and external mechanical integrity test (MIT) every 5 years	• Explicit procedures for reporting and correcting problems due to lack of mechanical integrity • Develop and follow a waste analysis plan • Analyze wastewaters as specified in the plan • Internal MIT every year • Test cement at base of well annually

REPORTING AND RECORD KEEPING – Informs the UIC Program about the operation of the well and all testing results.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
• Quarterly on injection and injected fluids and monitoring of USDW in the area of review • Every 5 years on internal and external MITs • Changes to the facility, progress on compliance schedule, loss of mechanical integrity (MI), or noncompliance with permit conditions	• Results from the waste analysis program and geochemical compatibility • Internal MIT yearly • Maximum injection pressure quarterly • Volume of fluid injected

CLOSURE –Ensures that the well is safely and properly abandoned when injection is completed.

Requirements for All Class I Wells	Additional Requirements for Hazardous Waste Wells
• Submit plugging and abandonment report	• Conduct pressure fall off and mechanical integrity tests • Continue ground water monitoring until injection zone pressure cannot influence USDW • Flush well with non-reactive fluid • Inform authorities about the well, its location, and zone of influence

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EPA

Class I Underground Injection Control Program: Study of the Risks Associated with Class I Underground Injection Wells

Contents

Preface

The Land Disposal Program Flexibility Act of 1996 (Public Law 104-119) requires the United States Environmental Protection Agency (EPA) to complete a study of the risks to human health and the environment associated with hazardous waste disposal practices and directly related to *decharacterized* wastes managed by surface impoundments and Class I injection wells regulated under the Underground Injection Control (UIC) program. EPA has been charged with compiling information on these waste disposal activities and making a determination on whether existing programs administered by the Agency or the states are adequately protective or new regulations are needed to ensure safe management of these wastes.

Two offices within EPA are tasked with this response. The Office of Solid Waste and Emergency Response, Office of Solid Waste (OSW) is preparing a study on surface impoundments to be completed within 5 years of the enactment of this legislation. The Office of Water, Office of Ground Water and Drinking Water (OGWDW) is conducting a study on Class I injection wells in a similar timeframe. This *Study of the Risks Associated with Class I Underground Injection Wells* is OGWDW's response to Congress' request.

Direction of the Class I *Study*

In the Act, Congress did not ask EPA to do an entirely new study regarding Class I UIC wells that would have required a re-collection of the large amount of report data and information already compiled. Nor did Congress require the states to contribute new field data or tabulations of data already being reported.

EPA decided that the Class I *study* would describe the current Class I UIC Program, document past compliance incidents involving Class I wells, and summarize studies of human health risks associated with Class I injection conducted for past regulatory efforts and policy documentation. This compilation would serve as the basis for the Agency's decision either to promulgate new regulations, or determine that existing Class I controls are adequate. This *study* would be submitted to appropriate members of Congress and their staffs and to fulfill the Agency's commitment under the Act.

The *Study* Report

As stated above, this study is a compilation of existing information on the Class I UIC injection program. Much program data has been gathered on Class I hazardous and nonhazardous injection wells, and each type of well is regulated separately, but stringently. In the *study*, the hazardous and nonhazardous Class I requirements are presented together to give a complete picture of the UIC program. Many UIC Primacy states place requirements on Class I nonhazardous waste disposal wells under their jurisdiction that are equivalent to, or stricter than, the federal Class I hazardous well requirements. Moreover, the Agency believes, from information collected in past studies and reports related to rulemaking, that substantial volumes of *decharacterized* wastewaters are being managed in Class I hazardous injection wells, thus providing a significant degree of protection to human health and the environment. Any different requirements between Class I non-hazardous and hazardous wells are described and compared to give the reader a more complete perspective of the preventative aspects of the entire UIC Class I program.

Based on the recommendations of expert reviewers, and to be consistent with the June 1998 memorandum from President Clinton to all federal agencies to take steps to improve the clarity of government writing, this report is written in "plain English." In addition, the authors assume that the audience is a mixture of educated non-scientists and people with a more sophisticated understanding of geology, risk analysis, and other relevant sciences. As a result, the report tries to educate the audience on the basic principles of geology, modeling, etc., and some portions could be considered repetitive by more knowledgeable readers.

Data Needs and Initial Steps

The *study* relies on secondary data, that is, existing information such as studies, reports, and background information documents prepared by EPA, the states, and others. By using existing information, OGWDW becomes bound by certain limitations, such as data accuracy, quality, soundness of methodology, and other pertinent technical data. However, EPA believes that such data are usually very accurate given the finite universe of Class I wells and the history of regulation of these wells by EPA and the states, among other things. EPA Regional Offices and the states have collected operational and construction-related data for these wells for a fairly long time, and such data are compiled and reviewed on a regular basis. Thus, the documents upon which the *study* is based are reliable. While many of these documents have not been peer reviewed, *per se*, they were subject to technical and policy review by informed individuals including regional staff, state staff, and other technical stakeholders. In most cases, they were developed to support Agency rulemakings and were therefore subject to public comment. A large library of such documents existed in EPA files and dockets as of 1996.

As the initial step in conducting the *study,* in September 1996 EPA prepared a paper titled *Class I Underground Injection Control Program: Background Document and Assessment of Risks Associated with Class I Underground Injection Wells*. Prior to completion of this paper, OGWDW decided to investigate and apply the Office of Water Peer Review Process to ensure that the scientific and technical "underpinnings" of any decisions involving Class I UIC wells meet two important criteria:

- They should be based on the best current knowledge from science, engineering, and other domains of technical expertise.
- They should be judged credible by those who deal with the Agency.

Although the Background Document, which represented a compilation of existing documents related to Class I UIC wells, was not judged to be a "major scientifically and technically based work product," OGWDW determined that it would benefit from some form of technical review. Although the *study* addresses controversial issues, supports a policy decision, and could have significant impact on the investment of Agency resources, other tempering factors (i.e., it is not a new data collection but a compilation of existing studies and it represents an "update" of progress in the UIC Class I program) suggest that it is not a candidate for *bona fide* peer review.

Expert Panel Process

OGWDW chose to seek external review of the initial draft of the *study* document primarily to ensure scientific and technical accuracy. To do this, EPA engaged a contractor to convene a panel of experts in the scientific and technical subject matter. The panel was balanced to encompass a multi-disciplinary group of experts in other disciplines who could contribute to the full range of issues concerning Class I wells.

The five-member panel's experts have many years of experience with deep well injection and related technology. Panel members represented a variety of perspectives on Class I wells, including industry and consulting, state regulatory agencies, and academia. They have experience with development and oversight of EPA and state UIC programs, as well as permit preparation and review. Their technical expertise spans aquifer characterization, geohydrologic model development, no-migration petition demonstrations, well siting and construction, and well testing including mechanical integrity. The expert panel's primary goal is to serve as peer reviewers and to further acknowledge that information and data collected is technically sound, appropriate, and accurate.

OGWDW distributed the first draft of its work product on the Class I *study* to the expert panel in April 1998. After initial review, the entire panel met in Alexandria, Virginia, in late April 1998 to begin discussions. The panel provided substantial comment and recommended several changes to the text of the report, including reordering the presentation, adding a discussion on modeling methodology, and writing the report in plain English. EPA revised the draft based on the expert panel members' comments and edits. A follow-up draft of the *study* was prepared and sent to the members for review in December 1998. The panel then met for a second time prior to a Ground Water Protection Council Meeting in New Orleans, Louisiana, in January 1999. Additional edits and comments were compiled via teleconferences and electronic mailings, and EPA prepared a third and final draft product in December 1999.

Distribution of the *Study* Document

The Office of Water (OW) is providing the Class I *study* to Congress for its consideration. OW is also making the study available to states and other stakeholders, including the interested public through a number of mechanisms. As part of the communication strategy for such studies, EPA will place it on a list of UIC documents on OGWDW's Web site, and make it available to the general membership of the Ground Water Protection Council and the National Drinking Water Council and via general Water Program announcements.

Exhibits

Executive Summary

In 1996, Congress enacted the Land Disposal Program Flexibility Act, which exempted Class I underground injection wells disposing of decharacterized hazardous wastes from the provisions of the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDRs). This legislation also required the U.S. Environmental Protection Agency (EPA) to conduct a study of such wastes and disposal practices to determine whether Class I wells pose risks to human health and the environment, and if current state or federal programs are adequate to address any such risks. EPA must also determine whether such risks could be better addressed under existing state or federal programs. Upon receipt of additional information or upon completion of such study and as necessary to protect human health and the environment, the Administrator may, but is not required to, impose additional requirements under existing Federal laws, including subsection (m)(1), or rely on other state or federal programs or authorities to address such risks.

EPA's *Study of the Risks Associated with Class I Underground Injection Wells* describes the Class I UIC Program, injection well technology, the Land Disposal Restrictions, and the 1996 legislation; documents past failures of Class I wells; and summarizes studies of human health risks associated with injection via Class I wells, including non-hazardous and hazardous wells. The study also includes an updated risk analysis using Class I injection well data and an annotated bibliography of literature on injection via Class I wells.

Class I wells inject industrial or municipal wastewater beneath the lowermost underground source of drinking water (USDW).[1] Class I wells are designated as hazardous or nonhazardous, depending on the characteristics of the wastewaters injected. (Wastewaters are considered to be hazardous wastes if they demonstrate a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity, or are a listed waste as determined by EPA.) This designation affects the stringency of the requirements imposed on operators of Class I wells. The wastewater injected into Class I wells typically is associated with the chemical products, petroleum refining, and metal products industries.

History: Early Concerns, EPA's Response

The practice of underground injection of wastewater began in the 1930s as oil companies began disposing of oil field brines and other waste products into depleted reservoirs. In the mid 1960s and 1970s, injection began to increase sharply, growing at a rate of more than 20 new wells per year. In 1974, responding to concerns about underground injection practices, including failure of some wells, EPA issued a policy statement in which it opposed underground injection

[1] EPA defines an underground source of drinking water as an aquifer or portion of an aquifer that supplies a public water system (PWS) or contains enough water to supply a PWS; currently supplies drinking water for human consumption or contains water with less than 10,000 milligrams/liter of total dissolved solids (TDS); and is not exempted by EPA or state authorities from protection as a source of drinking water (40 CFR 144.3).

without strict control and clear demonstration that the wastes will not adversely affect ground water supplies. In December 1974, Congress enacted the Safe Drinking Water Act (SDWA), which required EPA to set requirements for protecting USDWs; EPA passed its Underground Injection Control (UIC) regulations in 1980.

In 1984, Congress enacted the Hazardous and Solid Waste Amendments (HSWA) to RCRA, which banned the land disposal of hazardous waste, unless the hazardous waste is treated to meet specific standards. EPA amended the UIC regulations in 1988 to address the Hazardous and Solid Waste Amendments. Operators of Class I wells are exempt from the ban if they demonstrate that the hazardous constituents of the wastewater will not migrate from the disposal site for 10,000 years or as long as the wastewater remains hazardous. This demonstration is known as a no-migration petition. HSWA also requires EPA to set dates to prohibit the land disposal of all hazardous wastes: EPA has instituted the LDRs in a phased-in schedule. The Phase III LDR rule implemented the Land Disposal Program Flexibility Act.

Class I Technology Ensures Safe Disposal

Class I fluids are injected into brine-saturated formations thousands of feet below the land surface, where they are likely to remain confined for a long time. The geological formation into which the wastewaters are injected, known as the injection zone, is sufficiently porous and permeable so that the wastewater can enter the rock formation without an excessive build up of pressure. The injection zone is overlain by a relatively nonpermeable layer of rock, known as the confining zone, which will hold injected fluids in place and restrict them from moving vertically toward a USDW.

EPA requires that Class I wells be located in geologically stable areas that are free of transmissive fractures or faults through which injected fluids could travel to drinking water sources. Well operators must also show that there are no wells or other artificial pathways between the injection zone and USDWs through which fluids can travel. The site-specific geologic properties of the subsurface around the well offer another safeguard against the movement of injected wastewaters to a USDW.

All Class I wells are designed and constructed to prevent the movement of injected wastewaters into USDWs. Their sophisticated multi-layer construction has many redundant safety features. The well's casing prevents the borehole from caving in and contains the tubing, or injection string. Constructed of a corrosion-resistant material such as steel or fiberglass-reinforced plastic, the casing consists of an outer surface casing, which extends the entire depth of the well; and an inner long string casing that extends from the surface to or through the injection zone. The innermost layer of the well, the injection tubing, conducts injected wastewater from the surface to the injection zone. All of the materials of which injection wells are made are corrosion-resistant and compatible with the wastewater and the formation rocks and fluids into which they come in contact. A constant pressure is maintained in the annular space and is continuously monitored to verify the well's mechanical integrity and proper operational conditions. Trained operators are responsible for day-to-day injection well operation, maintenance, monitoring, and testing.

EPA's Requirements Minimize Risk

There are two potential pathways through which injected fluids can migrate to USDWs. First, wells could have a loss of waste confinement; second, improperly plugged or completed wells or other pathways near the well can allow fluids to migrate to USDWs. EPA's extensive technical requirements for Class I wells at 40 CFR 146 (for all Class I wells) and 148 (for hazardous waste wells) are designed to prevent contamination of USDWs via these pathways. The requirements for hazardous wells are more stringent than those for nonhazardous wells.

Class I wells must be sited so that wastewaters are injected into a formation that is below the lowermost formation containing, within one-quarter mile of the well, a USDW. Class I well operators must demonstrate via geologic and hydrogeologic studies that their proposed injection will not endanger USDWs. Operators must identify all wells in the vicinity that penetrate the injection or confining zone, determine whether they could serve as pathways for migration of wastewaters, and take any corrective action necessary. In addition, Class I operators seeking to inject hazardous wastewaters must demonstrate via a no-migration petition that the hazardous constituents of their wastewaters will not migrate from the disposal site for as long as they remain hazardous.

EPA requires that Class I wells be designed and constructed to prevent the movement of injected wastewaters into USDWs. These requirements specify the multi-layer design of Class I wells. Class I wells must be operated so that injection pressures will not initiate new fractures or propagate existing fractures in the injection or confining zones. Class I hazardous wells must be equipped with continuous monitoring and recording devices that automatically sound alarms and shut down the well whenever operating parameters exceed permitted ranges.

Operators of Class I wells must continuously monitor the characteristics of the injected wastewater, annular pressure, and containment of wastewater within the injection zone. Operators also must periodically test the well's mechanical integrity.

Upon closing their wells, operators must flush the well with a non-reactive fluid, and tag and test each cement plug for seal and stability before the closure is completed. Operators must submit a plugging and abandonment report when closure is complete.

Studies Assess the Safety of Class I Practices

EPA and others have performed numerous studies to assess the risks associated with disposal via Class I wells. Early studies of the effectiveness of the 1980 UIC regulations looked at ways in which Class I wells fail.[2] Many of the failures documented in these studies were a result of historic practices that are no longer acceptable under the UIC regulations.

Although studies emphasizing risk of injection practices have primarily focused on Class I hazardous waste injection wells, EPA believes such studies to be very relevant to all Class I wells, including those managing decharacterized wastewaters. The Agency believes that a substantial volume of decharacterized wastewaters are, in fact, injected into Class I hazardous waste wells, thus affording a particularly strong level of public health protection from these activities.

Studies performed in anticipation of the 1988 updates to the UIC regulations assessed the risks associated with disposal of hazardous wastewater via Class I wells. These include a two-phase qualitative assessment of waste confinement potential in the Texas Gulf Coast geologic setting given either a grout seal failure or the presence of an unplugged abandoned borehole. An additional study assessed the difference in risk among various geologic settings.

In support of EPA's Phase III LDR rulemaking, the Office of Ground Water and Drinking Water (OGWDW) prepared a draft Benefits Analysis estimating the risks associated with injection of Phase III wastes into Class I hazardous wells; EPA revised the Benefits Analysis in response to comments in 1995. To provide a quantifiable analysis in support of the *de minimis* requirements in the proposed Phase III rule, EPA in 1996 analyzed cancer and noncancer risks of varying the underlying hazardous constituent concentrations for five Phase III LDR waste constituents.

In the most recent studies of the risks posed by Class I wells, data on Class I wastewaters have been used to refine models of well failure scenarios. And failure-tree scenarios have been used to estimate quantitatively the risk that waste would no longer be contained based on the probabilities that sequences of events leading to containment loss would occur.

Conclusions: Current Class I Regulations are Adequately Protective of Human Health and the Environment

Since the early days of Class I injection, EPA has learned much about what makes Class I wells safe and what practices are unacceptable. The UIC regulations are based on the concept that injection into properly sited, constructed, and operated wells is a safe way to dispose of wastewater.

Class I injection practices offer multiple safeguards against failure of Class I non-hazardous and hazardous waste wells, or the migration of injected fluids. For example, EPA requires operators to identify and address all improperly abandoned wells in the area of review

[2] Failures are defined by two potential pathways through which injected fluids can migrate to USDWs: failure of the well or improperly plugged or completed wells or other pathways near the well.

(AoR) around the injection well, because studies show that an unplugged abandoned borehole may contribute significantly to the migration of injected fluids from the injection zone. (Many of the states that oversee a large proportion of the Class I well inventory have even more stringent AoR requirements than does EPA.) In addition to the AoR requirement, Class I wells are sited to minimize the potential for waste migration and designed to minimize the possibility that the wells will fail. Inspections and well testing, along with passive monitoring systems, can detect malfunctions before wastewaters escape the injection system. Several decades of well operation bear this out: only four cases of significant wastewater migration from underground injection wells have been documented (none of which affected a drinking water source).

Under EPA's UIC regulations, the probability of loss of waste confinement due to Class I injection has been demonstrated to be low. The early problems with Class I wells were a result of historic practices that are not permissible under the UIC regulations. Class I wells have redundant safety systems and several protective layers to reduce the likelihood of failure. In the unlikely event that a well should fail, the geology of the injection and confining zones serve as a final check on movement of wastewaters to USDWs.

Through modeling and other studies of Class I injection, EPA has learned much about the fate and behavior of hazardous wastewater in the subsurface. The 1988 UIC regulations implementing the HSWA offer additional protection by requiring operators of Class I hazardous wells to complete no-migration petitions to demonstrate that the hazardous constituents of their wastewater will not migrate from the injection zone for 10,000 years, or that characteristic hazardous wastewater will no longer be hazardous by the time it leaves the injection zone. EPA believes that a substantial volume of decharacterized wastewaters are being injected into Class I hazardous wells (which require a no-migration petition) because industrial, manufacturing, and petrochemical facilities typically do not segregate waste streams. Therefore, an extremely high level of protection, even above minimum federal requirements, is given by these practices. But, even the disposal of decharacterized wastewaters into a typical Class I non-hazardous well affords the public and the environment an extremely low level of risk from injection due to the multiple levels of safety features outlined in this study.

Class I Expert Panel

EPA prepared the *Study of the Risks Associated with Class I Underground Injection Wells* in consultation with a panel of experts on Class I deep well injection practices. These experts were selected because of their experience with deep well injection and related technology; they represent industry and consulting, state regulatory agencies, and academia. The experts attended two working sessions on drafts of the study report, discussed the preliminary findings, and reviewed and offered comments on the technical accuracy of the study.

E. Scott Bair, Ohio State University, Department of Geological Sciences

Professor E. Scott Bair is chair of the Department of Geological Sciences at Ohio State University. He teaches courses on quantitative groundwater flow modeling, hydrogeology, field methods in hydrogeology, contaminant hydrogeology, science in the courtroom, and water resources. He has worked with the U.S. Geological Survey and as a consultant on groundwater monitoring and groundwater modeling issues. Dr. Bair has written or co-written more than 40 books, papers, and government-sponsored reports on groundwater monitoring, aquifer investigations, groundwater flow modeling, aquifer management, and wellhead protection area delineation. He was a 1998 fellow of the Geological Society of America and the 2000 Birdsall-Dreiss Distinguished Lecturer sponsored by the society. He is a member of the American Geophysical Union's Horton Scholarship Committee and an associate editor of the journal *Ground Water* published by the National Ground Water Association. Dr. Bair earned his Ph.D. and Master's degrees in Geology from the Pennsylvania State University and his Bachelor's degree in Geology from the College of Wooster.

Larry Browning, P.E., Geological Engineering Specialties

A Principal with Geological Engineering Specialties, Larry Browning is an expert in every aspect of the UIC program. As a consultant or an EPA employee, Mr. Browning has supported virtually every UIC regulatory initiative since the program began and has in-depth knowledge of all classes of UIC wells. He was appointed special technical advisor to EPA's landmark Class I Regulatory Negotiation Committee. For EPA's Class I petition review process, Mr. Browning developed training documents and performed technical reviews of important petitions. He performed two analyses of Class I mechanical integrity failures, spanning 1988 through 1991 and 1991 through 1998. Since 1975, he has performed over 120 technical studies for EPA, including a two-volume technical manual on wireline testing of Class II injection wells which is used in all 10 EPA regions. Mr. Browning worked with EPA Region 6 and supported writing of the original UIC regulations. He has also performed ground water investigations, well testing, and investigations of injection wells and hazardous waste disposal facilities. Mr. Browning earned a Master's degree in Geology from the University of Texas at Austin and a Bachelor's degree in Geology from Northern Kentucky University.

James Clark, DuPont Engineering

James Clark has over 25 years' experience, including 18 years with DuPont working on groundwater issues. As a senior leader for DuPont, he works on Class I UIC issues spanning well construction, permitting, testing, and no-migration petitions. In this capacity, he has written numerous publications on injection issues and regulatory requirements for Class I wells. For the past 14 years, Mr. Clark has served as a technical representative to the Chemical Manufacturers Association's UIC Group; in this capacity, he worked on an assessment of the risk associated with Class I injection. Prior to joining DuPont, Mr. Clark worked as a geohydrologist with Law Engineering Testing Co. where he gained 4 years' experience on suitability studies of salt domes as repositories for nuclear waste. He also served as Chief Geologist for the Georgia Department of Transportation. Mr. Clark has written over 20 publications on Class I injection, waste confinement, aquifer monitoring, and groundwater flow. Mr. Clark has a Master's degree in geophysical sciences from the Georgia Institute of Technology and a Bachelor's degree in geology from Auburn University.

Ben Knape, TNRCC, UIC Permit Team

For over 20 years, Ben Knape has worked with the Texas Natural Resource Conservation Commission (TNRCC) and its predecessors on regulation of Class I injection wells and oversight of the state's UIC program. As a UIC Program geologist, Mr. Knape focuses on ground water studies and the use of Class I wells for industrial waste disposal. As UIC program administrator, he served as project coordinator on revising the commission's UIC program to reflect a significant rulemaking, which included strengthening construction and performance standards for Class I wells and interpreting and implementing the commission's program standards for Class I well monitoring and inspections. Mr. Knape has served as co-chair of the Ground Water Protection Council's Division I, representing Class I injection issues, and is a board member of the Underground Injection Practices Research Foundation. He is leader of TNRCC's UIC Permits Team for Class I and Class III wells. Mr. Knape holds degrees in Geology and Zoology from the University of Texas at Austin.

David Ward, Michael Baker Jr., Inc.

David Ward recently joined Michael Baker Jr., Inc. as Director of the Technology Applications Division. He has over 20 years of experience as a consultant, with expertise in hydrogeologic modeling of groundwater flow and hazardous waste transport in porous and fractured media. He has managed projects for EPA and industrial clients on deep well injection of hazardous wastes, including well test interpretation, groundwater flow and waste confinement, and no-migration petition preparation. Mr. Ward performed numerical simulations of well failures in a variety of geologic settings. He has prepared applications of flow and transport codes for many hydrogeologic models, including SWIFT and MODFLOW, including applications to geochemical analyses and no-migration demonstrations. He has written more than 80 publications on groundwater flow, waste transport, and well failure simulations. Mr. Ward holds a Master's degree in Water Resources from Princeton University and a Bachelor's degree in Civil Engineering from Lehigh University.

Abbreviations

ACC	American Chemistry Council
AoR	Area of Review
BDAT	Best Demonstrated Available Technology
CFR	Code of Federal Regulations
CMA	Chemical Manufacturers Association
DI	Direct Implementation
EPA	U.S. Environmental Protection Agency
GAO	General Accounting Office
GWPC	Ground Water Protection Council
HSWA	Hazardous and Solid Waste Amendments
HWIR	Hazardous Waste Identification Rule
LDR	Land Disposal Restriction
MI	Mechanical Integrity
MIT	Mechanical Integrity Test
OAL	Oxygen Activation Log
OGWDW	Office of Ground Water and Drinking Water
OSWER	Office of Solid Waste and Emergency Response
PWS	Public Water System
RCRA	Resource Conservation and Recovery Act
RIA	Regulatory Impact Analysis
RTS	Radioactive Tracer Survey
SDWA	Safe Drinking Water Act
TDS	Total Dissolved Solids
TRI	Toxic Release Inventory
UHC	Underlying Hazardous Constituent
UIC	Underground Injection Control
UIPC	Underground Injection Practices Council
USDW	Underground Source of Drinking Water
UTS	Universal Treatment Standards

I. Introduction

The U.S. Environmental Protection Agency (EPA) regulates Class I underground injection wells under the Safe Drinking Water Act (SDWA) and the Hazardous and Solid Waste Amendments of the Resource Conservation and Recovery Act (RCRA). These regulations establish siting, design, construction, and monitoring requirements for Class I injection wells to ensure protection of underground sources of drinking water (USDWs) from injected wastewater. HSWA prohibits injection of certain hazardous wastewater[3] unless the well operator can prove that the injected wastewater will not migrate out of the injection zone for as long as the wastewater remains hazardous.

Under the Land Disposal Program Flexibility Act of 1996,[4] Congress declared that wastewaters considered hazardous only because they exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) are not prohibited from land disposal if they do not exhibit the characteristic (i.e., decharacterized) at the point of disposal. Class I well operators do not, therefore, have to identify and treat underlying hazardous constituents in these decharacterized wastewaters prior to injection. This legislation effectively overturned the D.C. Circuit Court's opinion in *Chemical Waste Management v. EPA*, 976 F. 2d 2 (D.C. Cir. 1992). EPA had interpreted the D.C. Circuit Court's opinion to require that hazardous constituents in characteristic wastes be removed, destroyed, or immobilized through treatment before the wastewaters were available for land disposal.

In passing the Land Disposal Program Flexibility Act, Congress stated the following (see Appendix A for the complete text of the Act):

> Not later than 5 years after the date of enactment of this paragraph, the Administrator shall complete a study of hazardous waste managed pursuant to paragraph (7) or (9) to characterize the risks to human health or the environment associated with such management. In conducting this study, the Administrator shall evaluate the extent to which risks are adequately addressed under existing state or federal programs and whether unaddressed risks could be better addressed under such laws or programs. [PL 104-119 s 2 (10)]

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[3] In order for a waste to be a hazardous waste, it must not be excluded by EPA under 40 Code of Federal Regulations (CFR) 261.4(a) or through the delisting process under 40 CFR 260.22. There are two major categories of hazardous wastes: listed wastes and characteristic hazardous wastes. The listed hazardous wastes are described in Subpart D of 40 CFR 261. The second major category of hazardous wastes includes any wastewater that exhibits any or all of the four characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, and toxicity) described in Subpart C of 40 CFR 261. Characteristic wastes are identified by sampling a wastewater, or using appropriate company records concerning the nature of the wastewater, to determine whether a wastewater has the relevant properties.

[4] Public Law 104-119, March 26, 1996.

In response to Congress' requirement for such a study, EPA identified the need for a document that synthesizes existing information on the Class I program, including documented studies of the risks to human health or the environment posed by Class I injection wells. This document presents this information by:

- Providing an overview and history of EPA's Class I Underground Injection Control (UIC) program.
- Summarizing the geologic, engineering, and modeling sciences as they relate to Class I injection and outlining the risks associated with Class I wells.
- Describing the regulations designed to minimize the potential threat Class I wells pose to human health or the environment, and reviewing the Land Disposal Restrictions, the D.C. Circuit Court's opinion, and the 1996 legislation.
- Presenting studies that document Class I well failures, synthesizing various studies of human health risks associated with Class I injection wells, and updating a risk analysis using recent Class I injection well data.
- Providing an annotated bibliography of documents related to Class I injection wells.

I.A Overview of Class I Wells

By definition, Class I wells inject industrial or municipal wastewater beneath the lowermost USDW.[5] An **underground source of drinking water** is an aquifer or portion of an aquifer that supplies a public water system (PWS) or contains enough water to supply a PWS, supplies drinking water for human consumption or contains water with less than 10,000 milli-grams/liter of total dissolved solids (TDS), and is not exempted by EPA or state authorities from protection as a source of drinking water.[6] Class I wells are classified as hazardous or nonhazardous, depending on the characteristics of the wastewaters injected.[7] Class I wells

[5] The UIC Program oversees four other classes of wells, in addition to Class I wells. Class II wells are used to dispose of fluids which are brought to the surface in connection with oil or natural gas production, to inject fluids for enhanced recovery of oil or natural gas, or to store hydrocarbons. Class III wells inject fluids for the extraction of minerals. Class IV wells inject hazardous or radioactive waste into or above strata that contain a USDW (these wells are banned). Class V includes wells not included in Classes I, II, III, or IV. Typical examples of Class V wells are agricultural drainage wells, storm water drainage wells, industrial drainage wells, untreated sewage waste disposal wells, and cesspools.

[6] 40 CFR 144.3.

[7] Hazardous wastes are defined at 40 CFR 261.

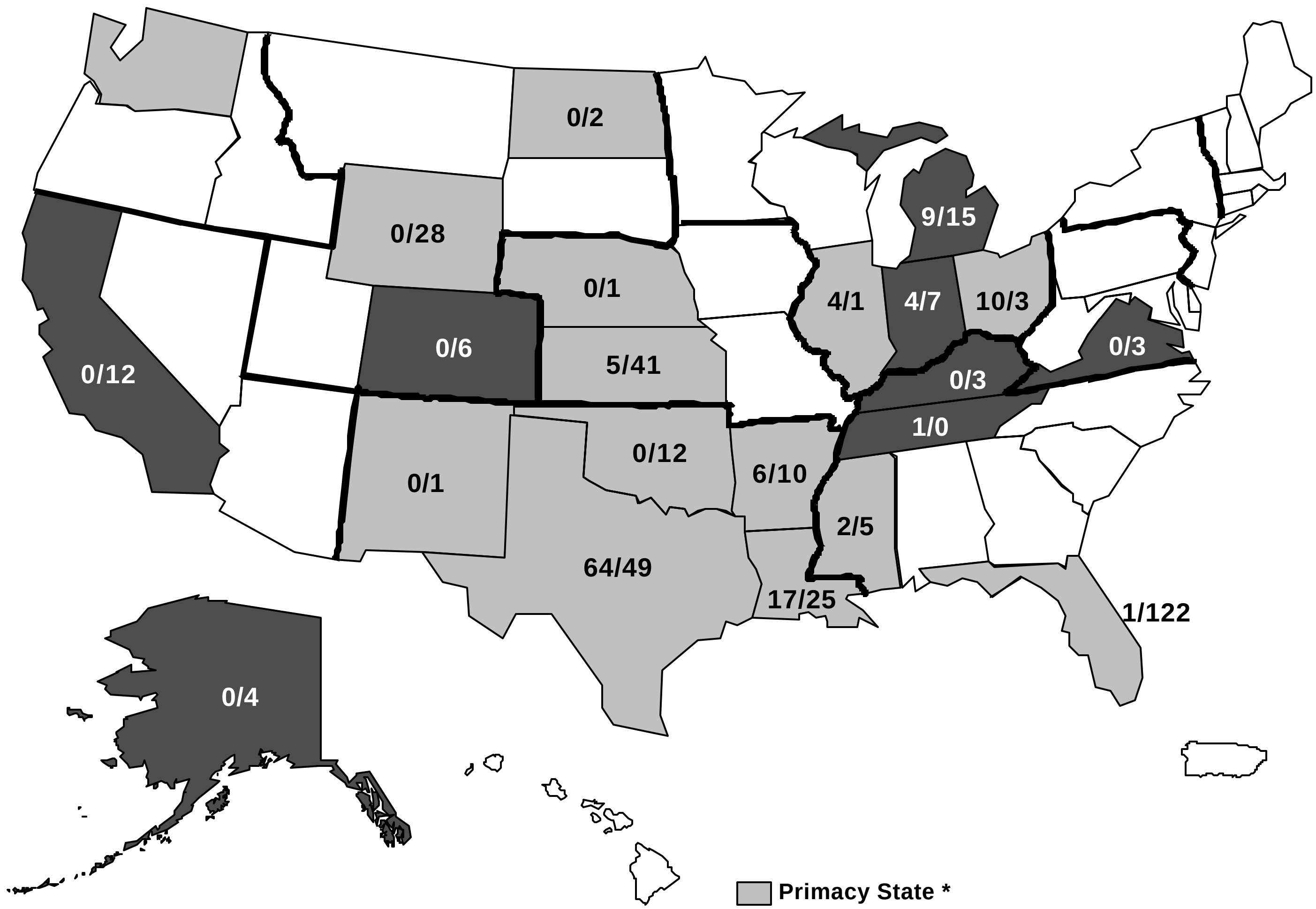
permitted to inject hazardous wastewater are referred to as hazardous wells; those that inject only nonhazardous wastewater are known as nonhazardous wells. Class I wells used for disposal of treated municipal sewage effluent are referred to as Class I municipal wells.

Many Class I wells inject wastewater associated with the chemical products, petroleum refining, and metal products industries. Injected wastewaters vary significantly based on the process from which they are derived. Some of the most common wastewaters are manufacturing process wastewater, mining wastes, municipal effluent, and cooling tower and air scrubber blowdown.

Class I municipal wells are found only in Florida, primarily due to a shortage of available land for waste disposal, strict limitations on surface water discharges, the presence of highly permeable injection zones, and cost considerations. Class I municipal wells inject sewage effluent that has been subject to at least secondary treatment. These wells have been constructed with well casings up to 30 inches in diameter to allow injection of large volumes of water (e.g., over 19 million gallons per day) at low pressures (e.g., about standard atmospheric pressure). Class I municipal wells are not subject to the same strict requirements as other Class I wells. This study does not address Class I municipal wells because they are not included in the Land Disposal Program Flexibility Act's mandate to Study Class I injection.

Currently, there are 473 Class I wells in the United States, of which 123 are hazardous, and 350 are nonhazardous or municipal wells. Most Class I wells are located in EPA Regions 6 (184 wells), 4 (134 wells), and 5 (53 wells). Texas has the greatest number of Class I hazardous wells (64), followed by Louisiana (17). Florida has the greatest number of nonhazardous wells (the majority of which are municipal wells), followed by Texas and Kansas. Exhibit 1 presents the national distribution of hazardous and nonhazardous Class I wells; Exhibit 2 shows the relative numbers of hazardous and nonhazardous Class I wells.

Exhibit 1
Number of Class I Wells by State



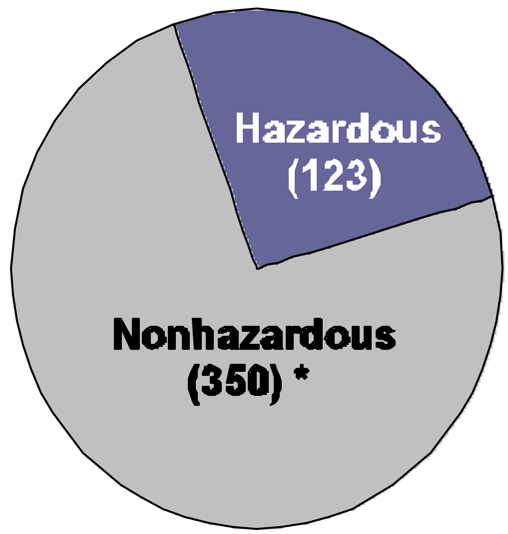
Primacy State *

Direct Implementation State *

* See Section IV.B for explanation.
EPA Regions are outlined.
Number of wells in State denoted: Hazardous/Nonhazardous.

Source: EPA's Class I Well Inventory, 1999.

Exhibit 2
Hazardous and Nonhazardous Class I Wells



* 122 nonhazardous are municipal waste disposal wells

I.B History of the UIC Program and Rulemakings Related to Class I Injection

Underground injection of wastewater began in the 1930s when oil companies began disposing of oil field brines and other oil and gas waste products into depleted reservoirs. Most of the early injection wells were oil production wells converted for wastewater disposal. In the 1950s, injection of hazardous chemical and steel industry wastes began. At that time, four Class I wells were reported; by 1963, there were 30 wells. In the mid 1960s and 1970s, Class I injection began to increase sharply, growing at a rate of more than 20 wells per year.

The 1980 UIC Regulations

Prior to EPA's regulation of Class I injection wells, several cases of well failures occurred. The Hammermill Paper Company in Erie, PA, and the Velsicol Chemical Corporation in Beaumont, TX, are two examples.

- In April 1968, corrosion caused the casing of Hammermill Paper Company's No. 1 well to rupture and spent pulping liquor to flow onto the land and enter Lake Erie. Additionally, a noxious black liquid seeped from an abandoned gas well at Presque Isle State Park, 5 miles away. The Pennsylvania Department of

Environmental Resources suspected (though never conclusively determined) that wastewaters from Hammermill's injection well migrated up the unplugged, abandoned well bore.

- In 1974 and 1975 the Velsicol Chemical Company noted lower than normal injection pressures in one of its two injection wells, which was designed without tubing. In 1975, Velsicol shut down the well to determine the cause of the decreased injection pressures, and an inspection revealed numerous leaks in the well's casing. The company decided to plug the well and drill a new one. During the course of the abandonment, Velsicol determined that contaminated wastewater had leaked to a USDW. The wastewater was pumped from the aquifer.

In 1974, responding to concerns about underground injection practices, EPA issued a policy statement in which the Agency opposed underground injection "without strict control and clear demonstration that such wastes will not interfere with present or potential use of subsurface water supplies, contaminate interconnected surface waters or otherwise damage the environment." In December 1974, Congress enacted the SDWA, which required EPA to set requirements for protecting USDWs.

EPA promulgated the UIC regulations in 1980 based on the idea that, properly constructed and operated, injection wells are a safe mechanism for disposing of liquid waste. The SDWA provided a definition of an underground source of drinking water; the 1980 UIC regulations categorized injection wells into five classes. The regulations established technical requirements for siting, construction, operating, and closure of injection wells. These regulations are described in section IV.A.

The RCRA Hazardous and Solid Waste Amendments

In 1984, Congress enacted the Hazardous and Solid Waste Amendments (HSWA) to RCRA, which banned the land disposal of hazardous waste, unless the hazardous waste is treated to meet specific concentration-based or technology-based standards, or unless the hazardous waste is injected into a land disposal unit that has an approved "no-migration" exemption. Underground injection is included in the definition of land disposal methods that require regulation at section 3004(k) of HSWA.

EPA amended the UIC regulations in 1988 to address the amendments to RCRA. The 1988 changes require operators of Class I hazardous wells to demonstrate through sophisticated models that the hazardous constituents of the wastewater will not migrate from the disposal site for 10,000 years, or as long as the wastewater remains hazardous. This demonstration is known as a no-migration petition, which may be in the form of a fluid flow petition or a waste transformation petition (see section IV.A for more on these demonstrations).

Once a no-migration petition is approved, an operator may inject only wastes that are listed in the petition. Operators who do not successfully complete the petition process must either treat their wastewater to acceptable levels, stop injecting, or implement pollution prevention measures, as specified by EPA in the regulations. EPA's treatment standards are based on the performance of the best demonstrated available technology (BDAT). EPA may also set treatment standards as constituent concentration levels, and the operator may use any technology not otherwise prohibited to treat the wastewater.

The Land Disposal Restrictions

HSWA also requires EPA to set dates to prohibit the land disposal of all hazardous wastes (40 CFR 148 and 40 CFR 268). EPA was required to promulgate, by May 8, 1990, land disposal prohibitions and treatment standards for all wastes that were either listed or identified as hazardous at the time of the 1984 amendments. The Agency was also required to promulgate prohibitions and standards for wastes listed or identified as hazardous after the 1984 amendments, within 6 months of the listing or identification of these wastes. EPA did not meet all of these deadlines and, as a result, the Environmental Defense Fund (EDF) filed a lawsuit which resulted in a consent decree outlining a schedule for adoption of prohibitions and treatment standards for hazardous wastes (*EDF v. Reilly*, Cir. No. 89-0598, D.D.C). Various wastes have been listed or identified as hazardous, and Congressionally mandated prohibitions on land disposal of these wastes have been instituted in a phased-in schedule. Progress on each phase of the Land Disposal Restriction (LDR) rulemakings is described below.

Phase I Rulemaking

Phase I included Congressionally mandated restrictions on spent solvents and dioxins, hazardous wastes that were banned from land disposal by the State of California (known as "California list" wastes), and an assessment of all the hazardous wastes listed in 40 CFR 261. Since there were a large number of these wastes, this requirement was divided into three parts, referred to as the first, second, and third-thirds wastes. The Third-Thirds rule, published in June 1990 (55 *FR* 22520, June 1, 1990), addressed regulation of characteristic wastes (i.e., wastes considered hazardous because they exhibit a characteristic of ignitability, corrosivity, reactivity, or toxicity). This rulemaking did not require treatment of underlying hazardous constituents (UHCs) in these characteristic wastes, and it generally allowed for the use of dilution to remove the characteristic in order to meet disposal standards.

In 1992, the D.C. Circuit court's opinion in *Chemical Waste Management v. EPA*, 976 F.2d 2 (D.C. Cir. 1992) essentially negated the 1990 Third-Thirds rule. In this decision, the court made a number of rulings pertaining to treatment standards for characteristically hazardous wastes. First, the court held that LDR requirements can continue to apply to characteristic hazardous wastes even after they no longer exhibit a hazardous characteristic. Second, to satisfy the requirements of RCRA section 3004(m) that address both short-term and long-term threats posed by land disposal, the court held that it is not enough that short-term threats are addressed (e.g., waste is rendered no longer corrosive). Instead, the court believed that long-term threats posed by toxic underlying hazardous constituents contained in the characteristically hazardous wastewater must be addressed. Third, the court held that dilution was not an acceptable means of treating hazardous constituents because it did not remove, destroy, or immobilize hazardous constituents.

This decision would have far-reaching implications for operators of Class I nonhazardous wells because a large number of these wells inject decharacterized wastewaters (e.g., wastewaters rendered nonhazardous through treatment or commingling with other wastewaters). These operators would have to reduce the UHCs to treatment standard levels through source reduction and waste segregation and remove the characteristic which rendered the waste hazardous.

Phase II and III Rulemakings

EPA published the Phase II LDR rule in September 1994. It established concentration-based "universal treatment standards" (UTS) for 216 characteristic and listed wastes. The UTS simplified treatment standards by setting uniform constituent concentration levels across all types of wastes and replacing concentration standards, which could vary based on the type of waste containing the constituents. These technology-based UTS may eventually be superseded, or capped, by the proposed risk-based exit levels in the Hazardous Waste Identification Rule (HWIR) (60 *FR* 66344, December 21, 1995).

In the Phase III Rule, as proposed in March 1995, the Agency suggested that Class I operators could segregate their characteristically hazardous wastes and treat just that volume of the wastewater to treatment standard levels in order to meet the treatment requirements. However, a number of commenters on the proposed rule indicated segregation was both technically and economically impractical due to the way wastewater is handled at Class I facilities. Commenters also noted that segregation and treatment could pose greater human health risks than underground injection. The other alternatives available to these operators were to seek a no-migration variance, apply for a case-by-case capacity variance (in addition to an existing national capacity variance), or reduce mass loadings of hazardous constituents by instituting pollution prevention measures.

On March 26, 1996, President Clinton signed the Land Disposal Program Flexibility Act. In effect, this legislation put back in place the approach adopted by EPA in the Third-Thirds rule of 1990 on the disposal of decharacterized wastewater. The new legislation stated, in essence, that hazardous wastes which are hazardous only because they exhibit a characteristic are not prohibited from Class I nonhazardous well disposal if they no longer exhibit the characteristic at the point of injection. The characteristic can be removed by any means, including dilution or other deactivation through aggregation of different wastewaters. Operators of Class I nonhazardous wells do not, therefore, have to identify and treat underlying hazardous constituents. Nonhazardous Class I facilities injecting decharacterized wastewater would not be reclassified as hazardous and would not have to make no-migration demonstrations or treat underlying hazardous constituents in order to keep injecting these wastes. The legislation also called for a study, to be completed within 5 years of the Act's passage, which would assess the risks of land disposal and Class I underground injection of decharacterized wastes.

The final Phase III LDR rule, published in April 1996, implemented the Land Disposal Program Flexibility Act by narrowing the applicability of UTS to decharacterized wastewaters managed in Class I wells. The Phase III rule also addressed issues related to small quantity generators by establishing a *de minimis* volume exclusion. Under this approach, Class I operators could continue injecting small volumes of characteristically hazardous wastewaters when mixed with a greater volume of nonhazardous waste. Class I facility wastewaters that meet the *de minimis* standard must have hazardous waste constituent concentrations of less than 10 times the established UTS at the point of generation. In addition, the facility's hazardous wastewater must account for less than 1 percent of the total flow at the point of injection and after commingling with the nonhazardous streams. Finally, the total volume of the hazardous streams must be no more than 10,000 gallons per day.

Phase IV Rulemaking

EPA published the Phase IV LDR rule on May 12, 1997 and May 26, 1998, establishing treatment standards and land disposal restrictions for wood preserving, toxicity characteristic metals, and mineral processing wastewaters. EPA estimated that the economic impact of restricting these wastes from disposal in Class I wells is minimal. Although the annual volume of Phase IV wastes is small, treatment capacity is not readily available or applicable because Phase IV wastes are process wastes injected on-site. Meeting no-migration demonstrations or other proposed management options may be difficult for most facilities at this time. A 2-year capacity variance has been granted to deal with the lack of treatment capacity.

II. Technology Summary

Injection engineering technology, regional and local geologic characterization, and site-specific mathematical modeling are combined to ensure that injected fluids from Class I wells travel to their intended location safely away from USDWs, and remain there for as long as they pose a risk to human health or the environment.

II.A Injection Well Technology

Class I wells are designed and constructed to prevent the movement of injected wastewaters into USDWs. Wells typically consist of three or more concentric layers of pipe: surface casing, long string casing, and injection tubing.[8] Exhibit 3 shows the key construction elements of a typical Class I well.

The well's **casing** prevents the borehole from caving in and contains the tubing. It typically is constructed of a corrosion-resistant material such as steel or fiberglass-reinforced plastic. **Surface casing** is the outermost of the three protective layers; it extends from the surface to below the lowermost USDW. The **long string casing** extends from the surface to or through the injection zone. The long string casing terminates in the injection zone with a screened, perforated, or open-hole **completion**, where injected fluids exit the tubing and enter the receiving formation. The well casing design and materials vary based on the physical and chemical nature of injected and naturally occurring fluids in the rock formation, as well as the formation's characteristics. The wastewater must be compatible with the well materials that come into contact with it. Cement made of latex, mineral blends, or epoxy is used to seal and support the casing.

The characteristics of the receiving formation determine the appropriate well completion assembly—a perforated or screen assembly is appropriate for unconsolidated formations such as sand and gravel, while an open-hole completion is used in wells that inject into consolidated sandstones or limestone.

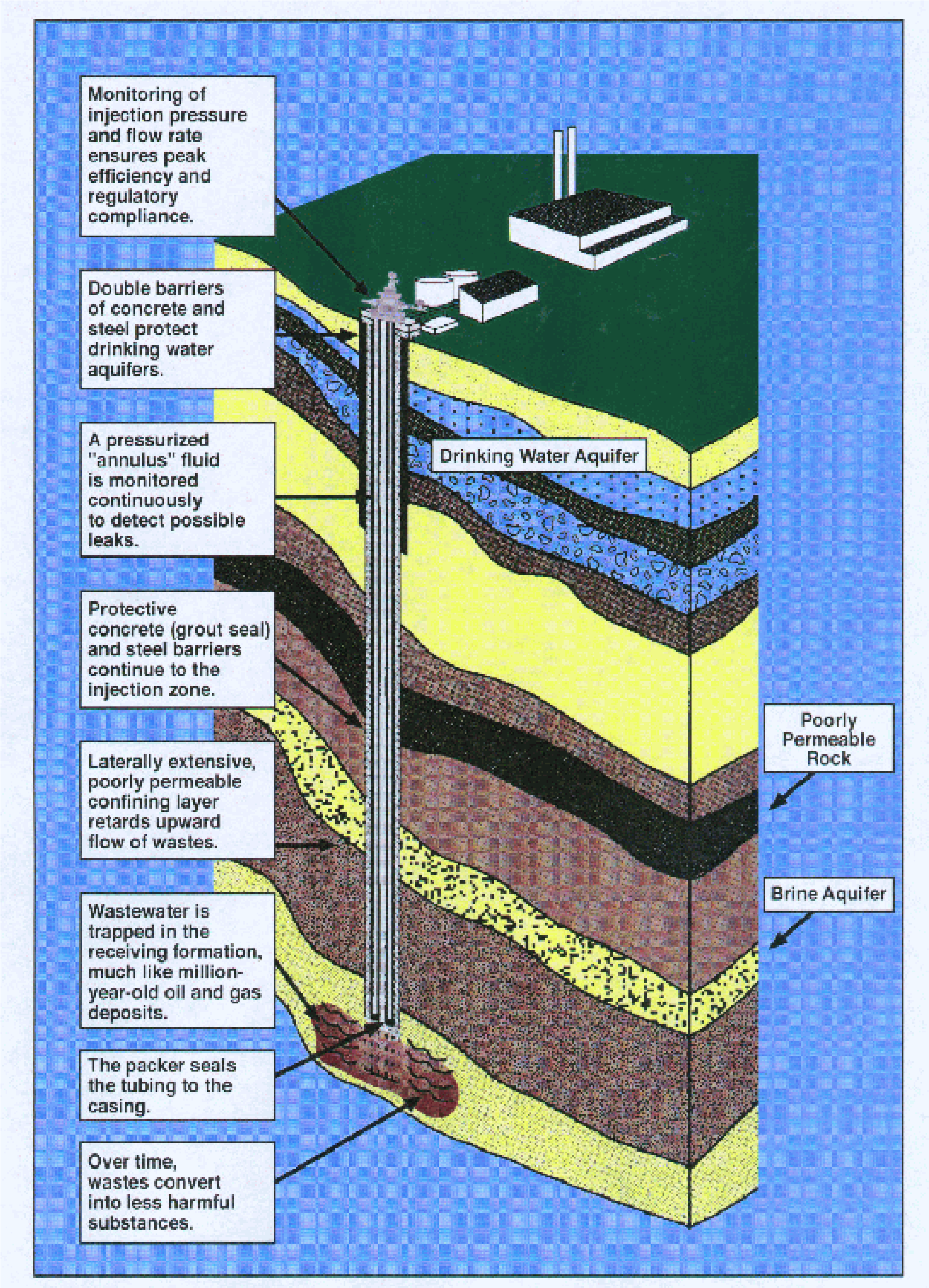
The innermost layer of the well, the **injection tubing**, conducts injected wastewater from the surface to the injection zone. Because it is in continuous contact with wastewater, the tubing is constructed of corrosion-resistant material (e.g., steel and high-nickel alloys, fiberglass-reinforced plastic, coated or lined alloy steel, or more exotic elements such as zirconium, tantalum, or titanium).

The annular space between the tubing and the long string casing, sealed at the bottom by a packer and at the top by the wellhead, isolates the casing from injected wastewater and creates a fluid-tight seal. The **packer** is a mechanical device set immediately above the injection zone that seals the outside of the tubing to the inside of the long string casing. The packer may be a simple mechanically set rubber device or a complex concentric seal assembly. Constant pressure is maintained in the annular space; this pressure is continuously monitored to verify the well's mechanical integrity and proper operational conditions.

[8] All three layers are required of Class I hazardous wells [40 CFR 146.65(c)].

Exhibit 3

A Typical Class I Injection Well



II.B Geologic Siting

In addition to the multiple safeguards of the injection well design, the geologic properties of the subsurface around the well offer a final safeguard against the movement of injected wastewaters to a USDW. Class I wells are sited so that, should any of their components fail, the injected fluids would be confined to the intended subsurface layer.

Class I wells inject into zones with the proper configuration of rock types to ensure that they can safely receive injected fluids. The geological formation into which the wastewaters are injected is known as the **injection zone**. Extensive pre-siting geological tests confirm that the injection zone is of sufficient lateral extent and thickness and is sufficiently porous and permeable so that the fluids injected through the well can enter the rock formation without an excessive build up of pressure and possible displacement of injected fluids outside of the intended zone. The injection zone is overlain by one or more layers of relatively impermeable rock that will hold injected fluids in place and not allow them to move vertically toward a USDW; this rock layer(s) defines the **confining zone**. Confining zones are typically composed of shales, which are "plastic," meaning they are less likely to be fractured than more brittle rocks, such as sandstones.

Class I fluids are injected deep into the earth into brine-saturated formations or non-freshwater zones. The typical Class I well injects wastewaters into geologic formations thousands of feet below the land surface. In the Great Lakes region, injection well depths typically range from 1,700 to 6,000 feet; in the Gulf Coast, depths range from 2,200 to 12,000 feet or more. Fluids at these depths move very slowly, on the order of a few feet per hundred or even thousand years, meaning that fluids injected into the deep subsurface are likely to remain confined for a long time.

Class I hazardous wells are located in geologically stable areas. The operator of a well must demonstrate that there are no transmissive fractures or faults[9] in the confining rock layer(s) through which injected fluids could travel to drinking water sources. Well operators also must show that there are no wells or other artificial pathways between the injection zone and USDWs through which fluids can travel. EPA regulations prevent Class I hazardous wells from being sited in areas where earthquakes could occur and compromise the ability of the injection zone and confining zone to contain injected fluids.

[9] A transmissive fracture or fault is one that has sufficient permeability and vertical extent to allow movement of fluids between formations.

II.C Class I Well Risks

There are two potential pathways through which injected fluids can migrate to USDWs: (1) failure of the well or (2) improperly plugged or completed wells or other pathways near the well. EPA's extensive technical requirements for Class I wells are designed to prevent contamination of USDWs via these pathways.

Well Failure

Contamination due to well failure is caused by leaks in the well tubing and casing or when injected fluid is forced upward between the well's outer casing and the well bore should the well lose mechanical integrity (MI). **Internal mechanical integrity** is the absence of significant leakage in the injection tubing, casing, or packer. An internal mechanical integrity failure can result from corrosion or mechanical failure of the tubular and casing materials. **External mechanical integrity** is the absence of significant flow along the outside of the casing. Failure of the well's external mechanical integrity occurs when fluid moves up the outside of the well due to failure or improper installation of the cement. To reduce the potential threat of well failures, operators must demonstrate that there is no significant leak or fluid movement through channels adjacent to the well bore before the well is issued a permit and allowed to operate. In addition, operators must conduct appropriate mechanical integrity tests (MITs) every year (for hazardous wells) and every 5 years (for nonhazardous wells) thereafter to ensure the wells have internal and external MI and are fit for operation. It is important to note that failure of an MIT, or even a loss of MI, does not necessarily mean that wastewater will escape the injection zone. Class I wells have redundant safety systems to guard against loss of waste confinement (see section III.A for further discussion).

Pathways for Fluid Movement in the Area of Review

The **Area of Review** (AoR) is the zone of endangering influence around the well, or the radius at which pressure due to injection may cause the migration of the injectate and/or formation fluid into a USDW. Improperly plugged or completed wells that penetrate the confining zone near the injection well can provide a pathway for fluids to travel from the injection zone to USDWs. These potential pathways are most common in areas of oil and gas exploration. Because the geologic requirements for Class I hazardous injection activities are similar to those for oil and gas exploration, these activities often take place in the same areas. EPA estimates that there may be as many as 300,000 abandoned wells and 100,000 producing wells potentially in the AoRs of Class I injection wells.

To protect against migration through this pathway, wells that penetrate the zone affected by injection pressure must be properly constructed or plugged. Before injecting, operators must identify all wells within the AoR that penetrate the injection or confining zone, and repair all wells that are improperly completed or plugged before a permit is issued.

Fluids could potentially be forced upward from the injection zone through transmissive faults or fractures in the confining beds which, like abandoned wells, can act as pathways for waste migration to USDWs. Faults or fractures may have formed naturally prior to injection or may be created by the waste dissolving the rocks of the confining zone. Artificial fractures may also be created by injecting wastewater at excessive pressures. To reduce this risk, injection wells are sited such that they inject below a confining bed that is free of known transmissive faults or fractures. In addition, during well operation, operators must monitor injection pressures to ensure that fractures are not propagated in the injection zone or initiated in the confining zone.

II.D Introduction to Modeling

Site-specific modeling of wastewater migration is the foundation of a no-migration demonstration that hazardous wastewaters will remain in the injection zone for as long as they remain hazardous. Models are also the basis on which the requirements for hazardous and nonhazardous waste disposal were developed. A long-term analysis is the only way to know with absolute certainty what will happen to injected fluids; however this is impractical, given the time frames involved in movement of deep-injected fluids. The purpose of modeling is to provide long-term prediction of the extent of injected wastewater migration at great depths and demonstrate, using conservative assumptions, that the wastewater will remain contained or rendered nonhazardous. Modeling is based on rigorous science, and models are well-established scientific tools. All of the models on which studies and no-migration petitions are based are accepted by the scientific and regulatory communities.

The modeling process has several components: the conceptual model, the mathematical model or equations, and the numerical model or computer code used to solve the equations. In general, modeling is a conceptual representation, using simplifying assumptions about the injection well, the surrounding formation, and well operations. The mathematical model involves equations to represent the conservation of mass and momentum. The equations simulate fluid pressure and chemical or constituent concentration levels changes over time. Because of the difficulty in measuring the slow movement of fluids over long time periods (i.e., 10,000 years at great depths), the injection and emplacement of the wastewater is modeled mathematically using complex computer simulations.

The conceptual model is a simplified representation of the geologic strata in the vicinity of the injection well. It is envisioned that the well operations include wastewater injection operations, based on both the actual operational history of the site and future injection conditions. In addition, the model includes a post-operation period of 10,000 years in which the wastewater will migrate from the point of emplacement in the injection zone. Several processes are considered in the conceptual model, including pressure build-up, fluid displacement, mixing or dispersion of the injected wastewater and the native formation fluids, and fluid density differences.

Mathematical models are used to simulate the injection and migration of fluids within the injection zone. These models include fluid flow and dissolved contaminant transport within geologic materials using mathematical expressions based on the physical principles associated with the geology and the native (*in situ*) and injected fluids. Within the model, the injection zone and the confining zone are defined by subdividing the region into series of adjoining "cells." The lateral extent of the model is often several miles wide. The cells or blocks are defined in order to segment the region both vertically and laterally. Each cell within the modeled region has defined geologic parameters and fluid properties including permeability, porosity, compressibility, dispersivity, fluid density and viscosity. The mathematical models solve for the fluid pressure and chemical concentration. Realistic modeling requires considerable knowledge about the fluid properties of the injectate and the physical properties of the rock formation, all of which serve as inputs to the model. It is also possible to mathematically simulate chemical interactions between the injected fluids, the native fluids, and the geologic formation. More complex models also include a representation of the complex geologic structure through a series of surface and subsurface maps.

The models or computer codes are used to simulate the effects of injecting fluids at some initial time into one or more of the cells and predict the flow and chemical concentration transferred from cell to cell over an extended period of time. Many calculations take place in the model. At each time step (i.e., from the start of the injection operations to 10,000 years), the model must track the new amount of wastewater injected, the flow and chemical flux into adjacent cells, and the subsequent flow and chemical flux from cell to cell. There may be thousands of cells in a model, and the flow and chemical flux must be calculated for every side of each cell. The model tracks the mass of the fluids, the fluid density and viscosity, chemical concentrations, and temperature of rock and water within every cell at specified times.

Models are constructed based on field observations and measurements of downhole pressure, surface injection pressure, geophysical logs, rock cores extracted from depth, injectivity tests, pressure fall-off test, tracer surveys, injection chemical concentration, and fluid density. The process of model calibration is a fitting of the input parameters in order to match field conditions. For example, pressure fall-off tests may be analyzed using analytical tools for injection zone permeability. The values for permeability are used as inputs from one fall-off test and then compared with field observations from another test. The input parameters are then adjusted to afford the best possible match with field conditions. Conservative assumptions are embedded throughout the model construction, so that the model predicts the maximum extent of wastewater migration.

The results of the model are verified against actual data from the field (i.e., data from pressure tests, drawdown or build-up tests). Typically, model verification does not address concentration levels. Occasionally, new wells are constructed near existing injection wells, and model verification of the existing wastewater plume can be performed. Because the model is predictive over a long time scale and the geologic materials are naturally variable, a conservative model is designed to address the issue of variability in the model parameters and fluid motion within the injection zone through a series of analyses. Multiple simulations or computer runs using differing input parameters are generally performed to assess variations in the predicted outcome. Moreover, it is preferable for the models to use conservative assumptions to predict worse-case scenarios and reflect the high degree of uncertainty in the no-migration demonstrations (40 CFR 148.21). This worst-case scenario brackets the outer limits of the fluid migration within the area of investigation.

When the modeling analysis is complete, the output is typically a series of graphs and maps that depict the amount of fluid pressure increase and the concentration of the injected fluid within the injection zone. Although the conditions at the final time step (10,000 years) are the objective, it is possible to show the physical position of injected fluids at any specified time.

Numerous models or codes are based on work by the United States Geologic Survey, EPA, U.S. Department of Defense, U.S. Army Corps of Engineers, many universities and colleges, and the oil and gas industry. These are distributed commercially, and many are available for free on the Internet. The models have evolved in their complexity and ability to represent the real world, from simple displacement approaches to models incorporating molecular diffusion and variable pressure responses.

III. Options for Decharacterized Wastewaters

Under RCRA, wastewaters that demonstrate the characteristic of ignitability, corrosivity, reactivity, or toxicity are considered to be hazardous wastes.

- **Ignitable wastes** are capable of causing fire through friction at standard temperature or pressure. Ignitable wastes are produced by the organic chemical production, laboratories and hospitals, paint manufacturing, cosmetics and fragrances, pulp and paper, and construction industries.

- **Corrosive wastes** are extremely acidic or alkaline (i.e., have a pH less than or equal to 2 or greater than or equal to 12.5). The organic chemical production, laboratories and hospitals, paint manufacturing, cosmetics and fragrances, equipment cleaning, soaps and detergents, electronics manufacturing, iron and steel, and pulp and paper industries produce corrosive wastes.

- **Reactive wastes** are normally unstable wastes that react violently or form potentially explosive mixtures with water. Examples of industries that produce reactive wastes include organic chemical production and petroleum refining.

- **Toxic organic wastes** contain toxic constituents in excess of a regulatory level. They are produced by organic chemical production, petroleum refining, and waste management and refuse systems.

Characteristic hazardous wastes are identified with waste codes D001 through D043. These waste codes are used for record keeping, tracking off-site shipments, and determining the applicability of the LDR program.

Prior to disposal in a Class I nonhazardous well, hazardous wastewaters must be decharacterized (i.e., the hazardous characteristic must be removed) by any means including treatment, dilution, or other deactivation through aggregation of different wastewaters, including commingling with nonhazardous or exempt wastewaters. The Class I nonhazardous wells, into which the decharacterized wastewater is injected, must conform with all federal and state UIC regulations. The management of these wastewaters by Class I injection well operators provides a low-risk option, as will be described in the next sections of this study.

In addition, from a general analysis of data from previous studies, including databases specific to Class I nonhazardous and hazardous injection wells, EPA believes that a substantial volume of decharacterized waste is being injected into Class I hazardous wells. Facilities using Class I injection wells, including industrial, manufacturing, petrochemical, and refinery operations, will generally use their Class I hazardous wells to dispose of wastewaters from their process operations which may not be amenable to segregation. They can use their Class I hazardous wells for disposal of any wastewaters allowed by their permits, and included in their no-migration petition demonstration (permitting and no-migration petitions will also be discussed later in this study). This practice affords an even greater (though not essential) level of protection, as the Class I hazardous waste wells have additional operating, monitoring, and other redundant safety requirements beyond the already protective requirements of the Class I nonhazardous wells.

IV. Oversight of Class I Wells

This section describes how EPA oversees the Class I program. Section IV.A describes the Agency's regulations for siting, constructing, operating, monitoring and testing, and closing Class I wells. Section IV.B describes how EPA Headquarters and regions oversee Class I injection practices.

IV.A Regulations and Criteria for Class I Wells

EPA's siting, construction, operating, monitoring, and closure requirements for Class I wells provide multiple safeguards against well leakage or the movement of injected wastewaters to USDWs. The following sections describe the Class I Program regulations (40 CFR 146 and 148).

Siting Requirements

Class I wells must be sited so that wastewaters are injected into a formation that is below the lowermost formation containing, within one-quarter mile of the well, a USDW [40 CFR 146.12(a); 40 CFR 146.62(a)]. In siting Class I wells, operators must use geologic and hydrogeologic studies and studies of artificial penetrations of the injection and confining zones to demonstrate that their proposed injection will not endanger USDWs. In addition, Class I operators seeking to inject hazardous wastewaters must demonstrate via a no-migration petition that the hazardous constituents of wastewaters will not migrate from the disposal site for as long as the wastewaters remain hazardous.

Additional siting requirements are imposed on Class I hazardous wells to ensure that they are located in geologically stable (e.g., low risk of earthquakes) formations that are free of natural or artificial pathways for fluid movement between the injection zone and USDWs.

Geologic Studies

Studies of the injection and confining zones are conducted to ensure that Class I wells are sited in geologically suitable areas. Well permitting decisions are based on whether the receiving formations are sufficiently permeable, porous, and thick to accept the injected fluids at the proposed injection rate without requiring excessive pressure. The injection zone should be homogeneous. It should also be of sufficient areal extent to minimize formation pressure buildup and to prevent injected fluids from reaching aquifer recharge areas. The confining zone should be of relatively low permeability to prevent upward movement of injected materials.

For Class I hazardous wells, additional structural studies must demonstrate that the injection and confining formations in the area around the well are free of vertically transmissive fissures or faults, and that the region is characterized by low seismicity and a low probability of earthquakes. The operator must demonstrate that the proposed injection will not induce earthquakes or increase the frequency of naturally occurring earthquakes.

Injected fluids must be geochemically compatible with the well materials and the rock and fluids in the injection and confining zones. The injection zone must have no economic value (i.e., be unfit for drinking or agricultural purposes and lack dissolved minerals in economically valuable quantities).

Operators must demonstrate that the wastewater and its anticipated reaction products are compatible with both the geologic material of the injection zone and any native (naturally occurring) or previously injected fluids. Water analyses must be performed to characterize the geochemistry of the native water to predict potential interactions, and to provide a baseline to determine whether contamination has occurred.

Area of Review

The AoR, or the zone of endangering influence (the radius at which injection can affect a USDW), must be determined by either a fixed radius or mathematical computation.[10] When a fixed radius is used, the AoR for Class I nonhazardous wells and municipal wells must be, at a minimum, one-quarter mile [40 CFR 146.69(b)]; for hazardous wells, the AoR is extended to, at a minimum, 2 miles [40 CFR 146.63]. It is important to note, however, that for many Class I nonhazardous wells, the radius of the AoR studied was larger than the federally-required one-quarter mile. Seventy-six percent of the wells studied by the Underground Injection Practices Council (UIPC) had an area of review that exceeded one-quarter mile.[11] Several states require an AoR for all Class I wells that is larger than that required under the federal regulations. For example, Texas requires a minimum 2½-mile AoR; Louisiana requires a 2-mile AoR; and Florida and Kansas regulations establish a 1-mile minimum. These four states collectively account for nearly 70 percent of the Class I well inventory.

Operators must identify all wells within the AoR that penetrate the injection or confining zone, and determine whether any of these wells are improperly completed or plugged and thus could serve as pathways for migration of wastewaters. Along with the permit application, the operator must submit a corrective action plan containing the necessary steps or modifications to address improperly completed or plugged wells [40 CFR 144.55(a)]. The plan must take into account the nature of native fluids or injection byproducts, potentially affected populations, geology and hydrogeology, and the history of injection activities. Prior to commencing injection, the operator must demonstrate that all potential pathways for migration have been adequately addressed.

[10] The zone of endangering influence may be determined via computations as specified at 40 CFR 146.6 for Class I nonhazardous wells, or at 40 CFR 146.61(b) for Class I hazardous wells. For hazardous wells, the computations specified in 40 CFR 146.6 are superseded by the requirement for a 2-mile radius, at 40 CFR 146.63 (whichever is greater).

[11] Underground Injection Practices Council. *A Class I Injection Well Survey (Phase I Report): Survey of Selected Sites.* D19976.S1. Prepared by CH2M Hill, Gainesville, Florida. April 1986.

No-Migration Petition

In addition to geological and AoR studies, operators of Class I hazardous waste injection wells must demonstrate with reasonable certainty that the hazardous components of their wastewaters will not migrate from the injection zone [40 CFR 148.20].

To qualify for this exemption from the ban on disposal of certain wastes, EPA requires operators to show that the wastewaters will remain in the injection zone for as long as they remain hazardous, or that the wastes will decompose or otherwise be attenuated to nonhazardous levels before they migrate from the injection zone. A detailed hydrogeological and geochemical modeling study, known as a **no-migration petition**, may take one of the following forms:

- A **Fluid Flow Petition** demonstrating that for at least 10,000 years[12] no lateral movement to a pathway to a USDW or vertical movement out of the injection zone will occur. Petitioners must demonstrate that the strata in the injection zone above the injection interval are free of transmissive faults or fractures and that a confining zone is present above the injection interval.
- A **Waste Transformation Petition** to demonstrate that attenuation, transformation, or immobilization will render wastes nonhazardous before they migrate from the injection zone. Petitioners must demonstrate that the zone where transformation, attenuation, or immobilization will occur is free of transmissive faults or fractures and that a confining zone is present above the injection interval.

Each petition is a multi-volume complex technical analysis which describes the well construction, the injected wastewater, and the local and regional geology and hydrogeology. It relies on conservative mathematical models demonstrating that the hazardous wastewater will not migrate from the injection zone into USDWs. Once a no-migration petition is approved, an operator may inject only those wastes that are listed in the petition. (See section II.D for a description of the modeling for no-migration petitions.)

Preparing a no-migration petition is a lengthy process which typically costs $300,000 and requires up to 11,000 hours of technical work by engineers, computer modelers, geochemists, geologists, and other scientists. Factoring in the cost of necessary geological testing and modeling, no-migration petitions can cost in excess of $2 million.

[12] The 10,000-year standard is considered sufficiently long to ensure that the no-migration standard would be met, and short enough to be within the abilities of predictive models. [NRDC v EPA, 907 F.2d at 1158 .]

Summary of Siting Requirements[13]	
Hazardous Wells	Nonhazardous Wells
• 2-mile AoR study performed. • No-migration petition demonstration required. • Sited in demonstrated geologically-stable areas. • Additional geologic structural and seismicity studies performed.	• ¼-mile AoR study performed (a larger AoR study may be conducted if required by state regulations). • Sited in demonstrated geologically-stable areas.

Construction Requirements

EPA requires that Class I wells be designed and constructed to prevent the movement of injected wastewaters into USDWs. Construction requirements for Class I nonhazardous wells and municipal wells are set forth at 40 CFR 146.12; construction requirements for hazardous wells are specified at 40 CFR 146.65 and 40 CFR 146.66. These requirements specify the multi-layer design of Class I wells, as described in section II.A.

During the permit application process, the permitting authority reviews and approves engineering schematics and subsurface construction details. The design of the casing, tubing, and packer must be based on the depth of the well; the chemical and physical characteristics of the injected fluids; injection and annular pressure; the rate, temperature, and volume of injected fluid; the size of the well casing [40 CFR 146.12(c)(2)]; and cementing requirements (40 CFR 146.65). Any changes to the proposed design during construction must be approved before being implemented.

During well construction, operators conduct deviation checks at sufficiently frequent intervals to ensure that there are no diverging holes which would allow vertical migration of fluids. Other logs and tests (e.g., resistivity or temperature logs) also may be required during construction. EPA or the permitting authority may witness portions of construction activities.

[13] Decharacterized waste is injected into Class I nonhazardous wells (although it may be injected into both hazardous and nonhazardous wells). Requirements for both Class I hazardous and nonhazardous wells are presented in this report for comparison and to provide a complete portrayal of the UIC Program. It should be noted that some states impose some of the federal Class I hazardous well requirements on nonhazardous wells.

Summary of Construction Requirements	
Hazardous Wells	Nonhazardous Wells
• Well is cased and cemented to prevent movement of fluids into USDWs. • Detailed requirements for appropriate tubing and packer. • UIC Program director must approve casing, cement, tubing and packer design prior to construction.	• Well is cased and cemented to prevent movement of fluids into USDWs. • Constructed with tubing and packer appropriate for injected wastewater.

Operating Requirements

EPA's operating requirements for Class I wells provide multiple safeguards to ensure that injected wastewater is fully confined within the injection zone and the integrity of the confining zone is never compromised. At a minimum, all Class I wells must be operated so that injection pressures will not initiate new fractures or propagate existing fractures after initial stimulation of the injection zone during well construction.

The annular space between the tubing and the long string casing must contain approved fluids only and permitted pressures must be maintained.[14] Class I hazardous wells are subject to additional or more explicit permitting requirements and operating standards related to annular monitoring parameters and continuous demonstration of mechanical integrity.[15]

Class I hazardous wells must be equipped with continuous monitoring and recording devices that automatically sound alarms and shut-in the well whenever operating parameters related to the injection pressure, flow rate, volume, temperature of the injected fluid, or annular pressure exceed permitted ranges.[16] When this occurs, the owner or operator must cease injection; notify the Director within 24 hours; and identify, analyze, and correct the problem. Operators of Class I wells are required to notify the UIC Program Director and obtain approval before performing

[14] 40 CFR 146.13 (a).

[15] 40 CFR 146.67 (a) to (e).

[16] 40 CFR 146.67 (f), (g), and (j).

any workover or major maintenance on the well.[17] The operator may resume injection only upon approval of the Director.

Summary of Operating Requirements	
Hazardous Wells	Nonhazardous Wells
• Continuously monitor injection pressure, flow rate, and volume. • Install alarms and devices that shut-in the well if approved injection parameters are exceeded. • Maintain injection at pressures that will not initiate new fractures or propagate existing fractures.	• Continuously monitor injection pressure, flow rate, and volume. • Maintain injection at pressures that will not initiate new fractures or propagate existing fractures.

Monitoring and Testing Requirements

Operators of Class I wells must monitor and test for mechanical integrity, containment within the injection zone, and characteristics of the injected wastewater. They must also monitor USDWs within the AoR for indications of fluid migration and pressure changes indicating a potential for contamination.[18]

Class I well operators must continuously monitor injection pressure, flow rates and volumes, and annular pressure.[19] Monitoring requirements for Class I hazardous wells have explicit procedures for reporting and correcting problems related to a lack of mechanical integrity or evidence of wastewater injection into unauthorized zones. In addition to monitoring the well operation, operators of hazardous wells are required to develop and follow a waste analysis plan for monitoring the physical and chemical properties of the injected wastewater.[20] The frequency of these analyses depends on the parameters being monitored. Complete analysis of the injected wastewaters must be conducted at frequencies specified by the plan or when process or operating changes affect the characteristics of the wastewater.

[17] 40 CFR 146.67 (j).

[18] 40 CFR 146.13 (b) (4).

[19] 40 CFR 146.13 (b).

[20] 40 CFR 146.68 (a).

Operators of Class I hazardous wells must perform tests to demonstrate that the wastewater's characteristics remain consistent and compatible with well materials with the wastewater.[21]

Periodic testing of all Class I wells also is required.[22] The operator must develop a monitoring program that includes, at minimum, an annual pressure fall-off test in addition to an internal MIT every year and an external MIT every 5 years. (Texas and Michigan require external MITs every year.)

Class I operators must conduct tests to demonstrate that their wells have internal and external mechanical integrity.[23] Every year, operators of Class I hazardous wells must demonstrate internal mechanical integrity by conducting an approved pressure test to inspect the long string casing, injection tubing, and annular seal, as well as an approved radioactive tracer survey (RTS) or Oxygen Activation Log (OAL)[24] to examine the bottom hole cement. Operators of Class I nonhazardous wells must demonstrate internal MI every 5 years. Every 5 years, all Class I well operators must demonstrate external MI using noise, temperature, or other approved logs to test for fluid movement along the borehole. Casing inspection logs or noise, temperature, or other approved logs are also required when a well workover is conducted, or if the Director believes that the long string casing lacks integrity.

An internal or external MI failure does not imply failure of the injection well or loss of wastewater confinement. These are simply indicators that one of several protective layers in the injection well system has malfunctioned. As long as the other protective elements are intact, wastewaters would be contained within the injection system.

UIC regulations authorize the use of monitoring wells in the AoR to monitor fluids and pressure. Monitoring wells can be used to supplement required injection and pressure monitoring if needed. The location, target formation, and the types of monitoring wells should

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[21] 40 CFR 146.68 (c).

[22] 40 CFR 146.13 (d) and 40 CFR 146.68 (e).

[23] 40 CFR 146.13 (b) and 146.68 (b).

[24] The OAL has been approved as an alternative to the RTS to test for movement of fluids between the casing and the well bore. Case studies by EPA Region 6 indicate that the RTS and the OAL are equally effective in identifying channels behind the casing, which are in hydraulic communication with the injection zone. The OAL is a preferred method where channeling is not in hydraulic communication with the injection interval. EPA Region 6 has also requested the use of the OAL to increase confidence in MIT results.

be based on potential pathways of contaminant migration. Monitoring within the USDW can provide geologic data or evidence of contamination.[25]

Summary of Monitoring and Testing Requirements	
Hazardous Wells	Nonhazardous Wells
• Follow approved waste analysis plan. • Conduct internal MIT every year and external MIT every five years. • Monitoring wells to supplement required monitoring are authorized.	• Conduct internal and external MITs every 5 years. • Monitoring wells to supplement required monitoring are authorized.

Reporting and Record Keeping Requirements

All Class I well operators must report the results of required monitoring and testing to the state or EPA UIC Director. Class I hazardous well operators must report quarterly on monitoring results and annually on the results of radioactive tracer surveys, casing pressure tests, ambient monitoring, and pressure fall-off tests. They must also report any changes to closure plans, including updates to plugging and abandonment cost estimates.

All Class I operators must report on the physical, chemical, and other relevant characteristics of injected fluids; monthly average, maximum, and minimum values for injection pressure, flow rate, volume, and annular pressure; and monitoring results of USDWs in the AoR.[26] MIT results, other required tests, and any well workovers must be reported in the next quarterly report following the tests or workovers.

Quarterly reports on Class I hazardous wells must also identify the maximum injection pressure for the quarter, any event that exceeds permitted annular or injection pressure, any event that triggers an alarm or shutdown from the continuous recording device, the total volume of fluid injected, any change in the annular fluid volume, results from the waste analysis program, and geochemical compatibility information.[27]

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[25] Warner, D. L. "Monitoring of Class I Injection Wells." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects*. John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996.

[26] 40 CFR 146.13 (c).

[27] 40 CFR 146.69.

In states where EPA administers the UIC program, the Regional Administrator may require operators to submit additional information, if needed to determine if a well poses a hazard to USDWs. Such information may include evidence of groundwater monitoring and periodic reports of such monitoring, periodic reports on analysis of injected fluids, and a description of the geologic strata through and into which injection is taking place.

In addition, all operators must notify the permitting authority of planned changes to the facility, changes that may result in noncompliance, progress in meeting the milestones of a compliance schedule, any loss of mechanical integrity or other indication of possible endangerment of a USDW (within 24 hours), and any noncompliance with permit conditions.

Summary of Reporting and Record Keeping Requirements	
Hazardous Wells	Nonhazardous Wells
• Report quarterly on injection and injected fluids and monitoring of USDWs in the AoR; results from the waste analysis program; and geochemical compatibility. • Report on internal MIT every year and external MIT every 5 years. • Report any changes to the facility, progress in meeting the milestones of a compliance schedule, loss of MI, or noncompliance with permit conditions.	• Report quarterly on injection and injected fluids and monitoring of USDWs in the AoR. • Report every 5 years on internal and external MITs. • Report any changes to the facility, progress in meeting the milestones of a compliance schedule, loss of MI, or noncompliance with permit conditions.

Closure Requirements

Upon closing their wells, operators must submit a plugging and abandonment report indicating that the well was plugged in accordance with the plugging and abandonment plan (submitted when the well was permitted). Plan requirements and subsequent closure reporting requirements are specified in greater detail for hazardous wells than for nonhazardous wells.

Class I hazardous well operators must also conduct pressure fall-off and mechanical integrity tests, and report the results in their closure reports. The well must be flushed with a non-reactive fluid. Each cement plug must be tagged and tested for seal and stability before the closure is completed.[28] In addition, Class I hazardous well operators are required to continue and complete outstanding clean-up actions, and continue groundwater monitoring until pressure in

[28] 40 CFR 146.71.

the injection zone decays to the point where no potential for influencing the USDW exists. They must also notify and provide appropriate information to local and state authorities regarding the well, its location, and its zone of influence at closure.[29]

Summary of Closure Requirements	
Hazardous Wells	Nonhazardous Wells
• Flush well with a non-reactive fluid; tag and test each cement plug. • Conduct pressure fall-off test and MIT. • Submit plugging and abandonment report. • Complete outstanding clean-up actions; continue groundwater monitoring until injection zone pressure can not influence USDW. • Inform authorities of the well, its location, and zone of influence.	• Flush well with a non-reactive fluid; tag and test each cement plug. • Submit plugging and abandonment report.

IV.B How EPA Administers the Class I UIC Program

Class I wells are regulated under the SDWA to ensure protection of USDWs. Class I hazardous wells also are regulated under RCRA and HSWA. They are subject to the ban on land disposal of certain wastes, unless owners/operators of these wells demonstrate via a no-migration petition that the wastewaters will not migrate from the injection zone for 10,000 years or as long as they remain hazardous.

EPA authorizes state agencies to regulate Class I wells, provided that the state meets requirements specified under section 1422 of the SDWA. States that receive primary regulatory and enforcement responsibility are referred to as primacy states. EPA regional offices administer the UIC program for tribes[30] and in states that do not have primacy authority, commonly referred to as direct implementation (DI) states.

29 40 CFR 146.72.

30 There are no Class I wells on Indian lands.

Operators in primacy states submit data to the primacy agency, and the primacy agencies forward this information to the regions. Operators in DI states submit data directly to the EPA region. The regions forward appropriate information to EPA Headquarters.

EPA Headquarters' Management of the National Program

EPA Headquarters is responsible for performing a variety of rulemaking activities, as well as other analytical and oversight functions, for the UIC program. Headquarters UIC staff coordinate with the EPA Office of Solid Waste on LDR rulemaking efforts. In connection with these efforts, Headquarters staff conduct independent economic analyses and regulatory impact analyses (RIAs) of the potential costs and benefits of proposed rules.

EPA Headquarters uses information from the regions to respond to information requests and to perform analyses for EPA management, the Office of Management and Budget, Congress, and the public. In addition, Headquarters uses information submitted by primacy agencies via the UIC program's 7520 reporting forms to track, evaluate, and report on state performance. Headquarters establishes and tracks performance targets and measures for EPA regional programs. EPA Headquarters also assesses the effectiveness of existing regulatory requirements, using state and regional information to justify future program modifications.

Headquarters compiles and analyzes Class I well information on a national basis, through efforts such as the 1996 Class I UICWELLS database. This database contains detailed well-specific data, such as geology, waste characteristics, and injection volumes. Headquarters uses the database to analyze the potential impacts of proposed rules on the Class I community.

Regional Oversight of Primacy Programs

The regions develop operating budgets and program plans, allocate resources, track state-by-state performance, and respond to inquiries. The regions are responsible for reviewing and verifying information before forwarding it to EPA Headquarters.

EPA's regions oversee the primacy agencies using quarterly, semi-annual, and annual reports submitted by the states. The information is used to track state progress against commitments and to ensure that state programs can take timely and appropriate action in response to threats to public health from contaminated USDWs.

Regions use well-specific information to track state enforcement actions against facilities that are significant noncompliers—violators most likely to contaminate USDWs. Regions may initiate federal enforcement action jointly with a primacy state, at the request of the state, or where a state does not fulfill its enforcement responsibilities.

EPA's regions are also responsible for reviewing all no-migration petitions associated with Class I hazardous wells. Each no-migration petition must be submitted to the Regional Administrator.[31] In reviewing no-migration petitions, EPA expects to gain valuable experience and information which may affect future land disposal restrictions.

Regional staff work closely with well operators throughout the petition development process. Several technical staff members may review a single petition and may take a year or more to determine whether it should be approved. Each part of a petition is reviewed by a specialist. For example:

- An engineer or geologist reviews information about the construction, operation, maintenance, and compliance history of the well; local and regional geology and seismology; and the compatibility of the wastewater with the well materials and the injection and confining zone rock and fluids.
- A modeling expert evaluates the accuracy of the model's predictions compared to actual conditions at the site. The modeler has to verify that the model takes into account all significant processes that affect waste mobility and transformation, is sensitive to subsurface processes, and has been properly validated and calibrated.

The petition is subject to public notice and comment. EPA publishes a draft notice of its decision to approve or deny the petition, offers a public hearing, develops a fact sheet or statement of basis, and responds to all comments. Notice of the final decision on a petition is published in the *Federal Register*.

Direct Implementation of State Programs

In addition to their oversight responsibilities, EPA regional offices implement the UIC program on tribal lands and in states without primacy. In these DI states, EPA regional offices review permit applications to ensure that proposed wells are properly sited and designed. Following permit approval and well completion, the regions use monitoring and testing reports submitted by operators to determine if the well has mechanical integrity. EPA regions are also responsible for reviewing no-migration petitions for Class I hazardous wells in DI states.

DI programs also use information submitted by operators to focus efforts on injection wells that require enforcement action. Operators who have been out of compliance for at least two consecutive quarters are identified and targeted for enforcement action.

[31] 40 CFR 268.6.

V. Risk Associated with Class I Wells

Early failures associated with Class I injection such as those at Hammermill Paper Company and Velsicol Chemical Company (described in section I.B), illustrated the potential threats of wastewater injection and the need for and importance of the UIC regulations.

The 1980 UIC regulations address many of these risks. Since passage of the regulations, EPA and other organizations have conducted numerous studies of hazardous and nonhazardous Class I wells which demonstrate that such failures are unlikely to occur. The following sections describe these studies. These reports are described in greater detail in the annotated bibliography at the end of this study report.

V.A Studies of the Effectiveness of the UIC Regulations

Early studies by EPA and other organizations looked at potential operational problems for Class I wells. Many of the failures documented in these studies were the result of historic practices that are no longer acceptable under the promulgated UIC regulations.

Underground Injection Practices Council and General Accounting Office Studies

In the mid-1980s, UIPC, presently the Ground Water Protection Council (GWPC), and the General Accounting Office (GAO) conducted studies which described past Class I well malfunctions in the United States and discussed how current Class I regulations would minimize the possibility of failures. In April 1986, UIPC published a study that provided comprehensive data on the operation and performance characteristics of Class I injection wells.[32] The study included case histories of Class I well sites or facilities with reported histories of operational problems. A 1987 GAO study focused on Class I failures resulting in aquifer contamination.[33] GAO reviewed the cause of each incident to determine whether regulations in place would have prevented it.

The UIPC study identified malfunctions at 26 facilities, involving 43 wells, suggesting an overall well malfunction rate of approximately 9 percent of the 500 Class I wells reported to exist at the time. Only six wells, or 2 percent of all Class I wells, experienced malfunctions resulting in leakage into a USDW. The 1987 GAO study reported only two cases of drinking

[32] Underground Injection Practices Council. *A Class I Injection Well Survey (Phase I Report): Survey of Selected Sites.* D19976.S1. Prepared by CH2M Hill, Gainesville, Florida. April 1986.

[33] U.S. General Accounting Office. *Hazardous Waste–-Controls Over Injection Well Disposal Operations*. 1987.

water contamination from Class I wells, one case of suspected contamination, and eight documented cases of non-drinking water aquifer contamination.[34]

At most of the facilities in the UIPC study where well malfunctions occurred and all of the cases in the GAO study, failing wells had been constructed and injection had commenced prior to the implementation of the 1980 UIC standards. Most of the malfunctions reported in the UIPC study were related to design, construction, or operating practices that are no longer allowed under UIC regulations. Examples of the various malfunction scenarios include the following:

> **Leaks in the injection well casing** caused movement of wastewaters into a USDW at four facilities. The leaks were detected either through annular monitoring or separate monitoring wells. These leakages were attributed to defects in well construction that would not have been allowed under the 1980 UIC regulations.
>
> **Excessive injection pressure** or hydraulic surges causing a blowout at the wellhead or surface piping, leading to contamination at the surface, was documented in the UIPC study. UIC requirements for siting wells to limit the need for excessive injection pressures and pressure monitoring requirements would have prevented such incidents.
>
> **The presence of improperly abandoned wells** was cited as a factor in contamination at the surface in the UIPC study. Required AoR studies would have detected these pathways and, under UIC regulations, they would have been plugged prior to any allowed injection.
>
> **Leaking packer assemblies** were the most likely cause of leakage into an unpermitted non-drinking water zone. This was the most commonly documented malfunction in the UIPC study, at 17 facilities involving 29 wells. Such leaks allow wastewater to come into contact with the protective well casing, causing corrosion. Under current UIC regulations, the packer design must meet EPA approval based on the chemical and physical characteristics of the injected fluids, as well as the rate, temperature, and volume of injected fluid.
>
> **Corrosion** of the casing or tubing was suspected as the cause of leakage of injected fluids documented in the GAO study. In one case, corrosion caused the tubing to separate, resulting in a blowout and waste spillage at the surface. UIC requirements stipulate that the well casing be constructed of a corrosion-resistant material and that the wastewater be compatible with the well materials which come into contact with it.

[34] The incidents described in the GAO report may also be included in the UIPC study; at least the two incidents of drinking water contamination are described in both reports.

Injection directly through the casing, without packer and tubing, was the primary cause of two cases of drinking water contamination from Class I wells. This practice is not allowed under UIC regulations: current safety features include double casing and cementing to below the base of the drinking water zone.

All of the wells in the UIPC study that experienced serious malfunctions were removed from service and plugged, repaired, and returned to service, or repaired and converted to monitoring wells as part of ongoing injection operations or to monitor water quality in the USDW. Both studies reported that aquifer restoration was initiated at the facilities where a USDW or non-drinking water aquifer was contaminated. Remedial activities included installation of monitoring wells, groundwater recovery systems, and excavation of contaminated soils.

The OSWER Report

The EPA Office of Solid Waste and Emergency Response (OSWER) prepared a study which evaluated the relative risks posed by many waste management practices.[35] The study found that, based on acute and chronic health risks and other health risks (such as cancer risks), groundwater sources affected, welfare effects, and ecological risks, Class I hazardous wells are safer than virtually any other waste disposal practice.

EPA Analysis of Class I MI Failures

EPA analyzed trends of all nonhazardous and hazardous Class I MI failures, in selected states, from 1988 to 1991.[36] This report assessed the number of these Class I injection failures during the period, analyzed the causes of these MI failures, and identified EPA and state responses to them. EPA studied more than 500 Class I nonhazardous and hazardous wells in 14 states and identified the following:

- From 1988 to 1991, 130 cases of internal MI failures (leakage in the injection tubing that can result from corrosion or mechanical failure of the tubular materials) were reported. All of these internal MI failures were detected during well operation by the continuous annulus monitoring systems or by MITs. The wells were shut-in until they were repaired. Of these MI failures, 42 percent occurred in the tubing and 23 percent involved the long string casing.

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[35] U.S. EPA, Office of Solid Waste and Emergency Response. *OSWER Comparative Risk Project: Executive Summary and Overview*. EPA/540/1-89/003. November 1989.

[36] U.S. EPA, Office of Ground Water and Drinking Water, Underground Injection Control Branch. *Class I Well Failure Analysis: 1988-1991*. March 1993.

- One external MI failure (flow along the outside of the casing) occurred. It was detected by a routine external MIT and did not involve wastewater migration.

- Only four cases of significant nonhazardous wastewater migration were detected. Three of the cases were detected by monitoring wells. The fourth potential wastewater migration case was discovered when a Class I well was drilled into the same formation. None of these failures is known to have affected a USDW.

To provide as up-to-date information as possible for the Class I study, EPA performed a second analysis, summarizing mechanical integrity failures in Class I nonhazardous and hazardous wells between 1993 and 1998.[37] This was the most recent time period for which the Agency had complete information. EPA found that MI failures of all types dropped by half in every state, except Texas. MI failures for all Class I wells in Texas increased two-fold during the assessment's time period compared to the previous study period. In fact, a relatively high Class I well mechanical integrity failure rate of 65 percent was indicated. However, Texas' UIC primacy agency, the Texas Natural Resource Conservation Commission (TNRCC), reviewed that assessment and refutes these numbers. Based on a review of the draft report against its records, TNRCC cites a 37-percent failure rate for Class I wells in Texas from 1993 to 1998.

V.B Qualitative Studies of Class I Wells

Two studies were performed in anticipation of the 1988 updates to the UIC regulations to assess the risks associated with disposal of hazardous wastewater via Class I wells. They were conducted by GeoTrans, Inc., in two phases, and Industrial Economics, Inc. (IEc).

In 1987, GeoTrans, Inc. conducted a two-phase qualitative study of Class I injection.[38] Phase I assessed the effects of certain variables on the performance of the Texas Gulf Coast geologic setting in containing waste. The study produced findings about the relative impacts of certain failure scenarios, including the presence of an abandoned unplugged borehole, fractured deterioration of a grout seal, and the presence of fractures in the confining zone,[39] along with high rates of withdrawal from an aquifer above the confining unit.

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[37] ICF, Inc. *Class I Mechanical Integrity Failure Analysis: 1993-1998.* Prepared by ICF, Inc., Fairfax, Virginia, for U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water, Underground Injection Control Program. September 1998.

[38] GeoTrans, Inc. *A Numerical Evaluation for Class I Injection Wells for Waste Confinement Performance, Final Report, Volumes I and II.* Prepared for U.S. Environmental Protection Agency, Office of Drinking Water, Underground Injection Control Program. September 30, 1987.

[39] Grout seal failure occurs when the seal is not sufficiently impermeable to prevent migration of wastewater to a USDW, or when the seal separates from the well casing or the borehole and loses integrity.

The Phase I study also modeled the extent of wastewater migration from the injection zone due to containment failure. It assessed the effect of the hydraulic conductivity of the potential failure pathway, the degree of containment loss, the injection fluid characteristics, and the relative location of the failure pathway to the injection well. The conclusions of the Phase I study include the following:

- Waste confinement increases in scenarios where abandoned unplugged boreholes are farthest from the injection zone.

- Under certain conditions, containment failure can result in migration of waste from the injection zone. When contamination of overlying strata does occur, waste migration appears to be localized to within a few hundred to a thousand feet from where the failure occurred.

- The mode of failure (e.g., grout seal failure, presence of an abandoned borehole, or fractures in the confining zone), is less significant than the degree of failure, the injection fluid characteristics, and the location of the failure pathway relative to the injection well.

- Pumpage in an overlying aquifer with failure pathways increases the amount of waste escaping from the injection zone. (It should be noted that, if a USDW were directly over a proposed injection zone, Class I regulations would not allow the well to be constructed; this makes the addition of the pumping scenario to the model overly conservative.)

The Phase II study by GeoTrans, Inc. focused on two of the failure scenarios studied in Phase I—grout seal failure and the presence of an unplugged abandoned borehole—and three ranges in the degree of failure for four hydrogeologic settings (East Gulf Coast, Great Lakes, Kansas, and Texas). Some of the conclusions reached in the Phase II study were:

- To ensure waste confinement, the confining zone should be much less permeable than the injection zone (by one-thousand fold). Where there is less contrast in permeability, significant amounts of wastewater may migrate into the overlying zone.

- Models should provide sufficient hydrogeological detail to account for rock layers between the injection zone and the USDW that could attenuate some of the wastewater that migrates upward through a failure pathway. Using simplified zones for injection, confinement, and USDW in models may cause overestimation of the potential extent of contamination in USDWs.

- The additional stress on the systems related to pumpage in the USDW significantly reduced waste containment in all settings.

Using the data from the GeoTrans modeling, IEc estimated the magnitude of human health risks which might occur if underground injection of hazardous wastewaters results in contamination of USDWs.[40] IEc assessed the difference in risk among the four geologic settings modeled by GeoTrans. Risk between the best and the worst setting may vary by over 20 orders of magnitude depending on the type of failure. The study also estimated relative risks associated with an abandoned, unplugged borehole and a grout seal failure along with the impact of withdrawing water from the USDW.

V.C Quantitative Studies of Risks Due to Phase III Wastes

In 1995, in support of EPA's Phase III LDR rulemaking (see section I.B), the EPA Office of Ground Water and Drinking Water (OGWDW) prepared a draft Benefits Analysis (as part of the Regulatory Impact Analysis [RIA] of the proposed Phase III LDR rule) to estimate the risks associated with injection of Phase III wastes into Class I hazardous wells. The Chemical Manufacturers Association (CMA), now the American Chemistry Council (ACC), submitted comments on the Benefits Analysis in 1995, after which EPA revised the RIA. In 1996, EPA performed an analysis in support of the *de minimis* requirements that the underlying hazardous constituent concentrations must be less than 10 times the universal treatment standard (UTS).

EPA OGWDW Draft Phase III LDR RIA

In 1995, OGWDW performed a Benefits Analysis as part of the RIA of the proposed Phase III LDR rule. In the RIA, EPA modified the approach taken in the 1987 IEc study to estimate human health risks from five Phase III waste constituents (benzene, carbon tetrachloride, chloroform, phenol, and toluene).[41] EPA estimated health risks, including cancer risks and hazard indices,[42] for each of the four geologic settings and two malfunction scenarios (grout seal failure and abandoned, unplugged borehole). The study also assessed the effects of varying drinking water well pumping rates. The results showed:

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[40] Industrial Economics, Inc. *Risk Analyses for Underground Injection of Hazardous Wastes.* May 1987.

[41] U.S. EPA, Office of Ground Water and Drinking Water. *Draft Regulatory Impact Analysis of Proposed Hazardous Waste Disposal Restrictions for Class I Injection of Phase III Wastes: Benefits Analysis.* 1995.

[42] A hazard index is used to compare the relative risk posed by contaminants. A hazard index of greater than one indicates an increased risk of non-carcinogenic health effects.

- Only two of the estimated cancer risks for both malfunction scenarios slightly exceed the one-in-ten-thousand to one-in-one-million risk range generally used by EPA to regulate exposure to carcinogens.[43] These were the cancer risks from exposure to benzene and carbon tetrachloride, assuming an abandoned borehole scenario in the East Gulf Coast region at the highest drinking water well pumping rate.

- All but one of the hazard indices for both malfunction scenarios are less than EPA's level of concern for a hazard index of 1.55 (i.e., greater than the concern level of 1). The exception is for exposure to carbon tetrachloride in the East Gulf Coast setting with an abandoned borehole and the highest drinking water well pumping rate.

Comments by the Chemical Manufacturers Association on the Phase III LDR RIA

CMA submitted a critique of the Benefits Analysis in the Phase III RIA as part of its comments on the proposed Phase III LDR rule.[44] CMA claimed the analysis was overly conservative, given that Class I regulations have made the occurrence of these failure scenarios highly unlikely. CMA expressed concerns about the assumptions used, the placement of receptors, and the modeling of the East Gulf Coast hydrogeologic setting. CMA also indicated in its critique that the benefits analysis should have taken into account the probability of the failure scenarios actually occurring, given Class I operational safeguards, and should have weighed the risks of injecting Phase III wastes against the risks of handling, storing, and transporting them.

CMA also evaluated the qualitative risk assessment. Its critique emphasized that there have not been any instances of USDW contamination at a facility in compliance with the current UIC program regulations, and the malfunctions cited in the EPA study involved facilities that had not yet been required to comply with the UIC program requirements. CMA further asserted that underground injection of hazardous waste is particularly low risk compared to other waste management practices,[45] and the risks of handling, transporting, and treating segregated Phase III wastes might actually be greater than the risks of injecting the waste.

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[43] U.S. EPA, Office of Solid Waste and Emergency Response. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*. OSWER Directive 9355.0-30. 1991.

[44] *Comments on Benefits Assessment of EPA's Draft Regulatory Impact Analysis*. Prepared by Woodward-Clyde Consultants for Chemical Manufacturers Association UIC Management Task Group. May 1995.

[45] U.S. EPA, Office of Solid Waste and Emergency Response. *OSWER Comparative Risk Project: Executive Summary and Overview*. EPA/540/1-89/003. November 1989.

EPA OGWDW Final RIA

The revised Phase III RIA[46] addressed several of the concerns raised in the CMA critique of the Phase III LDR Benefits Analysis. Specifically, waste receptors in the base of the USDW were included in the analysis, and limitations on the results of the analysis were discussed. Although a lack of data precluded a quantitative assessment of the probability of the failure scenarios actually occurring, incident occurrences were discussed further. The conclusions regarding human health risks did not change.

Evaluation of Risks from Exceedance of the UTS

To provide a quantifiable assessment in support of the *de minimis* requirements in the proposed Phase III rule, EPA analyzed the effects of varying the criteria that underlying hazardous constituent concentrations must be less than 10 times UTS.[47] Specifically, it outlined how increasing permissible levels to 50 times UTS changes the estimated potential health risks for several contaminants detected in the wastewaters of facilities affected by the Phase III LDR rule. The analysis estimated cancer and noncancer risks based on the well failure scenario and geologic setting that are associated with the greatest risk as depicted in the Benefits Analysis of the Phase III LDR RIA. In this analysis, EPA again used the five Phase III waste constituents (benzene, carbon tetrachloride, chloroform, phenol, and toluene) that were evaluated in the Phase III LDR RIA and Benefit Analysis.

Results of the analysis showed that, in general, carcinogenic risks were within the range generally used by EPA to regulate exposure to carcinogens, and noncancer risks were less than the hazard index of 1. The analysis concluded that a standard which would be more reflective of the potential for health hazards could be satisfied by defining the *de minimis* criterion as a value between 10 times and 50 times the UTS.

Using the same methodology, EPA conducted a brief analysis of the Hazardous Waste Identification Rule exit levels for the five chemicals examined. For benzene, carbon tetrachloride, and chloroform, the HWIR exit level concentrations were well below the UTS. Since the risk analysis presented above showed acceptable risk levels for these three chemicals at concentrations higher than the HWIR exit levels, no significant risk would be associated with the HWIR exit levels. For toluene and phenol, however, the HWIR exit levels were significantly

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[46] U.S. EPA, Office of Ground Water and Drinking Water. *Final Draft: Regulatory Impact Analysis of Proposed Hazardous Waste Disposal Restrictions for Class I Injection of Phase III Wastes: Benefits Analysis*. 1995.

[47] U.S. EPA, Office of Ground Water and Drinking Water. *Evaluation of Risks from Exceedance of the Universal Wastewater Treatment Standards (UTS), Including Addendum on HWIR Concentrations*. February 1996.

higher than 50 times the UTS. Neither chemical analyzed yielded a hazard index equal to or greater than 1, indicating an acceptable level of risk.

V.D Other Studies of Risk Due to Class I Wells

More recently, GeoTrans conducted additional modeling of MI failure scenarios using then current data on Class I wastewaters. In 1998, CMA quantitatively estimated the risk of waste containment loss from a Class I well based on probabilities that sequences of events would occur and result in a loss of containment.

Revisions to GeoTrans' Modeling Assumptions

At EPA's request, in response to CMA's 1995 comments on the Benefits Analysis and using more recent data on the constituents of Class I wastewaters, GeoTrans revised certain assumptions in its 1987 modeling of failure scenarios.[48] In this study, additional modeling focused on the scenario of an abandoned unplugged borehole 500 feet from the Class I well and a high drinking water well pumping rate. In the models, the differences in permeability between the injection zone and the layer just above the injection zone were increased by four orders of magnitude (i.e., by 10,000 times).

Results from the analysis showed that the effect of the abandoned borehole overwhelms the transport directly through the confining zone—with increasing permeability ratios, greater amounts of fluid are transported upward through the borehole and into the USDW. In effect, the reduced conductivity "squeezes" more of the waste fluids up the path of least resistance (the borehole). This is consistent with the conclusions drawn in the 1987 study.

This increase in concentration, however, occurs only between the base case and the revised scenarios. Comparison of the individual results for the revised scenarios shows that the concentrations decrease as the permeability ratio increases. This could imply that the "squeezing" effect does not hold true after a certain permeability contrast has been achieved, or that possibly some small amount of leakage occurs through the confining zone. Thus, greater permeability contrasts lead to lower contamination concentrations in the USDW. These potential causes may be the subject of further research.

Human health risks were calculated using the results of the revised GeoTrans analysis. (Appendix B to this report presents the complete revised human health risks analysis.) Recent data from EPA's UICWELLS database were used to determine 90th-percentile concentrations for benzene, carbon tetrachloride, and arsenic. The cancer risks for each chemical, based on

[48] *Revisions to GeoTrans' Modeling Assumptions, Analysis of New Data From 1996 Class I UICWELLS Database.* September 1996.

exposures to concentrations estimated at a receptor 500 feet from the injection well in an aquifer below the USDW at higher permeability ratios, exceed the risk range generally used by EPA to regulate exposures to carcinogens.[49] Likewise, at the same receptor location, the hazard indices estimated for each chemical are greater than EPA's level of concern for a hazard index greater than 1. All other cancer risk and hazard index estimates are within regulatory levels.

These risk levels should, however, be assessed in the context of the low probability of this failure scenario actually occurring given Class I AoR requirements. Although no quantitative method to assess this probability currently exists, the small number of such failures after promulgation of the existing UIC regulations, indicates that the probability is likely very low.

A number of detailed human health risk analyses were conducted using actual Class I waste constituent data to determine the potential for cancer and noncancer risks associated with ingesting water from a USDW contaminated by a Class I well. The results showed that cancer and noncancer risks exceed the acceptable risk range for three chemicals at one receptor located adjacent to an abandoned unplugged borehole, 573 feet from the injection well, in an aquifer below the USDW. This assumes an abandoned borehole is located 500 feet from the injection well, and a drinking water well located 1,000 feet from the injection well is pumping 720,000 gallons per day from an overlying aquifer. Under current UIC regulations requiring AoR studies, however, it is unlikely that an abandoned borehole would go undetected. Also, given the small number of documented USDW contamination incidents (described in section V.A), the probability of this scenario actually occurring is likely very low.

Probabilistic Risk Assessment of Class I Hazardous Wells

In 1998, Rish et al. quantitatively estimated the risk of waste containment loss as a result of various sets of events associated with Class I hazardous wells.[50] Through a series of "event trees," the study estimated the probability that an initiating event will occur and be undiscovered, followed by subsequent events that could ultimately result in a release of injected fluids to a USDW.

The study assumed that, given the redundant safety systems in a typical Class I well, loss of containment requires a string of improbable events to occur in sequence. For example, a leak develops in the packer, followed by a drop in annulus pressure that is undetected due to a

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[49] U.S. EPA, Office of Solid Waste and Emergency Response. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*. OSWER Directive 9355.0-30. 1991.

[50] Rish, W.A., T. Ijaz, and T.F. Long. *A Probabilistic Risk Assessment of Class I Hazardous Waste Injection Wells*. Draft. 1998.

simultaneous malfunction of the pressure monitoring system, followed by a leak in the long string casing between the surface casing and the upper confining layer, resulting in a loss of waste isolation.

The Rish study concluded that Class I hazardous injection wells which meet EPA's minimum design and operating requirements (i.e., a completed no-migration study, two confining zones between the injection zone and the lowermost USDW, completed long string and surface casings, and redundant safety systems) pose risks that are well below acceptable levels. According to the study, the probability of containment loss resulting from each of the scenarios examined ranges from one-in-one-million to one-in-ten-quadrillion. The risks for each are ranked as follows (from most probable to least probable): cement microannulus leak, inadvertent extraction from the injection zone, major injection tube failure, major packer failure, breach of the confining zone(s), leak in the packer, and leak in the injection tubing.

This low risk is attributed to the use of engineered systems and geologic knowledge to provide multiple barriers to the release of wastewater to USDWs. And although this risk analysis was primarily concerned with Class I hazardous wells, many of the well design and construction requirements pertain to Class I nonhazardous wells also. Therefore, the findings of a relative low risk in operation of the wells investigated in the Rish study can be extrapolated to the typical Class I well which may be managing only decharacterized wastewaters.

VI. Conclusions

EPA's UIC requirements and current operational practices for all Class I wells reflect years of experience and insight into what makes Class I wells safe and what practices are unacceptable. From the early failures of Class I wells, EPA learned that migration of injected wastewater can result from failure of injection wells due to faulty design, construction, operating practices, or the presence of pathways for migration near the injection zone.

Recognizing this, EPA passed its UIC regulations for Class I nonhazardous and hazardous wells in 1980 based on the idea that injection into properly constructed and operated wells is a safe means to dispose of wastewater. EPA's geologic siting, well engineering, and operating requirements for Class I wells offer multiple safeguards against failure of the well or migration of injected fluids.

Because the presence of an unplugged abandoned borehole can be a significant potential contributing factor to migration of injected fluids from the injection zone, EPA requires operators to identify and address all improperly abandoned wells in the AoR. Several states that account for the majority of all Class I wells require an AoR that is even larger than that required by federal regulations. These unplugged wells, if found, must be properly addressed before UIC permitting authorities will allow operators to begin injection.

In addition to the AoR requirement, Class I wells are sited to minimize the potential for waste migration. Pre-construction studies by operators must demonstrate that the rock formations which make up the injection and confining zones and the local geologic structure are amenable to safe injection and confinement of wastewaters. Wells are constructed using well materials that are suitable to the injection of wastewaters at the intended pressure, rate, and volume.

Inspections and well testing, along with passive monitoring systems such as continuous annulus monitoring systems, can detect malfunctions before wastewaters could escape the injection system. Periodic MITs are an additional means of ensuring the integrity of the well components. An internal or external MI failure does not imply failure of the injection well or loss of wastewater confinement. Rather, they indicate that one of the several protective elements may have malfunctioned.

The probability of Class I well failures, both nonhazardous and hazardous, has been demonstrated to be low. Many early Class I failures were a result of historic practices that are no longer permissible under the UIC regulations. Class I wells have redundant safety systems and several protective layers; an injection well would fail only when multiple systems fail in sequence without detection. In the unlikely event that a well would fail, the geology of the injection and confining zones serves as a final safety net against movement of wastewaters to USDWs. Injection well operators invest millions of dollars in the permitting, construction, and operation of wells, and even in the absence of UIC regulations would carefully monitor the integrity of the injection operation to safeguard their investments.

Indeed, failures of Class I wells are rare. Most failures of MI are internal failures, detected by continuous annulus monitoring systems or MITs, and the wells are shut-in until they are repaired. EPA's study of more than 500 Class I nonhazardous and hazardous wells showed that loss of MI contributed to only 4 cases of significant wastewater migration (none of which affected a drinking water source) over several decades of operation. Even as injection wells are entering "middle age," their MI remains intact. This can be attributed to the rigorous requirements for monitoring and for ensuring that the well materials are compatible with the wastewater injected.

The 1988 UIC regulations implementing the HSWA offer additional protection by requiring operators of Class I hazardous wells to complete a no-migration petition to demonstrate that the hazardous constituents of the wastewater will not migrate from the injection zone for 10,000 years, or as long as the wastewater remains hazardous. Although operators are not required to place decharacterized wastes in wells subject to no migration requirements, the fact that these wastes are being injected into Class I hazardous wells offers additional protection by this practice.

From an assessment of information collected on Class I wells, both nonhazardous and hazardous, EPA believes that a substantial volume of decharacterized wastes are still being disposed via Class I hazardous wells, particularly where the facility may not segregate waste streams. Thus, public health and the environment is being afforded an additional level of protection by this injection practice, because the additional controls on hazardous wells are in place. No migration petitions account for all volumes of waste injected into a Class I hazardous well to ascertain the size, shape, and directional drift of the waste plume.

In addition, states with a proportionally large number of the national total for Class I injection wells have stricter regulatory requirements than the minimum federal standards for their Class I nonhazardous wells. As such, a substantial number of Class I nonhazardous wells managing decharacterized wastes are extremely protective. The EPA has no reason but to conclude that existing Class I UIC regulatory controls are strong, adequately protective, and provide an extremely low-risk option in managing the wastewaters of concern.

VII. Annotated Bibliography of Class I Documents

The sections below provide an annotated bibliography of documents related to Class I injection wells. The bibliography is organized by type of document as follows: general information on Class I injection; descriptions of computer modeling; studies of mechanical integrity testing; program histories, overviews, and evaluations; Class I research; risk analyses; and technical and instructional documents.

General Information on Class I Injection

The American Association of Petroleum Geologists. "Underground Waste Management and Environmental Implications." Memoir 18 in T.D. Cook, ed., *Proceedings of the Symposium on Underground Waste Management and Environmental Implications* Houston, Texas, December 6-9, 1971. AAPG. 1972.

The United States Geological Survey and The American Association of Petroleum Geologists undertook joint sponsorship of the Symposium on Underground Waste Management and Environmental Implications. Their goal was to document the facts, clearly and objectively review the state of the art, and highlight segments of the underground waste disposal problems that need further study. The organizing committees arranged a program which touched on all aspects of underground waste management and its environmental implications. They called upon a panel of distinguished authors and practitioners to discuss various segments of the problem. Their data are presented in this document.

The American Association of Petroleum Geologists. "Underground Waste Management and Environmental Implications." Jules Braunstein, ed. *Papers Presented at the Second International Symposium on Underground Waste Management and Artificial Recharge* New Orleans, Louisiana, September 26-30, 1973. Vol. 1 and Vol. 2, AAPG. 1973.

> The two volumes in this publication represent the third in a continuing series of AAPG publications devoted to the subject of underground waste management. They were preceded by *Memoir* 10, *Subsurface Disposal in Geologic Basins*, and *Memoir* 18, the proceedings of the First Symposium on Underground Waste Management and Environmental Implications.

Brown, Michael. "The Lower Depths: Underground Injection of Hazardous Wastes." *The Amicus Journal.* Winter 1986.

> The premise of this article is that deep injection of industrial waste has become extensive in America and a way for corporations to rid themselves of toxic residues without encountering rigid governmental restrictions and the public clamor associated with the more visible landfills. During the previous two decades (especially during the period in which the Clean Water Act was implemented), use of such wells had grown to the point where more hazardous liquids are injected deep underground than are poured into metal drums and buried in standard dumpsites. At the same time that the Chemical Manufacturers Association describes deep well injection as "a technically sound and costly practice," a small but growing band of critics contends that, quite to the contrary, it is both cheap and dangerous. Several cases of groundwater and air pollution resulting from injection wells are provided. The author asserts that problems with UIC programs include insufficient regulation and noncompliance with existing regulations. The author also claims that some of the weaknesses of the UIC program are its failure to set testing requirements to prevent adverse interactions between waste and formation; the lack of requirements for financial responsibility after well abandonment; lack of monitoring requirements; lack of requirements for post-closure care; and infrequent mechanical integrity testing.

Carter, L.M.H., ed. *Energy and the Environment—Application of Geosciences to Decision-Making*. U.S. Geological Survey Circular 1108. February 13-16, 1995.

> Sessions of the Tenth V.E. McKelvey Forum on Mineral and Energy Resources included an introduction to energy and the environment, availability and quality of energy resources, environmental effects of natural energy occurrence, and environmental effects of energy extraction and utilization. This document contains the program and a list of short papers from the event.

Chemical Manufacturers Association. *Class I Underground Injection Wells: Responsible Management of Chemical Wastes* (Pamphlet). 1994.

> This pamphlet highlights many of the successful efforts by Chemical Manufacturers Association members to minimize wastes sent to deep injection wells.

Chemical Manufacturers Association. *Deep Well Injection: An Option for Responsible Management of Chemical Wastes* (Pamphlet). 1994.

> The suitability of deep well injection as a disposal method depends upon the local geology and hydrology and the nature and volume of wastes. This pamphlet by the Chemical Manufacturers Association provides an introduction to deep well injection of chemical wastes.

Clark, James E. "Environmental Scoring Without Risk Assessment." Presented at CLEAN TEXAS 2000 - Environmental Trade Fair, Underground Injection Control Workshop, Austin, Texas. April 14, 1994.

> Many environmental ranking systems continue to rely heavily on the U.S. EPA Toxic Release Inventory (TRI) regarding releases of toxic chemicals to the environment. The author believes that the current system of TRI reporting does not accurately measure exposure or risk to human health and the environment and can overstate the risks associated with underground injection.

E.I. DuPont de Nemours & Co., DuPont Deepwell Training Committee. *An Introduction to Deepwell Disposal.* Injection Well Operator Training Series, Vol. 1. Beaumont, Texas: Tele-Con Productions (Videocassette). 1989.

E.I. DuPont de Nemours & Co., DuPont Deepwell Training Committee. *Well Operations and Diagnostic Procedures.* Injection Well Operator Training Series, Vol. 2. Beaumont, Texas: Tele-Con Productions (Videocassette). 1989.

Ground Water Protection Council. *Injection Well Bibliography*. Third Edition. Oklahoma City, Oklahoma: Ground Water Protection Council. August 1995.

> This is the most comprehensive bibliography published to date on injection wells in the United States. It is an update of the editions published by the Underground Injection Practices Council in 1989 and 1993. The project was designed by the Ground Water Protection Council as a primary reference tool for persons interested in the operation, construction, and regulation of various types of injection wells. The bibliography is divided into sections based upon well classification and associated topics for easier and

more accurate searching. The bibliography includes four sections on Class I injection wells: "General," "Hazardous Waste Wells," "Non-Hazardous, Industrial Wells," and "Non-Hazardous, Municipal Wells."

Hickey, John J., and John Vecchioli. "Subsurface Injection of Liquid Waste with Emphasis on Injection Practices in Florida." U.S. Geological Survey Water-Supply Paper 2281. 1984.

Subsurface injection of waste is not well understood by many state and local governmental officials and environmentally concerned citizens who make decisions about waste disposal. This report serves as an elementary guide to subsurface injection and presents subsurface injection practices in Florida as an example of how one state is managing injection.

Lehr, Jay H. "Underground Injection: A Positive Advocate." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

EPA has focused most of its public attention on the more prevalent brine reinjection wells known as Class II wells. Concurrently EPA oversees *in situ* mining wells (Class III), outlaws the disposal of hazardous wastes into or above potable aquifers (Class IV), and intends to offer general guidelines for all other injection wells from salt-water intrusion barrier wells to geothermal energy wells (Class V). Since the passage of SDWA, the least attention was focused on wells disposing of hazardous waste below and separated from current or potential underground sources of drinking water (Class I).

Moffett, Tola B., Philip E. LaMoreaux, Janet Y. Smith, and M. Ben Dismukes. *Management of Hazardous Wastes by Deep-Well Disposal*. Open File Report No. 11. Tuscaloosa, Alabama: University of Alabama, Environmental Institute for Waste Management Studies. 1987.

This report provides an assessment of the deep-well injection of hazardous waste for technically trained audiences and the general public. Chapter 2, "Relevant Issues," describes the complex factors that affect deep-well injection. Chapters 3 through 8 provide basic information concerning the history of deep-well injection, its methodology, and its current status. These chapters also provide a basis for determining benefits and risks of deep-well injection and for analyzing its potential role in hazardous waste management.

National Water Well Association. *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

The International Symposium on Subsurface Injection of Liquid Wastes was held in New Orleans, Louisiana, March 3-5, 1986. Government officials, industry representatives, consulting engineers, and geologists, researchers, and other interested persons met to learn about and discuss state-of-the-art techniques employed and variables to consider in the operation of underground injection facilities. The conference papers addressed a wide variety of topics including a point/counterpoint on the practice of underground injection, well construction and testing methods, case studies on the operation of selected facilities, and a discussion of the fate and transport of injected wastes. This conference provided a forum for all who attended to communicate and share experiences about the practice of subsurface disposal and to learn about the implications of future regulation in this area.

Russian-American Center for Contaminant Transport Studies. *Summary Report (1993-1994)*. 1994.

This report summarizes the activities of the Russian-American Center for Contaminant Transport Studies at the Lawrence Berkeley National Laboratory in 1993-1994. It presents the publications and workshops sponsored by the Center, including the International Symposium on Scientific and Engineering Aspects of Deep Injection Disposal of Hazardous and Industrial Waste (May 10-13, 1994). Co-sponsored by EPA's Office of Ground Water and Drinking Water and the Department of Energy's Office of Environmental Management, the symposium provided an avenue to compare experiences and ideas for improving deep well injection technology.

Smith, R. E. EPA Mission Research in Support of Hazardous Waste Injection 1986-1994. In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 9-24.

The central focus of the UIC Class I research program has been to determine under what conditions (if any) injection of hazardous wastes is protective of human health and the environment. Geological and hydrogeological research helped EPA set minimum siting criteria for Class I wells and determine the appropriateness of specific areas for injection. Geophysical research has helped delineate underground reservoirs, find abandoned wells for Area of Review studies, and determine whether injection could contribute to earthquake risk. Geochemical research has provided some additional information on transformation of injected waste. Several studies have suggested new methods for well siting, testing, and monitoring. Computer models have been required since the 1988

Land Ban Regulations. A new area of study in modeling is diffusion, which can cause minor upward vertical movement of injected wastes.

Strycker, Arden, and A. Gene Collins. *State-of-the-Art Report: Injection of Hazardous Wastes Into Deep Wells*. Prepared by National Institute for Petroleum and Energy Research for U.S. Department of Energy and U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory. December 15, 1986.

A survey of the literature shows that some information is available on nearly all of the potential chemical and biological transformation processes of hazardous wastes. This survey also indicates that additional research is needed in all areas of abiotic and biotic waste interactions before definitive explanations can be given on their long-term fate.

Thornton, Joe. *A Shot in the Dark: Underground Injection of Hazardous Waste.* A Greenpeace Report. July 1990.

Deep well disposal of hazardous wastes has contaminated groundwater resources, caused earthquakes, damaged geological formations, and contaminated soils and surface water near wellheads. Because of loopholes in federal laws governing hazardous waste disposal, deep well injection is the cheapest and one of the most poorly regulated of all disposal methods.

Underground Injection Practices Council. *Injection Wells: An Introduction to Their Use, Operation, and Regulation.* Undated.

This document is an outreach brochure designed to disseminate general information about all classes of underground injection wells (including Class I).

Underground Injection Practices Council. *An Introduction to the Underground Injection Control Program.* May 1990.

This manual is written to inform interested persons about the basic concepts, elements, and procedures of the UIC program. Its purpose is to present a comprehensive overview of the UIC program so those working with a single program element will have an appreciation of the whole program and so elected officials and administrators will be able to understand the operation and needs of a successful UIC program. This manual has been written from the standpoint of experience gained operating and administering state regulatory programs.

U.S. EPA, Office of Water. *Class I Injection Wells and Your Drinking Water.* EPA 813-F-94-002. July 1994.

This document is an EPA outreach brochure designed to disseminate general information about Class I underground injection wells.

U.S. EPA, Office of Water. *Underground Injection Wells and Your Drinking Water.* EPA 813-F-94-001. July 1994.

This document is an EPA outreach brochure designed to disseminate general information about all classes of underground injection wells (including Class I wells).

Computer Modeling

Javandel, Iraj, Chin Fu Tsang, and Paul A. Witherspoon. *Hydrologic Detection of Abandoned Wells*. Prepared by Lawrence Berkeley Laboratory for U.S. Environmental Protection Agency, Office of Drinking Water. June 1986.

Thorough characterization of injection zones and confining beds is essential to ensuring that no pathways exist for movement of injected wastes to USDWs. This paper presents an analytical model for detecting improperly abandoned wells. The analytic solution calculates the amount of leakage from an abandoned well and the corresponding drawdown at monitoring wells. This paper also proposes a method for detecting deep abandoned wells in the area of influence of proposed deep injection wells in a multiple aquifer system.

Kazmann, Raphael G. "Deep Well Injection: Models, Reality, and How to Do It Right." *Ground Water.* November/December 1988.

Deep well disposal, when properly done, is the safest method that can be devised for removing hazardous wastes from the biosphere. The critical point is the wellhead where injection takes place. The fate of the waste should be of no concern, if the geology has been interpreted correctly and the other mechanical criteria that have been established are met. The article asserts that mathematical modeling does not improve the safety of the procedure and that, in the interest of saving time and money, EPA should abandon the requirement that mathematical models be prepared as part of the application for a permit for deep well disposal of hazardous wastes. The safety of the procedure depends on the ability and integrity of the hydrogeologist who interprets the field data and the engineer who designs and tests the injection well.

LaMoreaux, P. E. *Synopsis of Use of Mathematical Models to Evaluate Sites for Injection Wells for Disposal of Hazardous Wastes.* Preliminary Draft. Environmental Institute for Waste Management Studies. December 1986.

Mathematical models are representations of physical systems or processes. Models, both flow and geochemical, range from simple to complicated. There are three methods of simulating injection of wastewater into reservoirs: analytical, semi-analytical, and numerical.

Larkin, R. G., J. E. Clark, and P. W. Papadeas. "Modeling the Effect of Injectate-Density Changes on Disposal Well Plumes." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 381-402.

This paper compares the waste plumes generated by a model using two different calculations for injectate density. Models of such plumes are required in some no-migration petitions. Injectate that is of lower density than the native fluid in the injection zone can cause the plume to float upward, while injectate with densities higher than those of native fluids can cause the plume to sink. One run of the model was performed using the average of densities recorded over time at an actual well. Another run was performed using varying daily densities at the same well. In addition, equivalent runs were done using randomly generated density data. No significant difference in the plume extent existed between runs using an average and runs using fluctuating daily data.

Miller, C., T.A. Fischer II, J.E. Clark, W.M. Porter, C.H. Hales, and J.R. Tilton. "Flow and Containment of Injected Wastes." *Ground Water Monitoring Review.* Summer 1986.

This article examines several analytical models for predicting waste movement and pressure increases within the injection zone and describing upward permeation of wastes through confining layers. Models attempted to account for density differences between the waste and native formation brine and permeability variation within the injection zone. Initial results indicate that faults and fractures are not likely to provide conductive pathways for contaminant migration in Gulf Coast settings, and that site-specific evaluations are required to assess the impact of abandoned wells.

Milly, P.C.D. *Obstacles Associated with Transport Modeling of Hazardous Waste Injected Underground.* 1987.

Mathematical modeling is one of the few alternatives available for assessing the risk of future USDW contamination resulting from subsurface waste injection; alternatives are extensive monitoring or comprehensive prohibitions of injection. This report describes

some of the more serious problems associated with using models to predict waste transport. The discussion is general and not limited to any particular mathematical model; most remarks apply to most of the models currently in use.

Morganwalp, David W., and Robert E. Smith. *Modeling of Representative Injection Sites*. 1987.

There are three main objectives to this study. The first is to find key parameters that control the transport of hazardous waste at representative injection well sites. The second is to investigate the role of molecular diffusion in hazardous waste injection well settings. The third objective is to show by example that hazardous waste injection can be modeled. The objectives were achieved by modeling idealized representations of actual hazardous waste injection wells.

Papadeas, P. W. "Field Testing for Model Confirmation: Case Histories from Du Pont." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 325-348.

As part of hazardous and nonhazardous waste injection at Class I injection wells, detailed, site-specific models are employed to predict and track waste injectate over time. Flow and containment of this injected waste in the subsurface can be demonstrated to regulators with a reasonable degree of certainty exclusively through the use of modeling techniques; however, only direct field testing can corroborate the model results. Case histories covering over 40 years of injection well operations corroborate the findings of models and active disposal systems.

Thornhill, J.T., T.E. Short, and L. Silka. "Application of the Area of Review Concept." *Ground Water.* Vol. 20, No. 1. January/February 1982.

Analytical equations can be used to calculate pressure buildup in injection zones. In areas of review characterized by numerous injection wells, care must be taken to account for the effect of every injection well on pressure buildup to prevent the migration of fluids to USDWs.

Mechanical Integrity Testing

The Cadmus Group, Inc. *External Mechanical Integrity Log Interpretations for Class I Wells in Texas (DRAFT).* Prepared for U.S. Environmental Protection Agency, Region 6, Underground Injection Control Section. September 30, 1993.

> This report presents a summary and analysis of the geophysical log interpretations performed for Class I hazardous waste (HW) disposal wells in Texas. This task was part of a larger Cadmus study of Class I HW file reviews undertaken for EPA Region 6, as part of the oversight efforts required for primacy states under the UIC Program. The report explains the technology, including radioactive tracer tests and cement bond logs, used to assess mechanical integrity for 61 Class I wells. Analysis of the data indicate that most radioactive tracer surveys were not conducted according to Texas Natural Resources Conservation Commission guidelines, 29 percent of the wells had no cement bond logs (CBLs) on file, and most wells that did have logs showed insufficient cement casing (even though their permit applications state that cement extends to the surface). Of the wells that did have CBLs, many had logs so poorly calibrated that interpretation could not be considered reliable. Recommendations included minimum standards for cement bond logs, performance standards for cementing Class I hazardous wells, use of oxygen activation logs instead of radioactive tracer tests in some cases, and supplemental training of MI reviewers at primacy agencies.

Engineering Enterprises, Inc. *Analysis of Mechanical Integrity Tests and Permit File Reviews.* Prepared for U.S. Environmental Protection Agency, Office of Drinking Water, Groundwater Protection Branch. September 1986.

> This report analyzes the mechanical integrity testing programs for Direct Implementation states. It discusses the applicability and effectiveness of various types of mechanical integrity tests and comments on significant variances in failure rates. The report evaluates the adequacy of file review procedures and provides recommendations for standardizing reporting forms, for follow-up actions for MIT failures and call-in procedures, and for file reviews of well operations.

Geraghty & Miller, Inc. *Mechanical Integrity Testing of Injection Wells.* Prepared for U.S. Environmental Protection Agency, Office of Drinking Water. April 30, 1980.

> The various logging techniques used in determining mechanical integrity are widely employed and were developed for this purpose. They are an indirect measurement and are indicators of a condition. They measure something electronically: temperature, sound velocity, noise levels, etc. Thus, data interpretation is subjective and depends on the skills and experience of the operator, in contrast to a pressure test, which is a more direct,

readily observable indicator of a condition. But surveys such as noise, temperature, and tracer logs can be substituted for pressure testing. While the pressure tests yield more positive results, it may be more economical for the operator to substitute the appropriate log or logs. The evidence will be less direct, but the burden of proof should be on the operator to demonstrate conclusively that the well possesses the required integrity.

Jarrell, Malcolm D. "Integrity Testing of Class I Hazardous Injection Wells—Related Experience in the Great Lakes Region." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

This paper discusses mechanical integrity testing of Class I hazardous waste disposal wells in EPA Region 5. It addresses test procedure development, implementation, and interpretation. The test procedures are based on site-specific well construction, operation, and geological considerations. Testing methods include the radioactive tracer survey and annular pressure testing. The interpretation of test results are discussed as related to U.S. EPA's criteria for acceptance. The principles applied could prove helpful in establishing regional standards for mechanical integrity testing.

Whiteside, Robert F., and Stuart F. Raef. "Mechanical Integrity of Class I Injection Wells." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* (New Orleans, Louisiana, March 3-5, 1986). Dublin, Ohio: National Water Well Association. 1986.

This paper reviews the siting, construction, and testing of Class I disposal wells and how these are designed to ensure mechanical integrity. Periodic mechanical integrity testing is discussed, including pressure testing and logging, as are the advantages and limitations of each technique. Advantages and disadvantages of packer-annulus versus packerless well completions are discussed as they pertain to annulus monitoring.

Program Histories, Overviews, and Evaluations

Brower, Ross D., Ivan G. Krapac, Bruce R. Hensel, Adrian P. Visocky, Gary R. Peyton, John Stephen Nealon, and Mark Guthrie. *Evaluation of Current Underground Injection of Industrial Waste in Illinois.* Final Draft Report. Savoy, Illinois: Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center. March 1986.

The objectives of this assessment were to determine whether underground injection is an appropriate method of waste disposal in Illinois and to provide recommendations to the Legislature, Legislative Council, the Governor's Office, and state agencies concerning this disposal practice. The final report presents the results of the study mandated by legislation. The following topics are addressed in the report: (1) The current state

regulations and regulatory practices of the Illinois Class I UIC program; (2) An historical evaluation of the operation and maintenance of underground injection facilities in Illinois, including a review of the types of wastes and potential problems associated with underground waste disposal; (3) A review of the Class I UIC programs in other states and comparison with the program in Illinois, including current issues and trends in deep well injection; (4) A summary of geologic information in Illinois to identify areas and geologic formations that are being used and might be targeted for future injection; (5) An identification of alternative waste disposal management options, along with treatment requirements, treatment technologies, associated costs for selected waste management options, and potential environmental impacts; and (6) Conclusions and recommendations. The authors conclude that deep well injection is a viable means of disposal when carried out within the requirements of the UIC regulations. The regulations are sufficient, although updates are needed for waste sampling protocol and chemical analysis of samples in order to keep up with technological advances. Additions recommended for Illinois' UIC program include analysis of the injection waste, which should be required at the time of permitting and annually thereafter. Pretreatment of injection waste to remove hazardous components could increase operating costs 3 to 40 times, depending on the industry, and could have more serious environmental impacts than injection without treatment. More research is needed on interaction between wastes, pore water, and formations. A monitoring strategy should be developed.

The Cadmus Group, Inc. Responses to questions 2, 5c, and 9b of Congressman John D. Dingell's letter to William K. Reilly, dated October 22, 1992, regarding disposal of hazardous wastes, deep injection, and underground wells at 42 U.S.C. section 6924 (F) - (G). Prepared for U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water, Underground Injection Control Branch. January 29, 1993 (for responses to 2 and 5c) and February 24, 1993 (for response 9b).

Questions 2, 5c, and 9b of Congressman Dingell's letter request a list of wells for which EPA has granted no-migration petitions, the education and background of staff who review no-migration petitions, and reviews of compliance with groundwater monitoring requirements associated with injection wells. This information is provided in the response document.

Chemical Manufacturers Association, Underground Injection Control Program. *Operational Status of Class I HW Wells: 1984-1991.* Washington, DC: Bryan, Cave, McPheeters & McRoberts. February 1991.

This study was conducted to determine the impact of the Hazardous and Solid Waste Amendments of 1984 on Class I hazardous waste injection well practices. The data includes only those facilities that were in existence prior to 1984. The conclusions are based on available documentation, including EPA's 1985 *Report to Congress on the Injection of Hazardous Waste*, EPA's February 1988 Federal Underground Injection Control Reporting System Class I wells printout, and individual facility reports.

Davis, Ken E., and T. Lawrence Hineline. "Two Decades of Successful Hazardous Waste Disposal Well Operation—A Compilation of Case Histories." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

The monitoring systems and mechanical integrity programs required by the federal and state UIC programs have an excellent record of detecting problem areas prior to any deleterious effects on the environment. Most alleged MI failures are due merely to the improper operation of monitoring equipment and do not result in any environmental hazard. This article presents case histories on how operation problems were identified and successfully eliminated, how monitoring systems identified potential problems, and how wells were repaired.

Dingell, John D., Chairman, U.S. House of Representatives, Subcommittee on Oversight and Investigations of the Committee on Energy and Commerce. Letter to William K. Reilly, Administrator, U.S. Environmental Protection Agency, regarding disposal of hazardous wastes, deep injection, and underground wells at 42 U.S.C. section 6924 (F) - (G). October 22, 1992.

Citing public concern about EPA's implementation of the HSWA Amendments, Congressman Dingell requested information on injection wells, including no-migration petitions, Class I well failures, inspection requirements, and other information.

Elsevier Science Inc. "RCRA Land Disposal Restrictions: A Guide to Compliance—1996 Edition." *The Hazardous Waste Consultant.* June/July 1996.

The most recent revisions to the Land Disposal Restrictions program were promulgated in the Phase III LDR rule in early April 1996. The primary focus of this regulation is implementation of H.R. 2036, the Land Disposal Program Flexibility Act. All of the rules issued under Phases I, II, and III are discussed in this guide.

Gordon, Wendy, and Jane Bloom. "Deeper Problems: Limits to Underground Injection as a Hazardous Waste Disposal Method." New York: Natural Resources Defense Council, Inc. 1986.

The injection of hazardous waste into subsurface rock formations is the predominant form of liquid hazardous waste disposal in the United States and one of the least understood. Despite the considerable reliance on underground injection for disposing of hazardous wastes, neither the effective injection of fluids nor their safe containment can presently be ensured. This article analyzes the practice of underground injection as a hazardous waste disposal method and evaluates the limits to its use and the degree of protection against groundwater contamination current injection methods can ensure. It identifies specific research needs necessary to determine the technical and environmental constraints associated with underground injection and its potential for ensuring complete containment of waste. Also examined is the adequacy of the UIC program in preventing groundwater contamination and other environmental damage due to migration of hazardous wastes. The article recommends specific regulatory changes that could result in more protective underground injection operations.

ICF, Inc. *Class I Mechanical Integrity Failure Analysis: 1993-1998.* Prepared by ICF, Inc., Fairfax, Virginia, for U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water, Underground Injection Control Program. September 1998.

This report summarizes mechanical integrity failures in Class I wells between 1993 and 1998, including the number of Class I injection failures during the period, the causes of these MI failures, and EPA and state responses to them. It is a follow up to a similar study of the period from 1988 to 1991. EPA found that between the last study and this one, MI failures of all types dropped by half in every state, except Texas, where MI failures increased two-fold. (The results of the study are described in greater detail in Section V.A.)

Michigan Department of Natural Resources. *Deep Well Injection of Hazardous Waste In Michigan.* May 1986.

The State of Michigan convened an advisory committee to determine whether deep well injection in Michigan should be banned or allowed to continue under existing or revised regulations. The committee concluded that deep well injection should be allowed to continue, provided that the state's regulatory program is improved. Key recommendations included specifying construction, closure, and mechanical integrity testing requirements; banning the injection of highly toxic, persistent halogenated organics; requiring shallow groundwater monitoring; requiring regular reassessments of alternative technologies; and improving the compliance and enforcement program.

Reeder, Louis R., James H. Cobbs, John W. Field, Jr., William D. Finley, Steven C. Vokurka, and Bernard N. Rolfe. *Review and Assessment of Deep-Well Injection of Hazardous Waste (Volumes I-IV).* Prepared by Louis R. Reeder and Associates for U.S. Environmental Protection Agency, Office of Research and Development, Municipal Environmental Research Laboratory. June 1977.

> Geologic and engineering data are generally available to locate, design, and operate a deep injection well. In contrast, little information exists on salaquifer chemistry as well as waste interactions with the receiving salaquifer. Problems occur when there is a failure to use available geologic information and proven engineering practices in design and completion. For more effective oversight of deep well injection, standardization of state regulations is necessary.

Temple, Barker & Sloane, Inc. "Findings on Class I Hazardous Wells Affected by the Land Ban Rules." Memorandum from Annette Hulse, Elaine Haemisegger, Marc Blaustein, Laurie Remmers, and Hollie Maheney (TBS) to John Atecheson, Dave Morganwalp, and Mario Salazar, U.S. Environmental Protection Agency. December 15, 1987.

> This report summarizes the findings of a study on (1) wells affected by the land ban rules, (2) available alternative commercial treatment, and (3) available transportation capacity (truck and rail) to move the banned wastes from the current point of disposal to the point of alternative treatment. The report concludes that, in the short-term after the land ban would take effect, there would likely be a shortage of transport capacity given the great increase in liquid hazardous waste to be transported. The report predicts that, after 2 years, the combination of reduced volumes of wastes to be transported and increased transportation capacity should allow for safe movement of banned wastes.

Texas Department of Water Resources. *Underground Injection Operations in Texas: A Classification and Assessment of Underground Injection Activities*. Compiled by Ben Knape. Report 291. Texas Department of Water Resources, Austin, Texas. December 1984.

> Underground injection operations in Texas are regulated by the Texas Department of Water Resources (succeeded by the Texas Natural Resource Conservation Commission) and the Railroad Commission of Texas. This report presents the history of regulatory program development for underground injection operations in Texas. It describes the construction features, operating practices, nature and volume of injected fluids, relative pollution potentials, legal and jurisdictional considerations, and regulatory recommendations for the various types of injection wells that exist in the state.

Underground Injection Practices Council. *A Class I Injection Well Survey (Phase I Report): Survey of Selected Sites*. D19976.S1. Prepared by CH2M Hill, Gainesville, Florida. April 1986.

This two-phase study provides a comprehensive data base and an objective summary of the performance and operation of Class I injection wells. Phase I of study consisted of a survey of the operational history of 45 Class I well sites representing 106 individual wells. The selection of these 45 sites was based upon published reports and input from UIC Program directors that identified injection well facilities with some history of or alleged operation problems. This report provides a factual summary of the events surrounding alleged operational problems at 45 Class I injection well facilities. (The results of the study are described in greater detail in Section V.A.)

Underground Injection Practices Council. *A Class I Injection Well Survey (Phase II Report): Survey of Operations*. December 1987.

In this nationwide study of Class I injection wells, files were reviewed and information collected on 539 operational, previously operational, or planned wells. Phase II of the study consisted of a survey of approximately 250 Class I injection well sites. Phase II included development of a comprehensive data base for each of these sites and an assessment of the performance characteristics of Class I injection wells. Ninety-nine of these wells were eliminated from the data base because they could not be classified as Class I wells by the type of waste injected, they were never constructed, or were under construction when the study was conducted. Construction, operation, and permit data for the remaining 440 wells as of January 1, 1985, were collected and reviewed to evaluate the suitability and reliability of these wells as a waste disposal method. The primary sources of information on Class I wells were the state or federal agencies responsible for permitting the Class I wells in each state. The study concludes that Class I wells are a viable method for disposal of wastewaters, where suitable hydrogeologic conditions exist.

Underground Injection Practices Council. *Class I Injection Well Survey*. Prepared by Golder Associates, Inc., Houston, Texas. April 1990 (updated from April 1986).

This nationwide survey of Class I injection wells was conducted by Golder Associates to evaluate the changes in geographic distribution and usage patterns and to identify the major concerns of Class I injection operators. The collection of data for this survey occurred from January 1 to March 31, 1990. As concluded in the previous Class I Injection Well Survey (UIPC, 1987), this type of injection, as presently regulated, is a cost-effective yet environmentally sound method of liquid waste disposal when suitable hydrogeologic conditions exist.

U.S. EPA. *Land Disposal Restrictions: Court Decision on Characteristic Hazardous Wastes.* Briefing for Administrator Carol Browner. March 1993.

> This decisional briefing provides an overview of the RCRA Land Disposal Restrictions Program, discusses the Third Third Rule, and highlights key aspects of the DC Circuit Court's 1992 opinion on characteristic wastes and aspects of the Court's decision that EPA must address.

U.S. EPA, Office of Drinking Water. *Report to Congress on Injection of Hazardous Waste.* EPA 570/9-85-003. May 1985 (Second Printing, July 1985).

> This report was prepared to meet the requirement of section 701 of the Hazardous and Solid Waste Amendments of 1984. The report summarizes the collected raw data and provides general information about disposal of waste by underground injection wells. The report also covers aspects of engineering, hydrogeology, waste characteristics, and regulatory controls.

U.S. EPA, Office of Drinking Water. *Site Visit Report; (Facilities Visited as Part of the Data Gathering Effort for the Preparation of the Report to Congress on the Injection of Hazardous Waste).* May 1985.

> This document represents working papers used in preparation of the final *Report to Congress on the Injection of Hazardous Waste.* It is a compilation of field reports on the geology, well design and operation, and regulatory controls based on visits to 20 facilities representing various hydrogeologic, regulatory, and other circumstances.

U.S. EPA, Office of Ground Water and Drinking Water. *Underground Injection Control Program: Information Collection Request*. Prepared by the Cadmus Group, Inc. June 1998.

> This document estimates the burden and cost to operators, states, and EPA associated with implementing the UIC requirements. It outlines required activities associated with siting, constructing, operating, and closing Class I hazardous and nonhazardous injection wells based on the federal requirements at 40 CFR 146 and estimates cost associated with all required activities, including no-migration petitions.

U.S. EPA, Office of Ground Water and Drinking Water. *Analysis of the Effects of EPA Restrictions on the Deep Injection of Hazardous Waste.* EPA 570/9-91-031. October 1991.

> This report describes how EPA regulations, including the no-migration petition requirement, prevent Class I hazardous wells from endangering USDWs. It also documents changes in the Class I hazardous well population and Class I hazardous waste

management practices that have occurred since the regulations were promulgated. The report concludes that Class I hazardous wells are subject to strict technical requirements and are rigorously evaluated to ensure that they do not endanger USDWs.

U.S. EPA, Office of Ground Water and Drinking Water, Underground Injection Control Branch. *Class I Well Failure Analysis: 1988-1991*. Prepared in response to Question 4 in Congressman John D. Dingell's letter to William K. Reilly, dated October 22, 1992, regarding disposal of hazardous wastes, deep injection, and underground wells at 42 U.S.C. section 6924 (F) - (G). March 5, 1993.

This study focuses on the records of over 500 Class I wells in 14 states for the period January 1988 to January 1993. Findings include 130 internal mechanical integrity (MI) failures, 1 external MI failure, and 4 cases of significant waste migration. None of the failures is known to have affected a USDW. The 130 internal MI failures were detected during operation by the continuous annulus monitoring system, and the wells were automatically shut-in until operators could make repairs. The single external MI failure did not involve waste migration from the injection zone or flow into a USDW, and was detected by routine periodic external MIT. Three of the 4 cases of nonhazardous waste migration occurred in areas of Florida known to have small-scale natural fracturing and were detected by deep monitoring wells installed for that purpose. The mechanism of migration of the other case (Aristech, Ironton OH) is unclear, but is believed to be small-scale natural fracturing. The need for deep monitoring wells at every Class I facility is precluded by geologic conditions at most sites, but the option is available to directors if local conditions warrant their use. (The results of the study are described in greater detail in Section V.A.)

U.S. EPA, Office of Water Supply. *The Report to Congress. Waste Disposal Practices and Their Effects on Ground Water*. January 1977.

This report to Congress examines the impact of waste disposal practices, including injection, on groundwater quality in the United States. It discusses the severity of contamination, sources of contaminants, and the regions of the nation where contamination is most prevalent. The report recommended additional legislation for groundwater protection. It also encouraged data collection on potential sources of contamination and more careful siting of new land disposal facilities.

U.S. General Accounting Office. *Hazardous Waste---Controls Over Injection Well Disposal Operations.* Report to the Chairman, Environment, Energy, and Natural Resources Subcommittee, Committee on Government Operations, House of Representatives. GAO/RCED-87-170. August 1987.

> At the request of the Chairman of the Environment, Energy, and Natural Resources Subcommittee, House Committee on Government Operations, GAO assessed the controls that monitor the operations of underground injection wells. It evaluated whether and to what extent there is evidence that hazardous waste from underground wells has contaminated underground sources of drinking water. GAO also assessed EPA and state oversight of underground injection of hazardous waste and determined what program changes are expected from an upcoming ban on the underground injection of hazardous waste. (The results of the study are described in greater detail in Section V.A.)

U.S. General Accounting Office. *Information on EPA's Underground Injection Control Program.* GAO/RCED-95-21. Report to The Honorable John D. Dingell, Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives. December 5, 1994.

> This report reviews certain aspects of EPA's program governing deep-well injection. Specifically, these include (1) results of EPA's efforts to implement the 1984 amendments to ban underground injection of hazardous wastes, (2) accuracy of EPA's inspection and enforcement data to ensure reliable program oversight, and (3) implementation of recommendations to improve the UIC program made in earlier reports. The report concludes that EPA has either implemented or is in the process of implementing most of the recommendations contained in GAO's prior two reports, including strengthening its oversight of each region's underground injection control program. EPA is currently reviewing proposed changes to the oil and gas waste injection well program. One of the proposed changes would require all well operators to search for and plug any improperly plugged wells in the immediate vicinity of their wells, as GAO recommended.

Van Voorhees, Robert F., Kenneth M. Kastner, and Barton D. Day. *New RCRA Land Disposal Restrictions Will Radically Change Regulation of Characteristic Hazardous Waste.* Prepared by Bryan Cave. 1994.

> This report is an update on the status of the RCRA LDR rules imposed by EPA in response to the "Third Third" court decision. The report also summarizes the key changes that occurred to the LDR program and EPA's rulemaking schedule.

Visocky, Adrian P., Gary R. Peyton, and John S. Nealon. "Study of Current Underground Injection Control Regulations and Practices in Illinois." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

> The regulatory structure for Class I injection wells is generally adequate in concept and scope to ensure containment of injected wastes and to safeguard underground sources of drinking water in Illinois. There is a need to update and strengthen selected portions of the regulatory practices in the areas of waste sampling protocol, chemical analysis of collected waste samples, and evaluation of well testing and monitoring data.

Class I Research

Collins, A. Gene and M.E. Crocker. *Laboratory Protocol for Determining Fate of Waste Disposed in Deep Wells: Project Summary.* EPA/600/S8-88/008. Ada, Oklahoma: U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory. April 1988.

> The objective of this research investigation was to develop a laboratory protocol for use in determining degradation, interaction, and fate of organic wastes disposed of in deep subsurface reservoirs via disposal wells. Knowledge of the ultimate fate of such wastes is important because provisions of the Resource Conservation and Recovery Act (RCRA) require that by August 1988, EPA must show that the disposal of specified wastes by deep-well injection is safe to human health and the environment, or the practice must be stopped. The National Institute for Petroleum and Energy Research (NIPER) developed this protocol primarily by transferring some of its expertise and knowledge of laboratory protocol relevant to improved recovery of petroleum; for example, (1) core analysis, (2) brine analysis, (3) oil analysis, (4) dynamic fluid flow systems, which simulate subsurface reservoir conditions, and (5) appropriately trained personnel. This study was designed to investigate the adsorption properties of a specific reservoir rock which is representative of porous sedimentary geologic formations used as repositories for hazardous organic wastes. Phenol is the principal hazardous waste product that has been injected into the Frio formation; therefore, a decision was made to use phenol and sedimentary rock from the Frio formation for a series of laboratory experiments to demonstrate the protocol. The developed protocol can be used to evaluate mobility, adsorption, and degradation of an organic hazardous waste under simulated subsurface reservoir conditions.

Goolsby, Donald A. *Geochemical Effects and Movement of Injected Industrial Waste in a Limestone Aquifer*. April 1972.

This paper presents a case history and the hydraulic and geochemical effects of an industrial injection well system near Pensacola, Florida. Geochemical effects of the injection, which were first detected at a monitoring well 10 months after injection commenced, included increases in calcium ion concentration, total alkalinity, and nitrogen and methane gas generation. Tests made in 1968 indicated that rapid denitrification and neutralization of the waste occurred near the wells.

Grula, M.M., and E.A. Grula. *Feasibility of Microbial Decomposition of Organic Wastes Under Conditions Existing in Deep Wells.* Final Report. U.S. Bureau of Mines. December 31, 1975.

The objective of this work was to determine the feasibility of inoculation of underground injected wastes with bacteria which would decompose toxic substances underground through metabolic processes. If such a technique could be developed, the toxicity of the injected wastes could eventually be neutralized and thus eliminate a possible, although remote, hazard that would result if the injected wastes found a conducting path to the surface at some future date. Several new aspects of microbe growth under conditions of elevated temperature and pressure were discovered. However, the general conclusion drawn from this work is that biodegradation of organic compounds will be very limited, or entirely absent, under the conditions existing in deep geologic formations.

Hickey, John J., and William E. Wilson. *Results of Deep-Well Injection Testing at Mulberry, Florida.* USGS/WRI 81-75. PB82-193004. Tallahassee, Florida: U.S. Geological Survey, Water Resources Division. February 1982.

At the Kaiser Aluminum and Chemical Corporation plant, Mulberry, Florida, high-chloride, acidic liquid wastes are injected into a dolomite section at depths below about 4,000 feet. Sonar caliper logs made in April 1976 revealed a solution chamber that is about 100 feet in height and has a maximum diameter of 23 feet in the injection zone. Results from two injection tests in 1972 were inconclusive because of complex conditions and the lack of an observation well that was open to the injection zone. In 1975, a satellite monitor well was drilled 2,291 feet from the injection well and open to the injection zone. In April 1975 and September 1976, a series of three injection tests were performed. Based on an evaluation of the factors that affect hydraulic response, water-level data suitable for interpretation of hydraulic characteristics of the injection zone were identified to occur from 200 to 1,000 minutes during the test. Test results indicate that leakage through confining beds is occurring. It appears that the overlying beds are probably relatively impermeable and significantly retard the vertical movement of neutralized waste effluent.

Horvath, Edward. *Interactions of Aquifer Flora and Industrial Waste in a Model Deep Well Disposal System.* Ph.D. Thesis, Department of Microbiology, North Carolina State University at Raleigh. 1977.

> A model system was developed to study the biological compatibility of aqueous industrial waste and subterranean disposal zones for injected waste. The model design incorporated devices for anaerobic, aseptic compositing of effluent samples (for chemical and biological analysis); collection of gases generated in the model elements; isolation of model elements against downstream contamination; and imposition of a normally distributed waste concentration profile in the feed stream. The model demonstrated that degradation of waste constituents was dependent on the addition of inorganic nutrients, even in diluted wastes. The model was also used to study the mutual effects of formaldehyde-free waste and aquifer flora. In effluent samples, formic acid in the waste was completely degraded in 2 months; this degradation is related to reduction of sulfate and nitrate in aquifer flora.

Jafvert, Chad T. and N. Lee Wolfe. *Degradation of Selected Halogenated Ethanes in Anoxic Sediment-Water Systems.* Undated.

> This paper presents the results of a study on degradation of selected halogenated ethanes in anoxic sediment-water suspensions. This study was undertaken to investigate factors that influence the rates of reductive transformations of halogenated hydrocarbons in environmental systems. The study examined both environmental variables and inherent chemical properties of substituted compounds. *Eh* measurements indicated reduced environmental conditions. Hexachloroethane, 1,1,2,2-tetrachloroethane, 1,2-diiodoethane and 1,2-dibromoethane degraded within minutes to days; 1,2-dichloroethane remained in the systems for at least 35 days (the length of the experiment).

Johnston, Orville C., and Ben K. Knape. *Pressure Effects of the Static Mud Column in Abandoned Wells*. LP86-06. Texas Water Commission, Austin, Texas. September 1986.

> This study evaluated historical drilling practices and the safety of injection operations as they relate to possible inter-formational fluid movement through abandoned boreholes, gel strength of wellbore muds, and the effects of geologic and geographic variation on natural borehole closure. It was based on literature and file research and interviews with knowledgeable staff. The study found that wells plugged with mud only resist vertical fluid movement to some extent, that abandoned uncased wells may remain stable for up to decades, mud gel strengths increase with time and temperature, and some abandoned uncased wells close on themselves due to unstable geology.

Kreitler, Charles W. "Hydrogeology of Sedimentary Basins as it Relates to Deep-Well Injection of Chemical Wastes." Preprint of a paper presented at the International Symposium on Subsurface Injection of Liquid Waste. New Orleans, Louisiana. March 3-5, 1986.

> This paper describes and compares the hydrogeology of three sedimentary basins in Texas (the Gulf of Mexico, East Texas, and Palo Duro basins). Sedimentary basin hydrogeology is important to hazardous waste injection because regional hydrogeology controls the fate, transport, and confinement of chemical wastes injected into deep saline sections of sedimentary basins. Factors that control and describe basin hydrogeology include geologic history, flow mechanisms, potential energy distributions, permeability, the occurrence of faults and fractures, and the origin and age of saline waters.

Leenheer, R.L. Malcolm and W.R. White. *Physical, Chemical, and Biological Aspects of Subsurface Organic Waste Injection Near Wilmington, North Carolina*. U.S. Geological Survey Professional Paper 987. 1976.

> This is a case study of injection of an industrial organic waste into a sand, gravel, and limestone aquifer near Wilmington, North Carolina. Field and laboratory data pertaining to the physical, chemical, and biological effects of waste injection at the site are also presented. The report discusses a conceptual model of the various stages of injectate reactivity and its subsurface movement. Problems with injection well pressure build-up and migration of wastes into shallower aquifers are attributed to reactions between certain organic wastes and aquifer components.

Schwarzenbach, Rene P., and Walter Giger. *Behavior and Fate of Halogenated Hydrocarbons in Ground Water.* Undated.

> Groundwater contamination by halogenated hydrocarbons has been reported on numerous occasions, and these compounds present human health concerns. This paper summarizes the results of laboratory and field studies on the behavior and fate of halogenated hydrocarbons in ground water and during groundwater infiltration. For example, many halogenated hydrocarbons are very mobile and are quite resistant to chemical transformations. Little is known about biotransformation, however. The paper focuses on sorption behavior and mobility of halogenated hydrocarbons in aquifers. The chemical and biological transformations of individual chemicals are discussed as well.

Scrivner, N.C., K.E. Bennett, R.A. Pease, A. Kopatsis, S.J. Sanders, D.M. Clark, and M. Rafal. "Chemical Fate of Injected Wastes." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

> The chemical fate of wastes put into disposal wells can be determined using standard chemical engineering techniques. The concentration of hazardous constituents is typically reduced by reactions within the waste itself or by reactions with the injection zone material, thus reducing any potential impact on the environment. Such reactions include neutralization, hydrolysis, ion exchange, adsorption, precipitation, co-precipitation, and microbial degradation. Extensive research was done to quantify these phenomena, so they could be used in a predictive model.

Vecchioli, John, D.J. McKenzie, C.A. Pascale, and W.E. Wilson. *Active Waste-Injection Systems in Florida, 1976.* Open-File Report 79-1296. U.S. Department of the Interior, Geological Survey. 1979.

> By the end of 1976, seven systems were injecting liquid wastes into Florida's subsurface environment at a combined average rate of 15 million gallons per day. This report presents information for each of these systems on the kind and amount of waste injected and type of pre-treatment, construction characteristics of the injection and monitor wells, type of test and monitoring data available, and briefly discusses any operational problems experienced.

Walter, Bill. "Remediation of Ground-Water Contamination Resulting From the Failure of a Class I Injection Well: A Case History." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

> The purpose of this paper is to describe the sequence of events leading to the contamination of a USDW and the ongoing cleanup process at an oil refinery industrial waste disposal well in the New Orleans, Louisiana area. The case history is unique in that the chronology covers a period of time which includes both pre- and post-regulatory compliance with respect to permitting, monitoring, reporting, inspection and testing of injection wells. Contaminated ground water near the injection zone has not been shown to pose a hazard to any water wells in the area. Furthermore, future ground water contamination being caused by the injection method used is unlikely because injection wells currently permitted in Louisiana are equipped with injection tubing and continuous monitoring of the annular space.

Risk Analyses

Chemical Manufacturers Association UIC Management Task Group. *Comments on Benefits Assessment of EPA's Draft Regulatory Impact Analysis*. Prepared by Woodward-Clyde Consultants. May 1995.

> This critique of the Benefits Analysis in the Phase III RIA evaluated the qualitative risk assessment in the RIA. It emphasized that there have not been any instances of USDW contamination at a facility in compliance with the current UIC program regulations, and the malfunctions cited in the RIA involved facilities that had not yet been required to comply with the UIC program requirements. The comments assert that injection of hazardous waste is particularly low risk compared to other waste management practices, and the risks of handling, transporting, and treating segregated Phase III wastes might actually be greater than the risks of injecting the waste. (The results of the study are described in greater detail in Section V.C.)

GeoTrans, Inc. *A Numerical Evaluation for Class I Injection Wells for Waste Confinement Performance, Final Report, Volumes I and II.* Prepared for U.S. Environmental Protection Agency, Office of Drinking Water, Underground Injection Control Program. September 30, 1987.

> The objective of this study was to evaluate the hydrogeologic response of injection well systems to potential migration pathways in order to assess their impact on waste containment performance. The scope of work assumed that these pathways may exist, allowing waste to migrate from the injection interval into the containment and/or other hydrogeologic strata in the vicinity of injection wells. The study relied on numerical models of groundwater flow and chemical waste transport. Among the findings were the following: under certain conditions, failure can result in escape of significant waste volumes from the injection zone within a localized area; confinement performance increases with distance between the injection well and the failure pathway; and the effect of pumpage on overlying strata increases the volume of waste escaping in the presence of a failure pathway. (The results of the study are described in greater detail in Section V.B.)

Industrial Economics, Inc. *Risk Analyses for Underground Injection of Hazardous Wastes*. Prepared for U.S. EPA, Office of Drinking Water. May 1987.

> This report estimates the magnitude of human health risks posed if underground injection of hazardous wastes resulted in contamination of USDWs. Risk estimates are presented for four geologic settings (East Gulf Coast, Great Lakes, Texas, and Kansas) and various failure modes and barrier thickness between the injection zone and the USDW. The risk

analysis concludes that risk varies substantially (over 20 orders of magnitude) among the geologic settings studied. Also, the risks associated with an abandoned, unplugged borehole are significantly greater than those associated with grout seal failure. Lastly, the report concludes that estimated health risks rise significantly when water is withdrawn from a USDW in the abandoned borehole failure scenario. (The results of the study are described in greater detail in Section V.B.)

Rish, W.A., T. Ijaz, and T.F. Long. *A Probabilistic Risk Assessment of Class I Hazardous Waste Injection Wells*. Draft. 1998.

This study quantitatively estimates the risk of waste containment loss as a result of various sets of events associated with Class I hazardous wells. Through a series of "event trees," the study estimated the probability that an initiating event will occur and be undiscovered, followed by subsequent events that could ultimately result in a release of injected fluids to a USDW. It concluded that Class I hazardous injection wells which meet EPA's minimum design and operating requirements (i.e., a completed no-migration study, two confining zones between the injection zone and the lowermost USDW, completed long string and surface casings, and redundant safety systems) pose risks that are well below acceptable levels. (The results of the risk assessment are described in greater detail in Section V.D.)

U.S. EPA, Office of Ground Water and Drinking Water. *Final Draft: Regulatory Impact Analysis of Proposed Hazardous Waste Disposal Restrictions for Class I Injection of Phase III Wastes: Benefits Analysis*. 1995.

This Benefits Analysis of the proposed Phase III LDR rule estimated human health risks from five Phase III waste constituents (benzene, carbon tetrachloride, chloroform, phenol, and toluene). EPA estimated health risks, including cancer risks and hazard indices, for four geologic settings and two malfunction scenarios (grout seal failure and abandoned, unplugged borehole) at varying drinking water well pumping rates. The results showed that only two of the estimated cancer risks for both malfunction scenarios slightly exceed the risk range generally used by EPA to regulate exposure to carcinogens. The analysis also showed that all but one of the hazard indices for both malfunction scenarios are less than EPA's level of concern for a hazard index of 1.55. (The results of the benefits analysis are described in greater detail in Section V.C.)

U.S. EPA, Office of Ground Water and Drinking Water. *Evaluation of Risks from Exceedance of the Universal Wastewater Treatment Standards (UTS), Including Addendum on HWIR Concentrations.* February 1996.

> To support the *de minimis* requirements in the proposed Phase III rule, EPA analyzed the effects of varying the criteria that underlying hazardous constituent concentrations must be less than 10 times UTS. Results of the analysis showed that, in general, carcinogenic risks were within the range generally used by EPA to regulate exposure to carcinogens, and noncancer risks were less than the hazard index of 1. The analysis concluded that a standard which would be more reflective of the potential for health hazards could be satisfied by defining the *de minimis* criterion as a value between 10 times and 50 times the UTS. (The results of the risk evaluation are described in greater detail in Section V.C.)

U.S. EPA, Office of Solid Waste and Remedial Response. *OSWER Comparative Risk Project: Executive Summary and Overview*. EPA/540/1-89/003. November 1989.

> In this study, several workgroups explored the comparative risks posed by various waste management practices regulated by or under OSWER purview. The study determined that injection wells generally posed medium or low risk for the types of effects examined. The workgroups found Class I hazardous wells to be of comparatively low risk for non-acute heath effects. Injection wells were ranked medium in terms of risk for acute health effects, medium-low for ecological effects, and of low risk for welfare effects. (The results of the study are described in greater detail in Section V.A.)

Ward, D.S., D.R. Buss, T.D. Wadsworth, J. Rosenblum, and S.T. Shaw. *Numerical Simulation for Waste Injection in Deep Wells: Phase 1 — Potential Failure Scenarios, Texas Gulf Coast.* Prepared by Engineering Enterprises, Inc. Prepared for U.S. Environmental Protection Agency, Office of Drinking Water. Herndon, Virginia: GeoTrans, Inc. January 1986.

> This report presents the results of the first phase of a three-part study on well failures. The purpose of Phase 1 was to assess the effect of undetected characteristics (the presence of an abandoned unplugged borehole, fractured discontinuities in the confining zone, failure of a grout seal, and high rates of ground water withdrawal in the aquifer above the confining layer) on the hydrologic performance of an injection zone. Preliminary results include the following findings: under certain conditions, failure can result in escape of significant waste volumes from the injection zone; potential contaminations can vary from waste concentrations that are below detection levels to nearly the same as that of the injectate; and potential contamination occurs within a localized area. These results will be used to formulate recommendations in later phases of the study.

Ward, D.S., T.D. Wadsworth, D.R. Buss, and J.W. Mercer. "Analysis of Potential Failure Mechanisms Pertaining to Hazardous Waste Injection in the Texas Gulf Coast Region." *International Symposium on Subsurface Injection of Liquid Wastes* New Orleans, Louisiana. March 3-5, 1986.

Three failure scenarios are presented and simulated to assess the effect of undetected characteristics of the Texas Gulf Coast hydrologic system in containing waste. The scenarios are failure of a grout seal, the presence of an abandoned unplugged borehole, and fractured discontinuities in the confining zone. A three-dimensional, finite-difference model is used to simulate these three failure scenarios. Results from the simulations are presented as time series plots of concentrations for various locations in the injection zone and the USDW. These simulations assist in determining the degree of safety inherent in hazardous waste injection.

Ward, David S., David R. Buss, David W. Morganwalp, and Terry D. Wadsworth. "Waste Confinement Performance of Deep Injection Wells." Proceedings from *Solving Ground Water Problems With Models.* Denver, Colorado. February 10-12, 1987.

A numerical flow and transport model is used to simulate the potential migration of waste over the operational life of an injection well and to evaluate the hydraulic response to hypothetical undetected pathways in the confining formations. Three potential pathways are considered in this analysis: annular grout seal deterioration (cement between casing and formation); presence of an unplugged, abandoned borehole; and plane of fractures or conductive faults in the confining unit. The study includes findings on the impact of migration pathways in four hydrogeologic settings studied (East Gulf Coast, Great Lakes, Texas, and Kansas), and the waste confinement potential within each setting.

Technical and Instructional Documents

Apps, John A., and Chin-Fu Tsang, eds. *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* San Diego, California: Academic Press. 1996.

This book is divided into eight sections that address the major subject areas pertinent to deep injection disposal. The first section concerns some topics from the regulatory perspective. It is followed by an introductory section covering the general aspects of deep-well injection disposal. The focus of this section is on principles and criteria affecting the optimal siting and operation of disposal wells. Section III includes papers on the engineering aspects of well design and emplacement. Following in Section IV is a collection of papers dealing with the important issues of well testing and model development. Section V addresses some of the attendant problems of well performance monitoring. Section VI, consisting of 10 chapters, addresses various aspects of the

chemical processes affecting the fate of the waste in the subsurface environment. Consideration is given here to reactions, such as acid neutralization, between the waste and the geologic medium and to reactions that take place within the wastewater itself, leading to the destruction of hazardous organic compounds. All aspects of this subject are covered, including experimentation, field observation, theoretical modeling, and prediction. Section VII provides a unique perspective on the philosophy and implementation of radioactive waste disposal practices in the former Soviet Union. Section VIII brings together four chapters that discuss novel technologies concerned with the disposal of hazardous waste slurries by deep well injection.

Booz, Allen and Hamilton, Inc. *Development of Procedures and Costs for Proper Abandonment and Plugging of Injection Wells.* Prepared by Booz, Allen and Hamilton Inc. under the direction of Geraghty & Miller, Inc. for U.S. Environmental Protection Agency, Office of Drinking Water. April 30, 1980.

This report summarizes the data analysis and findings on proper abandonment and plugging. The objective was to assist EPA in resolving issues raised in public comments on the proposed abandonment regulations and in completing the rule making. Five major topic areas are discussed: (1) procedures for proper abandonment; (2) feasibility of aquifer restoration; (3) abandonment costs; (4) financial responsibility; and (5) timing of abandonment. Based on the public comments, literature review, and interviews, several recommendations were made. The authors recommended retaining the proposed mud weight equalization requirement for the well preparation phase of abandonment. On the issue of aquifer restoration, they recommended that EPA issue guidance for restoration and allow states to adopt requirements if desired; they concluded it was not feasible to restore all degraded aquifers to baseline levels. The data indicate that costs of new abandonment regulation will be low, since most states already require proper abandonment. The authors suggest that EPA not require immediate abandonment but determine a reasonable deadline beyond which wells must be properly abandoned or put back into operation.

Clark, J. E., P. W. Papadeas, D. K. Sparks, and R. R. McGowen. "Gulf Coast Borehole Closure Test Well: Orangefield, Texas." In: *Proceeding of the Underground Injection Practices Council, 1991 Winter and Summer Meetings.* Point Clear, Alabama, February 24-27, 1991 and Reno, Nevada. July 28-31, 1991.

This paper describes a borehole closure protocol for a Gulf Coast site near Orangefield, Texas, developed by Du Pont. The procedures, based largely upon recommendations provided by EPA Region 6, created a test to demonstrate that, under a worst case scenario, any artificial penetration will seal naturally. The test successfully demonstrated natural sealing. Within 1 week of setting the screen, tubing, and pressure transducers in

the borehole, testing confirmed the absence of upward movement of fluid from the test sand. The absence of upward movement is documented by a Schlumberger Water Flow Log and the absence of pressure response on the upper transducer located outside the tubing and inside the casing. Testing was conducted in accordance with specified procedures, with pressure testing conducted at even higher pressures to allow an added margin of confidence. The borehole closure test provides a significant additional margin of confidence that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous.

Creech, John R. "Class I Injection Well Design Considerations." *Proceedings of the International Symposium on Subsurface Injection of Liquid Waste.* New Orleans, Louisiana, March 3-5, 1986. Dublin, Ohio: National Water Well Association. 1986.

No single material is available that is universally resistant to all types of waste fluids. It is important to match well materials to the injection stream for each injection well application. For some wastes, the ferrous and nonferrous metals or Portland cements commonly used in deep well construction may not offer the desired corrosion resistance. This paper discusses two materials, fiber-reinforced thermoset plastics (FRP) and epoxy resin cement, which have been particularly useful in solving these corrosion resistance problems. The report concludes that when proper materials are used to minimize corrosion, less maintenance and repairs are required and well operations are more reliable.

Davis, Ken E. *Factors Affecting the Area of Review for Hazardous Waste Disposal Wells*. 1986.

This paper presents a method for calculating the area of review for hazardous waste wells. It focuses on artificial pathways such as abandoned test holes or oil and gas wells. These pathways are sealed with cement plugs and drilling mud; the mud provides resistance to upward flow. Flow in an improperly abandoned well bore is initiated when the pressure in an injection zone exceeds the sum of the static mud pressure and the mud gel strength pressure. If the sum of these values is not exceeded, no potential for USDW contamination exists. This paper presents a simplified approach for calculating the area affected by the injection pressures.

Engineering Enterprises, Inc. *Assessment of Treatment Technologies Available to Attain Acceptable Levels for Hazardous Waste in Deep Injection Wells*. Prepared for U.S. Environmental Protection Agency, Underground Injection Control Branch. October 1987.

The potential for restrictions on land-disposal of hazardous waste into deep injection wells under the Hazardous and Solid Waste Amendments of 1984 stimulated the need to

evaluate the ability of treatment technologies to reduce the likelihood of migration of hazardous waste constituents from the injection zone. Physical/chemical and biological (both above ground and *in situ*) pre-treatment technologies were assessed with respect to their potential applicability in minimizing the mobility of injected hazardous constituents via adsorption, precipitation, or transformation. The study shows that pretreatment applications to minimize the mobility of contaminants in the injection zone could pose operational problems for deep well injection systems. The extent to which specific contaminants may be removed is unknown and may be complicated by interference with nonhazardous components of the wastestream and by varying composition and concentrations of many wastestreams. One important consideration is that many pretreatment technologies result in the generation of sludge residue, requiring further treatment or disposal.

Geraghty & Miller, Inc. *Technical Manual: Injection Well Abandonment.* Final. Prepared for U.S. Environmental Protection Agency, Office of Drinking Water. 1983.

The purpose of this document is to provide technical guidance to assist the regulator in reviewing proposed well abandonment plans. Emphasizing that proper abandonment consists of more than cement plug placement, the document discusses all aspects of well abandonment. Many procedures and materials are available for well abandonment; their selection is influenced by a number of factors and depends on the specifics of the situation. Frequently, there is no single best method. The approach taken in this document is to identify and discuss the considerations needed to plug and abandon wells of Classes I, II, or III. This approach will enable the regulator to make decisions regarding a specific abandonment plan. In this document, four major chapters follow the introduction in Chapter 1. Chapter 2 considers injection well construction, general considerations important to abandonment, and special Class III abandonment considerations. Chapter 3 discusses the preparation of the well prior to plugging. Procedures for plugging are covered in Chapter 4. Chapter 5 concludes the report with an analysis of abandonment costs.

Geraghty & Miller, Inc., and Booz, Allen & Hamilton, Inc. *Injection Well Construction Practices and Technology*. Prepared for U.S. Environmental Protection Agency, Office of Drinking Water. October 1982.

This document describes construction practices and technologies related to Class I, Class II, and selected Class III and Class V injection wells as defined by EPA. Topics covered include siting, drilling, completion, equipment and materials, corrosion control, well evaluation/logging, and formation testing. This document is not intended to be a comprehensive "how-to" treatment of injection well construction; rather, it is a reference that describes the different aspects of design and construction of injection wells.

Kazmann, Raphael G. "A Closer Look at Deep Well Disposal of Wastes." *Ground Water*. May/June 1981.

> This discussion is directed to conditions in the area away from the injection well: within the quarter-mile to half-mile radius required by the EPA and the various state agencies. The wells and abandoned test holes in this area are seen as potential pathways for the movement of dangerous aqueous wastes from the storage aquifer to the biosphere. The concern here is primarily with conditions in the Gulf Coast area, where the underlying formations are either unconsolidated or semiconsolidated.

Keckler, K. P. "BP Chemicals Lima No-Migration Petition Demonstration Based on Stratigraphic Test-Well and Site-Specific Data." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 287-314.

> To demonstrate containment of injected wastewater and to calibrate a site-specific reservoir model, BP Chemicals drilled a stratigraphic test well at a Lima, Ohio, facility where it has injected wastewater from acrylonitrile production since 1968. This paper presents the results of the extensive geologic testing and transport modeling. Sampling from the waste plume at a test well approximately 1,700 feet from the nearest injection well indicated significant degradation of most of the nitriles in the injected waste. In addition, BP developed an extensive database which included core mechanical properties; *in situ* stress test, transient pressure test, and minifrac test data; and a summary of the facility's 20-year operating history.

Ken E. Davis Associates. *Annulus Pressure Monitoring Systems for Class I Wells.* Prepared by Ken E. Davis Associates, Houston, Texas, for U.S. Environmental Protection Agency, Office of Drinking Water. October 1986.

> This report presents specific information concerning equipment and procedures currently in use or available for detecting leakage from the annulus between the injection tubing and the protection casing in injection wells. In current operating practice, this annulus space is filled with nonhazardous, nonreactive fluid and maintained at a predetermined pressure. The annulus pressure is monitored because a leak will result in a change in the annulus pressure. However, the minimum rate of leakage or the amount of leakage that can be detected by pressure-monitoring systems is not known. In addition, information is also needed on alternative means of detecting leaks in disposal wells. This report is therefore not confined to reporting on equipment and systems in use, but also on systems

that have the potential for such use. This report includes a review and inventory of equipment that is, has, or could be used to detect leaks into or out of the annulus space in injection wells. In addition, the review compares the leak detection capability of wells completed with packers, seal assemblies, and fluid seals.

Mankin, Charles J., Tola B. Moffett, and Laura E. Whitaker. *Evaluation of Certain Crucial Issues Regarding the Use of Hazardous Waste Injection Wells*. Prepared by the University of Alabama Environmental Institute for Waste Management Studies for U.S. Environmental Protection Agency, Office of Drinking Water. August 1988.

This report contains an evaluation of specific methodologies for siting, testing, and monitoring of Class I injection wells. The evaluation of potential locations for hazardous waste injection wells is a site-specific process which is analogous to that performed in the siting of oil and gas wells. Seismic surveys and pressure testing, both of which are used in the petroleum industry, are recommended. Regional studies and standard well logs are considered insufficient. Hydrogeologic models of the site should be developed and updated through the drilling and testing of the injection well. Recommendations for the monitoring and testing of industrial waste injection wells are discussed.

SMC Martin, Inc., and The Underground Injection Control Quality Assurance Workgroup. *Technical Assistance Document: Corrosion, Its Detection and Control in Injection Wells*. Prepared for U.S. Environmental Protection Agency, Office of Drinking Water. August 1987.

This report summarizes available information on the occurrence, detection, and control of corrosion in injection wells. Corrosion of the metallic materials and degradation of nonmetallic materials are possible causes of leaks in injection wells. General corrosion, the uniform or near-uniform thinning of metal, may be addressed by building a corrosion allowance into the design thickness of the well casing. Localized corrosion, such as pitting and cracking, is problematic because it can lead to premature failure of the well.

Tsang, C. F. "Some Hydrologic Factors Affecting the Safety of Deep Injection Disposal of Liquid Wastes." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 35-45.

Factors such as the presence of faults, formation fracturing pressures, and hydrology as they relate to monitoring systems are important considerations in the planning of deep injection wells. This paper reviews three phenomena that could affect estimates of waste plume movement within the injection zone. They are formation heterogeneity; sloping of the injection zone, which can cause a plume to flow by gravity; and fractures that can form in the injection zone if the injection pressure is too high. The paper concludes that the issues presented should be considered in determining optimal designs for monitoring deep well injection.

U.S. EPA, Office of Drinking Water, State Programs Division. *Technical Assistance Document: The Application and Calibration of Pressure Instruments, Flowmeters, and Flow Control Devices as Applied to Injection Wells.* EPA 570/9-87-003. September 1987.

This report discusses the various devices that are used to measure the pressures and the flow rates of injection wells, particularly those instruments used by regulatory agencies and operators for assessing well operations. This report introduces the basic concepts of flow and pressure metering in injection wells to EPA regional office staffers, state regulators, and the regulated community.

U.S. EPA, Office of Ground Water and Drinking Water, and U.S. Department of Energy, Environmental Management, Office of Technology Development. *Scientific and Engineering Aspects of Deep Injection Disposal of Hazardous and Industrial Wastes: An International Symposium*. Lawrence Berkeley Laboratory, Berkeley, California. May 10-13, 1994.

This document contains abstracts of papers presented at an international symposium on the scientific and engineering aspects of the deep injection of hazardous and industrial wastes. The symposium covered general aspects of deep well injection, engineering aspects of well emplacement, well testing, monitoring, and model development.

U.S. EPA, Office of Research and Development. *Assessing the Geochemical Fate of Deep-Well-Injected Hazardous Waste: A Reference Guide*. EPA/625/6-89/025a. June 1990.

This reference guide presents state-of-the-art information on the geochemical fate of injected wastes to address issues related to no-migration petitions and determination of the compatibility of injected wastes with the injection zone formation. The seven chapters in the guide provide an overview of injection practices in the United States, processes affecting the geochemical fate of wastes, environmental factors affecting geochemical processes, geochemical characteristics of hazardous wastes, methods and models for predicting the geochemical fate of injected wastes, field sampling and laboratory procedures, and case studies of deep-well injection of hazardous wastes.

Warner, D. L. "Monitoring of Class I Injection Wells." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 421-431.

Class I injection wells have historically been monitored by observing well operating parameters and by testing and logging to verify the mechanical integrity of the well.

Engineering and geologic reasoning support such limited monitoring as the most appropriate, since most possible vertical pathways for escape of fluids from the injection zone are concentrated in or immediately around the injection well. Such pathways can be detected or inferred by monitoring and testing of the injection well. This paper discusses ways to determine the necessity of monitoring wells, and how wells should be selected and positioned.

Warner, Don L., and Jay H. Lehr. *An Introduction to the Technology of Subsurface Wastewater Injection*. Prepared for U.S. Environmental Protection Agency, Office of Research and Development, Robert S. Kerr Environmental Research Laboratory. December 1977.

This report provides an introduction to the proper siting, construction, testing, operation, and abandonment of injection wells. Prior to construction, the local geologic and hydrologic setting must be determined to assess compatibility with injected wastes. If necessary, the waste may be treated to ensure physical, biological, and chemical compatibility with the injection zone. Once the well begins operation, it should be monitored for changes in injection conditions which may lead to system failure. (Reprinted as: Warner, Don L, and Jay H. Lehr. *Subsurface Wastewater Injection: The Technology of Injecting Wastewater into Deep Wells for Disposal.* Berkeley, California: Premier Press. 1981.)

Whiteside, R. F., T. P. Roth, and J. R. Creech. "Applications of Corrosion-Resistant Materials and Cement in the Design and Construction of Class I Injection Wells." In: *Deep Injection Disposal of Hazardous and Industrial Waste: Scientific and Engineering Aspects.* John A. Apps and Chin-Fu Tsang, eds. San Diego, California: Academic Press. 1996. p. 145-164.

Although numerous alternative candidate materials have been available, the typical problems encountered with corrosion-resistant injection well designs prior to the mid to late 1970s were due mainly to the inherent difficulties in adapting various alloy metals, fiberglass, elastomers, resins, plastics, etc., from surface to subsurface applications. Refinements over the past 15 to 20 years in the fabrication and machining of these materials and well designs have dramatically improved the integration of specialized corrosion-resistant materials into the design of Class I wells. This article describes these materials and how they are tested by manufacturers.

APPENDIX A

Land Disposal Program Flexibility Act of 1996

Public Law 104-119, March 26, 1996

PUBLIC LAW 104–119—MAR. 26, 1996

LAND DISPOSAL PROGRAM FLEXIBILITY ACT OF 1996

Public Law 104–119
104th Congress

An Act

Mar. 26, 1996
[H.R. 2036]

To amend the Solid Waste Disposal Act to make certain adjustments in the land disposal program to provide needed flexibility, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Land Disposal Program Flexibility Act of 1996. Environmental protection. 42 USC 6901 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Land Disposal Program Flexibility Act of 1996".

SEC. 2. LAND DISPOSAL RESTRICTIONS.

42 USC 6924.

Section 3004(g) of the Solid Waste Disposal Act is amended by adding after paragraph (6) the following:

"(7) Solid waste identified as hazardous based solely on one or more characteristics shall not be subject to this subsection, any prohibitions under subsection (d), (e), or (f), or any requirement promulgated under subsection (m) (other than any applicable specific methods of treatment, as provided in paragraph (8)) if the waste—

"(A) is treated in a treatment system that subsequently discharges to waters of the United States pursuant to a permit issued under section 402 of the Federal Water Pollution Control Act (commonly known as the "Clean Water Act") (33 U.S.C. 1342), treated for the purposes of the pretreatment requirements of section 307 of the Clean Water Act (33 U.S.C. 1317), or treated in a zero discharge system that, prior to any permanent land disposal, engages in treatment that is equivalent to treatment required under section 402 of the Clean Water Act (33 U.S.C. 1342) for discharges to waters of the United States, as determined by the Administrator; and

"(B) no longer exhibits a hazardous characteristic prior to management in any land-based solid waste management unit.

"(8) Solid waste that otherwise qualifies under paragraph (7) shall nevertheless be required to meet any applicable specific methods of treatment specified for such waste by the Administrator under subsection (m), including those specified in the rule promulgated by the Administrator June 1, 1990, prior to management in a land-based unit as part of a treatment system specified in paragraph (7)(A). No solid waste may qualify under paragraph (7) that would generate toxic gases, vapors, or fumes due to the presence of cyanide when exposed to pH conditions between 2.0 and 12.5.

"(9) Solid waste identified as hazardous based on one or more characteristics alone shall not be subject to this subsection, any prohibitions under subsection (d), (e), or (f), or any requirement promulgated under subsection (m) if the waste no longer exhibits a hazardous characteristic at the point of injection in any Class I injection well permitted under section 1422 of title XIV of the Public Health Service Act (42 U.S.C. 300h–1).

"(10) Not later than five years after the date of enactment of this paragraph, the Administrator shall complete a study of hazardous waste managed pursuant to paragraph (7) or (9) to characterize the risks to human health or the environment associated with such management. In conducting this study, the Administrator shall evaluate the extent to which risks are adequately addressed under existing State or Federal programs and whether unaddressed risks could be better addressed under such laws or programs. Upon receipt of additional information or upon completion of such study and as necessary to protect human health and the environment, the Administrator may impose additional requirements under existing Federal laws, including subsection (m)(1), or rely on other State or Federal programs or authorities to address such risks. In promulgating any treatment standards pursuant to subsection (m)(1) under the previous sentence, the Administrator shall take into account the extent to which treatment is occurring in land-based units as part of a treatment system specified in paragraph (7)(A).

"(11) Nothing in paragraph (7) or (9) shall be interpreted or applied to restrict any inspection or enforcement authority under the provisions of this Act.".

SEC. 3. GROUND WATER MONITORING.

(a) AMENDMENT OF SOLID WASTE DISPOSAL ACT.—Section 4010(c) of the Solid Waste Disposal Act (42 U.S.C. 6949a(c)) is amended as follows:

(1) By striking "CRITERIA.—Not later" and inserting the following: "CRITERIA.—

"(1) IN GENERAL.—Not later".

(2) By adding at the end the following new paragraphs:

"(2) ADDITIONAL REVISIONS.—Subject to paragraph (3), the requirements of the criteria described in paragraph (1) relating to ground water monitoring shall not apply to an owner or operator of a new municipal solid waste landfill unit, an existing municipal solid waste landfill unit, or a lateral expansion of a municipal solid waste landfill unit, that disposes of less than 20 tons of municipal solid waste daily, based on an annual average, if—

"(A) there is no evidence of ground water contamination from the municipal solid waste landfill unit or expansion; and

"(B) the municipal solid waste landfill unit or expansion serves—

"(i) a community that experiences an annual interruption of at least 3 consecutive months of surface transportation that prevents access to a regional waste management facility; or "(ii) a community that has no practicable waste management alternative and the landfill unit is located in an area that annually receives less than or equal to 25 inches of precipitation.

"(3) PROTECTION OF GROUND WATER RESOURCES.—

"(A) MONITORING REQUIREMENT.—A State may require ground water monitoring of a solid waste landfill unit that would otherwise be exempt under paragraph (2) if necessary to protect ground water resources and ensure compliance with a State ground water protection plan, where applicable.

"(B) METHODS.—If a State requires ground water monitoring of a solid waste landfill unit under subparagraph (A), the State may allow the use of a method other than the use of ground water monitoring wells to detect a release of contamination from the unit.

"(C) CORRECTIVE ACTION.—If a State finds a release from a solid waste landfill unit, the State shall require corrective action as appropriate.

"(4) NO-MIGRATION EXEMPTION.—

"(A) IN GENERAL.—Ground water monitoring requirements may be suspended by the Director of an approved State for a landfill operator if the operator demonstrates that there is no potential for migration of hazardous constituents from the unit to the uppermost aquifer during the active life of the unit and the post-closure care period.

"(B) CERTIFICATION.—A demonstration under subparagraph (A) shall be certified by a qualified ground-water scientist and approved by the Director of an approved State.

"(C) GUIDANCE.—Not later than 6 months after the date of enactment of this paragraph, the Administrator shall issue a guidance document to facilitate small community use of the no migration exemption under this paragraph.

"(5) ALASKA NATIVE VILLAGES.—Upon certification by the Governor of the State of Alaska that application of the requirements described in paragraph (1) to a solid waste landfill unit of a Native village (as defined in section 3 of the Alaska Native Claims Settlement Act (16 U.S.C. 1602)) or unit that is located in or near a small, remote Alaska village would be infeasible, or would not be cost-effective, or is otherwise inappropriate because of the remote location of the unit, the State may exempt the unit from some or all of those requirements. This paragraph shall apply only to solid waste landfill units that dispose of less than 20 tons of municipal solid waste daily, based on an annual average.

"(6) FURTHER REVISIONS OF GUIDELINES AND CRITERIA.—Recognizing the unique circumstances of small communities, the Administrator shall, not later than two years after enactment of this provision promulgate revisions to the guidelines and criteria promulgated under this subtitle to provide additional flexibility to approved States to allow landfills that receive 20 tons or less of municipal solid waste per day, based on an annual average, to use alternative frequencies of daily cover application, frequencies of methane gas monitoring, infiltration layers for final cover, and means for demonstrating financial assurance: *Provided*, That such alternative requirements take into account climatic and hydrogeologic conditions and are protective of human health and environment.".

(b) REINSTATEMENT OF REGULATORY EXEMPTION.—It is the intent of section 4010(c)(2) of the Solid Waste Disposal Act, as added by subsection (a), to immediately reinstate subpart E of part 258 of title 40, Code of Federal Regulations, as added by the final rule published at 56 Federal Register 50798 on October 9, 1991. 42 USC 6949a note.

SEC. 4. TECHNICAL CORRECTIONS TO SOLID WASTE DISPOSAL ACT.

The Solid Waste Disposal Act is amended as follows:

(1) In section 3001(d)(5) by striking "under section 3001" and inserting "under this section". 42 USC 6921.

(2) By inserting a semicolon at the end of section 3004(q)(1)(C). 42 USC 6924.

(3) In section 3004(g), by striking "subparagraph (A) through (C)" in paragraph (5) and inserting "subparagraphs (A) through (C)".

(4) In section 3004(r)(2)(C), by striking "pertroleum-derived" and inserting "petroleum-derived".

(5) In section 3004(r)(3) by inserting after "Standard" the word "Industrial".

(6) In section 3005(a), by striking "polycholorinated" and inserting "polychlorinated". 42 USC 6925.

(7) In section 3005(e)(1), by inserting a comma at the end of subparagraph (C).

(8) In section 4007(a), by striking "4003" in paragraphs (1) and (2)(A) and inserting "4003(a)". 42 USC 6947.

Approved March 26, 1996.

LEGISLATIVE HISTORY—H.R. 2036:

HOUSE REPORTS: No. 104–454 (Comm. on Commerce).
CONGRESSIONAL RECORD, Vol. 142 (1996):
Jan. 30, 31, considered and passed House.
Feb. 20, considered and passed Senate, amended.
Mar. 7, House concurred in Senate amendments.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 32 (1996):
Mar. 26, Presidential statement.

APPENDIX B

Supplemental Risk Analysis in Support of The Class I UIC Regulatory Impact/Benefits Analysis For Phase III Wastes:

Examination of Risks Associated With East Gulf Coast/Abandoned Borehole Scenario And Variations in Permeability Ratio Between The Injection Zone And The Confining Layer

Supplemental Risk Analysis in Support of The Class I UIC Regulatory Impact/Benefits Analysis For Phase III Wastes:

Examination of Risks Associated With East Gulf Coast/Abandoned Borehole Scenario And Variations in Permeability Ratio Between The Injection Zone And The Confining Layer

Introduction

This study further explores the results of the quantitative risk analysis conducted in the benefits assessment for the Class I well injection of Phase III wastes described in the revised Phase III RIA.[1] In that analysis, EPA estimated health risks associated with five Phase III waste constituents under two malfunction scenarios (grout seal failure and abandoned unplugged borehole) in four geologic settings. The study also assessed the effects of varying drinking water well pumping rates. The analysis showed that the only cases of elevated cancer and non-cancer risks estimated were associated with exposure to benzene or carbon tetrachloride via migration of injected Class I waste through an abandoned borehole into a USDW, with a drinking water well pumping from an overlying aquifer at a rate of 720,000 gallons per day (gpd). The slightly elevated risks were observed only when the above scenarios was assumed to be located in a hydrogeologic situation comparable to the East Gulf Coast.

In the GeoTrans[2] study, the model of the East Gulf Coast hydrogeology was designed to examine the effect of highly permeable confining zones. Specifically, GeoTrans set the ratio of the hydraulic conductivity between adjacent formations to be less than 100:1. That is, the injection zone was less than 100 times more permeable than the confining layer.

The purpose of this analysis is to supplement the GeoTrans[3] original risk assessment of the above scenario by assuming five different permeability ratios of 1:1,000; 1:10,000; 1:100,000; 1:1,000,000; and, 1:10,000,000. GeoTrans varied the permeability ratio by reducing the hydraulic conductivity of the lowest hydrogeologic zone (aquitard 6) just above the injection zone.

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[1] U.S. EPA, Office of Ground Water and Drinking Water. *Draft Regulatory Impact Analysis of Proposed Hazardous Waste Disposal Restrictions for Class I Injection of Phase III Wastes: Benefits Analysis.* 1995.

[2] GeoTrans, Inc. *Numerical Simulations of Deep Injection Wells in Support of EPA's UIC, Office of Ground Water and Drinking Water.* August 21, 1995.

[3] GeoTrans, Inc. *Numerical Simulations of Deep Injection Wells in Support of EPA's UIC, Office of Ground Water and Drinking Water.* September 17, 1996.

Other aquifer and aquitard properties from the former analysis were unchanged in this analysis. Specifically:

- The same hydrogeologic scenario is used: the East Gulf Coast hydrogeology, with an abandoned borehole, and a high rate of pumping from the overlying aquifer.

- The same quantitative risk methodology as described previously and based on the Industrial Economics, Inc. (IEc) methodology is used.[4] The current version of SWIFT/486 was used to model these scenarios.

- The chemicals of concern for this risk assessment were selected via a procedure consistent with that in the original risk analysis. Carbon tetrachloride and benzene, two organic contaminants reported in Class I facilities, were selected as the chemicals of concern. (The present risk analysis also includes arsenic, an inorganic contaminant reported in Class I facilities.)

- The present analysis also uses the methods described in the previous studies to determine the normalized injectate concentrations, to provide a range of concentrations achieved, and to examine the ultimate effect on the risk estimates at different locations relative to the injection well and USDW.

To assess the cancer and non-cancer risks from exposure to each of these three contaminants, EPA used the 90th percentile concentration data for each contaminant as reported in the Class I facility-specific data from OGWDW's 1996 Class I UICWELLS database. The waste stream concentrations ("initial concentrations") of Phase III contaminants were obtained from recent information provided by Class I facilities on concentrations of contaminants in their waste streams.

The following section describes the normalized injectate concentrations modeled by GeoTrans[5] assuming the variations in permeability ratio as noted above and assuming three different receptors. Concentrations at these receptors are upper-bound estimates.

Quantitative Risk Assessment

EPA used the results of GeoTrans' fate and transport modeling of drinking water contamination from a nearby unplugged borehole to estimate the concentrations of certain Phase III contaminants at three selected receptor locations within or below the USDW. The three receptors are located: 500 feet from the injection well in an aquifer below the USDW (receptor

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[4] Industrial Economics, Inc. *Risk Analyses for Underground Injection of Hazardous Wastes.* May 1987.

[5] GeoTrans, Inc. 1996.

B2); 500 feet from the injection well in the USDW (receptor A2); and approximately 2,000 feet from the injection well in the USDW (receptor A4).

The concentrations at each receptor were used to estimate the risk to human health from the hypothetical occurrence of these failures. Exhibits 1 and 2 present the normalized injectate concentrations at the designated receptors assuming permeability ratios of 1:1,000 and 1:10,000,000, respectively.

Exhibit 1

Normalized Injectate Concentrations in the USDW Based on East Gulf Coast Hydrogeology/Abandoned Borehole Failure Scenario With Pumping at 720,000 GPD and 1:1,000 Permeability Ratio [1]

Geographic Location	Abandoned Unplugged Borehole: Concentration (mg/L) 500 feet away from the injection well in the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [2]	Abandoned Unplugged Borehole: Concentration (mg/L) 500 feet away from the injection well in an aquifer below the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [3]	Abandoned Unplugged Borehole: Concentration (mg/L) 2,000 feet away from the injection well in the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [4]
East Gulf Coast	2.52E-04 (22.2 years)	3.34E-02 (22.2 years)	4.83E-10 (22.2 years)

[1] Source: GeoTrans, Inc. September 13, 1996. *Numerical Simulation of Deep Injection Wells in Support of EPA's UIC, Office of Ground Water and Drinking Water.*

[2] The concentration noted is based on the concentration at receptor A2, located 500 feet away from the injection well in the USDW.

[3] The concentration noted is based on the concentration at receptor B2, located adjacent to an abandoned unplugged borehole that is 573 feet away from the injection well in an aquifer below the USDW.

[4] The concentration noted is based on the concentration at receptor A4, located 2,000 feet away from the injection well in the USDW.

Exhibit 2
Normalized Injectate Concentrations in the USDW
Based on East Gulf Coast Hydrogeology/Abandoned Borehole Failure Scenario
With Pumping at 720,000 GPD and 1:10,000,000 Permeability Ratio [1]

Geographic Location	Abandoned Unplugged Borehole: Concentration (mg/L) 500 feet away from the injection well in the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [2]	Abandoned Unplugged Borehole: Concentration (mg/L) 500 feet away from the injection well in an aquifer below the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [3]	Abandoned Unplugged Borehole: Concentration (mg/L) 2,000 feet away from the injection well in the USDW plus a well pumping drinking water at 720,000 gpd (and time of occurrence in years) [4]
East Gulf Coast	1.68E-04 (22.2 years)	2.10E-02 (22.2 years)	3.06E-10 (22.2 years)

1 Source: GeoTrans, Inc. September 13, 1996. *Numerical Simulation of Deep Injection Wells in Support of EPA's UIC, Office of Ground Water and Drinking Water.*

2 The concentration noted is based on the concentration at receptor A2, located 500 feet away from the injection well in the USDW.

3 The concentration noted is based on the concentration at receptor B2, located adjacent to an abandoned unplugged borehole that is 573 feet away from the injection well in an aquifer below the USDW.

4 The concentration noted is based on the concentration at receptor A4, located 2,000 feet away from the injection well in the USDW.

Exhibit 3 presents toxicity factors and concentration data for benzene, carbon tetrachloride, and arsenic. Information presented includes the Cancer Slope Factor, Reference Dose, and initial concentrations for each contaminant.

Exhibit 3

Toxicity and Concentration Data for Hazardous Phase III Contaminants

	Benzene	Carbon Tetrachloride	Arsenic
Chemical Abstract Services (CAS) Number	71-43-2	56-23-5	7440-38-2
Cancer Slope Factor* $(mg/kg/day)^{-1}$	2.9×10^{-2}	1.3×10^{-1}	1.5×10^{0}
Reference Dose (RfD)** (mg/kg/day)	NA	7×10^{-4}	3.4×10^{-4}
Initial Concentration*** (mg/L)	47	2.23	2.6

* Source: U.S. EPA. January 11, 1995. Integrated Risk Information System (IRIS). Arsenic CSF is from IRIS. 1993.

** Source: U.S. EPA. January 11, 1995. IRIS. Arsenic RfD is from IRIS. 1993.

*** Based on the 90th percentile concentration from USEPA OGWDW. 1996. UICWELLS database.

NA = Not Available

Methodology for Estimating Health Risks

The risk to human health was estimated separately for benzene, carbon tetrachloride, and arsenic. The risk calculations were based on several assumptions about the average individual. These include an average body weight of 70 kilograms and the ingestion of 2 liters of contaminated water per day. The calculations also assumed that the affected person's body retains 100 percent of the contaminants in the water.

The calculation of carcinogenic risk was based on the Cancer Slope Factor (CSF) developed for individual carcinogens by EPA's Carcinogen Assessment Group. The Cancer Slope Factor, an upper-bound estimate of the probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen, is calculated as follows:

- The actual chemical concentration in the drinking water, expressed as milligrams per liter, is calculated by multiplying the unit concentration from the dispersion modeling by the contaminant concentration in the waste stream.

- Using the above assumptions about consumption of drinking water, the concentration figure is converted to a dose expressed in milligrams of contaminant consumed per kilogram of body weight per day (mg/kg/day).

- The dose is multiplied by the cancer unit risk factor, resulting in an upper-bound estimate of the increased likelihood of developing cancer. The CSFs for benzene, carbon tetrachloride, and arsenic are presented in Exhibit 3.

To calculate noncarcinogenic health effects, the chronic daily intake (CDI), in mg/kg/day, of each contaminant is estimated. The CDI is based on a 70-year lifetime exposure. The CDI is then compared to the toxicity factor for non-cancer effects, known as the Reference Dose (RfD). The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime of exposure. The RfD represents EPA's preferred toxicity value for evaluating non-cancer effects.[6] Exhibit 3 presents the RfD for carbon tetrachloride and arsenic. Benzene does not have an RfD.

The ratio of the CDI to the RfD represents the hazard index, which is used to compare the relative risk posed by contaminants. A hazard index of greater than one indicates an increased risk of non-carcinogenic health effects.

Results of Applying Methodologies

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6 U.S. EPA. *Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual.* EPA/540/1-89/002. 1989.

Exhibit 4 summarizes the cancer risks and hazard indices for each chemical of concern given the malfunction scenario and assuming 1:1,000 and 1:10,000,000 permeability conductivity ratios. Exhibits 5 to 8 present specific input parameters used in the calculations of cancer risks and hazard indices for benzene, carbon tetrachloride, and arsenic under the scenario of concern. The quantitative risk assessment for the East Gulf Coast/abandoned borehole scenario shows the following results:

- Cancer risks at receptors in the USDW are lower than those from the aquifer below the USDW. The cancer risks were higher for the 1:1,000 permeability ratio than for the 1:10,000,000 permeability ratio.

    - The risk assessment shows that cancer risks are the lowest at the receptor 2,000 feet from the well for either permeability ratio. These risks are extremely low: on the order of four- to 120-in-one-trillion.

    - Cancer risks are higher at the receptor located 500 feet from the injection well in the aquifer below the USDW. These cancer risks range from on the order of 1.4-in-one-million to 1.8-in-one-hundred-thousand.

    - The cancer risks associated with exposures to concentrations estimated at receptor B2, 500 feet from the injection well in an aquifer below the USDW, consistently exceed the one-in-ten-thousand to one-in-one-million risk range generally used by EPA to regulate exposures to carcinogens.[7] All other cancer risk estimates are within regulatory levels.

- The hazard indices for each contaminant were lowest at the receptor 2,000 feet from the well, higher at the receptor 500 feet from the well, and the highest in the aquifer below the USDW. For both carbon tetrachloride and arsenic, hazard indices were higher for the 1:1,000 permeability ratio than for the 1:10,000,000 permeability ratio.

- Similar to the results for the cancer risk estimates, all of the hazard indices estimated at the receptor in the aquifer below the USDW at both permeability ratios are greater than EPA's level of concern for a hazard index of greater than 1. All other hazard index estimates are within regulatory levels.

Thus, the cancer risks and hazard indices in all cases are higher assuming the permeability ratio of 1:1,000 versus 1:10,000,000. The cancer and non-cancer risks associated with exposure to contaminant concentrations at receptor B2, 500 feet from the injection well in an aquifer below the USDW are, in all cases, above the level recommended by EPA as being acceptable for human health exposures.

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[7] U.S. EPA. Office of Solid Waste and Emergency Response. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.* OSWER Directive 9355.0-30. 1991.

It should be noted that, given the existing UIC regulations, a failure scenario such as that described in this analysis occurring is highly unlikely. Current regulations require that an area of review (AoR) surrounding injection wells be identified, and abandoned boreholes within this area be located. Therefore, a borehole within 500 feet of the well would be identified and properly plugged before any injection would be permitted.

Exhibit 4

Cancer Risks and Hazard Indices for Contaminants of Concern Based on East Gulf Coast/Abandoned Borehole Scenario With Pumping at 720,000 GPD and 1:1,000 and 1:10,000,000 Permeability Ratio [1]

Chemical/ Receptor Location	Cancer Risk/1:1,000 Permeability Ratio	Hazard Index/ 1:1,000 Permeability Ratio	Cancer Risk/ 1:10,000,000 Permeability Ratio	Hazard Index/ 1:10,000,000 Permeability Ratio
Benzene:				
- 500 feet from well in base of USDW plus pumping	9.82E-06	NA	6.55E-06	NA
- 500 feet from well in aquifer below USDW plus pumping	1.30E-03	NA	8.19E-04	NA
- 2,000 feet from well in base of USDW plus pumping	1.88E-11	NA	1.19E -11	NA
Carbon Tetrachloride:				
- 500 feet from well in base of USDW plus pumping	2.09E-06	2.30E-02	1.39E-06	1.53E-02
- 500 feet from well in aquifer below USDW plus pumping	2.77E-04	3.04E+00	1.74E-04	1.91E+00
- 2,000 feet from well in base of USDW plus pumping	4.00E-12	4.40E-08	2.54E-12	2.79E-08
Arsenic:				
- 500 feet from well in base of USDW plus pumping	2.81E-05	6.25E-02	1.87E-05	4.16E-02
- 500 feet from well in aquifer below USDW plus pumping	3.73E-03	8.28E+00	2.34E-03	5.21E+00
- 2,000 feet from well in base of USDW plus pumping	5.39E-11	1.20E-07	3.41E-11	7.58E-08

Exhibit 5

CANCER RISKS ASSOCIATED WITH BENZENE, CARBON TETRACHLORIDE, AND ARSENIC ASSUMING EAST GULF COAST WITH AN ABANDONED BOREHOLE SCENARIO AND WITH PUMPING AT 720,000 GPD AND A PERMEABILITY RATIO OF 1:1,000 BETWEEN THE INJECTION ZONE AND THE CONFINING LAYER

Chemical/ Receptor Location	Initial Constituent Concentrations (mg/l) [1]	Normalized Injectate Concentrations (mg/l) [2]	Drinking Water Concentration (mg/l)	Ingestion Conversion Factor (l/kg/day) [3]	Unit Dose (mg/kg/day)	Cancer Slope Factor $(mg/kg/day)^{-1}$ [4]	Individual Cancer Risk
Benzene:							
- 500 feet from well in base of USDW plus pumping [5, 6]	47.00	2.250E-04	1.18E-02	0.0286	3.39E-04	2.90E-02	9.82E-06
- 500 feet from well in aquifer below USDW plus pumping [7]	47.00	3.340E-02	1.57E+00	0.0286	4.49E-02	2.90E-02	1.30E-03
- 2,000 feet from well in base of USDW plus pumping [8]	47.00	4.830E-10	2.27E-08	0.0286	6.49E-10	2.90E-02	1.88E-11
Carbon Tetrachloride:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.23	2.250E-04	5.62E-04	0.0286	1.61E-05	1.30E-01	2.09E-06
- 500 feet from well in aquifer below USDW plus pumping [7]	2.23	3.340E-02	7.45E-02	0.0286	2.13E-03	1.30E-01	2.77E-04
- 2,000 feet from well in base of USDW plus pumping [8]	2.23	4.830E-10	1.08E-09	0.0286	3.08E-11	1.30E-01	4.00E-12
Arsenic:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.60	2.250E-04	6.55E-04	0.0286	1.87E-05	1.50E+00	2.81E-05
- 500 feet from well in aquifer below USDW plus pumping [7]	2.60	3.340E-02	8.68E-02	0.0286	2.48E-03	1.50E+00	3.73E-03
- 2,000 feet from well in base of USDW plus pumping [8]	2.60	4.830E-10	1.26E-09	0.0286	3.59E-11	1.50E+00	5.39E-11

[1] Concentration set at 90th percentile concentration reported from hazardous and nonhazardous Class I facilities.

[2] Based on information provided in GeoTrans, Inc., September 13, 1996 report titled " Numerical Simulation of Deep Injection Wells in Support of UIC OGWDW."

[3] IEC, Inc., 1987.

[4] IRIS. January 11, 1995.

[5] Assume pumping rate of 720,000 gallons per day.

[6] The concentration measured at receptor A2 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

[7] The concentration measured at receptor B2 located in an aquifer below the USDW as modeled in GeoTrans, Inc., 1995.

[8] The concentration measured at receptor A4 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

Exhibit 6

CANCER RISKS ASSOCIATED WITH BENZENE, CARBON TETRACHLORIDE, AND ARSENIC ASSUMING EAST GULF COAST WITH AN ABANDONED BOREHOLE SCENARIO AND WITH PUMPING AT 720,000 GPD AND A PERMEABILITY RATIO OF 1:10,000,000 BETWEEN THE INJECTION ZONE AND THE CONFINING LAYER

Chemical/ Receptor Location	Initial Constituent Concentrations (mg/l) [1]	Normalized Injectate Concentrations (mg/l) [2]	Drinking Water Concentration (mg/l)	Ingestion Conversion Factor (l/kg/day) [3]	Unit Dose (mg/kg/day)	Cancer Slope Factor $(mg/kg/day)^{-1}$ [4]	Individual Cancer Risk
Benzene:							
- 500 feet from well in base of USDW plus pumping [5, 6]	47.00	1.680E-04	7.90E-03	0.0286	2.26E-04	2.90E-02	6.55E-06
- 500 feet from well in aquifer below USDW plus pumping [7]	47.00	2.100E-02	9.87E-01	0.0286	2.82E-02	2.90E-02	8.19E-04
- 2,000 feet from well in base of USDW plus pumping [8]	47.00	3.060E-10	1.44E-08	0.0286	4.11E-10	2.90E-02	1.19E-11
Carbon Tetrachloride:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.23	1.680E-04	3.75E-04	0.0286	1.07E-05	1.30E-01	1.39E-06
- 500 feet from well in aquifer below USDW plus pumping [7]	2.23	2.100E-02	4.68E-02	0.0286	1.34E-03	1.30E-01	1.74E-04
- 2,000 feet from well in base of USDW plus pumping [8]	2.23	3.060E-10	6.82E-10	0.0286	1.95E-11	1.30E-01	2.54E-12
Arsenic:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.60	1.680E-04	4.37E-04	0.0286	1.25E-05	1.50E+00	1.87E-05
- 500 feet from well in aquifer below USDW plus pumping [7]	2.60	2.100E-02	5.46E-02	0.0286	1.56E-03	1.50E+00	2.34E-03
- 2,000 feet from well in base of USDW plus pumping [8]	2.60	3.060E-10	7.96E-10	0.0286	2.28E-11	1.50E+00	3.41E-11

[1] Concentration set at 90th percentile concentration reported from hazardous and nonhazardous Class I facilities.

[2] Based on information provided in GeoTrans, Inc., September 13, 1996 report titled " Numerical Simulation of Deep Injection Wells in Support of UIC OGWDW."

[3] IEC, Inc., 1987.

[4] IRIS. January 11, 1995.

[5] Assume pumping rate of 720,000 gallons per day.

[6] The concentration measured at receptor A2 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

[7] The concentration measured at receptor B2 located in an aquifer below the USDW as modeled in GeoTrans, Inc., 1995.

[8] The concentration measured at receptor A4 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

Exhibit 7

HAZARD INDEX – CARBON TETRACHLORIDE AND ARSENIC
ASSUMING EAST GULF COAST WITH AN ABANDONED BOREHOLE SCENARIO AND WITH PUMPING AT 720,000 GPD AND A PERMEABILITY RATIO OF 1:1,000 BETWEEN THE INJECTION ZONE AND THE CONFINING LAYER

Chemical/ Receptor Location	Initial Constituent Concentrations (mg/l) [1]	Normalized Injectate Concentrations (mg/l) [2]	Drinking Water Concentration (mg/l)	Ingestion Conversion Factor (l/kg/day)[3]	Unit Dose (mg/kg/day)	Reference Dose (RfD) (mg/kg/day) [4]	Hazard Index
Carbon Tetrachloride:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.23	2.520E-04	5.62E-04	0.0286	1.61E-05	7.00E-04	2.30E-02
- 500 feet from well in aquifer below USDW plus pumping [7]	2.23	3.340E-02	7.45E-02	0.0286	2.13E-03	7.00E-04	3.04E+00
- 2,000 feet from well in base of USDW plus pumping [8]	2.23	4.830E-10	1.08E-09	0.0286	3.08E-11	7.00E-04	4.40E-08
Arsenic:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.60	2.520E-04	6.55E-04	0.0286	1.87E-05	3.00E-04	6.25E-02
- 500 feet from well in aquifer below USDW plus pumping [7]	2.60	3.340E-02	8.68E-02	0.0286	2.48E-03	3.00E-04	8.28E+00
- 2,000 feet from well in base of USDW plus pumping [8]	2.60	4.830E-10	1.26E-09	0.0286	3.59E-11	3.00E-04	1.20E-07

[1] Concentration set at 90th percentile concentration reported from hazardous and nonhazardous Class I facilities.

[2] Based on information provided in GeoTrans, Inc., September 13, 1996 report titled " Numerical Simulation of Deep Injection Wells in Support of UIC OGWDW."

[3] IEC, Inc., 1987.

[4] IRIS. January 11, 1995.

[5] Assume pumping rate of 720,000 gallons per day.

[6] The concentration measured at receptor A2 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

[7] The concentration measured at receptor B2 located in an aquifer below the USDW as modeled in GeoTrans, Inc., 1995.

[8] The concentration measured at receptor A4 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

Exhibit 8

HAZARD INDEX – CARBON TETRACHLORIDE AND ARSENIC
ASSUMING EAST GULF COAST WITH AN ABANDONED BOREHOLE SCENARIO AND WITH PUMPING AT 720,000 GPD AND A PERMEABILITY RATIO OF 1:10,000,000 BETWEEN THE INJECTION ZONE AND THE CONFINING LAYER

Chemical/ Receptor Location	Initial Constituent Concentrations (mg/l) [1]	Normalized Injectate Concentrations (mg/l) [2]	Drinking Water Concentration (mg/l)	Ingestion Conversion Factor (l/kg/day)[3]	Unit Dose (mg/kg/day)	Reference Dose (RfD) (mg/kg/day) [4]	Hazard Index
Carbon Tetrachloride:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.23	1.680E-04	3.75E-04	0.0286	1.07E-05	7.00E-04	1.53E-02
- 500 feet from well in aquifer below USDW plus pumping [7]	2.23	2.100E-02	4.68E-02	0.0286	1.34E-03	7.00E-04	1.91E+00
- 2,000 feet from well in base of USDW plus pumping [8]	2.23	3.060E-10	6.82E-10	0.0286	1.95E-11	7.00E-04	2.79E-08
Arsenic:							
- 500 feet from well in base of USDW plus pumping [5, 6]	2.60	1.680E-04	4.37E-04	0.0286	1.25E-05	3.00E-04	4.16E-02
- 500 feet from well in aquifer below USDW plus pumping [7]	2.60	2.100E-02	5.46E-02	0.0286	1.56E-03	3.00E-04	5.21E+00
- 2,000 feet from well in base of USDW plus pumping [8]	2.60	3.060E-10	7.96E-10	0.0286	2.28E-11	3.00E-04	7.58E-08

[1] Concentration set at 90th percentile concentration reported from hazardous and nonhazardous Class I facilities.

[2] Based on information provided in GeoTrans, Inc., September 13, 1996 report titled " Numerical Simulation of Deep Injection Wells in Support of UIC OGWDW."

[3] IEC, Inc., 1987.

[4] IRIS. January 11, 1995.

[5] Assume pumping rate of 720,000 gallons per day.

[6] The concentration measured at receptor A2 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

[7] The concentration measured at receptor B2 located in an aquifer below the USDW as modeled in GeoTrans, Inc., 1995.

[8] The concentration measured at receptor A4 located in the base of the USDW as modeled in GeoTrans, Inc., 1995.

STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION

RECEIVED
NOV 12 2014
WATER QUALITY CONTROL COMMISSION

IN THE MATTER TO AMEND 20.6.2.5000 NMAC

No. WQCC 14-15 (R)

FIRST AMENDED PETITION TO AMEND 20.6.2.5000 NMAC AND REQUEST FOR HEARING

Pursuant to the New Mexico Water Quality Act ("WQA"), NMSA 1978, §§76-6-1 to 76-6-17 (2009) and Section 301 of the *Guidelines for Water Quality Control Commission Hearings*, Navajo Refining Company, L.L.C. ("Navajo") petitions the Commission to adopt new rules authorizing Class I underground injection control wells for hazardous waste ("Class I hazardous waste injection wells") generated by oil refineries, 20.6.2.5300 NMAC to 20.6.2.5305 NMAC, hereinafter referred to as the Water Conservation Rule ("WCR"). The WCR would incorporate existing federal regulations, promulgated under the authority of the Safe Drinking Water Act ("SWDA") for Class I hazardous waste injection wells. Navajo's proposed Water Conservation Rule, attached as Attachment 1, would amend 20.6.2.5004 and add new text as 20.6.2.5300 through 20.6.2.5305.

This First Amended Petition ("Amended Petition") hereby amends the Petition to Amend 20.6.2.5000 NMAC that Navajo filed with the Water Quality Control Commission on November 5, 2014 ("Original Petition"). The Amended Petition limits the application of the WCR, specifically it limits it to oil refineries, the Original Petition otherwise remains unchanged.

I. Statement of Reasons for the Rule Change

Navajo operates an oil refinery in Artesia, New Mexico and generates a wastewater stream that, on a constituent basis, is very similar to produced water routinely disposed of in connection with the production of oil and gas. For the reasons stated in this petition, it desires to use an injection well to dispose of process wastewaters that may be classified as hazardous due to concentration of constituents through water reuse. To do so, it seeks by this petition to authorize and to implement a hazardous waste injection well permitting regime that adopts federal requirements for such wells.

Authorizing Class I hazardous waste injection wells and adopting a permitting regime for those wells used by oil refineries will provide a number of benefits to both the State and to refineries and others in the oil and natural gas industry. These benefits include the following:

1. Water conservation: Allowing for permitting of Class I hazardous waste injection wells will promote water reuse and conservation by allowing for extraction and disposal of hazardous constituents in the waste streams generated by oil refineries.
2. Waste minimization: The WCR would promote waste minimization. Through water reuse, the final effluent stream that would be sent to a Class I hazardous waste injection well could be materially smaller than a full effluent stream that is typically disposed of now in underground injection control wells for non-hazardous wastes. Wastes generated by oil refineries would therefore be minimized.
3. Economic benefits: The WCR would provide a number of economic benefits to communities supporting refineries. Through reuse of water and reduction of fresh water usage in by oil refineries, more fresh water is available for use by the surrounding communities and businesses, including agriculture.
4. Preservation of disposal capacity: Because disposal capacity at existing oil refinery wells is finite, reducing effluent discharges to those wells preserves refining and disposal capacity. This capacity fosters oil and gas production by allowing for additional crude oil and recovered oil processing.

5. Improved oil and gas industry reliability: The WCR will also allow those in the oil and gas industry to improve reliability in their systems and production by allowing the refineries they depend upon to manage any unexpected generation of hazardous waste in the wastewater stream. Currently, refineries must treat wastewaters before disposal so that the waters are not hazardous. This treatment process can curtail crude oil throughput. Creating disposal capacity for hazardous wastewaters will allow refineries to maintain greater crude oil throughput, avoiding adverse financial consequences to their suppliers and the State.

II. Waste Management Practices of Oil Refineries in New Mexico

Oil refining companies must complete a number of processes in order to transform crude oil and recovered oil (i.e., oil recovered from oil-bearing residuals generated in the refining industry) into refined products. During these processes refineries use significant quantities of water and generates wastewater streams that can be recycled, especially if certain chemical constituents can be removed from these streams before reuse. Some of these chemical constituents could be considered hazardous waste if present in sufficient concentrations. Class I hazardous waste injection wells provide a demonstrated means for safely disposing of such wastes in deep geologic formations that are isolated from aquifers suitable for use as water supplies. The deep formations used for injection would be substantially below aquifers used for fresh drinking and agricultural/industrial water supplies and are separated from those supplies by numerous layers of impermeable rock formations. The WCR require that any injection of fluids by the well occur beneath the lowermost formation that contains 10,000 milligrams per liter or less of total dissolved solids ("TDS").

Since 2001, Class I hazardous waste injection wells have not been authorized in New Mexico, but elsewhere, under federal law, the United States Environmental Protection Agency ("EPA") allows disposal of hazardous waste by use of Class I hazardous waste injection wells. The federal regulations were promulgated in 1983 and have a demonstrated history of protection of human health and the environment. In 1984 New Mexico assumed primacy over the Safe Drinking Water Act program. After New Mexico assumed primacy the federal regulations changed to impose different requirement for Class I hazardous waste injection wells. New Mexico never amended its regulations to incorporate the changes made in the federal regulations. Therefore, the State's pre-2001 regulations did not impose different requirements for hazardous waste wells. In 2001, New Mexico eliminated the regulation allowing this practice because it had not been used and no such wells had been drilled.

The proposed amendment does not alter the responsibilities of the New Mexico Environment Department ("NMED") or the Oil Conservation Division ("OCD") for administering the programs currently delegated to the State by the EPA under the SDWA. Since the WCR only applies to oil refineries, the requirements of the WCR (adopting the federal EPA regulations) would be administered by OCD. OCD currently administers the Underground Injection Control well program for oil and gas related industries, including refineries, and is authorized to administer the permitting regime for Class I hazardous waste injection wells pursuant to the EPA's delegation to New Mexico under the SDWA.

As described fully below, Class I wells are a safe and economical way to dispose of wastewater. Federal regulations are comprehensive, imposing exacting requirements for the selection of the site, well construction standards, and the day-to-day operations to ensure that the USDW is safe and secure.

III. Background of Class I Injection Wells

Wastewater is an unavoidable byproduct of the manufacturing processes that create thousands of products we use every day. While industries continue to research and implement ways to reduce waste by recycling and improving the manufacturing processes, wastes are still generated and require disposal.

Class I underground injection wells represent a technically sound and safe disposal option for high-volume wastewaters. Class I underground injection wells present a low risk wastewater disposal option, as demonstrated by stringent design and operating requirements and a history of safe disposal that spans many decades.

(a) Regulatory Framework for UIC Wells

"Underground injection" refers to the placement of fluids, often wastewater, underground through a well bore. As the Environmental Protection Agency ("EPA") Regional Office for Region 6 found, "some waste fluids are generated in such volumes as to make treatment economically impractical. If properly constructed, and operated, injection wells are by far the best way to dispose of these waste fluids."[1] Not allowing underground injection wells "removes a safe, economically proven technology by which wastes can be effectively addressed."[2]

As part of the federal Safe Drinking Water Act ("SDWA") of 1974, a federal Underground Injection Control Program ("UIC Program") was established.[3] Since ground water is a major source of drinking water in the United States, the UIC Program requirements were designed to prevent ground water contamination. Most ground water used as drinking water today contains less than 3,000 milligrams per liter of total dissolved solids ("TDS"). The UIC

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[1] ENVIRONMENTAL PROTECTION AGENCY, *Frequently Asked Questions About the Underground Injection Control Program*, http://www.epa.gov/Region6/water/swp/uic/faq3.htm#banned.
[2] *Id.*
[3] 42 U.S.C. §300h.

Program protects waters with significantly higher mineral concentrations to ensure that all water with the potential to be treated and used as drinking water in the future is protected.

New Mexico, like other states and the federal government, has a reasonable objective to protect any underground source of drinking water ("USDW"). A USDW is defined by EPA as an "aquifer or its portion which supplies any public water system or contains a sufficient quantity of ground water to supply a public water system, and either currently supplies a public water system, or contains less than 10,000 milligrams per liter of [TDS] and is not an exempted aquifer."[4] In essence, a USDW is a collection of clean water large enough that it could potentially serve the public.

(b) Class I Wells

There are six classes of underground injection wells. These classes are based on the types of fluids injected; each well classification has technical standards for well design and construction, injection depth, and operating and monitoring techniques in order to ensure that wells that serve the same function are designed in a way to protect USDWs.

Class I wells, further classified as hazardous and non-hazardous wells, inject industrial or municipal wastewater far beneath the lowermost source of drinking water. Class I wells are used mainly by the following industries: petroleum refining, metal production, chemical production, pharmaceutical production, commercial waste disposal, food production, and municipal wastewater treatment.[5]

Class I wells inject wastewater into formations without suitable water to extract as a source of drinking water and that are located thousands of feet below the land surface. The geological formation into which the wastewater is injected, known as the injection zone, must be

[4] 40 C.F.R. § 144.3
[5] ENVIRONMENTAL PROTECTION AGENCY, *Industrial & Municipal Waste Disposal Wells (Class I)*, http://water.epa.gov/type/groundwater/uic/wells_class1.cfm.

demonstrated to be sufficiently porous and permeable so that the wastewater can enter the rock formation without an excessive buildup of pressure. The injection zone is typically beneath a large, relatively non-permeable layer of rock, known as the confining zone, which along with the natural force of gravity, will hold injected fluids in place and restrict them from moving upward toward a USDW. A diagram depicting the general schematic of a Class I well is attached to this rulemaking petition as Attachment 2.

There are currently approximately 550 Class I injection wells in the United States. Approximately 121 of these wells (22%) are Class I hazardous waste injection wells.[6] Most Class I wells are located in EPA Region 6 (comprised of Arkansas, Louisiana, New Mexico, Oklahoma, Texas, and 66 Native American Tribes).[7] At least 21 states currently have Class I injection wells.[8] Texas has the greatest number of Class I wells, including hazardous waste wells, followed by Louisiana.[9] Florida and Kansas also have a large number of Class I wells.[10]

(c) Federal Regulations Regarding Class I Wells

Federal regulations strictly control the creation and maintenance of Class I wells. EPA requires that Class I wells be located in geologically stable areas that are free of fractures or faults through which injected fluids could travel to drinking water sources.[11] Well operators must also show that there are no wells or other artificial pathways between the injection zone and USDWs through which fluids can travel. The site-specific geologic properties of the subsurface around the well offer another safeguard against the movement of injected wastewaters to a USDW.

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[6] *Id.*
[7] ENVIRONMENTAL PROTECTION AGENCY, *EPA Region 6 (South Central),* http://water.epa.gov/type/groundwater/uic/wells_class1.cfm.
[8] EPA, CLASS I UNDERGROUND INJECTION CONTROL PROGRAM: STUDY OF THE RISKS ASSOCIATED WITH CLASS I UNDERGROUND INJECTION WELLS 3(March 2001).
[9] *Id.*
[10] *Id.*
[11] 40 CFR §146.62.

All Class I wells are designed and constructed to prevent the movement of injected wastewaters into USDWs. Their stringent, multi-layer construction[12] has many redundant safety features. One of these features is the well's casing, which prevents the borehole from caving in. The casing is made out of a corrosion-resistant material such as steel or fiberglass-reinforced plastic. It consists of an outer surface casing, that extends the entire depth of the well, and an inner "long string" casing that extends from the surface to or through the injection zone. The innermost layer of the well, the injection tubing, brings injected wastewater from the surface to the injection zone.

All of the materials that injection wells are made are made of are corrosion-resistant and compatible with the wastewater and the formation rocks and fluids into which they come in contact. A constant pressure is maintained in the space and is continuously monitored to verify the well's mechanical integrity and proper operational conditions.[13] Trained operators are responsible for day-to-day injection well operation, maintenance, monitoring, and testing.[14] In addition to monitoring the well operation, operators of hazardous waste wells are required to develop and follow a waste analysis plan for monitoring the physical and chemical properties of the injected wastewater.[15]

(d) Safety Factors and Safety Record

Because these Class I wells inject waste far below the deepest possible USDW, there is very little chance of any negative effect on potentially usable ground water. In fact, in its March 2001 Study of Class I wells the, EPA said that "the probability of loss of waste confinement due to Class I injection has been demonstrated to be low" and "existing Class I regulatory controls

[12] Wells typically consist of three or more concentric layers of pipe: surface casing, long string casing, and injection tubing. Class I hazardous wells must have 3 layers of casing. [40 CFR 146.65(c)].
[13] 40 CFR §146.67.
[14] 40 CFR§ 146.13(b).
[15] 40 CFR §146.68 (a).

are strong, adequately protective, and provide an extremely low-risk option in managing the wastewaters of concern."[16] In other words, the deep geologic formations that receive the waste ("the injection zone"), the related impermeable confining layers above the injection zone, and the many layers of protection required in the construction, operation, and monitoring of wells, provide many safeguards against upward fluid movement, effectively protect USDWs.

Class I injection wells that meet EPA's design and operating requirements are well studied and pose minimal risks. In 1998, scientists quantitatively estimated the risk of waste containment loss as a result of various sets of events associated with Class I hazardous waste wells.[17] According to the study, because of the redundant safety systems in a typical Class I well, loss of containment would requires a series of improbable events to occur in sequence. As a result, the calculated probability of containment loss resulting from each of the scenarios examined ranges from one-in-one-million to one-in-ten-quadrillion.[18]

In the field, the probability of Class I well failures, both non-hazardous and hazardous, has also been demonstrated to be very low. Many early Class I failures were a result of historic practices that are no longer permissible under the federal UIC regulations, such as improper well construction or improper well closure upon cessation of operations. Class I wells have redundant safety systems and several protective layers; an injection well would fail only when multiple systems fail in sequence without detection. In the unlikely event that a well would fail, the geology of the injection and confining zones serves as a final safety mechanism to prevent movement of wastewaters to USDWs. Injection well operators invest millions of dollars in the

[16] EPA, CLASS I UNDERGROUND INJECTION CONTROL PROGRAM: STUDY OF THE RISKS ASSOCIATED WITH CLASS I UNDERGROUND INJECTION WELLS xiii (March 2001) (emphasis supplied).
[17] Rish, W.A., T. Ijaz, and T.F. Long, *A Probabilistic Risk Assessment of Class I Hazardous Waste Injection Wells,* 1998.
[18] *Id.*

permitting, construction, and operation of wells and even in the absence of UIC regulations would carefully monitor the integrity of the injection operation to safeguard their investments.

Failures of Class I wells are exceedingly rare and have generally not resulted in significant harm to the environment or fresh water supplies. Most failures of mechanical integrity are internal failures, detected by continuous pressure monitoring systems or integrity tests. Any wells that fail are shut down until they are repaired to the satisfaction of the regulatory agency. EPA's study of more than 500 Class I non-hazardous and hazardous wells showed that loss of mechanical integrity contributed to only 4 cases of significant wastewater migration (none of which affected a drinking water source) over several decades of operation.[19] This safety record can be attributed to the rigorous requirements for monitoring and for ensuring that the well materials are compatible with the wastewater injected.

(e) Monitoring Requirements

Finally, Class I injection wells are continuously monitored and controlled, usually with sophisticated computers and digital equipment, which provide real-time data and information to the well operator. Thousands of data points about the pumping pressure for fluid disposal, the pressure in the space between the injection tubing and the well casing (that shows there are no leaks in the well), and data on the fluid being disposed of, such as its temperature and flow rate, are monitored and recorded each day.[20]

Alarms are connected to sound if anything out of the ordinary happens, and if unusual pressures are sensed by the monitoring equipment, the well pump automatically shuts off.[21] Disposal in the well does not resume until the cause of the unusual event is investigated, and the

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[19] EPA, CLASS I UNDERGROUND INJECTION CONTROL PROGRAM: STUDY OF THE RISKS ASSOCIATED WITH CLASS I UNDERGROUND INJECTION WELLS 41 (March 2001).
[20] 40 CFR §146.67(a).
[21] 40 CFR §146.67(f).

people responsible for operating the well and the regulatory agencies both are sure that no environmental harm has been or will be done by well operations.[22]

The wells are also tested regularly, using special tools that are inserted into the well to record data about the well and surrounding rock formations. Regulators review all the data about the well operations, monitoring and testing frequently, and inspecting the well site to make sure everything is operating according to the requirements put in place to protect drinking water sources.

IV. Summary of Amendments

1. Navajo proposes the following change to 20.6.2.5004(A)(3) NMAC:

Delete the words "hazardous or" from the regulation. This would authorize the use of Class I hazardous waste injection wells.

2. Navajo proposes the addition of 20.6.2.5300

This new section sets forth the requirements for all Class I hazardous waste injection wells. It specifies that Class I hazardous waste injection wells are subject to the same permitting procedures as Class I non-hazardous waste injection wells. It limits Class I hazardous waste injection wells to use by oil refineries. Additionally, it incorporates by reference the subsequent sections (20.6.2.5301 NMAC through 20.2.6.5305 NMAC) that set forth specific requirements for Class I hazardous waste injection wells.

3. Navajo proposes the addition of 20.6.2.5301

This new section incorporates by reference the federal regulations that set forth the general requirements for Class I hazardous waste injection wells, 40 C.F.R. Section 144.14. This federal regulation sets forth specific notification, recordation, reporting and training requirements for operators of Class I hazardous waste injection wells.

[22] 40 CFR 146.67(h).

4. Navajo proposes the addition of 20.6.2.5302

This new section incorporates by reference 40 C.F.R. Sections 144.60 through 144.70, the federal regulations that set forth the requirements for financial responsibility for owners and operators of Class I hazardous waste injection wells. These regulations include financial assurance for plugging and abandonment.

5. Navajo proposes the addition of 20.6.2.5303

This new section incorporates by reference 40 C.F.R. 146.61 through 146.73, the federal regulations that set forth the specific requirements and conditions for Class I hazardous waste injection wells. These regulations include construction requirements, testing requirements, operating requirements, monitoring requirements, reporting requirements, closure requirements, and post-closure requirements for Class I hazardous waste injection wells.

6. Navajo proposes the addition of 20.6.2.5304

This new section incorporates by reference 40 C.F.R. Part 148, the federal regulations that set forth the requirements and restrictions on Class I hazardous waste injection wells, including the specific substances that are prohibited from being injected in Class I hazardous waste injection wells.

7. Navajo proposes the addition of 20.6.2.5305

This new section clarifies the terms, references, and definitions used in the federal regulations. These are clarified in order to vest authority into the relevant state agency that has been delegated primacy by the federal program.

V. <u>Request for Hearing</u>

Navajo requests that the Commission schedule a rulemaking hearing to consider the proposed Water Conservation Act. Navajo requests that the rulemaking hearing to be scheduled to begin on April 14, 2015. This hearing date will allow the Commission to conduct the hearing in conjunction with the Commission's April 2015 meeting.

It is anticipated that the rulemaking hearing will take approximately one day or less.

Respectfully Submitted,

Michael D. McKee

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WATER QUALITY CONTROL COMMISSION HEARING PETITION ATTACHMENT 1

NAVAJO REFINING COMPANY L.L.C.'S PROPOSED WATER CONSERVATION RULE

The Proposed Water Conservation Rule will consist of amending an existing regulation, and adding new regulations to NMAC 20.6.2.5000. The proposed amendments are as follows:

The Proposed Water Conservation Rule will amend the following regulation:

20.6.2.5004 PROHIBITED UNDERGROUND INJECTION CONTROL ACTIVITIES AND WELLS:

A. No person shall perform the following underground injection activities nor operate the following underground injection control wells:

(1) The injection of fluids into a motor vehicle waste disposal well is prohibited. Motor vehicle waste disposal wells are prohibited. Any person operating a new motor vehicle waste disposal well (for which construction began after April 5, 2000) must close the well immediately. Any person operating an existing motor vehicle waste disposal well must cease injection immediately and must close the well by December 31, 2002, except as provided in this Subsection.

(2) The injection of fluids into a large capacity cesspool is prohibited. Large capacity cesspools are prohibited. Any person operating a new large capacity cesspool (for which construction began after April 5, 2000) must close the cesspool immediately. Any person operating an existing large capacity cesspool must cease injection immediately and must close the cesspool by December 31, 2002.

(3) The injection of any ~~hazardous or~~ radioactive waste into a well is prohibited, except as provided in this Subsection.

(a) Class I ~~hazardous or~~ radioactive waste injection wells are prohibited, except naturally-occurring radioactive material (NORM) regulated under Section 20.3.1.1407 NMAC is allowed as a Class I non-hazardous waste injection well pursuant to Subsection B (1) of Section 20.6.2.5002 NMAC;

(b) Class IV wells are prohibited, except for wells re-injecting treated ground water into the same formation from which it was drawn as part of a removal or remedial action if the injection has prior approval from the Environmental Protection Agency (EPA) or the department under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Resource Conservation and Recovery Act (RCRA).

(4) Barrier wells, drainage wells, recharge wells, return flow wells, and motor vehicle waste disposal wells are prohibited, except when the discharger can demonstrate that the discharge will not adversely affect the health of persons, and

(a) the injection fluid does not contain a contaminant which may cause an exceedance at any place of present or reasonable foreseeable future use of any primary state drinking water maximum contaminant level as specified in the water supply regulations, "Drinking Water" (20 NMAC 7.1) [20.7.10 NMAC], adopted by the Environmental Improvement Board under the Environmental Improvement Act or the standard of Section 20.6.2.3103 NMAC, whichever is more stringent;

(b) the discharger can demonstrate that the injection will result in an overall or net improvement in water quality as determined by the secretary.

B. Closure of prohibited underground injection control wells shall be in accordance with Section 20.6.2.5005 NMAC and Section 20.6.2.5209 NMAC.

[20.6.2.5004 NMAC - N, 12-1-01]

The Proposed Water Conservation Rule will add the following regulations to the New Mexico Administrative Code:

20.6.2.5300 REQUIREMENTS FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided for in 20.6.2.5301 through 20.6.2.5305, all Class I hazardous waste wells are subject to the permit requirements for all Class I non-hazardous waste wells, including the notification and general operation requirements set forth in 20.6.2.5003 NMAC, the discharge permit requirements for Class I non-hazardous waste wells set forth in 20.6.2.5101 NMAC, the pre-construction requirements for Class I non-hazardous waste wells set forth in 20.6.2.5102 NMAC, and the designated aquifer requirements set forth in 20.6.2.5103 NMAC.

B. Class I hazardous waste wells are only authorized for use by oil refineries.

C. Class I hazardous waste injection wells must meet the requirements of Sections 20.6.2.5300 through 20.6.2.5305.

D. The New Mexico Oil Conservation Division will administer and oversee all permitting requirements required in Sections 20.6.2.5300 through 20.6.2.5305.

20.6.2.5301 GENERAL PROGRAM REQUIREMENTS FOR WELLS INJECTING HAZARDOUS WASTE:

A. Except as otherwise provided, the federal regulations set forth by the Environmental Protection Agency in 40 C.F.R. Section 144.14 through July 1, 2015 are hereby incorporated by reference.

20.6.2.5302 FINANCIAL RESPONSIBILITY: CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided, the federal regulations set forth by the Environmental Protection Agency in 40 C.F.R. Sections 144.60 through 144.70, through July 1, 2015, are hereby incorporated by reference.

20.6.2.5303 CONDITIONS APPLICABLE TO CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided, the federal regulations set forth by the Environmental Protection Agency in 40 C.F.R. Sections 145.51, through 145.55, through July 1, 2015 that pertain to Class I hazardous waste injection wells are hereby incorporated by reference.

20.6.2.5303 CRITERIA AND STANDARDS APPLICABLE TO CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided, the federal regulations set forth by the Environmental Protection Agency in 40 C.F.R. Sections 146.61, through 146.73 through July 1, 2015 are hereby incorporated by reference.

20.6.2.5304 HAZARDOUS WASTE INJECTION RESTRICTIONS:

A. Except as otherwise provided, the federal regulations set forth by the Environmental Protection Agency in 40 C.F.R. Part 148 through July 1, 2015 are hereby incorporated by reference.

20.6.2.5305 MODIFICATIONS, EXCEPTIONS AND OMISSIONS:

A. Except as otherwise provided, the following modifications, exceptions and omissions are made to the incorporated federal regulations:

(1) "director" or "regional administrator means the Director of the Oil Conservation Division or his/her designee.

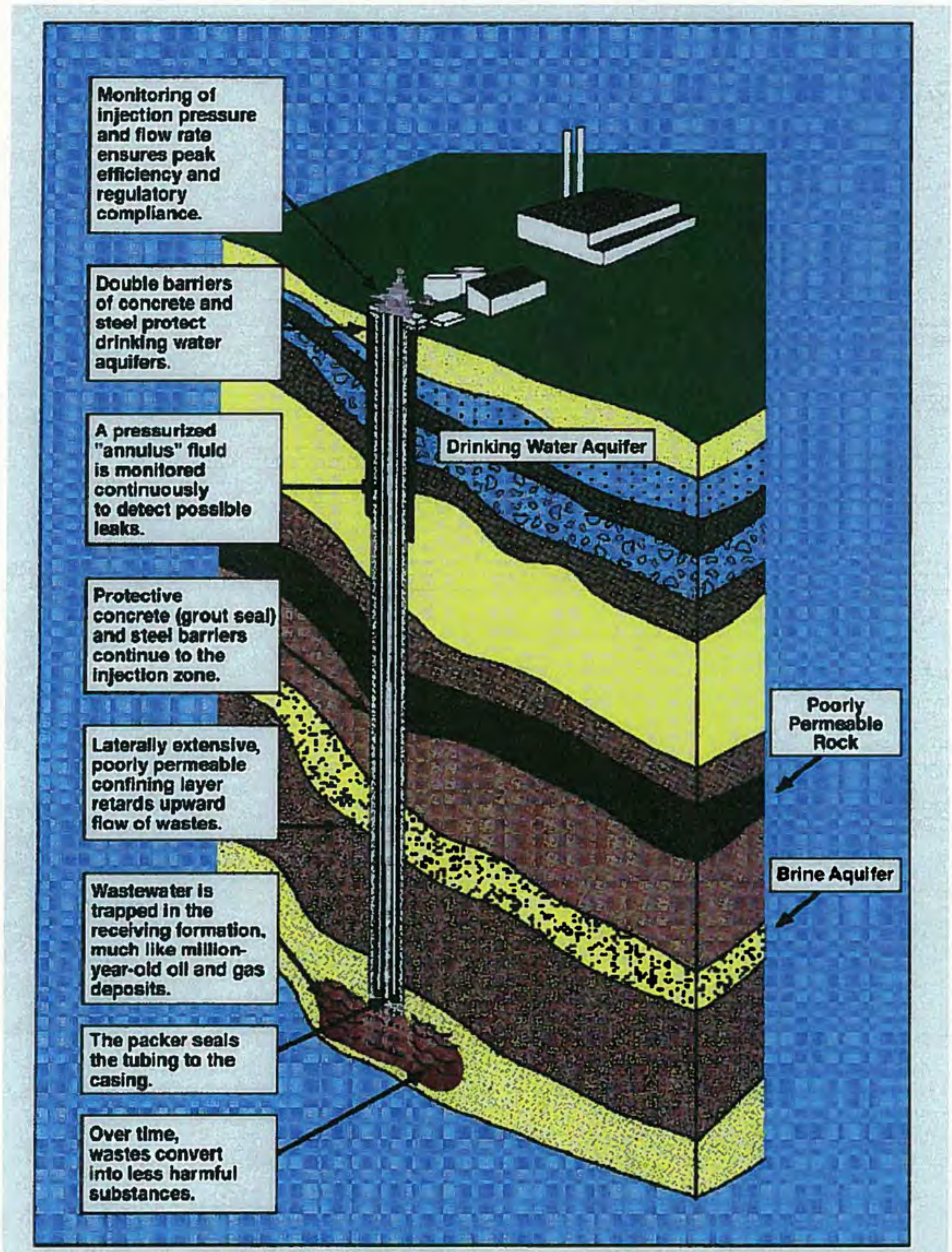
(2) "RCRA" (Resource Conservation and Recovery Act, as amended) means the New Mexico Hazardous Waste Act, NMSA 1978, Sections 74-4-1 through 74-4-14 (as amended).

(3) "SDWA" (Safe Drinking Water Act, as amended) 42 U.S.C. 300f *et seq.* means the Safe Drinking Water Act, the implementation of which is delegated to the New Mexico Environment Department.

B. Wherever there is a requirement in any of the federal regulations incorporated into this Section to report an emergency situation, the requirement shall be construed to mean that the party required to report shall report the incident to the Oil Conservation Division's emergency response number.

WATER QUALITY CONTROL COMMISSION HEARING PETITION
ATTACHMENT 2

CLASS I INJECTION WELL DIAGRAM



EPA, CLASS I UNDERGROUND INJECTION CONTROL PROGRAM: STUDY OF THE RISKS ASSOCIATED WITH CLASS I UNDERGROUND INJECTION WELLS 3(March 2001).

SUMMARY OF PROPOSED WATER CONSERVATION RULE

Navajo Refining Company LLC (Navajo Refining) has petitioned the New Mexico Water Quality Control Commission (WQCC) to amend several existing Sections of 20.6.2.3000 NMAC and 20.6.2.5000 NMAC and to adopt several new Sections of 20.6.2.5300 NMAC (collectively the Water Conservation Rule (WCR) or proposed regulations).[1] The proposed regulations would authorize the New Mexico Oil Conservation Division (OCD) to regulate underground injection control (UIC) Class I hazardous waste injection wells for refineries in New Mexico. The UIC program is part of the federal Safe Drinking Water Act (SDWA), and New Mexico has been delegated authority to administer this program. As a condition of that delegated authority, New Mexico's UIC regulations must be at least as stringent as the U.S. Environmental Protection Agency's (EPA's) regulations.

In general, the proposed regulations are based on federal regulations for Class I hazardous waste injection wells found in 40 C.F.R. Parts 144 and 146. The proposed regulations draw from these federal provisions in two ways. First, in many cases, entire Code of Federal Regulation (C.F.R.) provisions have been incorporated verbatim (with minor conforming changes discussed below) and, as a result, are as stringent as the federal regulations. Minor adjustments were made to reflect the fact that (1) the regulations would be administered by OCD rather than by EPA and (2) the regulations will become a part of the NMAC. As a result, names, titles, and cross references have been adjusted to refer to New Mexico agencies and existing provisions in the NMAC. Second, where practicable, the proposed regulations incorporate relevant C.F.R. provisions by reference.

In most cases, New Mexico's existing UIC requirements are functionally equivalent to EPA's regulations. In turn, the proposed regulations are, at a minimum, as stringent as EPA's regulations. In several cases, however, the proposed regulations are more stringent than EPA's regulations, due in part to the stringency of New Mexico's existing UIC regulations. Finally, the proposed regulations would amend several existing sections of the NMAC because Class I hazardous waste injection wells would no longer be prohibited under New Mexico law.

The sections below describe the changes and additions that Navajo Refining is proposing and explains their relevance to the Class I hazardous waste injection well program. Two exhibits are attached to this Summary of the Proposed Water Conservation Rule. The first is a Cross Reference Table that shows each C.F.R. provision included in the proposed regulations along with the corresponding NMAC citation. The second is a draft of the portions of the proposed WCR that were adapted from the C.F.R. provisions. It shows in redline the changes that were made to the original C.F.R. provisions.

20.6.2.3106 NMAC APPLICTION FOR DISCHARGE PERMITS AND RENEWALS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.3106 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect new fee provisions for Class I hazardous waste

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[1] The summary is based on the Second Amended Petition, as further revised according to the proposed changes outlined in the Direct Testimony of Robert O'Brien.

injection wells located in 20.6.2.5302 NMAC. The amount of the fees was developed based on discussions with OCD. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.3107 NMAC MONITORING, REPORTING, AND OTHER REQUIREMENTS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.3107 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the new well closure requirements for Class I hazardous waste injection wells located in 20.6.2.5361 NMAC. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.3109 NMAC SECRETARY APPROVAL, DISAPPROVAL, MODIFICATION OR TERMINATION OF DISCHARGE PERMITS, AND REQUIREMENTS FOR ABATEMENT PLANS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.3109 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5001 NMAC PURPOSE:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5000 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5002 NMAC UNDERGROUND INJECTION CONTROL WELL CLASSIFICATIONS:

Navajo Refining has proposed an administrative change to Section 20.6.2.5001 NMAC to expand the scope of hazardous or radioactive waste regulated under 20.6.2.5000 *et seq.* to include those materials listed in Section 20.4.1.200 NMAC (incorporating 40 C.F.R. § 261.3). This change is necessary to ensure that New Mexico's Class I hazardous waste injection well regulations are as stringent as the federal requirements.

20.6.2.5003 NMAC NOTIFICATION AND GENERAL OPERATION REQUIREMENTS FOR ALL UNDERGROUND INJECTION CONTROL WELLS:

Navajo Refining has proposed an administrative change to Section 20.6.2.5003 NMAC to reflect the fact that New Mexico's Ground and Surface Water Protection regulations would encompass Sections 20.6.2.1 through 20.6.2.5399 NMAC. This change is necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5004 NMAC PROHIBITED UNDERGROUND INJECTION CONTROL ACTIVITIES:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5004 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5101 NMAC DISCHARGE PERMIT AND OTHER REQUIREMETNS FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5101 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. Navajo Refining has also proposed new signatory requirements for reports required by Class I hazardous waste injection well permits. These signatory requirements are the same as existing requirements for UIC permit applications. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5102 NMAC PRE-CONSTRUCTION REQUIREMETNS FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5102 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5103 NMAC DESIGNATED AQUIFERS FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5103 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5104 NMAC WAIVER OF REQUIREMENT BY SECRETARY FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5104 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5200 NMAC TECHNICAL CRITERIA AND PERFORMANCE STANDARDS FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed an administrative change to Section 20.6.2.5200 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. This change is necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5201 NMAC PURPOSE:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5201 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited and to reference additional requirements for Class I hazardous waste injection wells located in Sections 20.6.2.5300 through 20.6.2.5399 NMAC. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5204 NMAC MECHANICAL INTEGRITY FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5204 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5209 NMAC PLUGGING AND ABANDONMENT FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5209 NMAC to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5210 NMAC INFORMATION TO BE CONSIDERED BY THE SECRETARY FOR CLASS I WELLS AND CLASS III WELLS:

Navajo Refining has proposed several administrative changes to Section 20.6.2.5210 NMAC to reflect the fact that New Mexico's UIC regulations would encompass Sections 20.6.2.5000 through 20.6.2.5399 NMAC and to reflect the fact that Class I hazardous waste injection wells would no longer be prohibited. These changes are necessary to reflect substantive changes proposed in other NMAC provisions.

20.6.2.5300 NMAC REQUIREMENTS FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

Section 20.6.2.5300 NMAC provides an overview of the Class I hazardous waste injection well program. Subsection A explains that Class I hazardous waste injection wells are subject to the general UIC regulations in Sections 20.6.2.5000 through 20.6.2.5299 NMAC as well as the specific Class I hazardous waste injection wells provisions located in 20.6.2.5300 through 5399 NMAC. It also clarifies that, in the event that regulatory provisions conflict, Class I hazardous waste injection wells must comply with Sections 20.6.2.5300 through 20.6.2.5399 NMAC. Subsection B limits the scope of New Mexico's Class I hazardous water injection well program to injection wells that are operated by petroleum refineries for the sole purpose of disposing of wastes generated by the refineries. As a result of this limitation, commercial hazardous waste injection wells would still be prohibited in New Mexico. Subsection C delegates authority to administer the Class I hazardous waste injection well program to the New Mexico energy, minerals, and natural resources department, oil conservation division (OCD), in accordance with NMSA 1978, § 70-2-12 and the 1982 Joint Powers Agreement Between the Environmental Improvement Division, the Oil Conservation Division, and the Mining and Minerals Division.

These provisions are intended to provide for the orderly administration of the Class I hazardous waste injection well program for oil refineries in New Mexico.

20.6.2.5301 NMAC DEFINITIONS

Section 20.6.2.5301 NMAC defines seven terms used in Sections 20.6.2.5300 through 20.6.2.5399 NMAC. Six of those terms—cone of influence, director, existing well, injection interval, new well, and transmissive fault or fracture—are copied verbatim from the EPA Class I hazardous waste injection regulations on which Sections 5300 through 5399 NMAC are based. The seventh term, "groundwater of the State of New Mexico" replaces the term "underground source of drinking water" that is used in EPA's regulations. Groundwater of the State of New Mexico defines a broader range of groundwater aquifers because it includes all groundwater with a total dissolved solid (TDS) of 10,000 mg/l or less, regardless of their size or current use. In contrast underground sources of drinking water are limited to those aquifers with a TDS of 10,000 or less that are used or have the potential to be used to supply a public water system. *See, e.g.*, 40 C.F.R. § 144.3. In this respect, the proposed regulations are more stringent than EPA's Class I hazardous waste injection well regulations because they are designed to protect a broader range of groundwater formations.

These definitions are intended to ensure that terms used in Sections 20.6.2.5300 through 20.6.2.5399 NMAC are properly understood and given a consistent meaning.

20.6.2.5302 NMAC FEES FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

Section 20.6.2.5302 NMAC prescribes a series of fees that are applicable to Class I hazardous waste injection well permit applicants and operators in lieu of the generally applicable fee provisions found in Section 20.6.2.3114 NMAC. It includes provisions for filing fees, permit fees, annual administration fees, renewal fees, modification fees, and financial assurance fees. All fees must be paid to the Water Quality Management Fund. The permit fee and renewal fees may be paid in annual installments over the life of the permit. The amounts were developed in coordination with OCD. A summary of the fees is provided in the table below:

Fee	Amount
Filing Fee	$100
Permit Fee	$30,000
Annual Administration Fee	$20,000
Renewal Fee	$10,000
Modification Fee	$10,000
Minor Modification Fee	$1,000

Financial Assurance Fee (approval)	Greater of $250 or 0.01%
Financial Assurance Fee (annual review)	Greater of $100 or 0.001%
Corporate Guarantee Financial Assurance Fee	$5,000

These fee provisions are intended ensure that the New Mexico OCD has adequate resources to administer the Class I hazardous waste injection well program.

20.6.2.5303 NMAC CONVERSION OF EXISTING INJECTION WELLS:

Section 20.6.2.5303 NMAC authorizes the conversion of existing Class I non-hazardous waste injection wells into Class I hazardous waste injection wells, provided that the well meets the requirements of Sections 20.6.2.5300 through 20.6.2.5399 NMAC and the well operator obtains a Class I hazardous waste injection well permit.

This provision is intended to allow refineries to begin siting and constructing Class I injection wells and, if necessary, using them to dispose of non-hazardous waste prior to the conclusion of the WQCC's consideration of this proposal and any subsequent approval that may be required by EPA before the New Mexico OCD is authorized to administer a Class I hazardous waste injection well program.

20.6.2.5310 NMAC REQUIREMENTS FOR WELLS INJECTING HAZARDOUS WASTE REQUIRED TO BE ACCOMPANIED BY A MANIFEST:

Section 20.6.2.5310 NMAC is based on 40 C.F.R. § 144.14 and, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions is not materially different from 40 C.F.R. § 144.14.

This Section applies to hazardous waste that is transported from the place of generation to the hazardous waste injection well by trucking or some other means that must be accompanied by a manifest under the federal Resource Conservation and Recovery Act (RCRA). It directs owners of hazardous waste injection wells accepting such waste to apply for authorization to inject such wastes within six months after approval of a State UIC program. In addition to Class I hazardous waste injection well regulations, the permittee must also comply with RCRA provisions regarding notification, identification numbers, manifest system, manifest discrepancies, operating records, annual reports, unmanifested waste reports, personnel training, and certification of closure.

This provisions is intended to ensure that wells injecting hazardous waste comply with New Mexico's Class I hazardous waste injection well program and that New Mexico's Class I hazardous waste injection well program is as stringent as EPA's class I hazardous waste injection well program.

20.6.2.5311 through 20.6.2.5319 NMAC [RESERVED]

20.6.2.5320 NMAC ADOPTION OF 40 CFR PART 144, SUBPART F (FINANCIAL RESPONSIBILITY: CLASS I HAZARDOUS WASTE INJECTION WELLS):

Section 20.6.2.5320 NMAC incorporates by reference EPA's financial assurance requirements for Class I hazardous waste injection wells found in 40 C.F.R. Part 144, Subpart F and thus is as stringent as EPA's regulations. Section 144.60 is an introductory provision that makes 40 C.F.R. Part 144, Subpart F applicable to all Class I hazardous waste injection wells. Section 144.61 defines a series of terms used in 40 C.F.R. Part 144, Subpart F. Section 144.62 requires Class I hazardous waste injection well permittees to estimate, and revise as necessary, the costs required to plug and abandon their wells when operations cease. These cost estimates provide the basis for the financial assurance requirements applicable to each well. Section 144.63 requires each Class I hazardous waste injection well permittee to provide financial assurance that is sufficient to cover the estimated plugging and abandonment costs. Options for providing financial assurance include a trust fund, surety bond, letter of credit, insurance, or a corporate parent guarantee. Section 144.64 requires the permittee of a Class I hazardous waste injection well to notify the Director of OCD if the entity providing the financial assurance becomes insolvent or if the instrument providing financial assurance is otherwise compromised. If such an event occurs, the permittee is also required to establish an alternative form of financial assurance. Section 144.70 provides forms for each specific type of financial assurance that must be utilized by permittees of Class I hazardous waste injection wells. The language included in the forms must be used verbatim in the financial assurance instruments.

These provisions are intended to ensure that sufficient funds are available to plug and abandon Class I hazardous waste injection wells in the event that the well operator lacks the financial capacity to do so when well operations cease.

20.6.2.5321 NMAC MODIFICATIONS, EXCEPTIONS, AND OMISSIONS:

Section 20.6.2.5321 NMAC provides modifications, exceptions, and omissions to the incorporation by reference of 40 C.F.R. Part 144, Subpart F. Subsections A and B modify the meaning of certain terms to refer to New Mexico agencies, officials, and definitions in lieu of their federal counterparts. This is necessary to reflect the fact that the permitting program will be administered by OCD rather than by EPA. Subsection C modifies certain provision to refer to NMAC provisions in lieu of equivalent CFR provisions, replaces references to EPA Identification Numbers with API Well Numbers, eliminates the option for a permittee-based financial test, and requires that trust agreements used for financial assurance be subject to New Mexico law. The elimination of a permittee-based financial assurance test narrows the scope of available financial assurance options and, therefore, makes the proposed regulations more stringent than EPA's requirements. Subpart D eliminates certain provisions of 40 C.F.R. Part 144, Subpart F that are inapplicable to Class I hazardous waste UIC programs administered by the States. It also eliminates the State assumption of liability provisions in 40 C.F.R. § 144.66, which makes the provisions more stringent by eliminating a permittee's option to rely on the State to assume responsibility for plugging and abandonment under certain circumstances.

20.6.2.5341 NMAC CONDITIONS APPLICABLE TO ALL PERMITS:

Section 20.6.2.5341 NMAC is based on 40 C.F.R. § 144.51. Unless otherwise specified below, Section 20.6.2.5341 NMAC is not materially different from 40 C.F.R. § 144.51, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides a series of conditions that must be included in all permits for Class I hazardous waste injection wells.

Subsection A requires permittees to comply with all permit conditions. This section explains that failure to comply with a permit condition is a violation of the Water Quality Act and provides a grounds for an enforcement action and penalties for noncompliance that may include permit modification or termination.

Subsection B requires permittees to apply for and obtain a permit renewal to continue operations after the expiration of a Class I hazardous waste injection well permit. Permit renewal applications are subject to the requirements of Subpart F of Section 20.6.2.3106 NMAC.

Subsection C provides that the need to halt or reduce injection to remain in compliance with permit conditions is not an available defense in an enforcement action.

Subsection D requires permittees to take all reasonable steps to mitigate any adverse impacts that may occur as the result of a failure to comply with permit conditions.

Subsection E requires permittees to properly operate and maintain all facilities and systems of treatment and control to ensure compliance with permit conditions. This includes providing adequate funding, staffing, training and quality assurance procedures. Permittees are also required to prepare and, if necessary, employ back-up or auxiliary facilities to maintain compliance with permit conditions.

Subsection F states that a Class I hazardous waste injection well permit may be modified, revoked and reissued, or terminated for cause. It further states that all permit conditions continue to apply while a request for modification, revocation and reissuance, or termination is pending. Thus, a permittee must continue to comply with all permit conditions until changes are approved by the Director of OCD.

Subsection G states that a Class I hazardous waste injection well permit does not convey any property rights to the permittee.

Subsection H requires a permittee to respond in a timely fashion to information requests made by the Director of OCD. This includes requests to determine whether cause exists to modify, revoke and reissue, or terminate a Class I hazardous waste injection well permit. It also applies to any records that a permittee is required to keep as a condition of its permit.

Subsection I requires a permit applicant to provide notice of the permit application to the public in accordance with Section 20.6.2.3108 NMAC. In addition, written notice must be mailed, return receipt requested, to all surface and mineral owners within a half-mile of the proposed well site.

Subsection J requires a permittee to allow the Director of OCD or an authorized representative to enter and inspect any Class I hazardous waste injection well premises. The Director is authorized to enter the well site as well as any facility where records are kept and must be given access to the records and to the facilities themselves. The Director is also authorized to collect samples or monitor operations for the purpose of ensuring compliance with permit conditions.

Subsection K requires permittees to ensure that all samples and measurements are representative and to maintain records of monitoring activities. Records associated with the nature and composition of injected fluids must be maintained until three years after plugging and abandonment of the wells; all other records, including calibration and maintenance records, must be maintained for a period of three years.

Subsection L requires that all applications, reports, and other information submitted to the Director of OCD must be signed and certified in accordance with the requirements in Section 20.6.2.5101 NMAC.

Subsection M require permittees to report, within specific time limits, any planned changes to Class I hazardous waste injection wells, any anticipated noncompliance, periodic monitoring reports, all noncompliance events that may endanger public health or the environment, all other instances of noncompliance, and other information related to incomplete or inaccurate permit applications. Any noncompliance event that may endanger public health or the environment must be reported within 24 hours. Subsection M is more stringent than 40 C.F.R. § 144.51(l) because it imposes additional reporting requirements for noncompliance events that may endanger public health or the environment that are not included in the federal requirements.

Subsection N requires a permittee to provide notice of well completion to the Director of OCD before commencing injection at the well site. The Director of OCD is given an opportunity to inspect the new well and verify compliance with permit conditions before injection begins. Subsection N is more stringent than 40 C.F.R. § 144.51(m) because New Mexico does not allow area permitting of UIC wells.

Subsection O requires a permittee to notify the Director of OCD before conversion or abandonment of a Class I hazardous waste injection well. Subsection O is more stringent than 40 C.F.R. § 144.51(n) because New Mexico does not allow area permitting of UIC wells.

Subsection P requires a permittee to meet the well plugging and abandonment requirements in Section 20.6.2.5209 NMAC when closing a well.

Subsection Q provides deadlines for the submission of a plugging and abandonment report to the Director of OCD after closure of a Class I hazardous waste injection well. The plan must state that the well was plugged in accordance with the well closure plan or provide an explanation of any deviations from the previously submitted well closure plan.

Subsection R requires a permittee to comply with the mechanical integrity provisions in Section 20.6.2.5204 NMAC. If the Director determines that well lacks mechanical integrity, injection must cease with 48 hours. A permittee then has the option to close the well or to undertake the necessary corrective action to prevent the migration of fluid into groundwater of the state of New Mexico. Injection cannot be restarted until approval is obtained from the Director of OCD.

Subsection S provides requirements for the transfer of a Class I hazardous waste injection well permit. A request for transfer must list all officers, directors, and owners of 25% or greater in the transferee. This provision is more stringent than 40 C.F.R. § 144.51(l)(3) because it requires the Director of OCD's written approval before a permit can be transferred. The transferror's financial assurance will not be released until the transfer is approved by the Director of OCD and the tranferree's financial assurance is in place.

These provisions are intended to ensure that Class I hazardous waste injection wells are constructed, operated, and closed in a manner that is consistent with permit conditions and New Mexico regulations and is protective of human health, the environment, and groundwater of the state of New Mexico.

20.6.2.5342 NMAC   ESTABLISHING PERMIT CONDITIONS:

Section 20.6.2.5342 NMAC is based on 40 C.F.R. § 144.52. Section 20.6.2.5342 NMAC is not materially different from 40 C.F.R. § 144.52, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

Subsection A requires the Director of OCD to establish permit conditions for Class I hazardous waste injection wells that are consistent with Sections 20.6.2.3019(H), 20.6.2.5343 (A), 20.6.2.5310, and 20.6.2.5351 through 20.6.2.5353 NMAC. These sections address the duration of permits, schedules of compliance, reporting and recordkeeping, and specific Class I hazardous waste injection well requirements described below.   Subsection A also requires the Director of OCD to establish permit conditions for financial assurance for well plugging and abandonment as well as any additional conditions that may be necessary to prevent migration of fluids into groundwater of the state of New Mexico.

Subsection B requires the Director of OCD to establish permit conditions for Class I hazardous waste injection wells that will assure compliance with all applicable requirements in Part 20.6.2 NMAC. An applicable requirement is defined as any requirement which takes effect prior to the final disposition of a permit, including applications for the issuance, modification, or revocation and reissuance of a permit.

Subsection C allows the Director of OCD to incorporate permit conditions expressly in the permit or to incorporate permit conditions by reference using specific citations to the NMAC.

These provisions are intended to ensure that all requirements imposed on Class I hazardous waste injection wells in Part 20.6.2. NMAC are included in an operator's Class I hazardous waste injection well permit.

20.6.2.5343 NMAC SCHEDULE OF COMPLIANCE:

Section 20.6.2.5343 NMAC is based on 40 C.F.R. § 144.53. Section 20.6.2.5343 NMAC is not materially different from 40 C.F.R. § 144.53, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section authorizes the Director of OCD to include in a Class I hazardous waste injection well permit a schedule of compliance leading to full compliance with Part 20.6.2 NMAC. The time for compliance cannot exceed three years from issuance of the permit. If the schedule of compliance exceeds one year, interim targets must be established to ensure the permittee is making progress toward full compliance. This Section also allows the Director of OCD to establish a schedule under which an existing Class I hazardous waste injection well can cease operations through plugging and abandonment rather than complying with new permit conditions. Finally, in cases where a permittee is undecided, the Director of OCD can establish a two-track compliance option that gives the permittee discretion to decide whether to comply with new permit requirements or cease operations and close the well.

These provisions are intended to provide a process through which Class I hazardous waste injection well operators can adjust operations to comply with new regulatory requirements that may be imposed on a Class I hazardous waste injection well.

20.6.2.5344 NMAC REQUIREMENTS FOR RECORDING AND REPORTING OF MONITORING RESULTS:

Section 20.6.2.5344 NMAC is based on 40 C.F.R. § 144.54. Section 20.6.2.5344 NMAC is not materially different from 40 C.F.R. § 144.54, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section requires the Director of OCD to include conditions in Class I hazardous waste injection well permits that specify the requirements for monitoring the injection of hazardous waste into the well and for reporting those monitoring results to OCD. Monitoring requirements must address the use, maintenance, installation of monitoring equipment and must also include sufficient detail to ensure that monitored samples are representative of operations at the facility. Reporting requirements must comply with the time intervals provided in Section 20.6.2.5359 NMAC.

These provisions are intended to ensure that monitoring data is accurate and representative of the regulated activity and that OCD is provided with monitoring data in a timely manner.

20.6.2.5345-20.6.2.5350 NMAC [RESERVED]

20.6.2.5351 NMAC APPLICABILITY

Section 20.6.2.5351 NMAC is based on 40 C.F.R. § 146.61(a). Section 20.6.2.5351 NMAC is not materially different from 40 C.F.R. § 146.61(a), with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions. The definitions included in 40 C.F.R. § 146.61(b) can be found in 20.6.2.5301 NMAC.

This Section explains that Sections 20.6.2.5351 though 20.6.25363 NMAC provide the standards and criteria for Class I hazardous waste injection wells. It further explains that, unless otherwise noted, these regulations that are specifically designed for Class I hazardous waste injection wells must be applied in place of any inconsistent provisions found in Sections 20.6.2.5000 through 20.6.2.5299 NMAC.

These provisions are intended to ensure that Class I hazardous waste injection well operators will comply with all applicable provisions designed specifically for Class I hazardous waste injections wells.

20.6.2.5352 NMAC MINIMUM CRITERIA FOR SITING:

Section 20.6.2.5352 NMAC is based on 40 C.F.R. § 146.62. Unless otherwise specified below, Section 20.6.2.5352 NMAC is not materially different from 40 C.F.R. § 146.62, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides the minimum criteria that must be applied when siting a Class I hazardous waste injection well. Subsection A states that Class I hazardous waste injection wells must be sited so that they inject into a formation that is below any formation that contains groundwater of the state of New Mexico and is located within one quarter mile of the well bore.

Subsection B provides a number of criteria that the Director of OCD must use to ensure that the area for a proposed Class I hazardous waste injection well is geologically suitable for the injection of hazardous waste. These include an analysis of the structure and stratigraphic geology, hydrogeology, and seismicity of both the region and the well site. The Director of OCD must also ensure that the local geology is sufficiently understood so that the limits of waste fate and transport can be accurately predicted by modeling.

Subsection C requires that the injection zone have necessary characteristics, including permeability, porosity, thickness, and areal extent to prevent the movement of fluids into groundwater of the state of New Mexico. The well site must also have a confining zone that is free of cracks, faults, or fractures and is capable of preventing vertical propagation of vertical fractures that could allow migration of fluids from the injection zone.

Subsection D requires the owner or operator of a Class I hazardous waste injection well to demonstrate at least one secondary feature to provide further protection of groundwater of the state of New Mexico. These secondary features include a sequence of permeable and less permeable strata between the confining zone and groundwater of the State of New Mexico, a comparison of the piezeometric surfaces of the injection zone and the lowermost groundwater of the state of New Mexico, or a demonstration that there is no groundwater of the state of New Mexico present at the well site.

These provisions are intended to ensure that hazardous waste disposed of at the target location and geologic formation will not migrate from the injection zone into groundwater of the state of New Mexico.

20.6.2.5353 NMAC AREA OF REVIEW

Section 20.6.2.5353 NMAC is based on 40 C.F.R. § 146.63. Section 20.6.2.5353 NMAC is not materially different from 40 C.F.R. § 146.63, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section requires Class I hazardous waste injection wells to employ an area of review that is defined as a two-mile radius around the well bore, unless the Director of OCD determines that a larger area of review is necessary. The area of review is used to evaluate other wells and geologic features that could potentially serve as conduits for migration of fluids out of the injection zone. This is a larger area of review than is used for the permitting of other UIC wells in New Mexico.

This provision is intended to ensure that Class I hazardous waste injection well permit applicants review an area that is sufficiently large to exceed the expected lateral migration or cone of influence from each proposed Class I hazardous waste injection well.

20.6.2.5354 NMAC CORRECTIVE ACTION

Section 20.6.2.5354 NMAC is based on 40 C.F.R. § 146.64. Section 20.6.2.5354 NMAC is not materially different from 40 C.F.R. § 146.64, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section describes the steps that a permit applicant must take to avoid the migration of injected fluid through other existing well bores located within the area of review. Class I hazardous waste injection well permit applicants are required to identify all wells that penetrate the confining zone or injection within the area of review and to determine whether the wells are adequately completed or plugged. Information related to the location, description, and records of plugging or completion for each well must be provided to the Director of OCD in a tabular form. If any wells are determined to be improperly plugged and abandoned, or if such information cannot be determined, the permit applicant must submit for the Director of OCD's approval a corrective action plan that outlines the steps it will take to prevent movement of fluids through such wells. For existing wells, all corrective actions must be completed within two years after issuance of a Class I hazardous waste injection well permit. For new wells, all corrective actions must be completed before injection may commence. The Director of OCD must evaluate adequacy of a corrective action plan based on a series of criteria including the type of fluid to be injected, the geology and hydrology at the site, the history of injection operations, the closure procedures when the wells were closed, the reliability of procedure used to identify abandoned wells, along with other factors that could affect the movement of fluids from the injection zone into groundwater of the United States.

These provisions are intended to ensure that a Class I hazardous waste injection well permit applicant identifies all wells in the area of review that could provide a path for the movement of fluids out of the injection zone and takes any corrective action necessary to isolate the injection zone.

20.6.2.5355 NMAC CONSTRUCTION REQUIREMENTS:

Section 20.6.2.5355 NMAC is based on 40 C.F.R. § 146.65. Section 20.6.2.5355 NMAC is not materially different from 40 C.F.R. § 146.65, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides the requirements that a Class I hazardous waste injection well permittee must comply with when constructing a well.

Subsection A requires that Class I hazardous waste injection wells must be constructed and completed to prevent the movement of fluids from the injection zone to groundwater of the state of New Mexico. In addition, wells must be constructed in a manner that allow for the use of testing devices, and workover tools as well as the continuous monitoring of injection tubing and long string casing.

Subsection B requires that the permittee ensure compatibility between the injection fluids and all materials with which such fluids will come into contact. Compatibility will be evaluated based on standards developed by the American Petroleum Institute, ASTM, or similar organizations.

Subsection C requires that well casing and cementing must be designed to prevent movement of fluids into groundwater of the state of New Mexico during the life of the Class I hazardous waste injection well (including post-closure care) and provides a series of criteria that the Director of OCD must consider when evaluating the sufficiency of the well casing and cementing program. It requires a surface casing string, at least one long string casing into the injection zone, cementing between casings, and requirements to ensure that well integrity will be maintained for the life of the well.

Subsection D provides a number of criteria that the Director of OCD must consider when establishing requirements for the tubing and packer through which fluids will be injected. These criteria include depth, characteristics of the injection fluid, injection and annular pressure, injection rate, and the size and strength of the casing and tubing. It also authorizes the Director of OCD to approve a fluid seal if certain criteria are met.

These provisions are intended to ensure that the design and construction of a Class I hazardous waste well will include all of necessary components to prevent migration of fluid from the injection zone or the well bore into groundwater of the state of New Mexico.

20.6.2.5356 NMAC LOGGING, SAMPLING, AND TESTING PRIOR TO WELL OPERATION:

Section 20.6.2.5356 NMAC is based on 40 C.F.R. § 146.66. Section 20.6.2.5356 NMAC is not materially different from 40 C.F.R. § 146.66, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides a series of tests that a Class I hazardous waste injection well permittee must conduct prior to commencing injection.

Subsection A requires a Class I hazardous waste injection well permittee to conduct a series of logs and tests during the well construction process to determine the geologic and hydrologic features of the well bore. Logs and tests must be run after installation of the surface casing and the long string casing. In addition, prior to well operation, the permittee must conduct a mechanical integrity test that consists of a pressure test, radioactive tracer survey, temperature or noise log, and any other test required by the Director of OCD.

Subsection B requires a permittee to collect whole cores or sidewall cores from the confining and injection zones, along with formation fluid samples from the injection zone. The Director of OCDapproves the substitution of representative cores from nearby wells if the well owner or operator can demonstrate that core retrieval is not possible.

Subsection C requires the permittee to record the temperature, pH, conductivity, pressure, and static fluid level of the injection zone fluid.

Subsection D requires the permittee to determine the fracture pressure and other chemical and physical characteristics of the injection and confining zones. The permittee must also determine the physical and chemical characteristics of the formation fluids in the injection zone.

Subsection E requires the permittee to conduct a pump test or injectivity test to verify the characteristics of the injection zone prior to operation of the well.

Subsection F requires the permittee to provide notice to the Director of OCD before conducting tests under Section 20.6.2.5351 through 20.6.2.5363 NMAC to allow the Director of OCD an opportunity to witness such tests. The notice must be provided at least 30 days before testing begins and must include a schedule of all logging and testing activities.

These provisions are intended to ensure that fluids will not migrate from the injection zone or well bore by verifying information about the suitability of the injection zone, confining zone, and well bore prior to operation of a Class I hazardous waste injection well.

20.6.2.5357 NMAC OPERATING REQUIREMENTS:

Section 20.6.2.5357 NMAC is based on 40 C.F.R. § 146.67. Section 20.6.2.5357 NMAC is not materially different from 40 C.F.R. § 146.67, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides a series of requirements that Class I hazardous waste injection well permittees must comply with during operation of the well.

Subsection A requires permittees to maintain an injection pressure at the wellhead that will avoid initiation of new fractures or propagation of existing fractures in the injection zone. The permittee must also ensure that the injection pressure will not initiate new fractures or propagate existing fractures in the confining zone above the injection zone.

Subsection B prohibits injection between the outermost well casing and the well bore in order to protect groundwater of the state of New Mexico.

Subsection C provides requirements for maintaining annulus pressure in the well to allow monitoring for leaks in the injection tubing. It also requires that the fluid in the annulus be noncorrosive.

Subsection D requires the permittee to maintain the mechanical integrity of the well at all times.

Subsection E requires the Director of OCD to impose additional permit requirements for Class I hazardous waste injection wells that may inject wastes that have the potential to react with the injection formation to generate gases. Conditions can include limits on temperature and pH and other procedures to avoid pressure imbalances.

Section F requires the permittee to install continuous monitoring systems for injection pressure, flow rate, volume, and temperature of the injection fluid and annulus pressure. The permittee must also install an automatic alarm and automatic shut-off system that is triggered (or certify the presence of a trained operator to respond) when pressures, flow rates, and other parameters fall outside of acceptable ranges.

If an automatic alarm or shutdown is triggered, Subsection G requires the permittee to investigate the cause of the alarm or shutdown. If the well lacks mechanical integrity, the permittee must cease operations, determine whether any leaks are present, and provide notice to the Director of OCD within 24 hours.

If a loss of mechanical integrity is discovered at a Class I hazardous waste injection well, Subsection H requires the permittee to immediately cease operations and take reasonable steps to determine whether hazardous waste was injected into any unauthorized zone. The permittee must also provide notice to the Director of OCD of the loss of mechanical integrity, and restore and demonstrate mechanical integrity of the well prior to resuming injection.

If the permittee obtains evidence of a release of injected waste outside of the injection zone, Subsection I requires the permittee to cease operations, notify the Director of OCD, characterize the release, and, if necessary, remediate the release and notify the public of any release into groundwater of the state of New Mexico. Injection may resume after the permittee demonstrates that injection will not endanger groundwater of the state of New Mexico.

Subsection J requires the permittee of a Class I hazardous waste injection well to obtain approval from the Director of OCD prior to conducting a well workover.

These provisions are intended to ensure that wells are operated in a manner that prevents migration of injected fluids out of the injection zone and to provide protocol to protect groundwater water of the state of New Mexico in the event that an incident occurs at the well site.

20.6.2.5358 NMAC TESTING AND MONITORING REQUIREMENTS:

Section 20.6.2.5358 NMAC is based on 40 C.F.R. § 146.68. Section 20.6.2.5358 NMAC is not materially different from 40 C.F.R. § 146.68, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides testing and monitoring requirements that Class I hazardous waste injection well permittees must comply with during operation of the well.

Subsection A requires the permittee to develop and follow a waste analysis plan to obtain a detailed physical and chemical analysis of representative samples of the injected waste. The plan must specify the parameters to be measured, the test methods that will be applied, and the sampling measures used to ensure representativeness. The permittee must repeat this analysis on a regular basis as required by the waste analysis plan and the Director of OCD.

Subsection B requires the permittee to demonstrate to the Director of OCD that the injected waste stream and any reaction products will not alter the chemical or physical properties of the injection or confining zone in a manner that would threaten the minimum siting criteria in Section 20.6.2.5352 NMAC.

Subsection C requires the permittee to demonstrate that all well materials that will come into contact with the injection fluid will be constructed of compatible materials. It also requires the Director of OCD to impose additional corrosion monitoring requirements for Class I hazardous waste injection wells that will dispose of corrosive waste.

Subsection D requires the permittee to conduct periodic mechanical integrity tests during operation of the well. Mechanical integrity tests must evaluate the long string casing, injection tube, annular seal, and bottom hole cement. The permittee is also required to run casing inspection logs whenever the permittee conducts a workover in which the injection string is pulled.

Subsection E requires the permittee to annual ambient monitoring to assess the potential for fluid movement from the well or injection zone. The monitoring program must be based on a site-specific assessment of potential fluid movement from the well or injection zone. The Director of OCD has discretion to require additional monitoring including monitoring of pressure in formations above the confining zone and monitoring of the groundwater quality in aquifers above the confining zone.

Subsection F authorizes the Director of OCD to require seismicity monitoring if the Class I hazardous waste injection well has the capacity to cause seismic disturbances.

These provisions are intended to require permittees to collect sufficient information during the operation of Class I hazardous waste injection wells to ensure that injected fluids do not migrate out of the injection zone into groundwater of the state of New Mexico.

20.6.2.5359 NMAC REPORTING REQUIREMENTS:

Section 20.6.2.5359 NMAC is based on 40 C.F.R. § 146.69. Section 20.6.2.5359 NMAC is not materially different from 40 C.F.R. § 146.69, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section provides reporting requirements that Class I hazardous waste injection well permittees must comply with during operations. Permittees are required to submit quarterly reports that contain information regarding maximum injection pressure, volume of fluid injected, the characteristics of the injected fluids and the results of any required monitoring. The permittee must also report any event that exceeds operating parameters or triggers an alarm or shutdown. The permittee must also comply with reporting requirements for mechanical integrity tests, well workovers, and other tests of the injection well required by the Director of OCD.

These provisions are intended to ensure that the Director of OCD is provided with necessary information about each Class I hazardous waste injection well in a timely manner.

20.6.2.5360 NMAC INFORMATION TO BE EVALUATED BY THE DIRECTOR:

Section 20.6.2.5360 NMAC is based on 40 C.F.R. § 146.70. Section 20.6.2.5360 NMAC is not materially different from 40 C.F.R. § 146.70, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section describes the information that the Director of OCD must consider when evaluating the design, construction, operation, and closure of Class I hazardous waste injection wells.

Subsection A describes a series of criteria and documents that the Director of OCD must review and evaluate before issuing a Class I hazardous waste injection well permit to ensure that the permittee will meet the requirements of Sections 20.6.2.5000 through 20.6.2.5399 NMAC. These include maps, cross-sections and tabulations showing wells located within the area of review, groundwater of the state of New Mexico, and geologic features at the proposed well site. The permit applicant must also provide information on the proposed construction and operation of the Class I hazardous waste injection well.

Subsection B describes the information that Class I hazardous waste injection well permittee must include in a well completion report before the Director of OCD can grant approval for operation of a Class I hazardous waste injection well. These include logging and testing data, proposed operating parameters, and the status of corrective action activities. The permittee must also provide evidence that that is has obtained a no migration exclusion from EPA Region 6.

Subsection C requires the Director of OCD to review the information regarding well closure and post-closure care in Subsection A(4) of Section 20.6.2.6361 NMAC and Subsection A of Section 20.6.2.5362 NMAC before granting approval of the plugging and abandonment of a Class I hazardous waste injection well.

Subsection D requires that the permittee of a Class I hazardous waste injection well must certify that it has established a program to reduce the volume and toxicity of the injected waste and that injection is the method of disposal that minimizes the threat to human health and the environment.

These provisions are designed to ensure that the Director of OCD has the necessary information to determine that Class I hazardous waste injection wells will be sited, constructed, operated, and closed in a manner that is protective of human health and the environment and that injected wastes will not migrate from the injection zone or well bore into groundwater of the state of New Mexico.

20.6.2.5361 NMAC CLOSURE:

Section 20.6.2.5361 NMAC is based on 40 C.F.R. § 146.71. Section 20.6.2.5361 NMAC is not materially different from 40 C.F.R. § 146.71, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section describes the requirements that Class I hazardous waste injection well permittees must comply with regarding closure of wells after the injection ceases.

Subsection A requires a permit applicant to submit and revise as necessary a well closure plan, which must be included as a permit condition for any Class I hazardous waste injection well. The plan must identify the type of number of plugs to be used, the method of placement of the plugs, any wells casing or other materials that will remain in the well bore, testing and measurement procedures, as well as other criteria. Subsection A also requires a permittee to maintain financial assurance that is sufficient to cover the cost of well closure. Finally, it also provides a procedure for Class I hazardous waste injection well permittees to temporarily cease operations for up to two years while keeping a well open.

Subsection B requires a permittee to provide the Director of OCD with at least 60 days' notice prior to closing a Class I hazardous waste injection well.

Subsection C requires a Class I hazardous waste injection well permittee to submit a closure report to the Director of OCD after closing a well. The report must be certified by the permittee and by the person who performed the closure operations. The report must describe any deviations from the previously filed well closure plan.

Subsection D provides the standards that a Class I hazardous waste injection well permittee must meet when closing a well. These standards include an analysis of pressure decay over time, mechanical testing of long string casing and cement that will remain in the well bore, flushing with a buffer fluid, and the placement of cement plugs.

These provisions are intended to ensure that Class I hazardous waste injection wells are properly closed so that there will be no migration of fluids from the injection zone when injection ceases.

20.6.2.5362 NMAC POST-CLOSURE CARE:

Section 20.6.2.5362 NMAC is based on 40 C.F.R. § 146.72. Section 20.6.2.5362 NMAC is not materially different from 40 C.F.R. § 146.72, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section describes the requirements that Class I hazardous waste injection well permittees must comply with regarding post-closure care of wells after the injection ceases.

Subsection A requires a permittee to prepare, modify as necessary, and provide financial assurance for a post-closure care plan. The plan must include information regarding the pressure before and after injection and the projected decay of pressure in the injection zone, the predicted position of the waste front at closure, and the status of any required cleanup efforts. The obligation to implement the post-closure care plan survives termination of the Class I hazardous waste injection well permit.

Subsection B requires a permittee to complete any cleanup activities required under Section 20.6.2.5354 NMAC and to conduct groundwater monitoring until the well's cone of influence no longer intersects the base of the lowermost groundwater of the state of New Mexico. The permittee must also provide notice of the injection and confining zones to state and local agencies with authority over drilling activities, and retain records of injected fluids for three years after well closure.

Subsection C requires the permittee to record a notation in the deed of all surface and subsurface owners on whose property the Class I hazardous waste injection well is located to inform future purchasers that hazardous waste was injected at the site. The notation must state that the property was used to manage hazardous waste, provide contact information to government agencies with information regarding the Class I hazardous waste injection well, and must describe the materials that were disposed of, along with the identity of the formation into which they were injected and the time period over which injection occurred.

These provisions are intended to prevent migration of fluids from the injection zone into groundwater of the state of New Mexico both through post-closure care of the well and by providing notice to future parties that hazardous waste was injected.

20.6.2.5363 NMAC FINANCIAL RESPONSIBILITY FOR POST-CLOSURE CARE

Section 20.6.2.5363 NMAC is based on 40 C.F.R. § 146.73. Section 20.6.2.5363 NMAC is not materially different from 40 C.F.R. § 146.73, with the exception of substituted cross references to NMAC provisions in lieu of equivalent cross references to federal CFR provisions.

This Section requires permittees to demonstrate and maintain financial responsibility for the costs of post-closure care using one of the instruments specified in Section 20.6.2.5320 NMAC. This obligation survives termination of a Class I hazardous waste injection well permit.

These provisions are intended to ensure that regardless of the solvency of the Class I hazardous waste injection well permittee, sufficient funds are set aside for post-closure care to prevent the movement of fluids from the injection zone into groundwater of the state of New Mexico.

Exhibit 1 - Cross Reference Table
for Proposed NM Class I Hazardous Waste UIC Program Rules—New Rule Sections

CFR Cite/Title	NMAC Cite	Notes
40 CFR Part 144 Subpart A - General Provisions (one section)		
§ 144.14 Requirements for wells injecting hazardous waste.	20.6.2.5310	Federal text adopted with conforming changes
40 CFR Part 144 Subpart E - Permit Conditions (all sections)		
§ 144.51 Conditions applicable to all permits.	20.6.2.5341	Federal text adopted with conforming changes
§ 144.52 Establishing permit conditions.	20.6.2.5342	Federal text adopted with conforming changes
§ 144.53 Schedule of compliance.	20.6.2.5343	Federal text adopted with conforming changes
§ 144.54 Requirements for recording and reporting of monitoring results.	20.6.2.5344	Federal text adopted with conforming changes
§ 144.55 Corrective action.	N/A	N/A
40 CFR Part 144 Subpart F - Financial Responsibility: Class I Hazardous Waste Injection Wells (all sections)		
§ 144.60 Applicability.	20.6.2.5320	Incorporated By Reference
§ 144.61 Definitions of terms as used in this subpart.	20.6.2.5320	Incorporated By Reference
§ 144.62 Cost estimate for plugging and abandonment.	20.6.2.5320	Incorporated By Reference
§ 144.63 Financial assurance for plugging and abandonment.	20.6.2.5320	Incorporated By Reference
§ 144.64 Incapacity of owners or operators, guarantors, or financial institutions.	20.6.2.5320	Incorporated By Reference
§ 144.65 Use of State-required mechanisms.	N/A	N/A
§ 144.66 State assumption of responsibility.	N/A	N/A
§ 144.70 Wording of the instruments.	20.6.2.5320	Incorporated By Reference
40 CFR Part 146 Subpart G - Criteria and Standards Applicable to Class I Hazardous Waste Injection Wells (all sections)		
§ 146.61 Applicability.	20.6.2.5351	Federal text adopted with conforming changes
§ 146.62 Minimum criteria for siting.	20.6.2.5352	Federal text adopted with conforming changes
§ 146.63 Area of review.	20.6.2.5353	Federal text adopted with conforming changes
§ 146.64 Corrective action for wells in the area of review.	20.6.2.5354	Federal text adopted with conforming changes
§ 146.65 Construction requirements.	20.6.2.5355	Federal text adopted with conforming changes

CFR Cite/Title	NMAC Cite	Notes
§ 146.66 Logging, sampling, and testing prior to new well operation.	20.6.2.5356	Federal text adopted with conforming changes
§ 146.67 Operating requirements.	20.6.2.5357	Federal text adopted with conforming changes
§ 146.68 Testing and monitoring requirements.	20.6.2.5358	Federal text adopted with conforming changes
§ 146.69 Reporting requirements.	20.6.2.5359	Federal text adopted with conforming changes
§ 146.70 Information to be evaluated by the Director.	20.6.2.5360	Federal text adopted with conforming changes
§ 146.71 Closure.	20.6.2.5361	Federal text adopted with conforming changes
§ 146.72 Post-closure care.	20.6.2.5362	Federal text adopted with conforming changes
§ 146.73 Financial responsibility for post-closure care.	20.6.2.5363	Federal text adopted with conforming changes

EXHIBIT 2 - COMPARISON OF PROPOSED WATER CONSERVATION RULE SECTIONS 20.6.2.5300 THROUGH 20.6.2.5399 AGAINST U.S. EPA REQUIREMENTS

The following shows a redline comparison of proposed Sections 20.6.2.5300 through 20.6.2.5399 NMAC against the minimum U.S. EPA requirements set forth in the Code of Federal Regulations. Any text not in redline is identical to the federal text, and any text in redline represents additional text and other changes. Also, footnotes have been added to explain some of the NMAC provisions, including differences between the U.S. EPA regulations and the proposed rule.

20.6.2.5300[1]

REQUIREMENTS FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

A. Except as otherwise provided for in Sections 20.6.2.5300 through 20.6.2.5399 NMAC, Class I hazardous waste wells are subject to the minimum permit requirements for all Class I- wells in Sections 20.6.2.5000 through 20.6.2.5299 NMAC, in addition to the requirements of Sections 20.6.2.5300 through 20.6.2.5399 NMAC. To the extent any requirement in Sections 20.6.2.5300 through 20.6.2.5399 NMAC conflicts with a requirement of Sections 20.6.2.5000 through 20.6.2.5299 NMAC, Class I hazardous waste injection wells must comply with Sections 20.6.2.5300 through 20.6.2.5399 NMAC.

B. Class I hazardous waste injection wells are only authorized for use by petroleum refineries for the waste generated by the refinery ("generator").

C. The New Mexico energy, minerals and natural resources department, oil conservation division will administer and oversee all permitting of Class I hazardous waste wells pursuant to Sections 20.6.2.5300 through 20.6.2.5399 NMAC.

20.6.2.5301

DEFINITIONS As used in Sections 20.6.2.5300 through 20.6.2.5399 NMAC:

A. "**cone of influence**" means that area around the well within which increased injection zone pressures caused by injection into the hazardous waste injection well would be sufficient to drive fluids into groundwater of the State of New Mexico.

B. "**director**" means the Director of the New Mexico energy, minerals and natural resources department, oil conservation division or his/her designee.[2]

C. "**existing well**" means a Class I hazardous waste injection well which has become a Class I hazardous waste injection well as a result of a change in the definition of the injected

[1] This provision is not in the CFR per se but is a necessary predicate to the CFR provisions and to tie the Class I hazardous well provisions to the pre-existing state program regulations.

[2] This addition is necessary because the term is not otherwise defined (Defined in 20.6.2.7 as secretary or director).

waste which would render the waste hazardous under Section 20.4.1.200 NMAC (incorporating 40 C.F.R. § 261.3).[3]

D. "**groundwater of the State of New Mexico**" means, consistent with Section 20.6.2.5001 NMAC, an aquifer that contains ground water having a TDS concentration of 10,000 mg/l or less.[4]

E. "**injection interval**" means that part of the injection zone in which the well is screened, or in which the waste is otherwise directly emplaced.

F. "**new well**" means any Class I hazardous waste injection well which is not an existing well.

G. "**transmissive fault or fracture**" is a fault or fracture that has sufficient permeability and vertical extent to allow fluids to move between formations.

20.6.2.5302

FEES FOR CLASS I HAZARDOUS WASTE INJECTION WELLS:

For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of Section 20.6.2.3114 NMAC.

A. *Filing Fee.* Every facility submitting a discharge permit application for approval of a UIC Class I hazardous waste injection well shall pay a filing fee of $100 to the Water Quality Management Fund at the time the permit application is submitted. The filing fee is nonrefundable.

B. *Permit Fee.*

(1) Every facility submitting a discharge permit application for approval of a UIC Class I hazardous waste injection well shall pay a permit fee of $30,000 to the Water Quality Management Fund. The permit fee may be paid in a single payment at the time of permit approval or in equal installments over the term of the permit. Installment payments shall be remitted yearly, with the first installment due on the date of permit approval. Subsequent installment permits shall be remitted yearly thereafter. The permit or permit application review of any facility shall be suspended or terminated if the facility fails to submit an installment payment by its due date.

(2) Facilities applying for permits which are subsequently withdrawn or denied shall pay one-half of the permit fee at the time of denial or withdrawal.

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[3] New Mexico has incorporated 40 CFR 261 by reference. See 20.4.1.200, 201. For clarity the CFR citation is retained. The provision at issue is entitled "Definition of hazardous waste."

[4] "Waters of the State of New Mexico" is a term used by the State in lieu of underground source of drinking water. It is more protective than USDW because it includes both drinking water and agricultural uses.

C. *Annual Administration Fee.* Every facility that receives a UIC Class I hazardous waste injection well permit shall pay an annual administrative fee of $20,000 to the Water Quality Management Fund. The initial administrative fee shall be remitted one year after commencement of disposal operations pursuant to the permit. Subsequent administrative fees shall be remitted annually thereafter.

D. *Renewal Fee.*

(1) Every facility submitting a discharge permit application for renewal of a UIC Class I hazardous waste injection well shall pay a renewal fee of $10,000 to the Water Quality Management Fund. The renewal fee may be paid in a single payment at the time of permit renewal or in equal installments over the term of the permit. Installment payments shall be remitted yearly, with the first installment due on the date of permit renewal. Subsequent installment permits shall be remitted yearly thereafter. The permit or permit renewal review of any facility shall be suspended or terminated if the facility fails to submit an installment payment by its due date.

(2) The Director may waive or reduce fees for discharge permit renewals which require little or no cost for investigation or issuance.

E. *Modification Fees.*

(1) Every facility submitting an application for a discharge permit modification of a UIC Class I hazardous waste injection well will be assessed a filing fee plus a modification fee of $10,000 to the Water Quality Management Fund.

(2) Every facility submitting an application for other changes to a UIC Class I hazardous waste injection well discharge permit will be assessed a filing fee plus a minor modification fee of $1,000 to the Water Quality Management Fund.

(3) Applications for both renewal and modification shall pay a filing fee plus renewal fee.

(4) If the Director requires a discharge permit change as a component of an enforcement action, the facility shall pay the applicable modification fee. If the Director requires a discharge permit change outside the context of an enforcement action, the facility shall not be assessed a fee.

(5) The Director may waive or reduce fees for discharge permit changes which require little or no cost for investigation or issuance.

F. *Financial Assurance Fees.*

(1) Facilities with approved UIC Class I hazardous waste injection well permits shall pay the financial assurance fees specified in Section 20.6.2.3114, Table 2 NMAC.

(2) Facilities relying on the corporate guarantee for financial assurance shall pay an additional fee of $ 5,000 to the Water Quality Management Fund.

20.6.2.5303

CONVERSION OF EXISTING INJECTION WELLS:

An existing Class I non-hazardous waste injection well may be converted to a Class I hazardous waste injection well provided the well meets the modeling, design, compatibility, and other requirements set forth in Sections 20.6.2.5300 through 20.6.2.5399 NMAC and the permittee receives a Class I hazardous waste permit pursuant to those Sections.

20.6.2.5304 – 20.6.2.5309: [RESERVED]

~~§ 144.14~~20.6.2.5310

REQUIREMENTS FOR WELLS INJECTING HAZARDOUS WASTE REQUIRED TO BE ACCOMPANIED BY A MANIFEST~~.~~:

~~(a)~~ **A.** *Applicability*. The regulations in this section apply to all generators of hazardous waste, and to the owners or operators of all hazardous waste management facilities, using any class of well to inject hazardous wastes accompanied by a manifest. (See also ~~§144.13~~Subsection A(3)(b) of Section 20.6.2.5004 NMAC[5].)

~~(b)~~ **B.** *Authorization*. The owner or operator of any well that is used to inject hazardous waste required to be accompanied by a manifest or delivery document shall apply for authorization to inject as specified in ~~§144.31~~Section 20.6.2.5102 NMAC[6] within 6 months after the approval or promulgation of the State UIC program.

~~(c)~~ **C.** *Requirements*. In addition to complying with the applicable requirements of this ~~p~~Part[7] ~~and 40 CFR part 146~~, the owner or operator of each facility meeting the requirements of Subsection B~~paragraph (b)~~ of this section, shall comply with the following:

(1) *Notification*. The owner or operator shall comply with the notification requirements of 42 U.S.C. § 6930~~section 3010 of Public Law 94-580~~.[8]

(2) *Identification number*. The owner or operator shall comply with the requirements of Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.11)[9].

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[5] § 144.13 is entitled "Prohibition of Class IV wells;" and 20.6.2.5004 NMAC in general, and A(3)(b) specifically, are the state corollary Class IV prohibitions.

[6] § 144.31 is entitled "Application for a permit; authorization for a permit." There is no complete state corollary because 20.6.2.5102 NMAC, which covers the same topic, does not cover Class I hazardous waste wells. In order to allow this cross reference to work, 20.6.2.5102 NMAC has been amended to include hazardous waste wells.

[7] "This Part" includes all of 20.6.2 NMAC and would cover all of New Mexico's UIC program which, by law, must be a stringent as the requirements EPA imposes under 40 CFR Parts 144 and 146. Therefore, it is the appropriate corollary to Part 146

[8] This is the federal provision for listing materials as hazardous waste (using the U.S.C. rather than Public Law citation). There is no state corollary to EPA's listing authority, so the federal provision has been retained.

(3) *Manifest system*. The owner or operator shall comply with the applicable recordkeeping and reporting requirements for manifested wastes in Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.71).[10]

(4) *Manifest discrepancies*. The owner or operator shall comply with Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.72).[11]

(5) *Operating record*. The owner or operator shall comply with Section 20.4.1.500 NMAC (incorporating 40 CFR Sections 264.73(a), (b)(1), and (b)(2)).[12]

(6) *Annual report*. The owner or operator shall comply with Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.75).[13]

(7) *Unmanifested waste report*. The owner or operator shall comply with Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.75).[14]

(8) *Personnel training*. The owner or operator shall comply with the applicable personnel training requirements of Section 20.4.1.500 NMAC (incorporating 40 CFR Section 264.16).[15]

(9) *Certification of closure*. When abandonment is completed, the owner or operator must submit to the Director certification by the owner or operator and certification by an independent registered professional engineer that the facility has been closed in accordance with the specifications in ~~§144.52(a)(6)~~Section 20.6.2.5209 NMAC.[16]

20.6.2.5311 – 20.6.2.5319: [RESERVED]

(cont.)
[9] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Identification number.”

[10] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Use of manifest system.”

[11] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Manifest discrepancies.”

[12] New Mexico has incorporated 40 CFR 264 by reference. See20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Personnel training.”

[13] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Biennial report.”

[14] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Biennial report.”

[15] New Mexico has incorporated 40 CFR 264 by reference. See 20.4.1.500, 501. For clarity the CFR citation is retained. The provision at issue is entitled “Personnel training.”

[16] The nearest state corollary to 40 CFR § 144.52 is 20.6.2.5209 NMAC. That section was amended to cover Class I hazardous wells.

20.6.2.5320 ADOPTION OF 40 CFR PART 144, SUBPART F (FINANCIAL RESPONSIBILITY: CLASS I HAZARDOUS WASTE INJECTION WELLS). Except as otherwise provided, the regulations of the EPA set forth in 40 CFR Part 144, Subpart F [insert current effective date] are hereby incorporated by reference.

20.6.2.5321 MODIFICATIONS, EXCEPTIONS, AND OMISSIONS. Except as otherwise provided, the following modifications, exceptions, and omissions are made to the incorporated federal regulations.

A. The following terms defined in 40 CFR Section 144.61 have the meanings set forth herein, in lieu of the meaning set forth in 40 CFR Section 144.61:

(1) "plugging and abandonment plan" means the plan for plugging and abandonment prepared in accordance with the requirements of 20.6.2.5341 NMAC.

B. The following terms not defined in 40 CFR Part 144, Subsection F have the meanings set forth herein when the terms are used in this part:

(1) "administrator," "regional administrator" and other similar variations means the Director of the New Mexico energy, minerals and natural resources department, oil conservation division or his/her designee;

(2) "United States Environmental Protection Agency" or "EPA" means New Mexico energy, minerals and natural resources department, oil conservation division or OCD, except when used in 40 CFR Section 144.70(f).

C. The following provisions of 40 CFR Part 144, Subpart F are modified in Section 20.6.2.5321 NMAC:

(1) cross references to 40 CFR Part 144 shall be replaced by cross references to Sections 20.6.2.5300 through 20.6.2.5399 NMAC

(2) the cross reference to §§ 144.28 and 144.51 in Section 144.62(a) shall be replaced by a cross reference to Section 20.6.2.5341 NMAC;

(3) the cross references to 40 CFR Parts 264, Subpart H and 265, Subpart H shall be modified to include cross references to 40 CFR Parts 264, Subpart H and 265, Subpart H and Sections 20.4.2.500 and 20.4.2.600 NMAC.

(4) references to EPA Identification Numbers in financial assurance documents shall be replaced by references to API Well Numbers (US Well Numbers);

(5) the first sentence of 40 CFR Section 144.63(f)(1) shall be replaced with the following sentence: "An owner or operator may satisfy the requirements of this section by obtaining a guarantee from a corporate parent that meets the requirements of 40 CFR Section 144.63(f)(10), including the guarantor meeting the requirements for the owner or operator under the financial test specified in this paragraph."

(6) trust agreements prepared in accordance with 40 CFR Section 144.70(a) must state that they will be administered, construed, and enforced according to the laws of New Mexico;

(7) surety companies issuing bonds prepared in accordance with 40 CFR Section 144, Subpart F must be registered with the New Mexico Office of Superintendent of Insurance;

D. The following provisions of 40 CFR Part 144, Subpart F are omitted from Section 20.6.2.5320 NMAC:

(1) Section 144.65;

(2) Section 144.66;

(3) the third sentence in 40 CFR Section 144.63(h);

20.6.2.5322 – 20.6.2.5340 [RESERVED]

~~§~~ 20.6.2.5341~~144.51~~

CONDITIONS APPLICABLE TO ALL PERMITS:~~.~~

The following conditions apply to all Class I hazardous[17] ~~UIC~~ permits. All conditions applicable to all permits shall be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to these regulations ~~(or the corresponding approved State regulations)~~[18] must be given in the permit.

~~(a)~~ **A.** *Duty to comply*. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the New Mexico Water Quality Act ~~Safe Drinking Water Act~~ and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the permittee need not comply with the provisions of this permit to the extent and for the duration such noncompliance is authorized in ~~an emergency permit under § 144.34~~a variance issued under Section 20.6.2.1210 NMAC.[19]

~~(b)~~ **B.** *Duty to reapply*. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a ~~new~~ permit renewal pursuant to Subpart F of Section 20.6.2.3106 NMAC.[20]

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[17] The rules at issue only apply to Class I hazardous waste well permits.

[18] "These regulations" now refer to the approved State regulations.

[19] There is no exact state corollary to this CFR provision. The variance provision in 20.6.2.1210 appears to be the closest state corollary to this CFR provision, and we would argue is its functional equivalent.

[20] The purpose of this addition is to make clear that timely renewal applications can authorize the permittee to continue to operate after the expiration date of the original permit.

~~(c)~~ **C.** *Need to halt or reduce activity not a defense.* 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.

~~(d)~~ **D.** *Duty to mitigate.* The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

~~(e)~~ **E.** *Proper operation and maintenance.* The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which 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.

~~(f)~~ **F.** *Permit actions.* 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.

~~(g)~~ **G.** *Property rights.* This permit does not convey any property rights of any sort, or any exclusive privilege.

~~(h)~~ **H.** *Duty to provide information.* 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.

I. *Duty to provide notice.* Public notice, when required, shall be provided as set forth in 20.6.2.3108 NMAC except that the following notice shall be provided in lieu of the notice required by 20.6.2.3108(B)(2):

A written notice must be sent by certified mail, return receipt requested, to all surface and mineral owners of record within a ½ mile radius of the proposed well or wells.

~~(i)~~ **J.** *Inspection and entry.* 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:

(1) 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;

(2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(3) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(4) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Sections 20.6.2.5300 through 20.6.2.5399 NMAC~~SDWA~~,[21] any substances or parameters at any location.

~~(j)~~ **K.** *Monitoring and records.*

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) 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 3 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 ~~§ 144.52(a)(6)~~Subsection A(6) of Section 20.6.2.5342 NMAC[22], or under ~~part 146 subpart G~~Sections 20.6.2.5351 through 20.6.2.5363 NMAC[23] as appropriate. The Director may require the owner or operator to deliver the records to the Director at the conclusion of the retention period. ~~For EPA administered programs, the owner or operator shall continue to retain the records after the three year retention period unless he delivers the records to the Regional Administrator or obtains written approval from the Regional Administrator to discard the records.~~[24]

(3) 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;

[21] Reference to the state rules is necessary in lieu of the SDWA.

[22] Internal cross reference (see cross reference table for details).

[23] Internal cross reference (see cross reference table for details). The cited sections are the corollary to Subpart G.

[24] This sentence is unnecessary as the Class I hazardous program will be administered by New Mexico, not EPA.

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

~~(4) Owners or operators of Class VI wells shall retain records as specified in subpart H of part 146, including §§ 146.84(g), 146.91(f), 146.92(d), 146.93(f), and 146.93(h) of this chapter.~~[25]

~~(k)~~ **L.** *Signatory requirement.* All applications, reports, or information submitted to the Director~~Administrator~~ shall be signed and certified. (See Subsection G of 20.6.2.5101 NMAC~~§ 144.32~~.[26])

~~(l)~~ **M.** *Reporting requirements*—

(1) *Planned changes.* The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility.

(2) *Anticipated noncompliance.* The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

~~(3) *Transfers.* 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 the Safe Drinking Water Act. (See § 144.38); in some cases, modification or revocation and reissuance is mandatory.)~~[27]

(~~4~~3) *Monitoring reports.* Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(~~5~~4) *Compliance schedules.* 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.

(~~6~~5) *Twenty-four hour reporting.* The permittee shall report any noncompliance which may endanger health or the environment, including:

(i) Any monitoring or other information which indicates that any contaminant may cause an endangerment to groundwater of the State of New Mexico~~a USDW~~; or

[25] Section 144.51(j)(4) is unnecessary as it applies to Class VI wells.

[26] Section 144.32 is entitled "Signatories to permit applications and reports." Section 20.6.2.5101 is the closest state corollary to the CFR provision and has been amended to apply to Class I hazardous waste wells and to apply the certification requirement to reports.

[27] Section 144.51(l)(3), "Transfers," has been replaced with 20.6.2.5341(R) below.

(ii) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between groundwater of the State of New Mexico~~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 5 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 area affected by the noncompliance, including any groundwater of the State of New Mexico~~underground sources of drinking water;~~ 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; the date and time the permittee became aware of the noncompliance; and steps taken or planned to reduce, remediate, eliminate, and prevent reoccurrence of the noncompliance.

(~~7~~6) *Other noncompliance.* The permittee shall report all instances of noncompliance not reported under ~~paragraphs (l)~~ Subsections M(3~~4~~), (4~~5~~), and (5~~6~~) of this ~~s~~Section, at the time monitoring reports are submitted. The reports shall contain the information listed in ~~paragraph~~ Subsection M~~(l)~~(~~6~~5)[28] of this ~~s~~Section.

(~~8~~7) *Other information.* 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.

~~(m)~~ **N.** *Requirements prior to commencing injection.* ~~Except for all new wells authorized by an area permit under § 144.33(c), a~~ [29]A new injection well may not commence injection until construction is complete, and

(1) The permittee has submitted notice of completion of construction to the Director; and

(2)

(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~~form~~ 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 in ~~paragraph (m)~~Subsection N(1) of this ~~s~~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.

[28] Subsection references were updated to reflect deletion of Subsection L(3), above.

[29] The state has not adopted area well permitting and thus this clause is unnecessary.

~~(n)~~ **O.** 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.~~[30]

~~(o)~~ **~~O~~P.** ~~A Class I, II or III permit shall include and a Class V permit may include conditions which meet the applicable requirements of § 146.10 of this chapter 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 § 146.10 of this chapter, 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 paragraph, or deny the permit. A Class VI permit shall include conditions which meet the requirements set forth in § 146.92 of this chapter. Where the plan meets the requirements of § 146.92 of this chapter, the Director shall incorporate it into the permit as a permit condition. For purposes of this paragraph, temporary or intermittent cessation of injection operations is not abandonment.~~The permittee shall meet the requirements of Section 20.6.2.5209 NMAC.[31]

~~(p)~~ **~~P~~Q.** *Plugging and abandonment report.* ~~For EPA-administered programs, w~~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 ~~Regional Administrator~~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:

(1) A statement that the well was plugged in accordance with the plan previously submitted to the ~~Regional Administrator~~Director; or

(2) Where actual plugging differed from the plan previously submitted, and updated version of the plan on the form supplied by the ~~regional administrator~~Director, specifying the differences.

~~(q)~~ **~~Q~~R.** *Duty to establish and maintain mechanical integrity.*

(1) The permittee shall meet the requirements of Section 20.6.2.5204 NMAC.[32] ~~The owner or operator of a Class I, II, III or VI well permitted under this part 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 § 146.8 of this chapter and the owner or operator of Class VI wells must maintain mechanical integrity as defined in § 146.89 of this chapter. For EPA-administered programs, the Regional Administrator may require by written~~

[30] The state has not adopted area well permitting and thus this clause is unnecessary.

[31] Section 20.6.2.5209 is the State corollary and has been amended to cover Class I hazardous waste wells.

[32] The state already has mechanical integrity requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5204 has been amended to cover Class I hazardous waste wells.

~~notice that the owner or operator comply with a schedule describing when mechanical integrity demonstrations shall be made.~~

(2) When the Director determines that a Class I hazardous~~, II, III or VI~~ well lacks mechanical integrity pursuant to Section 20.6.2.5204 NMAC[33] ~~§ 146.8 or § 146.89 of this chapter for Class VI of this chapter~~, he/she shall give written notice of his/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 Section 20.6.2.5209 NMAC[34] ~~§ 146.10 of this chapter~~ 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 groundwater of the State of New Mexico~~underground sources of drinking water~~ 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 Sections 20.6.2.5204 and 20.6.2.5358 NMAC[35] ~~§ 146.8 of this chapter~~.

(3) The Director may allow the owner or operator of a well which lacks mechanical integrity pursuant to Subsection A of Section 20.6.2.5204 NMAC[36] ~~§ 146.8(a)(1) of this chapter~~ 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 groundwater of the State of New Mexico~~underground sources of drinking water~~.

~~R~~S. *Transfer of a permit.* The operator shall not transfer a permit without the Director's prior written approval. A request for transfer of a permit shall identify officers, directors and owners of 25 percent or greater in the transferee. Unless the director otherwise orders, public notice or hearing are not required for the transfer request's approval. If the Director denies the transfer request, it shall notify the operator and the proposed transferee of the denial by certified mail, return receipt requested, and either the operator or the proposed transferee may request a hearing with 10 days after

[33] The state already has mechanical integrity requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5204 has been amended to cover Class I hazardous waste wells.

[34] The state already has well plugging and abandonment requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5209 has been amended to cover Class I hazardous waste wells.

[35] The state already has mechanical integrity requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5204 has been amended to cover Class I hazardous waste wells. Section 20.6.5358 (internal cross reference) provides additional mechanical integrity testing requirements for Class I hazardous wells.

[36] The state already has mechanical integrity requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5204 has been amended to cover Class I hazardous waste wells.

receipt of the notice. Until the Director approves the transfer and the required financial assurance is in place, the Director shall not release the transferor's financial assurance.[37]

~~§~~ 20.6.2.5342~~144.52~~

ESTABLISHING PERMIT CONDITIONS:~~.~~

~~(a)~~ **A.** In addition to conditions required in Section 20.6.2.5341 NMAC~~§ 144.51~~,[38] the Director shall establish conditions, as required on a case-by-case basis under Subsection H of Section 20.6.2.3109 NMAC~~§ 144.36~~[39] (duration of permits), Subsection A of Section 20.3.2.5343 NMAC~~§ 144.53(a)~~[40] (schedules of compliance), and Section 20.3.2.5344 NMAC ~~§ 144.54 (monitoring), and for EPA permits only § 144.53(b) (alternate schedules of compliance), and § 144.4 (considerations under Federal law)~~.[41] Permits for owners or operators of hazardous waste injection wells shall also include conditions meeting the requirements of Section 20.6.2.5310 NMAC~~§ 144.14~~[42] (requirements for wells injecting hazardous waste), Subsections ~~paragraphs (a)~~A(~~7~~1) and ~~(a)~~A(~~9~~2) of this section,[43] and Sections 20.6.2.5351 through 20.6.2.5363 NMAC~~subpart G of part 146~~.[44] ~~Permits for owners or operators of Class VI injection wells shall include conditions meeting the requirements of subpart H of part 146. Permits for other wells shall contain the following requirements, when applicable.~~[45]

~~(1) *Construction requirements* as set forth in 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 constuction may commence until a permit has been issued containing construction requirements (see § 144.11). 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 Administrator as minor modifications (§ 144.41). No such changes may be physically incorporated into construction of the well prior to approval of the modification by the Director.~~

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[37] This provision, which requires OCD's written approval for a transfer, is more stringent than 40 CFR 144.51(l)(3).

[38] Internal cross reference (see cross reference table for details).

[39] This CFR section is entitled "Duration of Permits." Subsection H of 20.6.2.3109 is not an exact corollary, but appears to be at least as stringent, since the permit duration is 5 years. 40 CFR 144.36 allows a period of up to 10 years, but with review after 5 years. 20.6.3109 is incorporated by reference into Subsection B of Section 20.6.2.5101 for other UIC wells.

[40] Internal cross reference (see cross reference table for details).

[41] This clause is not necessary for permit programs administered by New Mexico.

[42] Internal cross reference (see cross reference table for details).

[43] Internal cross references (see cross reference table for details). These cross references are updated to reflect the fact that subsections 1-6 and 8 have been deleted as inapplicable.

[44] Internal cross reference (see cross reference table for details).

[45] Because this section sets out specific requirements for Class I hazardous wells, the general requirements for "other wells" are not applicable unless explicitly incorporated above.

~~(2) Corrective action as set forth in §§ 144.55, 146.7, and 146.84 of this chapter.~~

~~(3) *Operation requirements* as set forth in 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 part 146 operating requirements.~~

~~(4) *Requirements for wells managing hazardous waste*, as set forth in § 144.14.~~

~~(5) Monitoring and reporting requirements as set forth in 40 CFR part 146. The permittee shall be required to identify types of tests and methods used to generate the monitoring data. For EPA administered programs, monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in table I of 40 CFR 136.3 or in appendix III of 40 CFR part 261 or in certain circumstances by other methods that have been approved by the Regional Administrator.~~

~~(6) After a cessation of operations of two years the owner or operator shall plug and abandon the well in accordance with the plan unless he:~~

~~(i) Provides notice to the Regional Administrator;~~

~~(ii) Describes actions or procedures, satisfactory to the Regional Administrator, 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 Regional Administrator.~~

(~~7~~1) *Financial responsibility.*

(i) 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:

(A) The well has been plugged and abandoned in accordance with an approved plugging and abandonment plan pursuant to Subsection O of Section 20.6.2.5341 NMAC~~§§ 144.51(o)~~,[46] and Section 20.6.2.5209 NMAC[47]~~146.10, and 146.92 of this chapter~~,[48] and submitted a plugging

[46] Internal cross reference (see cross reference table for details).

[47] The state already has plugging and abandonment requirements generally that EPA has apparently already determined are sufficient to meet the cited CFR provision. Section 20.6.2.5209 has been amended to cover Class I hazardous waste wells.

[48] 40 CFR § 146.92 applies to Class IV wells and is inapplicable here.

and abandonment report pursuant to Subsection P of Section 20.6.2.5341 NMAC~~§ 144.51(p)~~;[49] or

(B) The well has been converted in compliance with the requirements of Subsection N of Section 20.6.2.5341 NMAC ~~§ 144.51(n)~~;[50] or

(C) The transferor of a permit has received notice from the Director that the transfer has been approved and that the transferee's required financial assurance is in place.~~the owner or operator receiving transfer of the permit, the new permittee, has demonstrated financial responsibility for the well.~~

(ii) ~~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.~~ [51]~~For EPA administered programs, the Regional Administrator may on a periodic basis require the holder of a lifetime permit to submit an estimate of the resources needed to plug and abandon the well revised to reflect inflation of such costs, and a revised demonstration of financial responsibility, if necessary.~~ [52]The owner or operator of a well injecting hazardous waste must comply with the financial responsibility requirements of Section 20.6.2.5320 NMAC~~subpart F of this part~~.[53] ~~For Class VI wells, the permittee shall show evidence of such financial responsibility to the Director by the submission of a qualifying instrument (see § 146.85(a) of this chapter), 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 § 146.85 of this chapter.~~[54]

~~(8) *Mechanical integrity.* A permit for any Class I, II, III or VI well or injection project which 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 § 146.8, or § 146.89 of this chapter for Class VI, that the well has mechanical integrity.~~

(2~~9~~) *Additional conditions.* 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.

[49] Internal cross reference (see cross reference table for details).

[50] Internal cross reference (see cross reference table for details).

[51] This sentence is not necessary given the specific reference to Class I hazardous wells below.

[52] Inapplicable to New Mexico-administered programs.

[53] Internal cross reference (see cross reference table for details).

[54] Inapplicable to Class I hazardous wells.

~~(b)~~ **B.**

(1) 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 ~~the SDWA and~~ this part~~parts 144, 145, 146 and 124~~.[55]

(2) ~~For a State issued permit, a~~An applicable requirement is a State statutory or regulatory requirement which takes effect prior to final administrative disposition of the permit. ~~For a permit issued by EPA, an applicable requirement is a statutory or regulatory requirement (including any interim final regulation) which takes effect prior to the issuance of the permit. Section 124.14 (reopening of comment period) provides a means for reopening EPA permit proceedings at the discretion of the Director where new requirements become effective during the permitting process and are of sufficient magnitude to make additional proceedings desirable.~~ [56]~~For State and EPA administered programs, a~~An applicable requirement is also any requirement which takes effect prior to the modification or revocation and reissuance of a permit~~, to the extent allowed in § 144.39~~.[57]

(3) New or renewed~~reissued~~ permits, and to the extent allowed under Section 20.6.2.3109 NMAC[58]~~§ 144.39~~ modified or terminated~~revoked and reissued~~ permits, shall incorporate each of the applicable requirements referenced in Section 20.6.2.5342 NMAC~~§ 144.52~~.[59]

(c) *Incorporation.* 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.

~~§~~ 20.6.2.5343~~144.53~~

SCHEDULE OF COMPLIANCE:~~.~~

~~(a)~~ **A.** *General.* The permit may, when appropriate, specify a schedule of compliance leading to compliance with ~~the SDWA and~~ this part[60]~~s 144, 145, 146, and 124~~.

[55] 20 NMAC 6.2 covers the same requires as 40 CFR parts 144 (Underground Injection Control Program), 145 (State UIC Program Requirements), 146 (Underground Injection Control Program: Criteria and Standards), and 124 (Procedures for Decisionmaking).

[56] Inapplicable to New Mexico-issued permits.

[57] Section 144.39(a)(3) includes provisions for inclusion of new regulations when permits are modified or revoked and reissued. There is no limit on inclusion of new regulations that are applicable to Class I hazardous wells. In contrast there are limits on new regulations applicable to Class I nonhazardous, Class II, Class III, and Class IV wells. There does not appear to be an existing corollary in the NMAC and deleting the clause with the cross reference may be the simplest way to address the issue since the limitations are not applicable to Class I hazardous wells.

[58] Section 144.39 is entitled “Modification or revocation and reissuance of permits.” Section 20.6.2.3109 NMAC is entitled “Secretary approval, disapproval, modification, or termination of discharge permits, and requirements for abatement plans is the State corollary to this provision

[59] Internal cross reference (see cross reference table for details).

(1) *Time for compliance.* Any schedules of compliance shall require compliance as soon as possible, and in no case later than 3 years after the effective date of the permit.

(2) *Interim dates.* Except as provided in Subsection ~~paragraph (~~B~~b)~~(1)(ii) of this section, if a permit establishes a schedule of compliance which exceeds 1 year from the date of permit issuance, the schedule shall set forth interim requirements and the dates for their achievement.

(i) The time between interim dates shall not exceed 1 year.

(ii) If the time necessary for completion of any interim requirement is more than 1 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) *Reporting.* The permit shall be written to require that if Subsection~~paragraph (~~A~~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)~~ **B.** *Alternative schedules of compliance.* A permit applicant or permittee may cease conducting regulated activities (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:

(i) The permit may be modified to contain a new or additional schedule leading to timely cessation of activities; or

(ii) 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 which will ensure timely compliance with 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:

(i) Both schedules shall contain an identical interim deadline requiring a final decision on whether to cease conducting regulated activities no later than a date

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(cont.)
[60] 20 NMAC 6.2 covers the same requires as 40 CFR parts 144 (Underground Injection Control Program), 145 (State UIC Program Requirements), 146 (Underground Injection Control Program: Criteria and Standards), and 124 (Procedures for Decisionmaking).

which ensures sufficient time to comply with applicable requirements in a timely manner if the decision is to continue conducting regulated activities;

(ii) One schedule shall lead to timely compliance with applicable requirements;

(iii) The second schedule shall lead to cessation of regulated activities by a date which will ensure timely compliance with applicable requirements;

(iv) Each permit containing two schedules shall include a requirement that after the permittee has made a final decision under Subsection~~paragraph~~ ~~(~~B~~b)~~(3)(i) of this section it shall follow the schedule leading to compliance if the decision is to continue conducting 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.

~~§~~ 20.6.2.5344~~144.54~~

REQUIERMENTS FOR RECORDING AND REPORTING OF MONITORING RESULTS:

All permits shall specify:

(a) Requirements concerning the proper use, maintenance, and installation, when appropriate, of monitoring equipment or methods (including biological monitoring methods when appropriate);

(b) Required monitoring including type, intervals, and frequency sufficient to yield data which are representative of the monitored activity including when appropriate, continuous monitoring;

(c) Applicable reporting requirements based upon the impact of the regulated activity and as specified in Section 20.6.2.5359 NMAC~~part 146~~.[61] Reporting shall be no less frequent than specified in the above regulations.

20.6.2.5345 – 20.6.2.5350: [RESERVED]

~~§ 144.55~~[62]

~~Corrective action.~~

~~(a) *Coverage.* Applicants for Class I, II, (other than existing), or III injection well permits shall identify the location of all known wells within the injection well's area of review which penetrate~~

[61] Internal cross reference to reporting provisions for Class I hazardous wells.

[62] Pursuant to 40 CFR § 146.64 (Section 20.6.2.5354 NMAC), Section 144.55 is not applicable to Class I hazardous wells.

~~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 which 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 ("corrective action"). 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 (based on the factors in § 146.07), the Director shall require the applicant to revise the plan, prescribe a plan for corrective action as a condition of the permit under paragraph (b) of this section, or deny the application. The Director may disregard the provisions of § 146.06 (Area of Review) and § 146.07 (Corrective Action) when reviewing an application to permit an existing Class II well.~~

~~(b) *Requirements*—~~

~~(1) *Existing injection wells.* Any permit issued for an existing injection well (other than Class II) requiring corrective action shall include a compliance schedule requiring any corrective action accepted or prescribed under paragraph (a) of this section to be completed as soon as possible.~~

~~(2) *New injection wells.* No owner or operator of a new injection well may begin injection until all required corrective action has been taken.~~

~~(3) *Injection pressure limitation.* 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.~~

~~(4) *Class III wells only.* When setting corrective action requirements 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 § 146.33(b) shall be designed to verify the validity of such determinations.~~

~~§~~ 20.6.2.5351~~146.61~~

APPLICABILITY:[63]

~~(a)~~ **A.** Sections 20.6.2.5351 through 20.6.2.5363 NMAC~~This subpart~~[64] establish~~es~~ criteria and standards for underground injection control programs to regulate Class I hazardous

[63] Adjusted formatting because definitions were moved to 20.6.2.5301.

[64] Internal cross reference (see cross reference table for details).

waste injection wells. Unless otherwise noted in~~this~~ these Sections ~~subpart~~ supplement~~s~~ the requirements of Sections 20.6.2.5000 through 20.6.2.5299 NMAC~~subpart A~~ and apply~~ies~~ instead of any inconsistent requirements for Class I non-hazardous waste injection wells~~subpart B to Class I hazardous waste injection wells~~.[65]

~~(b)~~ **B.** ~~*Definitions.*~~

~~*Cone of influence* means that area around the well within which increased injection zone pressures caused by injection into the hazardous waste injection well would be sufficient to drive fluids into an underground source of drinking water (USDW).~~

~~*Existing well* means a Class I well which was authorized prior to August 25, 1988, by an approved State program, or an EPA-administered program or a well which has become a Class I well as a result of a change in the definition of the injected waste which would render the waste hazardous under § 261.3) of this part.~~

~~*Injection interval* means that part of the injection zone in which the well is screened, or in which the waste is otherwise directly emplaced.~~

~~*New well* means any Class I hazardous waste injection well which is not an existing well.~~

~~*Transmissive fault or fracture* is a fault or fracture that has sufficient permeability and vertical extent to allow fluids to move between formations.~~

~~§~~ 20.6.2.5352~~146.62~~

MINIMUM CRITERIA FOR SITING:~~.~~

~~(a)~~ **A.** All Class I hazardous waste injection wells shall be sited such that they inject into a formation that is beneath the lowermost formation containing within one quarter mile of the well bore groundwater of the State of New Mexico~~an underground source of drinking water~~.

~~(b)~~ **B.** The siting of Class I hazardous waste injection wells shall be limited to areas that are geologically suitable. The Director shall determine geologic suitability based upon:

(1) An analysis of the structural and stratigraphic geology, the hydrogeology, and the seismicity of the region;

(2) An analysis of the local geology and hydrogeology of the well site, including, at a minimum, detailed information regarding stratigraphy, structure and rock properties, aquifer hydrodynamics and mineral resources; and

[65] Subpart A of Section 146 is entitled "General Provisions;" Subpart B of Section 146 is entitled "Criteria and Standards Applicable to Class I Wells." The NMAC does not contain the same divisions. This rephrasing has the same effect of supplementing generally applicable UIC provisions while replacing provisions specific to Class I non-hazardous wells.

(3) A determination that the geology of the area can be described confidently and that limits of waste fate and transport can be accurately predicted through the use of models.

~~(c)~~ **C.** Class I hazardous waste injection wells shall be sited such that:

(1) The injection zone has sufficient permeability, porosity, thickness and areal extent to prevent migration of fluids into groundwater of the State of New Mexico~~USDWs~~.

(2) The confining zone:

(i) Is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to ~~prevenet~~prevent the movement of fluids into groundwater of the State of New Mexico~~a USDW~~; and

(ii) Contains at least one formation of sufficient thickness and with lithologic and stress characteristics capable of preventing vertical propagation of fractures.

~~(d)~~ **D.** The owner or operator shall demonstrate to the satisfaction of the Director that:

(1) The confining zone is separated from the base of the lowermost groundwater of the State of New Mexico~~USDW~~ by at least one sequence of permeable and less permeable strata that will provide an added layer of protection for groundwater of the State of New Mexico~~the USDW~~ in the event of fluid movement in an unlocated borehole or transmissive fault; or

(2) Within the area of review, the piezometric surface of the fluid in the injection zone is less than the piezometric surface of the lowermost groundwater of the State of New Mexico~~USDW~~, considering density effects, injection pressures and any significant pumping in the overlying groundwater of the State of New Mexico~~USDW~~; or

(3) There is no groundwater of the State of New Mexico~~USDW~~ present.

(4) The Director may approve a site which does not meet the requirements in Subsections~~paragraphs~~ ~~(~~~~d~~D~~)~~ (1), (2), or (3) of this section if the owner or operator can demonstrate to the Director that because of the geology, nature of the waste, or other considerations, abandoned boreholes or other conduits would not cause endangerment of groundwater of the State of New Mexico~~USDWs~~.

~~§~~ 20.6.2.5353~~146.63~~

AREA OF REVIEW:

For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of Section 20.6.2.5202 NMAC~~§ 146.6~~.[66] The area of review for Class I hazardous waste injection

[66] Section 146.6 is entitled "area of review." Section 20.6.2.5202 NMAC defines area of review in the NMAC.

wells shall be a 2-mile radius around the well bore. The Director may specify a larger area of review based on the calculated cone of influence of the well.

~~§~~ 20.6.2.5354~~146.64~~

CORRECTIVE ACTION FOR WELLS IN THE AREA OF REVIEW:

For the purposes of Class I hazardous waste wells, this section shall apply to the exclusion of Section 20.6.2.5203 NMAC~~§§ 144.55 and 146.07~~.[67]

~~(a)~~ **A.** The owner or operator of a Class I hazardous waste well shall as part of the permit application submit a plan to the Director outlining the protocol used to:

(1) Identify all wells penetrating the confining zone or injection zone within the area of review; and

(2) Determine whether wells are adequately completed or plugged.

~~(b)~~ **B.** The owner or operator of a Class I hazardous waste well shall identify the location of all wells within the area of review that penetrate the injection zone or the confining zone and shall submit as required in Subsection A of Section 20.6.2.5360 NMAC~~§ 146.70(a)~~:[68]

(1) A tabulation of all wells within the area of review that penetrate the injection zone or the confining zone; and

(2) A description of each well or type of well and any records of its plugging or completion.

~~(c)~~ **C.** For wells that the Director determines are improperly plugged, completed, or abandoned, or for which plugging or completion information is unavailable, the applicant shall also submit a plan consisting of such steps or modification as are necessary to prevent movement of fluids into or between groundwater of the State of New Mexico~~USDWs~~. 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 (based at a minimum on the factors in Subsection~~paragraph~~ ~~(~~E~~e)~~ of this section), the Director shall:

(1) Require the applicant to revise the plan;

(2) Prescribe a plan for corrective action as a condition of the permit; or

(3) Deny the application.

[67] Section 144.55 (Corrective Action) and 146.07 (Corrective Action) are generally applicable corrective action provisions for all UIC wells. Section 20.6.2.5203 NMAC includes the generally applicable corrective action requirements for Class I non-hazardous and Class III wells in the NMAC.

[68] Internal cross reference (see cross reference table for details).

~~(d)~~ **D.** Requirements:

(1) Existing injection wells. Any permit issued for an existing Class I hazardous waste injection well requiring corrective action other than pressure limitations shall include a compliance schedule requiring any corrective action accepted or prescribed under Subsection~~paragraph~~ ~~(c~~C~~)~~ of this section. Any such compliance schedule shall provide for compliance no later than 2 years following issuance of the permit and shall require observance of appropriate pressure limitations under Subsection~~paragraph~~ ~~(d~~D~~)~~(3) until all other corrective action measures have been implemented.

(2) New injection wells. No owner or operator of a new Class I hazardous waste injection well may begin injection until all corrective actions required under this section have been taken.

(3) The Director may require pressure limitations in lieu of plugging. If pressure limitations are used in lieu of plugging, the Director shall require as a permit condition that injection pressure be so limited that pressure in the injection zone at the site of any improperly completed or abandoned well within the area of review would not be sufficient to drive fluids into or between groundwater of the State of New Mexico~~USDWs~~. This pressure limitation shall satisfy the corrective action requirement. Alternatively, such injection pressure limitation may be made part of a compliance schedule and may be required to be maintained until all other required corrective actions have been implemented.

~~(e)~~ **E.** In determining the adequacy of corrective action proposed by the applicant under Subsection~~paragraph~~ ~~(~~C~~c)~~ of this section and in determining the additional steps needed to prevent fluid movement into and between groundwater of the State of New Mexico~~USDWs~~, the following criteria and factors shall be considered by the Director:

(1) Nature and volume of injected fluid;

(2) Nature of native fluids or byproducts of injection;

(3) Geology;

(4) Hydrology;

(5) History of the injection operation;

(6) Completion and plugging records;

(7) Closure procedures in effect at the time the well was closed;

(8) Hydraulic connections with groundwater of the State of New Mexico~~USDWs~~;

(9) Reliability of the procedures used to identify abandoned wells; and

(10) Any other factors which might affect the movement of fluids into or between groundwater of the State of New Mexico~~USDWs~~.

~~§~~ 20.6.2.5355~~146.65~~

CONSTRUCTION REQUIREMENTS:

~~(a)~~ **A.** *General.* All existing and new Class I hazardous waste injection wells shall be constructed and completed to:

(1) Prevent the movement of fluids into or between groundwater of the State of New Mexico~~USDWs~~ or into any unauthorized zones;

(2) Permit the use of appropriate testing devices and workover tools; and

(3) Permit continuous monitoring of injection tubing and long string casing as required pursuant to Subsection F of Section 20.6.2.5357 NMAC~~§ 146.67(f)~~.[69]

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

~~(c)~~ **C.** *Casing and Cementing of New Wells.*

(1) Casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well, including the post-closure care period. The casing and cementing program shall be designed to prevent the movement of fluids into or between groundwater of the State of New Mexico~~USDWs~~, and to prevent potential leaks of fluids from the well. In determining and specifying casing and cementing requirements, the Director shall consider the following information as required by Section 20.6.2.5360 NMAC~~§ 146.70~~:[70]

(i) Depth to the injection zone;

(ii) Injection pressure, external pressure, internal pressure and axial loading;

(iii) Hole size;

(iv) Size and grade of all casing strings (wall~~well~~ thickness, diameter, nominal weight, length, joint specification and construction material);

(v) Corrosiveness of injected fluid, formation fluids and temperature;

[69] Internal cross reference (see cross reference table for details).

[70] Internal cross reference (see cross reference table for details).

(vi) Lithology of injection and confining zones;

(vii) Type or grade of cement; and

(viii) Quantity and chemical composition of the injected fluid.

(2) One surface casing string shall, at a minimum, extend into the confining bed below the lowest formation that contains ~~a~~ groundwater of the State of New Mexico~~USDW~~ and be cemented by circulating cement from the base of the casing to the surface, using a minimum of 120% of the calculated annual volume. The Director may require more than 120% when the geology or other circumstances warrant it.

(3) At least one long string casing, using a sufficient number of centralizers, shall extend to the injection zone and shall be cemented by circulating cement to the surface in one or more stages:

(i) Of sufficient quantity and quality to withstand the maximum operating pressure; and

(ii) In a quantity no less than 120% of the calculated volume necessary to fill the annular space. The Director may require more than 120% when the geology or other circumstances warrant it.

(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 is continuous and does not allow fluid movement behind the well bore.

(5) Casings, including any casing connections, must be rated to have sufficient structural strength to withstand, for the design life of the well:

(i) The maximum burst and collapse pressures which may be experienced during the construction, operation and closure of the well; and

(ii) The maximum tensile stress which may be experienced at any point along the length of the casing during the construction, operation, and closure of the well.

(6) At a minimum, cement and cement ~~additivies~~additives must be of sufficient quality and quantity to maintain integrity over the design life of the well.

~~(d)~~ **D.** *Tubing and packer.*

(1) All Class I hazardous waste injection wells shall inject fluids through tubing with a packer set at a point specified by the Director.

(2) In determining and specifying requirements for tubing and packer, the following factors shall be considered:

(i) Depth of setting;

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

(iii) Injection pressure;

(iv) Annular pressure;

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

(vi) Size of casing; and

(vii) Tubing tensile, burst, and collapse strengths.

(3) The Director may approve the use of a fluid seal if he determines that the following conditions are met:

(i) The operator demonstrates that the seal will provide a level of protection comparable to a packer;

(ii) The operator demonstrates that the staff is, and will remain, adequately trained to operate and maintain the well and to identify and interpret variations in parameters of concern;

(iii) The permit contains specific limitations on variations in annular pressure and loss of annular fluid;

(iv) The design and construction of the well allows continuous monitoring of the annular pressure and mass balance of annular fluid; and

(v) A secondary system is used to monitor the interface between the annulus fluid and the injection fluid and the permit contains requirements for testing the system every three months and recording the results.

~~§~~ 20.6.2.5356~~146.66~~

LOGGING, SAMPLING, AND TESTING PRIOR TO NEW WELL OPERATION:

~~(a)~~ **A.** During the drilling and construction of a new Class I hazardous waste injection well, appropriate logs and tests shall be run to determine or verify the depth, thickness, porosity, permeability, and rock type of, and the salinity of any entrained fluids in, all relevant geologic units to assure conformance with performance standards in Section 20.6.2.5355 NMAC~~§ 146.65~~,[71] and to establish accurate baseline data against which future measurements may be compared. A descriptive report interpreting results of such logs and tests shall be prepared by a

[71] Internal cross reference (see cross reference table for details).

knowledgeable log analyst and submitted to the Director. At a minimum, such logs and tests shall include:

(1) Deviation checks during drilling on all holes constructed by drilling ~~a~~ pilot holes which are enlarged by reaming or another method. Such checks shall be at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling; and

(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. At a minimum, the following logs shall be required in the following situations:

(i) 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, and a temperature log after the casing is set and cemented.

(ii) Upon installation of the long string casing:

(A) Resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs 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.

(iii) The Director may allow the use of an alternative to the above logs when an alternative will provide equivalent or better information; and

(3) A mechanical integrity test consisting of:

(i) A pressure test with liquid or gas;

(ii) A radioactive tracer survey;

(iii) A temperature or noise log;

(iv) A casing inspection log, if required by the Director; and

(v) Any other test required by the Director.

~~(b)~~ **B.** Whole cores or sidewall cores of the confining and injection zones and formation fluid samples from the injection zone shall be taken. The Director may accept 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)~~ **C.** The fluid temperature, pH, conductivity, pressure and the static fluid level of the injection zone must be recorded.

~~(d)~~ **D.** At a minimum, the following information concerning the injection and confining zones shall be determined or calculated for Class I hazardous waste injection wells:

(1) Fracture pressure;

(2) Other physical and chemical characteristics of the injection and confining zones; and

(3) Physical and chemical characteristics of the formation fluids in the injection zone.

~~(e)~~ **E.** Upon completion, but prior to operation, the owner or operator shall conduct the following tests to verify hydrogeologic characteristics of the injection zone:

(1) A pump test; or

(2) Injectivity tests.

~~(f)~~ **F.** The Director shall have the opportunity to witness all logging and testing required by Sections 20.6.2.5351 through 5363 NMAC~~this subpart~~.[72] The owner or operator shall submit a schedule of such activities to the Director 30 days prior to conducting the first test.

~~§~~ 20.6.2.5357~~146.67~~

OPERATING REQUIREMENTS:

~~(a)~~ **A.** Except during stimulation, the owner or operator shall assure that injection pressure at the wellhead does 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. The owner or operator shall assure that the injection pressure does not initiate fractures or propagate existing fractures in the confining zone, nor cause the movement of injection or formation fluids into groundwater of the State of New Mexico~~a USDW~~.

~~(b)~~ **B.** Injection between the outermost casing protecting groundwater of the State of New Mexico~~USDWs~~ and the well bore is prohibited.

~~(c)~~ **C.** The owner or operator shall maintain an annulus pressure that exceeds the operating injection pressure, unless the Director determines that such a requirement might harm the integrity of the well. The fluid in the annulus shall be noncorrosive, or shall contain a corrosion inhibitor.

[72] Internal cross reference (see cross reference table for details).

~~(d)~~ **D.** The owner or operator shall maintain mechanical integrity of the injection well at all times.

~~(e)~~ **E.** Permit requirements for owners or operators of hazardous waste wells which inject wastes which have the potential to react with the injection formation to generate gases shall include:

(1) Conditions limiting the temperature, pH or acidity of the injected waste; and

(2) Procedures necessary to assure that pressure imbalances which might cause a backflow or blowout do not occur.

~~(f)~~ **F.** The owner or operator shall install and use continuous recording devices to monitor: the injection pressure; the flow rate, volume, and temperature of injected fluids; and the pressure on the annulus between the tubing and the long string casing, and shall install and use:

(1) Automatic alarm and automatic shut-off systems, designed to sound and shut-in the well when pressures and flow rates or other parameters approved by the Director exceed a range and/or gradient specified in the permit; or

(2) Automatic alarms, designed to sound when the pressures and flow rates or other parameters approved by the Director exceed a rate and/or gradient specified in the permit, in cases where the owner or operator certifies that a trained operator will be on-site at all times when the well is operating.

~~(g)~~ **G.** If an automatic alarm or shutdown is triggered, the owner or operator shall immediately investigate and identify as expeditiously as possible the cause of the alarm or shutoff. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under Subsection~~paragraph~~ ~~(~~~~f~~F~~)~~ of this section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator shall:

(1) Cease injection of waste fluids unless authorized by the Director to continue or resume injection.

(2) Take all necessary steps to determine the presence or absence of a leak; and

(3) Notify the Director within 24 hours after the alarm or shutdown.

~~(h)~~ **H.** If a loss of mechanical integrity is discovered pursuant to Subsection~~paragraph~~ ~~(~~~~g~~G~~)~~ of this section or during periodic mechanical integrity testing, the owner or operator shall:

(1) Immediately cease injection of waste fluids;

(2) Take all steps reasonably necessary to determine whether there may have been a release of hazardous wastes or hazardous waste constituents into any unauthorized zone;

(3) Notify the Director within 24 hours after loss of mechanical integrity is discovered;

(4) Notify the Director when injection can be expected to resume; and

(5) Restore and demonstrate mechanical integrity to the satisfaction of the Director prior to resuming injection of waste fluids.

~~(i)~~ **I.** Whenever the owner or operator obtains evidence that there may have been a release of injected wastes into an unauthorized zone:

(1) The owner or operator shall immediately case injection of waste fluids, and:

(i) Notify the Director within 24 hours of obtaining such evidence;

(ii) Take all necessary steps to identify and characterize the extent of any release;

(iii) Comply with any remediation plan specified by the Director;

(iv) Implement any remediation plan approved by the Director; and

(v) Where such release is into groundwater of the State of New Mexico~~a USDW~~ currently serving as a water supply, place a notice in a newspaper of general circulation.

(2) The Director may allow the operator to resume injection prior to completing cleanup action if the owner or operator demonstrates that the injection operation will not endanger groundwater of the State of New Mexico~~USDWs~~.

~~(j)~~ **J.** The owner or operator shall notify the Director and obtain his approval prior to conducting any well workover.

~~§~~ 20.6.2.5358~~146.68~~

TESTING AND MONITORING REQUIREMENTS:

Testing and monitoring requirements shall at a minimum include:

~~(a)~~ **A.** Monitoring of the injected wastes.

(1) The owner or operator shall develop and follow an approved written waste analysis plan that describes the procedures to be carried out to obtain a detailed chemical and physical analysis of a representative sample of the waste, including the quality assurance procedures used. At a minimum, the plan shall specify:

(i) The ~~paramenters~~parameters for which the waste will be analyzed and the rationale for the selection of these parameters;

(ii) The test methods that will be used to test for these parameters; and

(iii) The sampling method that will be used to obtain a representative sample of the waste to be analyzed.

(2) The owner or operator shall repeat the analysis of the injected wastes as described in the waste analysis plan at frequencies specified in the waste analysis plan and when process or operating changes occur that may significantly alter the characteristics of the waste stream.

(3) The owner or operator shall conduct continuous or periodic monitoring of selected parameters as required by the Director.

(4) The owner or operator shall assure that the plan remains accurate and the analyses remain representative.

~~(b)~~ **B.** Hydrogeologic compatibility determination. The owner or operator shall submit information demonstrating to the satisfaction of the Director that the waste stream and its anticipated reaction products will not alter the permeability, thickness or other relevant characteristics of the confining or injection zones such that they would no longer meet the requirements specified in Section 20.6.2.5352 NMAC~~§ 146.62~~.[73]

~~(c)~~ **C.** Compatibility of well materials.

(1) The owner or operator shall demonstrate that the waste stream will be compatible with the well materials with which the waste is expected to come into contact, and submit to the Director a description of the methodology used to make that determination. Compatibility for purposes of this requirement is established if contact with injected fluids will not cause the well materials to fail to satisfy any design requirement imposed under Subsection B of Section 20.6.2.5355 NMAC~~§ 146.65(b)~~.[74]

(2) The Director shall require continuous corrosion monitoring of the construction materials used in the well for wells injecting corrosive waste, and may require such monitoring for other waste, by:

(i) Placing coupons of the well construction materials in contact with the waste stream; or

(ii) Routing the waste stream through a loop constructed with the material used in the well; or

(iii) Using an alternative method approved by the Director.

(3) If a corrosion monitoring program is required:

(i) The test shall use materials identical to those used in the construction of the well, and such materials must be continuously exposed to the operating pressures and temperatures (measured at the well head) and flow rates of the injection operation; and

[73] Internal cross reference (see cross reference table for details).

[74] Internal cross reference (see cross reference table for details).

(ii) The owner or operator shall monitor the materials for loss of mass, thickness, cracking, pitting and other signs of corrosion on a quarterly basis to ensure that the well components meet the minimum standards for material strength and performance set forth in Subsection B of Section 20.6.2.5355 NMAC~~§ 146.65(b)~~.[75]

~~(d)~~ **D.** *Periodic mechanical integrity testing.* In fulfilling the requirements of Section 20.6.2.5204 NMAC~~§ 146.8~~,[76] the owner or operator of a Class I hazardous waste injection well shall conduct the mechanical integrity testing as follows:

(1) The long string casing, injection tube, and annular seal shall be tested by means of an approved pressure test with a liquid or gas annually and whenever there has been a well workover;

(2) The bottom-hole cement shall be tested by means of an approved radioactive tracer survey annually;

(3) An approved temperature, noise, or other approved log shall be run at least once every five years to test for movement of fluid along the borehole. The Director may require such tests whenever the well is worked over;

(4) Casing inspection logs shall be run whenever the owner or operator conducts a workover in which the injection string is pulled, unless the Director waives this requirement due to well construction or other factors which limit the test's reliability, or based upon the satisfactory results of a casing inspection log run within the previous five years. The Director may require that a casing inspection log be run every five years, if he has reason to believe that the integrity of the long string casing of the well may be adversely affected by naturally-occurring or man-made events;

(5) Any other test approved by the Director in accordance with the procedures in 40 CFR ~~§~~Section 146.8(d)[77] may also be used.

~~(e)~~ **E.** *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

[75] Internal cross reference (see cross reference table for details).

[76] Section 146.8 is entitled "Mechanical Integrity." Section 20.6.2.5204 NMAC includes mechanical integrity requirements for Class I non-hazardous and Class III wells.

[77] 40 C.F.R. § 146.8(d) requires the Director to obtain approval from the EPA administrator after notice in the Federal Register. There is no exact corollary provision in the NMAC. Subsection B(d) of Section 20.6.2.5204 NMAC, however, allows use of "other appropriate tests as the Secretary may require" but does not include any reference to approval from the EPA administrator.

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:

(i) 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;

(ii) 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;

(iii) Periodic monitoring of the ground water quality in the first aquifer overlying the injection zone;

(iv) Periodic monitoring of the ground water quality in the lowermost groundwater of the State of New Mexico~~USDW~~; and

(v) Any additional monitoring necessary to determine whether fluids are moving into or between groundwater of the State of New Mexico~~USDWs~~.

~~(f)~~ **F.** The Director may require seismicity monitoring when he has reason to believe that the injection activity may have the capacity to cause seismic disturbances.

~~§~~ 20.6.2.5359~~146.69~~

REPORTING REQUIREMENTS:

Reporting requirements shall, at a minimum, include:

~~(a)~~ **A.** Quarterly reports to the Director containing:

(1) The maximum injection pressure;

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

(3) A description of any event which triggers an alarm or shutdown device required pursuant to Subsection F of Section 20.6.2.5357 NMAC~~§ 146.67(f)~~[78] and the response taken;

(4) The total volume of fluid injected;

[78] Internal cross reference (see cross reference table for details).

(5) Any change in the annular fluid volume;

(6) The physical, chemical and other relevant characteristics of injected fluids; and

(7) The results of monitoring prescribed under Section 20.6.2.5358 NMAC~~§ 146.68~~.[79]

~~(b)~~ **B.** Reporting, within 30 days or with the next quarterly report whichever comes later, the results of:

(1) Periodic tests of mechanical integrity;

(2) Any other test of the injection well conducted by the permittee if required by the Director; and

(3) Any well workover.

~~§~~ 20.6.2.5360~~146.70~~

INFORMATION TO BE EVALUATED BY THE DIRECTOR:

This section sets forth the information which must be evaluated by the Director in authorizing Class I hazardous waste injection wells. For a new Class I hazardous waste injection well, the owner or operator shall submit all the information listed below as part of the permit application. For an existing or converted Class I hazardous waste injection well, the owner or operator shall submit all information listed below as part of the permit application except for those items of information which are current, accurate, and available in the existing permit file. For both existing and new Class I hazardous waste injection 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 and readily available to the Director (for example, in the permitting agency's files) and sufficiently identifiable to be retrieved. ~~In cases where EPA issues the permit, all the information in this section must be submitted to the Administrator or his designee.~~[80]

~~(a)~~ **A.** Prior to the issuance of a permit for an existing Class I hazardous waste injection well to operate or the construction or conversion of a new Class I hazardous waste injection well, the Director shall review the following to assure that the requirements of Sections 20.6.2.5000 through 20.6.2.5399 NMAC~~this part and part 144~~ are met:[81]

[79] Internal cross reference (see cross reference table for details).

[80] Inapplicable to New Mexico-administered program.

[81] 20 NMAC 6.2 covers the same requirements as 40 CFR parts 144 (Underground Injection Control Program) and 146 (Underground Injection Control Program: Criteria and Standards).

(1) Information required in Section 20.6.2.5102 NMAC[82]~~§ 144.31~~;

(2) A map showing the injection well 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 (surface and subsurface), quarries, water wells and other pertinent surface features, including residences and roads. The map should also show faults, if known or suspected;

(3) A tabulation of all wells within the area of review which penetrate the proposed injection zone or confining 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) The protocol followed to identify, locate and ascertain the condition of abandoned wells within the area of review which penetrate the injection or the confining zones;

(5) Maps and cross-sections indicating the general vertical and lateral limits of all groundwater of the State of New Mexico~~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 groundwater of the State of New Mexico~~underground source of drinking water~~ which may be affected by the proposed injection;

(6) Maps and cross-sections detailing the geologic structure of the local area;

(7) Maps and cross-sections illustrating the regional geologic setting;

(8) Proposed operating data;

(i) Average and maximum daily rate and volume of the fluid to be injected; and

(ii) Average and maximum injection pressure;

(9) Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the injection formation and the confining zone;

(10) Proposed stimulation program;

(11) Proposed injection procedure;

[82] § 144.31 is entitled "Application for a permit; authorization for a permit." There is no complete state corollary because 20.6.2.5102 NMAC, which covers the same topic, does not cover Class I hazardous waste wells. In order to allow this cross reference to work, 20.6.2.5102 NMAC has been amended to include hazardous waste wells.

(12) Schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(13) Contingency plans to cope with all shut-ins or well failures so as to prevent migration of fluids into any groundwater of the State of New Mexico~~USDW~~;

(14) Plans (including maps) for meeting monitoring requirements of Section 20.6.2.5358 NMAC~~§ 146.68~~;[83]

(15) For wells within the area of review which penetrate the injection zone or the confining zone but are not properly completed or plugged, the corrective action to be taken under Section 20.6.2.5354 NMAC~~§ 146.64~~;[84]

(16) Construction procedures including a cementing and casing program, well materials specifications and their life expectancy, logging procedures, deviation checks, and a drilling, testing and coring program; and

(17) A demonstration pursuant to Section 20.6.2.5320 NMAC~~part 144, subpart F~~,[85] that the applicant has the resources necessary to close, plug or abandon the well and for post-closure care.

~~(b)~~ **B.** Prior to the Director's granting approval for the operation of a Class I hazardous waste injection well, the owner or operator shall submit and the Director shall review the following information, which shall be included in the completion report:

(1) All available logging and testing program data on the well;

(2) A demonstration of mechanical integrity pursuant to Section 20.6.2.5358 NMAC~~§ 146.68~~;[86]

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

(4) The results of the injection zone and confining zone testing program as required in Subsection A(9) of Section 20.6.2.5360 NMAC~~§ 146.70(a)(9)~~;[87]

(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 with the materials used to construct the well;

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[83] Internal cross reference (see cross reference table for details).

[84] Internal cross reference (see cross reference table for details).

[85] Internal cross reference (see cross reference table for details). Part 144, subpart F refers to 40 CFR §§ 144.60-70.

[86] Internal cross reference (see cross reference table for details).

[87] Internal cross reference (see cross reference table for details).

(7) The calculated area of review based on data obtained during logging and testing of the well and the formation, and where necessary revisions to the information submitted under Subsections A(2) and (3) of Section 20.6.2.5360 NMAC~~§ 146.70(a) (2) and (3).~~;[88]

(8) The status of corrective action on wells identified in Subsection A(15) of Section 20.6.2.5360 NMAC~~§ 146.70(a)(15).~~; and[89]

(9) Evidence that the permittee has obtained an exemption under 40 C.F.R. Part 148, Subpart C for the hazardous wastes permitted for disposal through underground injection.

~~(c)~~ **C.** Prior to granting approval for the plugging and abandonment (*i.e.*, closure) of a Class I hazardous waste injection well, the Director shall review the information required in Subsection A(4) of Section 20.6.2.5361 NMAC and Subsection A of Section 20.6.2.5362 NMAC~~§§ 146.71(a)(4) and 146.72(a)~~.[90]

~~(d)~~ **D.** Any permit issued for a Class I hazardous waste injection well for disposal on the premises where the waste is generated shall contain a certification by the owner or operator that:

(1) The generator of the hazardous waste has a program to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable; and

(2) Injection of the waste is that practicable method of disposal currently available to the generator which minimizes the present and future threat to human health and the environment.

~~§~~ 20.6.2.5361~~146.71~~

CLOSURE:

~~(a)~~ **A.** *Closure Plan.* The owner or operator of a Class I hazardous waste injection well shall prepare, maintain, and comply with a plan for closure of the well that meets the requirements of Subsection D~~paragraph (d)~~ of this section and is acceptable to the Director. The obligation to implement the closure plan survives the termination of a permit or the cessation of injection activities. 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 shall submit the plan as a part of the permit application and, upon approval by the Director, such plan shall be a condition of any permit issued.

(2) The owner or operator shall submit any proposed significant revision to the method of closure reflected in the plan for approval by the Director no later than the date on which

[88] Internal cross reference (see cross reference table for details).

[89] Internal cross reference (see cross reference table for details).

[90] Internal cross reference (see cross reference table for details).

notice of closure is required to be submitted to the Director under Subsection B~~paragraph (b)~~ of this section.

(3) The plan shall assure financial responsibility as required in Subsection A(7) of Section 20.6.2.5342 NMAC~~§ 144.52(a)(7)~~.[91]

(4) The plan shall include the following information:

(i) The type and number of plugs to be used;

(ii) The placement of each plug including the elevation of the top and bottom of each plug;

(iii) The type and grade and quantity of material to be used in plugging;

(iv) The method of placement of the plugs;

(v) Any proposed test or measure to be made;

(vi) The amount, size, and location (by depth) of casing and any other materials to be left in the well;

(vii) The method and location where casing is to be parted, if applicable;

(viii) The procedure to be used to meet the requirements of Subsection D(5)~~paragraph (d)(5)~~ of this section;

(ix) The estimated cost of closure; and

(x) Any proposed test or measure to be made.

(5) The Director may modify a closure plan following the procedures of Section 20.6.2.3109 NMAC~~§ 124.5~~.[92]

(6) An owner or operator of a Class I hazardous waste injection well who ceases injection temporarily, may keep the well open provided he:

(i) Has received authorization from the Director; and

(ii) Has described actions or procedures, satisfactory to the Director, that the owner or operator will take to ensure that the well will not endanger groundwater of the State of New Mexico~~USDWs~~ during the period of temporary disuse. These

[91] Internal cross reference (see cross reference table for details).

[92] Section 124.5 is entitled "Modification, revocation, and reissuance, or termination of permits; subsection (c) applies to NPDES and UIC permits. Section 20.6.2.3109 NMAC provides corollary requirements.

actions and procedures shall include compliance with the technical requirements applicable to active injection wells unless waived by the Director.

(7) The owner or operator of a well that has ceased operations for more than two years shall notify the Director 30 days prior to resuming operation of the well.

~~(b)~~ **B.** *Notice of intent to close.* The owner or operator shall notify the Director at least 60 days before closure of a well. At the discretion of the Director, a shorter notice period may be allowed.

~~(c)~~ **C.** *Closure report.* Within 60 days after closure or at the time of the next quarterly report (whichever is less) the owner or operator shall submit a closure report to the Director. If the quarterly report is due less than 15 days after completion of closure, then the report shall be submitted within 60 days after closure. The report shall be certified as accurate by the owner or operator and by the person who performed the closure operation (if other than the owner or operator). Such report shall consist of either:

(1) A statement that the well was closed in accordance with the closure plan previously submitted and approved by the Director; or

(2) Where actual closure differed from the plan previously submitted, a written statement specifying the differences between the previous plan and the actual closure.

~~(d)~~ **D.** *Standards for well closure.*

(1) Prior to closing the well, the owner or operator shall observe and record the pressure decay for a time specified by the Director. The Director shall analyze the pressure decay and the transient pressure observations conducted pursuant to Subsection E(1)(i) of Section 20.6.2.5358 NMAC~~§ 146.68(e)(1)(i)~~[93] and determine whether the injection activity has conformed with predicted values.

(2) Prior to well closure, appropriate mechanical integrity testing shall be conducted to ensure the integrity of that portion of the long string casing and cement that will be left in the ground after closure. Testing methods may include:

(i) Pressure tests with liquid or gas;

(ii) Radioactive tracer surveys;

(iii) Noise, temperature, pipe evaluation, or cement bond logs; and

(iv) Any other test required by the Director.

(3) Prior to well closure, the well shall be flushed with a buffer fluid.

[93] Internal cross reference (see cross reference table for details).

(4) Upon closure, a Class I hazardous waste well shall be plugged with cement in a manner that will not allow the movement of fluids into or between groundwater of the State of New Mexico~~USDWs~~.

(5) Placement of the cement plugs shall be accomplished by one of the following:

(i) The Balance Method;

(ii) The Dump Bailer Method;

(iii) The Two-Plug Method; or

(iv) An alternate method, approved by the Director, that will reliably provide a comparable level of protection.

(6) Each plug used shall be appropriately tagged and tested for seal and stability before closure is completed.

(7) The well to be closed 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).

~~§~~ 20.6.2.5362~~146.72~~

POST-CLOSURE CARE:

~~(a)~~ **A.** The owner or operator of a Class I hazardous waste well shall prepare, maintain, and comply with a plan for post-closure care that meets the requirements of Subsection B~~paragraph (b)~~ of this section and is acceptable to the Director. The obligation to implement the post-closure plan survives the termination of a permit or the cessation of injection activities. The requirement to maintain an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit.

(1) The owner or operator shall submit the plan as a part of the permit application and, upon approval by the Director, such plan shall be a condition of any permit issued.

(2) The owner or operator shall submit any proposed significant revision to the plan as appropriate over the life of the well, but no later than the date of the closure report required under Subsection C of Section 20.6.2.5361 NMAC~~§ 146.71(c)~~.[94]

(3) The plan shall assure financial responsibility as required in Section 20.6.2.5363 NMAC~~§ 146.73~~.[95]

[94] Internal cross reference (see cross reference table for details).

[95] Internal cross reference (see cross reference table for details).

(4) The plan shall include the following information:

(i) The pressure in the injection zone before injection began;

(ii) The anticipated pressure in the injection zone at the time of closure;

(iii) The predicted time until pressure in the injection zone decays to the point that the well's cone of influence no longer intersects the base of the lowermost groundwater of the State of New Mexico~~USDW~~;

(iv) Predicted position of the waste front at closure;

(v) The status of any cleanups required under Section 20.6.2.5354 NMAC~~§ 146.64~~;[96] and

(vi) The estimated cost of proposed post-closure care.

(5) At the request of the owner or operator, or on his own initiative, the Director may modify the post-closure plan after submission of the closure report following the procedures in Section 20.6.2.3109 NMAC.~~§ 124.5.~~[97]

~~(b)~~ **B.** The owner or operator shall:

(1) Continue and complete any cleanup action required under Section 20.6.2.5354 NMAC~~§ 146.64~~,[98] if applicable;

(2) Continue to conduct any groundwater monitoring required under the permit until pressure in the injection zone decays to the point that the well's cone of influence no longer intersects the base of the lowermost groundwater of the State of New Mexico~~USDW~~. The Director may extend the period of post-closure monitoring if he determines that the well may endanger groundwater of the State of New Mexico~~a USDW~~.

(3) Submit a survey plat to the local zoning authority designated by the Director. The plat shall indicate the location of the well relative to permanently surveyed benchmarks. A copy of the plat shall be submitted to the ~~Regional Administrator~~Director ~~of the appropriate EPA Regional Office~~.

(4) Provide appropriate notification and information to such State and local authorities as have cognizance over drilling activities to enable such State and local authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the well's confining or injection zone.

[96] Internal cross reference (see cross reference table for details).

[97] Section 124.5 is entitled "Modification, revocation, and reissuance, or termination of permits; subsection (c) applies to NPDES and UIC permits. Section 20.6.2.3109 NMAC provides corollary requirements.

[98] Internal cross reference (see cross reference table for details).

(5) Retain, for a period of three years following well closure, records reflecting the nature, composition and volume of all injected fluids. The Director shall require the owner or operator to deliver the records to the Director at the conclusion of the retention period, and the records shall thereafter be retained at a location designated by the Director for that purpose.

~~(c)~~ **C.** Each owner of a Class I hazardous waste injection well, and the owner of the surface or subsurface property on or in which a Class I hazardous waste injection well is located, must record a notation on the deed to the facility property or on some other instrument which 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 manage hazardous waste;

(2) The name of the State agency or local authority with which the plat was filed, as well as the address of the Director~~Regional Environmental Protection Agency Office to which it was submitted~~;

(3) The type and volume of waste injected, the injection interval or intervals into which it was injected, and the period over which injection occurred.

~~§~~ 20.6.2.5363~~146.73~~

FINANCIAL RESPONSIBILITY FOR POST-CLOSURE CARE:

The owner or operator shall demonstrate and maintain financial responsibility for post-closure by using a trust fund, surety bond, letter of credit, financial test, insurance or corporate guarantee that meets the specifications for the mechanisms and instruments revised as appropriate to cover closure and post-closure care in Section 20.6.2.5320 NMAC,[99] ~~40 CFR part 144, subpart F.~~ The amount of the funds available shall be no less than the amount identified in Subsection A(4)(vi) of Section 20.6.2.5362 NMAC~~§ 146.72(a)(4)(vi)~~.[100] The obligation to maintain financial responsibility for post-closure care survives the termination of a permit or the cessation of injection. The requirement to maintain financial responsibility is enforceable regardless of whether the requirement is a condition of the permit.

20.6.2.5364 – 20.6.2.5399: [RESERVED]

[99] Internal cross reference (see cross reference table for details). Part 144, subpart F refers to 40 CFR §§ 144.60-70.

[100] Internal cross reference (see cross reference table for details).