Permit

Permittee Ethyl Corporation
Address Post Office Box 729
Magnolia, Arkansas 71753

Permit Number 4-U
CSN 14-0028

Pursuant to the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Stats. 82-1901, et seq.), and the Arkansas Underground Injection Control (UIC) Code, a permit is issued to Ethyl Corporation (hereinafter called the Permittee) to construct and/or operate (a) Class I waste disposal injection well(s) at the following locations:

Three (3) Disposal wells, WDW #1, #2, and #13 within Ethyl Plant site on State Highway 79 South of Magnolia, Arkansas.

The Permittee must comply with all the terms and conditions of this permit. This permit consists of the conditions contained herein (including those in any attachments 1 through 5), and the applicable standard and specific facility conditions developed in accordance with the Arkansas Underground Injection Control (UIC) Code, and the provisions of Title 40, Code of Federal Regulations (40 CFR) Parts 144, 146, and 124, as specified in the permit. Applicable State and Federal Regulations are those which are in effect on the date of issuance of the permit, such Federal Regulations adopted by reference in Section 3 of the Arkansas Underground Injection Control (UIC) Code. (See 40 CFR 144.52(b)(2) and Attachment 1).

This permit is based on the assumption that all information submitted in the permit application attached to Permittee's letter dated December 16, 1983 as modified by subsequent amendments dated January 31, 1984; March 1, 1984; May 11, 1984; July 30, 1984 and August 24, 1984 (hereinafter referred to as the application) is accurate and that the facility will be constructed and operated as specified in the application. Any inaccuracies found in this information may be grounds for the termination or modification of this permit (See 40 CFR 144.39, 144.40, and 144.41) and possible enforcement action.

This permit is effective as of October 6, 1985 and shall remain in effect until October 6, 1995 unless revoked and reissued, or terminated (40 CFR 144.39 and 144.40) or continued in accordance with the Arkansas UIC Code.

Issued this 6th day of September, 1985.

ARKANSAS DEPARTMENT OF POLLUTION CONTROL & ECOLOGY

by: Phyllis Barnett
Director

PART I

STANDARD CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is authorized to construct and/or operate (a) waste disposal injection well(s) in accordance with the conditions of this permit. Any injection of wastes not authorized in this permit is prohibited. Compliance with this permit constitutes, for purposes of enforcement, compliance with Part C of the Safe Drinking Water Act (SDWA) and the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended). Issuance of this permit does not convey any property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property; any invasion of other private rights, or any infringement of State or local law or regulation. Compliance with the terms of this permit does not constitute a defense to any action brought under the provisions of the Water and Air Pollution Control Act (Act 472 of 1949, as amended) or any other law governing protection of public health or the environment for any imminent and substantial endangerment to human health or the environment.

I.B. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person, including the Permittee, or upon the Director's initiative. However, modification, revocation and reissuance, or termination of this permit shall be allowed only under the conditions set forth in I.B.1., I.B.2., and I.B.3. below. All requests for modification (except for minor modifications as specified under 40 CFR 144.41), revocation and reissuance, or termination shall be in writing and shall contain facts or reasons supporting the request.

1. Modification or Revocation and Reissuance of Permit

   The Director may modify, or revoke and reissue, this permit if he or she determines, based upon receipt of any information, that one or more of the causes specified under 144.39(a) or 144.39(b) for modification, revocation and reissuance, or both, exists. Except as provided by 144.41, modification or revocation and reissuance of this permit by the Director shall be in accordance with 40 CFR 144.39.

2. Termination of Permit

   The Director may terminate this permit during its term as specified under Condition I.C. or deny any application for renewal of this permit for causes identified in 40 CFR 144.40.

3. Minor Modifications to the Permit

   Upon the consent of the Permittee, the Director may make minor modifications to the permit as specified in 40 CFR 144.41 without following the procedures of 40 CFR Part 124. Any modification not determined to be a minor modification under 144.41 must comply with the procedures of 40 CFR 124.5 and 144.39.

4. Part III containing any variances, compliance schedules, or other conditions placed on the facility.

VI. BRIEF SUMMARY OF THE PERMIT CONDITIONS

PART I. STANDARD CONDITIONS

Part I of the permit sets forth the standard procedural conditions that are applicable to all underground injection management facilities. The regulatory basis for these conditions is found in Title 40, Code of Federal Regulations (CFR), Part 144, as adopted by reference in Section 3 of the Arkansas Underground Injection Control Code, and other requirements of the Code. Specific citations are found in 40 CFR Part 144, Subparts A through E and Section 6 of the UIC Code.

PART II. CONDITIONS APPLICABLE TO THE SPECIFIC FACILITY

Part II of the permit contains conditions applicable to each specific underground injection facility. The regulatory basis for these conditions can be found in 40 CFR Part 144, Subpart E and 40 CFR Part 146, Subparts A and B.

PART III. VARIANCES, COMPLIANCE SCHEDULES, AND OTHER CONDITIONS PLACED UPON THE FACILITY

Part III of the permit contains conditions applicable to any variances requested by the applicant or granted by the Director, any compliance schedules made a part of this permit, and any other conditions placed upon the facility which are unique to the facility, or required by the Arkansas UIC Code and not covered elsewhere in the permit. The regulatory basis for these conditions can be found in 40 CFR 144.16 and 40 CFR 144.53, and the Arkansas UIC Code.

VII. VARIANCES AND WAIVERS

No variances were requested by the applicant and none were granted by the Director in this permit.

VIII. PURPOSE OF THE PERMITTING PROCESS

The purpose of the permitting process is to afford ADPC&E and interested citizens the opportunity to evaluate the ability of the Permittee, Ethyl Corporation, to comply with the applicable underground injection control (UIC) requirements promulgated under the Arkansas Water and Air Pollution Control Act to ensure proper construction and safe operation of the facility. ADPC&E is required to prepare a draft permit which sets forth in one concise document all the applicable requirements with which the Department intends to require the Permittee to comply during the ten year duration of the permit. The public is given thirty (30) days to review the application and comment on the draft permit conditions prior to ADPC&E taking final permit action on the application.

IX. PROCEDURES FOR REACHING A FINAL DECISION

The issuance of an Underground Injection Control (UIC) permit to Ethyl Corporation will be under the authority of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended) and the provisions of the Arkansas Underground Injection Control (UIC) Code. The regulations under 40 CFR 124.10, adopted by reference in the UIC Code, requires that the public be given a 30-day comment period for each draft permit prepared under the Safe Drinking Water Act (SDWA).

The comment period will begin on the date of publication of the Public Notice in a major local newspaper of general circulation.

Any person interested in commenting on the application or draft permit must do so within the thirty day comment period discussed above. All persons wishing to comment on any of the permit conditions or the permit application should submit comments in writing to: The Department of Pollution Control and Ecology, Post Office Box 9583, Little Rock, Arkansas 72219. Attention: Doug Szenher, Information Officer.

The public may also request a public hearing to be held on the draft permit submitting a written request for a hearing to the Department at the address above. Each request for a hearing should set forth the issue or issues to be raised at the hearing. The Director, ADPC&E, will consider all written comments received by ADPC&E during the comment period, and all verbal comments received at the hearing, if one is held, as well as the requirements for underground injection control as specified in 40 CFR Parts 144, 146, and 124, the Arkansas Underground Injection Control Code, and the agency's permitting policies.

If significant public interest is expressed in holding a public hearing, the hearing will be scheduled by ADPC&E in Magnolia, Arkansas, and a public notice will be issued setting forth the date and time for such hearing. The decision on whether there is significant public interest will be determined by the Director.

When the Director makes a final decision on the permit, notice will be given the applicant and to each person who has submitted written comments or requested notice of the final permit decision. When the permit is finalized, it is signed by the Director, and will be effective on the date of issuance.

The Contact Person for the Ethyl Corporation draft permit is:

Doug Szenher, Information Officer
Arkansas Department of Pollution
Control and Ecology
8001 National Drive
Post Office Box 9583
Little Rock, Arkansas 72219
Telephone: (501) 562-7444

I.C. DURATION OF PERMIT

This permit is effective for a period not to exceed ten years unless terminated for causes specified in 40 CFR 144.40.

I.D. CONTINUATION OF EXPIRING PERMIT

This permit and all conditions therein will remain in effect beyond the permit's expiration date if the Permittee has submitted a timely, complete application and through no fault of the Permittee, the Director has not issued a new permit as set forth in Act 472. Permits continued under the conditions in this section remain fully enforceable and are subject to those actions specified in 40 CFR 144.37(c).

I.E. TRANSFER OF PERMITS

1. Transfers by Modification

This permit may be transferred by the Permittee to a new owner or operator if the permit has been modified or revoked and reissued pursuant to 40 CFR 144.39(b)(2), or a minor modification made under 40 CFR 144.41(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Safe Drinking Water Act.

2. Automatic Transfers

Any UIC permit for a well not injecting hazardous waste may be automatically transferred to a new Permittee if:

(a) The current Permittee notifies the Director at least thirty (30) days in advance of a proposed transfer date referred to in Condition I.E.2(b) below;

(b) The notice includes a written agreement between the existing and new Permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them, and the notice demonstrates that the financial responsibility requirements of 40 CFR 144.52(a)(7) will be met by the new Permittee; and

(c) The Director does not notify the existing and the proposed new Permittee of his or her intent to modify or revoke and reissue the permit. A modification under this condition may also be a minor modification under 40 CFR 144.41. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Condition I.E.2(b) above.

I.F. DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit under 144.34. Any permit noncompliance constitutes a violation of Act 472 and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application.

2. 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 submit a new application for a new permit at least one hundred eighty (180) days before this permit expires.

3. 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.

4. 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.

5. Duty to Provide Information

The Permittee shall furnish to the Director within a reasonable time, any relevant 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.

6. 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 a back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. 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:

(a) Entry

Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

(b) Access to Records

Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(c) Inspection

Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(d) Sampling for Compliance

Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Act 472, any substances or parameters at any location.

8. Monitoring and Records

(a) Monitoring

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(b) Records

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least three (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 will be automatically extended during the course of any unresolved enforcement action regarding this facility. The Permittee shall also retain records on the nature and composition of all injected fluids until three (3) years after the completion of any plugging and abandonement procedures specified under 144.52(a)(6) and Conditions II.F.1. of this permit. The Director may require the owner or operator to deliver the records to the Director at the conclusion of the retention periods.

(c) Content of Monitoring Records

Records of monitoring information shall include:

(i) The date, exact place, and time of sampling or measurements;

(ii) The individual(s) who performed the sampling or measurements;

(iii) The date(s) analyses were performed;

(iv) The individual(s) who performed the analyses;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

9. Reporting Requirements

(a) Notification of Facility Alterations or Additions

The Permittee shall notify the Director as soon as possible of any planned physical alterations or additions to the permitted facility.

(b) Notice of Changes in Facility

The Permittee shall give the Director advance notice of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

(c) Permit Transfer

This permit is nontransferable 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 other requirements as may be required under the SDWA, Act 472, or Condition I.E. above.

(d) Monitoring Reports

Monitoring results shall be reported at the intervals specified in Conditions II.E. of this permit.

(e) Compliance Reports

Reports of compliance or noncompliance with any compliance schedule of this permit shall be submitted to the Director no later than 14 days following each schedule date.

(f) Noncompliance Endangerment

The Permittee shall report to the Director any noncompliance that may endanger health or the environment, including any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW, or that any non-compliance with a permit condition or malfunction of the injection system may cause fluid migration between USDWs. This information shall be provided orally within 24 hours of the time the Permittee becomes aware of the circumstances. The information to be included in the oral report is as follows:

(i) Information concerning release of any contaminant that may cause an endangerment to public drinking water supplies.

(ii) Any information of a release or discharge of a contaminant, or of a fire or explosion from the facility, which could threaten the environment or human health outside the facility. The description of the occurrence and its cause shall include:

(A) Name, address, and telephone number of the owner or operator;

(B) Name, address, and telephone number of the facility;

(C) Date, time, and type of incident;

(D) Name and quantity of material(s) involved;

(E) The extent of injuries, if any;

(F) An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

(G) Estimated quantity and disposition of recovered material that resulted from the incident.

(g) Noncompliance Endangerment Report

The Permittee shall also provide the Director with a written submission within 5 days after he or she becomes aware of any noncompliance described under I.F.9(f). The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, the length of time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence.

(h) Certification of Construction or Modification

The Permittee may not commence injection of waste into a newly permitted facility nor in a modified portion of an existing injection facility until:

(A) The Permittee has submitted to the Director by certified mail or hand delivery, a letter signed by the Permittee and a registered professional engineer stating that the facility has been constructed or modified in compliance with this permit; and

(B) (i) The Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of this permit; or

(ii) The Director has either waived the inspection or has not, within 15 days of receiving the notice in Condition I.F.9(h)(A) above, notified the Permittee of his or her intent to inspect the new injection well, in which case prior inspection or review is waived and the Permittee may commence injection. The Director shall include, in any notification of intent to inspect, a reasonable time period in which he or she will inspect the well.

(i) Notification of Interim Compliance

The Permittee shall submit to the Director notification indicating compliance or noncompliance with interim compliance requirements established under Condition III.B.1 of this permit. This notification shall include at a minimum, a discussion of activities completed during the reporting month; reasons for noncompliance with interim compliance requirements established in Condition III.B.1 of this permit; any other problems encountered during the reporting period; mitigative measures taken to correct problems encountered; and possible effects on the compliance schedule resulting from these problems. This notification shall be submitted to the Director no later than 14 days following interim dates and dates of completion established in Condition III.B.1 of this permit.

(j) Other Noncompliance Reports

At the time monitoring reports are submitted, the Permittee shall report all instances of noncompliance not reported under Conditions I.F.9.(a), (d), (e), (f), (g), and (h) of this permit. The reports shall contain the information listed in Condition I.F.9.(g) of this section.

(k) Amendment of Permit Application and Reports

Within 7 days after the Permittee becomes aware that relevant facts were not submitted or were incorrect in a permit application or in any report to the Director, Permittee shall submit such new or corrected facts or information.

(l) Conversion or Abandonment of Well

The Permittee shall notify the Director before conversion or abandonment of the well, or in the case of area permits, before closure of the project.

10. Signatory Requirement

All applications, reports, or other information requested by the Director shall be signed and certified as required by 40 CFR 144.32.

11. Confidential Information

The Permittee may claim as confidential any information required to be submitted by this permit in accordance with 40 CFR 144.5, with the exception of the name and address of any applicant or Permittee, and information which deals with the existence, absence, or level of contaminants in drinking water.

I.G. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART II

SPECIFIC CONDITIONS

II.A CONSTRUCTION REQUIREMENTS

1. Drilling and Completion

Except as specifically required in the terms of this permit, drilling and completion of the well shall be done in accordance with the plans and specifications submitted with the permit application. Any proposed changes to the plans and specifications must be in writing and approved by the Director as providing protection equivalent to or greater than the original design criteria and standards.

2. Commencement of Construction

No construction may commence until a permit has been issued containing construction requirements, except as authorized by an area permit. All wells shall be in compliance with the applicable provisions of 40 CFR Part 146 prior to commencing injection operations.

3. Formation Used For Injection

Injection must be into a formation which is beneath the lowermost formation, containing, within ¼ mile of the well bore, an underground source of drinking water.

4. Casing and Cementing

(a) For new UIC wells, the wells shall be cased and cemented as follows, or as necessary to prevent the movement of fluids into or between underground sources of drinking water:

(1) The permittee shall set and cement casings to minumum subsurface depths as follows:

Well #	Surface Casing	Long String Casing
WDW #1	169 ft.	3198 ft.
WDW #2	1200 + ft.	4650 + ft.
WDW #13	1266 ft.	8670 ft.

(2) Cementing shall be by the following method with cement used to fill the annular space between the hole and casings to the surface:

Well #	Cementing Method	Type and Grade of Cement
WDW #1	Circulation to surface	Surface Casing - Class A + 2% $CaCl_2$ Long String - Class "H"
WDW #2	Circulation to surface	Class "H"
WDW #13	Circulation to surface	50/50 Pozmix/Lite

(3) Cementing of the long string casing shall include a tail slurry resistant to degradation and penetration by the injected waste, and of sufficient quantity to fill the annular space to the surface.

(4) Waste fluids shall be injected through tubing with a packer set immediately above the injection zone. The tubing and packer shall be designed for the expected service. Tubing and packer specifications shall be maintained as follows:

Well #	Tubing Specifications	Packer Specifications
WDW #1	5½" set at 2991 ft.	TIW set at 2991 ft.
WDW #2	4½" carbon steel, set at 4500 ± ft. (Proposed)	4½" x 7" set at 4500 ft. (Proposed)
WDW #13	4½" carbon steel, set at 7373 ft.	4½" x 9 5/8" TIW set at 7373 ft.

(5) Certification

The Permittee shall certify that construction and completion of the well is in compliance with the requirements and conditions of this permit prior to commencement of injection operations.

(b) For existing UIC wells, the Permittee has adequately demonstrated and documented in the application that the well(s) are in compliance with the minimum construction requirements in this Condition II.A.4.(a).

II.B. DRILLING AND COMPLETION REQUIREMENTS (Not applicable to existing wells. Information on construction is described in the application, and included in Attachment 3).

1. Prior Notification

The Permittee shall notify the Land Disposal Section, Permits Branch of the Department at least forty-eight (48) hours prior to beginning drilling operations, and again at least forty-eight (48) hours prior to cementing operations.

2. Logging Requirements

A minimum of the following logs shall be conducted during the drilling and completion of the well. The Permittee shall ensure that a descriptive report interpreting the results of these logs and tests is prepared by a knowledgeable log analyst and submitted to the Director:

(a) The maximum point at which a well penetrates the injection formation shall not unreasonably vary from the vertical drawn from the center of the borehole at the surface. Deviation in excess of three degrees from the vertical drawn from the center of the borehole at the surface shall be deemed to be unreasonable. Deviation checks on the hole shall be performed at sufficiently frequent intervals, depending on the lithology of the strata being penetrated to assure that vertical avenues for fluid migration are not created during drilling.

(b) For surface casing:

(i) Resistivity, spontaneous potential and caliper logs before the casing is installed; and

(ii) Cement bond log, variable density log, noise and/or temperature log, and a pressure test after the casing is set and cemented.

(c) For intermediate and/or long string casings:

(i) Resistivity, spontaneous potential, porosity, and gamma ray before the casing is installed; and

(ii) Cement bong log, variable density log, radioactive tracer survey, noise and/or temperature log, and a pressure test after the casing is set and cemented.

(d) For either II.B.2.(b)(ii) or (c)(ii) above, if mechanical integrity tests indicate that the cement job is poor in a particular zone and that fluid movement may occur behind the casing, then a squeeze job or other method approved by the Director shall be employed to properly seal off this zone. Following a squeeze job, the Permittee must run a cement bond log, a variable density log, and a noise and/or temprature log through the interval from 100 feet above to 100 feet below the squeezed zone. A pressure test must also be conducted to ensure the integrity of the squeeze job. A report discussing the results of the squeeze job and subsequent mechanical integrity tests must be submitted to the Department within 30 days. Approval must be received from the Department before injection operations may resume.

3. Cores and Core Analysis

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

4. Testing of Casing

Casings shall be tested using the procedures outlined in Attachment 5.

5. Additional Requirements

(a) After completion of the well, mechanical integrity shall be demonstrated and injectivity tests shall be performed to determine well capacity and reservoir characteristics.

(b) Prior to performing injectivity tests above, bottom-hole pressure, bottom-hole temperature, fracture pressure, static fluid level, flow direction, and flow velocity shall be determined and a representative sample of formation water

from each of the proposed injection formations obtained and analyzed. This analysis shall, in part, consist of TOC (total organic carbon), TOX (total organic halogen), pH, specific conductivity, specific gravity and total chlorides. Samples of formation water from the Tokio formation and the James Limestone shall be collected for compatability testing. The compatability tests shall at a minimum consist of the following:

(1) Mixing formation water from the Tokio Formation with individual wastestream samples designated for WDW #1, WDW #2, and WDW #13;

(2) Mixing formation water from the Tokio Formation with every possible combination of mix of the wastestream samples designated for WDW #1, WDW #2, and WDW #13;

(3) Mixing formation water from the James Limestone with individual wastestream samples designated for WDW #2 and WDW #13; and

(4) Mixing formation water from the James Limestone with every possible combination of mix of the wastestream samples designated for WDW #2 and WDW #13. These tests involving mixing of formation water and wastestream fluid should all be conducted under conditions as similar to those existing in the actual formations as possible. Compatability testing of the actual formation materials shall also be conducted to a similar fashion introducing the different formtion material samples to all of the possible combinations of wastestream samples designated for WDW #1, WDW #2, and WDW #13. These should also be conducted under conditions as similar to those existing in the actual formations as possible.

II.C. CORRECTIVE ACTION PLAN

The Permittee shall ensure that the Corrective Action Plan, prepared in accordance with 40 CFR 144.55 and 146.07, is carried out as specified in the Compliance Schedule, if applicable.

II.D. OPERATIONAL REQUIREMENTS

1. Waste to be Injected

Wastes not authorized to be stored, processed, or otherwise handled in associated surface waste handling facilities are not authorized for injection. Until July 1, 1987, the Permittee is authorized to inject the following wastestreams (see condition III.C.2.):

WDW #1 - aqueous waste from DETCP process. This material is hazardous due to arsenic content and high pH.

WDW #2 - Contaminated process water. Additionally, WDW #2 will be used as a back-up for WDW #1 if necessary, to inject aqueous waste from DETCP process.

WDW #13 - Contaminated process water.

2. Operation Requirements

The Permittee shall ensure that the following requirements are met:

OPERATING REQUIREMENTS

Well #	pH (max/min)	max. rate of injection (gals/min)	max. volume of injection (gals/month)	max. surface inj. pressure (psig)	annular fluid	minimum annulus pressure
WDW #1	14/3	100	4,383,333	700 (Tokio) (UPPER & LOWER)	Fresh water	12" water column at grade
WDW #2	12/3	175	7,666,666	~~1350 (James)~~ Set Plug 900 (UPPER TOKIO)	Proposed fresh water	12" water column at grade
WDW #3	12/3	175	6,833,333	1350 (James) ~~900 (Tokio)~~ ~~2600 (Smackover)~~	Fresh water	12" water column at grade

INJECTION DEPTHS

WDW #1 – UPPER TOKIO 3048' TO 3093'
LOWER TOKIO 3139' TO 3164'?

WDW #2 – UPPER TOKIO 3050' TO 3099'

WDW #3 JAMES LIMESTONE 4510' – 4570'

3. Instrumentation

The Permittee shall ensure that the following instrumentation is installed and maintained to monitor the annular space:

Well #	Type of Instrumentation
WDW #1, WDW #2, & WDW #13	atmospheric pressure annular space monitoring system

4. Parameters to be Measured

The following parameters shall be measured for well number(s) WDW #1, WDW #2, and WDW #13 with an appropriate continuous recording device housed in a weatherproof enclosure:

(a) Injection pressure
(b) Injection rate
(c) Injection volume
(d) Annulus pressure (Head tank level)
(e) Injection fluid temperature
(f) Annular fluid pH (not continuous; grab sample)

5. Mechanical Integrity

Mechanical integrity shall be demonstrated upon well completion and thereafter once every five (5) years for the life of the well. The demonstration of mechanical integrity consists of the running of a cement bond log, a variable density log, a noise and/or temperature log, a radioactive tracer survey, and a pressure test. These results will be submitted to the Department along with an interpretive analysis by the log analyst from the company that ran the tests. Also, the well must pass a radioactive tracer survey once every two years and a pressure test at least once a year, after each workover, and after each shut-down of the well in excess of 30 days. Results from the continuous monitoring of each well must also be submitted to the Department once a month. Mechanical integrity must be demonstrated to the satisfaction of the Director in accordance with 40 CFR 146.08 and within the guidelines established by the Department.

II.E. MONITORING AND REPORTING

1. Initial Reports

(a) Within ninety (90) days after well completion, the Permittee shall submit to the Director the drilling and completion history, casing and cementing records, well logs, and injectivity tests performed on the well, along with a surveyor's plat showing the exact location of the well. The drilling history shall include a complete and accurate record of the depth, thickness, and character of strata penetrated. The Permittee shall integrate data obtained into adjusted formation pressure increase calculations, fluid front calculations and cross-sections of the disposal zone and include these items in the completion report.

(b) Wells within the area of review to be used to monitor any migration of fluids into, and pressure in, underground sources of drinking water shall be tested as follows:

Well Locations	Parameters	Frequency
Ethyl Water Wells # 1, 2 and 3	pH	quarterly
	total chlorides	
	total organics	semi-annually

(c) The Permittee shall notify the Director in writing of the following events:

(i) Anticipated well construction dates, i.e., cementing and development; and

(ii) Anticipated well start-up date.

2. Other Operational Reports

(a) The Permittee shall analyze injected fluids at least every day and submit written documentation to the Director monthly;

(b) The Permittee shall submit quarterly reports (within 20 days after the end of the month constituting a quarter) to the Director on the following:

(i) Physical, chemical and other relevant characteristics of the injection fluids;

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

(iii) The results of monitoring prescribed under condition II.E.1(b) above.

(c) The Permittee shall file annually, as of January 1, to be submitted by March 1, an acceptable report of the pressure effects of the well upon its injection zone, including a direct measurement of bottom-hole pressure, or a calculation of bottom-hole pressure using the specific gravity of fluid in the well bore and the static fluid level. To the extent such information is reasonably available, the report shall also include:

(i) Locations of newly constructed and discovered wells within the area of review, if such wells were not included in the technical report accompanying the permit application or in later reports.

(ii) a tabulation of data for all newly constructed and discovered wells within ½ mile of the injection well, that penetrate to within 300 feet of the top of the injection zone.

(iii) Annual injection fluid analysis.

(d) The Permittee shall notify the Director within twenty-four (24) hours of any change in monitoring parameters which could reasonably be attributed to a leak or other failure in well equipment.

(e) The Permittee shall submit within forty-five (45) days after completion of the following tests a report including both data and interpretation of the results of:

(i) Periodic tests of mechanical integrity; and

(ii) Any other test of the injection well or injection zone, if required by the Director.

II.F PLUGGING AND ABANDONMENT

1. Plugging and Abandonment Plan

Upon final abandonment of the well, the Permittee shall ensure that the well is plugged in accordance with the approved plugging and abandonment plan submitted with the application, and hereinafter made a condition of this permit. Prior to plugging, the Permittee must give the Department notification of intent to plug, and the mechanical integrity of the well shall be verified by a program approved by the Director. Any proposed changes to plugging and abandonment plans must be approved by the Director after the Permittee demonstrates that the changes will provide protection equivalent to or greater than the original design criteria and standards. Changes of plugging and abandonment plans shall be treated as a minor modification of the permit under 40 CFR 144.41(g).

2. Financial Assurance

The Permittee shall secure and maintain in full force and effect at all times a performance bond in a form acceptable to the Director, to provide for proper closing, plugging and abandonment of the permitted waste disposal well(s) in the amount set forth below. The amount of financial assurance may, upon approval of the Director, be altered at a future date to provide for plugging subject to prevailing general economic conditions. This permit does not authorize underground injection of fluids unless the Permittee has in effect a performance bond acceptable to the Director.

Well #	Amount of Financial Assurance
WDW #1	$20,000
WDW #2	$20,000
WDW #13	$20,000
	$60,000

PART III

VARIANCES, COMPLIANCE SCHEDULES, AND OTHER CONDITIONS

III.A. VARIANCES

1. The applicant has not requested, nor has the Director granted, any variances in this permit.

III.B. COMPLIANCE SCHEDULES

1. None

III.C. OTHER CONDITIONS

1. The Permittee shall, as an alternative to performing a squeeze job on WDW #1, as requested in a letter to the Department dated June 25, 1985, cement the present injection tubing in place by circulating cement to the surface. The Permittee shall then install a new smaller injection tubing and packer and demonstrate the mechanical integrity of WDW #1 to the satisfaction of the Director. Any other alternative(s) to performing a squeeze job on WDW #1 must be approved by the Director. The Permittee shall also submit a schedule for this and any other major workovers of the Permittee's Class I waste disposal wells to the Director, well in advance, so that a representative of the Department UIC Program may be on site to witness such workovers.

2. The Permittee shall eliminate injection of organic constituents according to the following schedule:

January 1, 1986	- Submit preliminary engineering report on wastewater treatment alternatives.
March 1, 1986	- Submit a permit application for the construction of the process wastewater treatment system.
July 1, 1986	- Enter into sufficient financial commitments to obtain the necessary equipment and begin construction.
January 1, 1987	- Begin shakedown and operational checks.
July 1, 1987	- Commence full scale operations of the process wastewater treatment system.

FACT SHEET FOR

ETHYL CORPORATION
MAGNOLIA

UNDERGROUND INJECTION CONTROL FACILITY

FACT SHEET FOR

ETHYL CORPORATION
MAGNOLIA

UNDERGROUND INJECTION CONTROL FACILITY

I. INTRODUCTION

Part C of the Safe Drinking Water Act (SDWA) of 1977 creates a management system to ensure that underground injection wells are properly constructed and safely operated. Owners and operators of underground injection wells must comply with standards established by EPA under Section 1421 of SDWA and by the State of Arkansas under the Water and Air Pollution Control Act (Act 472 of 1949, as amended). EPA promulgated regulations on May 19, 1980, June 24, 1980 and February 3, 1982, to fulfill Section 1421 of SDWA establishing a permit system governing the underground injection of wastes. These regulations include a set of design and operation standards for underground injection wells, and a set of monitoring and response requirements applicable to these waste management units. Under the authority of the Arkansas Water and Air Pollution Control, the State of Arkansas has adopted by reference applicable Federal Regulations pertaining to the disposal of wastes, both hazardous and non-hazardous, by underground injection.

II. FACILITY DESCRIPTION

A. General

Ethyl Corporation is located approximately six miles south of Magnolia, Arkansas in Columbia County. Access is from U.S. Highway 79 South, about one mile east of the plant. The company operates a bromine extraction plant at the site. Manufacturing operations generate several process waste streams that are proposed to be injected into three (3) existing injection wells and one (1) new well.

B. SITE DESCRIPTION

The four wells are located on plant property, as follows:

WDW #1	Lat 33° 10' 37" N, Long 93° 12' 58" W
WDW #2 (New)	Lat 33° 10' 24" N, Long 93° 12' 59" W
WDW #6	Lat 33° 09' 55" N, Long 93° 12' 55" W
WDW #13	Lat 33° 10' 38" N, Long 93° 12' 53" W

The four wells are described as follows:

Well #	Location	inj. Formation	inj. Interval
WDW #1	Lat 33° 10' 37" N Long 93° 12' 58" W	Tokio	3048' - 3093', 3139' - 3164'
WDW #2	Lat 33° 10' 24" N Long 93° 12' 59" W	Tokio James Limestone	3048' - 3164' 4500' - 4555'

WDW #6	Lat 33° 09' 55" N Long 93° 12' 55" W	Tokio	3084' -3102', 3112' - 3152'
WDW #13	Lat 33° 10' 38" N Long 93° 12' 53" W	Smackover Tokio James Limestone	8666' - 8736' 3050' - 3160',

C. PROCESS DESCRIPTION

The wastes to be injected consist of DECTP Process wastewater, hazardous due to arsenic and high pH, which will be injected into well WDW #1. WDW #2 will serve as a backup to #1 should it be out of service for corrective action or testing. Tail brine pond solids are injected into WDW #6. These solids are the result of lime neutralization of tail brine from the bromine process. From past experience, solids in the tail brine pond would be periodically injected approximately every three years. WDW #13 and #2 will inject many miscellaneous wastestreams which presently go into the tail brine pond, including cooling tower blowdown, recycled brine (NaCl, NaBr), trace organics, plant washdown water and rainfall runoff from diked areas inside the plant.

III. WASTES TO BE INJECTED

The wastes to be injected consist of process wastewater from DECTP production which is hazardous due to Arsenic and high pH and several non-hazardous wastestream consisting of tail brine pond solids, cooling tower blowdown, recycled brine, trace organics, plant washdown water, and rainfall run-off. Attachment 2 to the permit contains a waste stream analysis at the point of injection.

IV. STATE AND FEDERAL REGULATIONS, OTHER THAN SDWA, CONSIDERED IN THIS PERMIT

The requirements of the following State and Federal Directives have been addressed and adhered to in the Permittee's application for the proposed underground injection facility:

Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended)

Arkansas Underground Injection Control (UIC) Code

Arkansas Water Quality Standards (Regulation No. 2)

Federal Clean Water Act (P.L. 95-217)

V. PERMIT ORGANIZATION

The permit is divided into four (4) sections:

1. A cover sheet setting forth the basic legal authority for issuing a permit.

2. Part I containing standard conditions applicable to all underground injection management facilities.

3. Part II containing conditions applicable to each specific facility.

RESPONSE TO COMMENTS
TO
DRAFT UNDERGROUND INJECTION CONTROL PERMIT
FOR
ETHYL CORPORATION, MAGNOLIA, ARKANSAS

On January 29, 1985, the Arkansas Department of Pollution Control and Ecology (ADPC&E) announced the Draft Underground Injection Control (UIC) Permit for one existing Class I waste disposal well, two Class V brine disposal wells being converted to Class I waste disposal wells, and one proposed new Class I waste disposal well at the Ethyl Corporation plant near Magnolia in Columbia County Arkansas. The ADPC&E announced the draft permits by:

1. Publishing legal notices and news releases in the Magnolia Banner-News, the Magnolia Library, Columbia County and Union County news media, and the statewide media based in Little Rock on December 12, 1984; December 21, 1984; January 11, 1985; and January 28, 1985; and

2. Mailing copies of the public notices to interested persons in Arkansas.

The public notice invited the public to comment on the draft permit in writing by March 11, 1985, and orally at the public hearing held February 28, 1985, at the Columbia County Courthouse in Magnolia. The public hearing was attended by approximately 172 people with several individuals making statements. The public hearing was well covered by local and regional news media (including press and television). The public comment period was extended to April 2, 1985 at the public hearing.

In addition to the oral comments received during the hearing, the ADPC&E received written comments from several individuals regarding the draft permit. The comments of all individuals are combined into one summary and for the sake of brevity have been categorized where possible. Attached are:

1. Responses to all significant comments received orally at the public hearing and written comments received during the public comment period, Attachment I.

2. List of changes to the draft permit and the reason for the changes, Attachment II.

ATTACHMENT I

Comment 1

Alternatives to injection.

Alternate disposal methods were considered by Ethyl and discussed in the application. However, none were considered to be economically practical. The DECTP waste contains arsenic, sulfur, and halogens. Ethyl has stated that during incineration, the arsenic would not be destroyed, but would be emitted as fly ash or tied up in ash residues. This ash/ash residue would require disposal, probably in a solid or hazardous waste landfill. The sulfur would be oxidized to sulfur dioxide, and the halogen converted to hydrogen chloride. A water scrubbing system to scrub the flue gases in the incinerator would be required to further treat these compounds. The wastestreams from the scrubber would also require disposal, most likely by deep well injection, since direct surface discharge would be highly impractical, due to the high chloride content of the scrubber water.

Another possibility investigated by Ethyl was neutralization of the DECTP waste stream. Neutralization would significantly increase the volume of the waste and increase the potential for chemical attack on the injection tubing, but would not decrease the amount of arsenic in the waste to be disposed. Ethyl's present method of operation involves an in-process hydrolysis that results in maximum recycling of useable materials, while minimizing the amount of waste destined for disposal.

Ethyl has considered all of the possible alternatives and has concluded that deep well injection is the most environmentally sound, practical, and economical means of disposal. The Department feels, however, that the process wastewater could and should be pretreated prior to injection and has specifically conditioned the permit to include a schedule to maximize pollutant removal prior to disposal.

Comment 2

Are leaks detected immediately after they occur?

No leaks have been detected in Ethyl's underground injection system since its inception in 1981. The annulus pressure monitoring device used by Ethyl to monitor for leaks has been and, through continuously advancing technology, shall continue to be an effective way to ensure groundwater protection. The annulus of the well communicates directly with an atmospheric head tank (D-2474). The fluid level in the head tank will fluctuate as the pressure in the annulus changes. The annular fluid pH and level in the head tank are continuously monitored and recorded on a strip chart recorder. Any leaks in the system will be detected by changes in the level of the head tank and recorded on the strip chart. All monitoring results are sent to the ADPC&E at the end of each month.

Comment 3

Will the public be informed if a problem occurs with Ethyl's wells?

The public will be informed of any occurrences which threaten human health or the environment.

Comment 4

Has and will Ethyl receive wastes from off-site for injection?

In reference to the comment about an in-house memo which says that Ethyl has received wastes from the Ethyl Corporation facility in Orangeberry, South Carolina, the Ethyl Corporation facility in Magnolia has in the past received some ammonia water from the Orangeberry facility. The ammonia water was used in place of lime to neutralize the brine in the tail brine pond before the brine was injected into Class V Smackover wells. The brine pH, originally 5.5 to 6, is lowered to a pH of about 1 after passing through the extraction towers. The ammonia water (lime is used now) was added to neutralize the brine back to a pH of 5.5 to 6.

The ammonia water was used by Ethyl's Magnolia facility for recycling as a chemical treatment agent, not as an off-site-generated waste for commercial disposal purposes. Neither on-site nor off-site materials not specifically included in the permit shall be allowed to be disposed of in these wells.

Comment 5

Why have some states outlawed injection wells? Why hasn't Arkansas?

The states which no longer allow injection do not do so because of:

1. Unsuitable geology; and

2. Careless and illegal operations, and general lack of cooperation from operators who refuse to be regulated.

Arkansas, like many other states, has not outlawed underground injection for the following reasons:

1. The geology of the area where underground injection occurs in Arkansas is suitable for injection; and

2. There is no record of careless and illegal Class I injection well operations in Arkansas and the Class I well operators in Arkansas are generally cooperative with the ADPC&E.

Comment 6

There were many more comments opposed to than for Ethyl's receiving an underground injection control permit. How can the ADPC&E even consider granting Ethyl a permit with so much opposition?

The issuance or denial of a UIC permit is based upon a thorough and comprehensive review of the application, compliance with federal and state laws, a careful geological evaluation of the vertical and lateral area surrounding the injection well, the integrity of the injection well system, and other factors that could be potentially affected by the injection of wastes. Comments by all interested persons on the draft permit conditions are reviewed and analyzed. However, if the proposed facility complies with all of the regulatory requirements, the Director of a federally delegated program has little discretion in permitting decisions. In short, the decision must be based solely on scientifically substantiated technical data, not on the number

of comments. The decision may be appealed to the Commission, in accordance with Regulation No. 8.

Comment 7

Neither corrosion nor compatibility tests were conducted.

No specific corrosion tests have been conducted using the wastewater being injected by Ethyl, however, carbon steel equipment has successfully been used by Ethyl to store, pump, and pipe the wastewater for many years. Periodic workovers of Ethyl's Class I injection well, specifically, for the replacement of the injection tubing and/or packer, have occurred in the past and have shown the tubing and packer to have very little wear, if any. Ethyl has essentially conducted corrosion testing under actual operational conditions, which is probably the most accurate means of testing. Since the surface and long string casings are also made of carbon steel and, for the most part, are isolated from the injection stream, then it is unlikely that the casing has undergone corrosion damage. Impending failure of the casing, etc., due to corrosion will be detected during mechanical integrity testing conducted every five years, and during annual pressure checks and radioactive tracer surveys which will be done once every two years.

If casing corrosion damage resulting in leaks does occur, the continuous annular space monitoring system will record the problem and the proper remedial action will be taken by Ethyl.

No compatibility tests using the wastestreams and the injection formations fluids have yet been done. However, when WDW #2 is constructed and the formation fluids are obtained, compatibility tests can and will be conducted, reviewed, and approved by the Arkansas Department of Pollution Control and Ecology.

Comment 8

Inadequate area of review.

The one-quarter mile area of review surrounding the proposed and existing injection wells has been thoroughly examined using the available information. Using oil field maps and Arkansas Oil and Gas Commission files, it was determined that no abandoned oil and gas wells exist in the areas of review for Ethyl's injection wells.

Some old wells do exist in the vicinity of the proposed injection wells, however, the nearest well (not including UIC application wells) is located over six-tenths of a mile away. The nearest well to the Interim Status WDW No. 1 is over three-quarters of a mile from the well site. These distances are greater than the calculated radial movement of the injected streams at their maximum flow rates. Considering the maximum flow rates are five times or more the average flow rates, this represents a considerable safety margin. Additionally, evidence indicates these old wells have been properly plugged.

The Department performed pressure build-up and fluid front radius calculations and constructed mathematical models independently of those submitted by Ethyl. The Department's results were very similar to those derived by Ethyl. Worst case condition calculations indicate that the twenty year fluid

front radius should extend no further than one-quarter mile from the Ethyl wells. The subsurface structural geology of the area of review and the region surrounding the area of review was also considered.

Comment 9

Will off-site testing be done?

Off-site sampling and testing will be required when it is determined by the ADPC&E that there has been a release or a threat of release.

Comment 10

What is DECTP and where does the arsenic in the DECTP process wastestream come from?

DECTP stands for diethylchlorothiophosphate. It is produced by the reaction of phosphorus, sulfur, ethanol, and chlorine. Ethyl gets the phosphorus raw material for its DECTP process from a supplier of phosphorite, a naturally occurring rock type which usually contains some arsenic. The arsenic, in the form of sodium arsenate salts, is of no economic value and passes by way of the DECTP process wastestream to the injection well.

Comment 11

The potential for earthquakes in the area of the wells.

Ethyl's Magnolia facility lies in a very seismically inactive area of the United States and of Arkansas. Therefore, the potential for earthquakes, especially major earthquakes, is very minimal. There is no record of production or disposal wells in the area of interest which have been damaged by earthquakes.

Comment 12

Salt water contamination in Magnolia.

The increase in chloride content in the public water supply wells in the Magnolia area is probably due to several reasons, all of which appear to be unrelated to the Ethyl UIC permit application presently being considered. Magnolia has a similar problem to that of El Dorado, although it is not yet quite as serious. A groundwater study of the Sparta conducted by the United States Geological Survey and the Arkansas Geological Commission in 1984 concludes that the most likely reasons for the increased chloride content in public water supply wells are:

1. Overpumping and poor groundwater management and well spacing have resulted in the lowering of the water level of the Sparta in the Magnolia area. This lowering of the water level results in a reversal of flow direction allowing the naturally saline down-dip Sparta water to flow toward Magnolia.

2. Charging of the Sparta with water migrating up from the Wilcox Formation via abandoned improperly plugged or unplugged oil and gas production wells in the Magnolia area, especially in areas where the Wilcox has been used as an injection formation for oil field brines, is

a distinct probability.

3. Millions of barrels of brine from oil and gas production in the Magnolia and surrounding areas have been pumped from various producing formations over the last 60-70 years. Most of this brine was discharged to the south - southeastward draining streams which run through or near most of the oil fields in the area. Appreciable amounts of brine were, and possibly still are, injected by the oil and gas industry into the Wilcox (Wilcox injection is now prohibited in Arkansas), Nacatoch, or other deeper formations for disposal and/or enhanced recovery. Generally, the brine is held in surface tanks before going to injection wells. In the past and at present, brine discharges and leaks through the sandy soils of the unlined surface ponds to the water table have contaminated the Cockfield Formation. According to the hydrostatic head for the shallow aquifers of the area (the Cockfield down through the Nacatoch), the direction of flow would be from the Cockfield to any of the deeper units if avenues of flow, such as wells, were provided. Thus, open bore holes and leaky wells could be plausible avenues for brine and associated contaminant migration from surface activities and contaminated areas of the Cockfield to the Sparta. In the absence of open bore holes and leaky salt water disposal wells however, the immediately underlying Cook Mountain Formation would act as a hydrologic barrier to movement of the contaminant to units below the Cockfield.

Comment 13

Why can't the processes used to produce hazardous wastes be reversed to render the wastes nonhazardous?

Many hazardous wastes are either by-products or co-products of a process by which a certain product is produced. In Ethyl's case, the hazardous substance, arsenic, is a constituent of a raw material used in the production of DECTP. The arsenic is not produced but is merely an undesirable leftover from the DECTP process. The waste being injected by Ethyl is hazardous due primarily to the high pH of the wastestream. The only way to render the wastestream nonhazardous is neutralization, which would significantly increase the volume to be injected. The reversal of the process used to produce the desired product would not in this case, nor in most other cases, render the hazardous by-product(s) or co-products(s) nonhazardous.

Comment 14

Increasing rates of cancer, respiratory illness, and allergies in the Magnolia area.

When the DECTP plant started up in 1979, there were several incidents of rashes reported. These cases were extensively studied by Ethyl's Medical, Toxicology, and Industrial Hygiene Department. Several different types of rashes were documented, however, no pattern was found and no link could be made with the DECTP process. The DECTP operation has remained essentially unchanged since start-up and no new cases of rash have been reported.

As noted by the local physician who spoke at the public hearing, the cancer data from the Arkansas Department of Health presented by Ethyl was for the years 1979-81. This represents the latest available cancer data for Arkansas

and clearly shows Columbia County with an age-adjusted cancer incidence rate below both the state and national averages. No data has been found supporting the alleged high cancer rate in this area.

Comment 15

Characteristics of Class I wells and their associated disposal reservoirs.

(a) Class I injection wells are:

(1) Wells used to inject industrial process waste (hazardous and nonhazardous) beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water.

(2) Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water.

(b) The injection zone must be located at least 1/4 mile (1320') below the lowermost formation containing an underground source of drinking water.

(c) The injection zone must be separated from local usable quality water aquifers by a sufficiently thick confining zone or group of confining zones as determined by the ADPC&E. No injection of any kind will be allowed above the base of the 400' to 600' thick Midway Group which consists predominantly of dense marine clay and acts as an excellent confining unit.

(d) The injection zone and associated confining units above and below the injection zone must be geologically sound within the one-quarter to one-half mile area of review to minimize the risk of leaking wastewater into potable aquifers. Geologically sound means devoid of faults, fractures, and other geologic structures which may provide an avenue of escape for the wastewater from the injection zone to formations containing usable quality water.

(e) Injection pressures must be kept low enough so as not to cause an increase in pressure at surrounding wells sufficient enough to cause movement of wastewater and/or brine up through those wells into usable quality water aquifers. Injection pressures must also be kept low enough so as not to exceed the fracture pressure of the receiving and confining formations.

Comment 16

Running mechanical integrity tests every five years is not often enough.

Basically, a complete mechanical integrity test consists of a pressure test and a logging protocol to detect any casing, tubing or packer leaks and/or significant fluid movement adjacent to the well bore caused by faulty cement, etc. This complete mechanical integrity test must be performed prior to issuance of a permit and at least every five years thereafter.

In agreement with some comments raised concerning mechanical integrity tests every five years, the ADPC&E UIC program also requires a radioactive tracer survey to be run once every two years and that pressure tests be run on each

well annually as well as after each workover and shut-down of each well in excess of 30 days. The program will require that a variable density log, a cement bond log, a radioactive tracer survey, a noise and/or temperature log, and a pressure test be run on each well every five years to demonstrate mechanical integrity. These and all well records are made available to the ADPC&E upon request. In addition, the wells, the monitoring instrumentation, and the plant monitoring records shall be checked at least once every two months during routine unannounced inspections by the Department. If any problems do occur, the Department shall be notified immediately and the well with the problem will be shut-in if necessary and not allowed to operate until the problem has been corrected to the satisfaction of the Department.

Ethyl also has three Sparta water wells in place that are utilized as monitoring wells. Each of these wells are located in the immediate vicinity of the injection wells and are continuously pumped. In the unlikely event of a leak, any released contaminants from the injection wells would be detected in one of these wells first. These three wells are used by Ethyl for potable and process water. Ethyl obviously has a vested interest in not allowing any groundwater contamination to occur.

The ADPC&E feels that the above procedures will adequately demonstrate that the wells are mechanically sound and will ensure that contaminants will be prevented from entering drinking water formations.

Comment 17

Who will be financially liable if Magnolia's drinking water is contaminated by Ethyl's waste systems?

If Magnolia's drinking water is found to be contaminated, further regulatory agency investigations and/or the state and federal courts will determine who is responsible and financially liable at that time.

Comment 18

The well water sample submitted to the Department at the public hearing.

A sample of well water was submitted at the public hearing as evidence of groundwater contamination caused by the Ethyl Corporation. As the gentleman who submitted the sample knows, his father-in-law's well is in a shallow formation of gypsum (calcium sulfate). His well water and that of 13 other Ethyl neighbors were analyzed by Hugh Johnson and Associates of Magnolia, Arkansas in a study completed in mid-1981. No evidence of salt water contamination was found in any of the wells. Additionally, Ethyl's, the City of Magnolia's, and other neighbors' well water were tested by the Arkansas Department of Health. No evidence of contamination by EDB or other constituents attributable to Ethyl's operation have been found in any well water tested.

Comment 19

Did your Department really deny the young women, (Ms. Ruhl, Ms. Culver, and Ms. Frase) who were seeking data on Ethyl, the use of your phones? Did you call Ethyl and tell them they should get their act together? If so, why?

The ADPC&E does not allow private citizens to make long distance calls on state

telephones. Nevertheless, no denial for local calls nor any such contact with Ethyl occurred.

Comment 20

Ethyl Corporation is a RCRA facility and must comply with RCRA Standards

Ethyl Corporation injects a wastestream considered to be hazardous due to high pH and arsenic content under the provisions of authorization by rule found in 40 CFR 144.21. Under this rule, existing Class I injection wells, both hazardous and nonhazardous, can continue to inject until a final UIC permit is issued. Once a permit is issued, Ethyl Corporation will be considered to have a "permit by rule" under RCRA (see 40 CFR 270.60) and no RCRA permit will be required. In the meantime, while Ethyl's UIC permit is being processed, Ethyl must comply with the provisions of 40 CFR Part 265, in particular 40 CFR 265 Subpart J with respect to management of wastes in tanks and Subpart R for underground injection. This requirement applies to treatment, storage, and disposal facilities under interim status and also to generators of hazardous waste under the provisions of 40 CFR 262.34 (accumulation of hazardous waste for periods less than 90 days). In addition to Subpart J, Ethyl must also comply with the provisions of 40 CFR Part 265 relating to general facility standards. At this writing, records and injection checklists indicate that Ethyl Corporation is in compliance with RCRA and UIC standards.

The Hazardous and Solid Waste Amendment of 1984 (HSWA) has added some additional requirements to the standards for UIC facilities injecting hazardous waste. Among these are certifications by the facility of compliance with 40 CFR 144.28(d) and 144.28(g) relating to financial assurance and monitoring requirements. If a UIC permit incorporating the provisions of 40 CFR 264.101 is not issued prior to November 8, 1985, Ethyl must make a certification of compliance with the two standards referred to above. Based on information on file at the Department under Ethyl's Authorization by Rule, Ethyl is in compliance with the above requirements, having installed a system for monitoring Underground Sources of Drinking Water (USDW) and executed a Surety Bond for plugging and abandonment.

One commenter expressed considerable concern for the corrective action requirements for HSWA, which states that before a RCRA permit can be issued, a facility must identify all past and continuing releases of hazardous wastes or constituents from solid waste management units and, if necessary, provide a plan for remedial action. Regulations implementing this Corrective Action requirement were published on July 15, 1985 but have not yet been adopted as state regulations as of this writing. When the required rulemaking is completed and the State is authorized to implement the new HSWA Amendments, necessary changes will be made to the permit.

ATTACHMENT II
AMENDMENTS TO DRAFT PERMIT

Based upon comments received during the public comment period, information presented at the public hearing, and comments received after the public hearing, the Department is making the following additions or changes to draft permit 4-U:

A. General Comment:

The Department has decided not to permit WDW #6 and has instructed the Permittee to cease utilizing this well. It will be plugged and abandoned on a schedule submitted by Ethyl and in a manner approved by the ADPC&E.

Reason:

In order to operate WDW #6 for the purpose proposed in the permit application, Ethyl must violate 40 CFR 146.13(a)(1).

B. Permit Condition II.A.4.(a)(1)

Change to read:

4. Casing and Cementing

(a) For new UIC wells, the wells shall be cased and cemented as follows, or as necessary to prevent the movement of fluids into or between underground sources of drinking water:

(1) The permittee shall set and cement casings to minimum subsurface depths as follows:

Well #	Surface Casing	Long String Casing
WDW #1	169 ft.	3198 ft.
WDW #2	1200 ± ft.	4650 ± ft.
WDW #13	1266 ft.	8670 ft.

Reason:

The depth to which surface casing would be set as proposed for WDW #2 in the permit application was 1500 ± feet. Ethyl subsequently proposed that 1200 ± feet of surface casing would be sufficient since the base of usable quality drinking water at the plant site is at a depth of approximately 1100-1150 feet. WDW #6 was removed from this list of specifications for the reason given in A. above.

C. Permit Condition II.A.4(a)(2)

Change to read:

(2) Cementing shall be by the following method with cement used to fill the annular space between the hole and casings to the surface:

Well #	Cementing Method	Type and Grade of Cement
WDW #1	Circulation to surface	Surface Casing - Class A + 2% $CaCl_2$ Long String - Class "H"
WDW #2	Circulation to surface	Class "H"
WDW #13	Circulation to surface	50/50 Pozmix/Lite

Reason:

WDW #6 was removed from this list of specifications for the reason given in A. above.

D. Permit Condition II.A.4.(a)(4)

Change to read:

(4) Waste fluids shall be injected through tubing with a packer set immediately above the injection zone. The tubing and packer shall be designed for the expected service. Tubing and packer specifications shall be maintained as follows:

Well #	Tubing Specifications	Packer Specifications
WDW #1	5 1/2" set at 2991 ft.	TIW set at 2991 ft.
WDW #2	4 1/2" carbon steel (proposed) set at 4500 ± ft.	4 1/2" x 7 (proposed) set at 4500 ± ft.
WDW #13	4 1/2" (proposed) set at 7373 ft.	4 1/2" x 9 5/8" (proposed) TIW set at 7373 ft.

Reason:

The Department received minor corrections of the original draft permit from Ethyl after the draft permit was placed on public

notice. WDW #6 was removed from this list of specifications for the reason given in A. above.

E. Permit Condition II.B.2.(a)

Change to read:

(a) The maximum point at which a well penetrates the injection formation shall not unreasonably vary from the vertical drawn from the center of the borehole at the surface. Deviation in excess of three degrees from the vertical drawn from the center of the borehole at the surface shall be deemed to be unreasonable. Deviation checks on the hole shall be performed at sufficiently frequent intervals, depending on the lithology of the strata being penetrated to assure that vertical avenues for fluid migration are not created during drilling.

Reason:

The wording of the original draft permit was changed because deviation checks by first drilling a pilot hole and then enlarging the hole by reaming is technologically out-dated, and very expensive.

F. Permit Condition II.B.2.(b)(ii)

Change to read:

(ii) Cement bond log, variable density log, noise and/or temperature log, and a pressure test after the casing is set and cemented.

Reason:

The mechanical integrity logging and testing requirements of the ADPC&E UIC program have been upgraded since the time the draft permit was distributed for public comment.

G. Permit Condition II.B.2.(c)(ii)

Change to read:

(ii) Cement bond log, variable density log, radioactive tracer survey, noise and/or temperature log, and a pressure test after the casing is set and cemented.

Reason:

Same as F. above.

H. Permit Condition II.B.2(d)

Change to read:

(d) For either II.B.2.(b)(ii) or (c)(ii) above, if mechanical integrity tests indicate that the cement job is poor in a particular zone and that fluid movement may occur behind the

casing, then a squeeze job or other method approved by the Director shall be employed to properly seal off this zone. Following a squeeze job, the Permittee must run a cement bond log, a variable density log, and a noise and/or temperature log through the interval from 100 feet above to 100 feet below the squeezed zone. A pressure test must also be conducted to ensure the integrity of the squeeze job. A report discussing the results of the squeeze job and subsequent mechanical integrity tests must be submitted to the Department within 30 days. Approval must be received from the Department before injection operations may resume.

Reason:

Same as F. above.

I. Permit Condition II.B.5.(b)

Change to read:

(b) Prior to performing the injectivity tests above, bottom-hole pressure, bottom-hole temperature, fracture pressure, static fluid level, flow direction, and flow velocity shall be determined and a representative sample of formation water from each of the proposed injection formations obtained and analyzed. This analysis shall, in part, consist of TOC (total organic carbon), TOX (total organic halogen), pH, specific conductivity, specific gravity and total chlorides. Samples of formation water from the Tokio Formation and the James Limestone shall be collected for compatibility testing. The compatibility tests shall at a minimum consist of the following:

(1) Mixing formation water from the Tokio Formation with individual wastestream samples designated for WDW #1, WDW #2, and WDW #13;

(2) Mixing formation water from the Tokio Formation with every possible combination of mix of the wastestream samples designated for WDW #1, WDW #2, and WDW #13;

(3) Mixing formation water from the James Limestone with individual wastestream samples designated for WDW #2 and WDW #13; and

(4) Mixing formation water from the James Limestone with every possible combination of mix of the wastestream samples designated for WDW #2 and WDW #13. These tests involving mixing of formation water and wastestream fluid should all be conducted under conditions as similar to those existing in the actual formations as possible. Compatability testing of the actual formation materials shall also be conducted in a similar fashion introducing the different formation material samples to all of the possible combinations of wastestream samples designated for WDW #1, WDW #2, and WDW #13. These should also be conducted under conditions as similar to those existing in the actual formations as

possible.

Reason:

Several of the actual reservoir properties of some of the proposed injection zones are presently unknown. The drilling of WDW #2 is an excellent opportunity to obtain this information and assure compatibility between the wastestream and the formations and formation fluids.

J. Permit Condition II.D.1.

Change to read:

1. Waste to be Injected

Wastes not authorized to be stored, processed, or otherwise handled in associated surface waste handling facilities are not authorized for injection. Until July 1, 1987 the Permittee is authorized to inject the following wastestreams (see condition III.C.2.):

WDW #1 - aqueous waste from DETCP process. This material is hazardous due to arsenic content and high pH.

WDW #2 - Contaminated process water. Additionally, WDW #2 will be used as a back-up for WDW #1 if necessary, to inject aqueous waste from DETCP process.

WDW #13- Contaminated process water.

Reason:

WDW #6 was removed from this list of specifications for the reason given in A. above.

K. Permit Condition II.D.2.

Change to read:

2. Operation Requirements

The Permittee shall ensure that the following requirements are met:

Reason:

The figure "14/13" under the pH (max/min) column was a typo and was changed to "14/3". The reason for the changes in the annular fluid column is that the Department received minor corrections of the original draft permit from Ethyl after the draft permit was placed on public notice. WDW #6 was removed from this list of specifications for the reason given in A. above.

L. Permit Condition II.D.3.

Change to read:

3. Instrumentation

The Permittee shall ensure that the following instrumentation is installed and maintained to monitor the annular space:

Well #	Type of Instrumentation
WDW #1, WDW #2, & WDW #13	atmospheric pressure annular space monitoring system

Reason:

WDW #6 was removed from this list of specifications for the reason given in A. above.

M. Permit Condition II.D.4.

Change to read:

4. Parameters to be Measured

The following parameters shall be measured for well number(s) WDW #1, WDW #2 and WDW #13 with an appropriate continuous recording device housed in a weatherproof enclosure:

(a) Injection pressure
(b) Injection rate
(c) Injection volume
(d) Annulus pressure (Head tank level)
(e) Injection fluid temperature
(f) Annular fluid pH

Reason:

WDW #6 was removed from this list of specifications for the reason given in A. above.

N. Permit Condition II.D.5.

Change to read:

5. Mechanical Integrity

Mechanical integrity shall be demonstrated upon well completion and thereafter once every five years for the life of the well. The demonstration of mechanical integrity consists of the running of a cement bond log, a variable density log, a noise

and/or temperature log, a radioactive tracer survey, and a pressure test. These results will be submitted to the Department along with an interpretive analysis by the log analyst from the company that ran the tests. Also, the well must pass a radioactive tracer survey once every two years and a pressure test at least once a year, after each workover, and after each shut-down of the well in excess of 30 days. Results from the continuous monitoring of each well must also be submitted to the Department once a month. Mechanical integrity must be demonstrated to the satisfaction of the Director in accordance with 40 CFR 146.08 and within the guidelines established by the Department.

Reason:

Mechanical integrity tests every five years is a minimum frequency for the life of the well set forth in 40 CFR 146.13(b)(3). The ADPC&E feels that complete mechanical integrity testing, including pressure tests and logging requirements, every five years is adequate. However, as an additional safeguard, the Department has established guidelines, and shall require as part of our final UIC permit, that the Permittee conduct pressure tests annually and radioactive tracer surveys once every two years at a minimum.

O. Permit Condition II.F.1.

Change to read:

1. Plugging and Abandonment Plan

Upon final abandonment of the well, the Permittee shall ensure that the well is plugged in accordance with the approved plugging and abandonment plan submitted with the application, and hereinafter made a condition of this permit. Prior to plugging, the Permittee must give the Department notification of intent to plug, and the mechanical integrity of the well shall be verified by a program approved by the Director. Any proposed changes of plugging and abandonment plans must be approved by the Director after the Permittee demonstrates that the changes will provide protection equivalent to or greater than the original design criteria and standards. Changes of plugging and abandonment plans shall be treated as a minor modification of the permit under 40 CFR 144.41(g).

Reason:

A member of the Department staff with a knowledge of the State UIC program will be on site to witness the plugging of all Class I injection wells.

P. Permit Condition II.F.2.

Change to read:

2. Financial Assurance

The Permittee shall secure and maintain in full force and effect at all times a performance bond in a form acceptable to the Director, to provide for proper closing, plugging and abanonment

of the permitted waste disposal well(s) in the amount set forth below. The amount of financial assurance may, upon approval of the Director, be altered at a future date to provide for plugging subject to prevailing general economic conditions. This permit does not authorize underground injection of fluids unless the Permittee has in effect a performance bond acceptable to the Director.

Well #	Amount of Financial Assurance
WDW #1	$20,000
WDW #2	$20,000
WDW #13	$20,000
	$60,000

Reason:

WDW #6 was removed from this list of specifications for the reason given in A. above.

Q. Permit Condition III.C.1.

Add new condition as follows:

The Permittee shall, as an alternative to performing a squeeze job on WDW #1, as requested in a letter to the Department dated, June 25, 1985, cement the present injection tubing in place by circulating cement to the surface. The Permittee shall then install a new smaller injection tubing and packer and demonstrate the mechanical integrity of WDW #1 to the satisfaction of the Director. Any other alternative(s) to performing a squeeze job on WDW #1 must be approved by the Director. The Permittee shall also submit a schedule for this and any other major workovers of the Permittee's Class I waste disposal wells to the Director, well in advance, so that a representative of the Department UIC Program may be on site to witness such workovers.

Reason:

The Department decided, based on an interpretation of the cement bond log for WDW #1, that a squeeze job, or an alternative to a squeeze job as approved by the Director, was necessary.

R. Permit Condition III.C.2.

Add new condition as follows:

The permittee shall eliminate injection of organic constituents according to the following schedule:

January 1, 1986 - Submit preliminary engineering report on wastewater treatment alternatives.

March 1, 1986 - Submit a permit application for the construction of the process wastewater treatment system.

July 1, 1986 - Enter into sufficient financial commitments to obtain the necessary equipment and begin construction.

January 1, 1987 - Begin shakedown and operational checks.

July 1, 1987 - Commence full scale operations of the process wastewater treatment system.

Reason:

The Department believes that the wastestream for WDW #1 is treatable. The hazardous constituents in the wastestreams of all underground injection wells should be reduced to an absolute minimum volume so as to minimize or, if possible, eliminate the risk of contamination of underground sources of usable quality water. The treatment of wastestreams for the removal of their hazardous constituents should result in the eventual elimination of hazardous waste injection wells.

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE P.O BOX 9583
LITTLE ROCK, ARKANSAS 72209

PHONE: (501) 562-7444

October 10, 1985

Mr. E. W. Henry
Plant Manager
Ethyl Corporation
Post Office Box 729
Magnolia, Arkansas 71753

Dear Mr. Henry:

The following is in response to your September 20, 1985 request for clarification of various conditions in Ethyl's UIC Permit #4-U:

1) Item II.D.4.(f) - The Department is aware that the annular fluid pH is not monitored by a continuous monitoring device, but that Ethyl, instead, samples and analyzes the annular fluid for pH manually twice per day, and submits the results to the Department in their monthly well operation monitoring report. The Department has no objection to this procedure.

2) Item II.E.2. - Ethyl currently analyzes each batch (approximately 1,000 gallons) of injection fluid for percent caustic prior to injection. This information shall be incorporated into the monthly well operation monitoring report as maximum, minimum, and average monthly values for percent caustic. Also, the well operation monitoring report shall continue to be submitted to the Department monthly rather than quarterly as stated in II.E.1.(b) and II.E.2.(b) of the permit. II.E.2.(a) and (b) may be translated to read:

(a) The Permittee shall analyze injected fluids at lease every day (unless no product is made and thus no waste is being generated) and submit written documentation to the Director monthly;

(b) The Permittee shall submit monthly reports for II.E.2.(b)(i) and (ii) (within twenty (20) days after the end of the month) to the Director on the following:

(i) . . .

(ii) . . .

(iii) . . .

Please keep a copy of this letter of clarification with your UIC permit for future reference. If you have any further questions concerning permit conditions or details, please contact David Thomas at (501) 562-7444, extension 625.

Sincerely,

John D. Ward
Manager
Permits Branch

O.T.
~~JDW~~/pa

cc: Robert E. Blanz, PH.D., Deputy Director, Program Operations
David Thomas, Geologist, Land Disposal Section
Warren Finch, Inspector II, CTA Branch
Ray Quick, UIC Coordinator, Water Division
Wayne Mitchell, Ethyl Corporation

14-0028

#7

SEP 23 1985

Dick/Harold T.

CHEMICALS GROUP
BROMINE CHEMICALS DIVISION

P. O. BOX 729
MAGNOLIA, ARKANSAS 71753
TELEPHONE 501-547-2211
501-234-2065

September 20, 1985

Mr. John Ward, Manager Permits Branch
Arkansas Department of Pollution Control and Ecology
P. O. Box 9583
Little Rock, Arkansas 72209

Dear Mr. Ward:

This letter is in regard to Ethyl's recently issued UIC Permit #4-U. Several additions and changes were made since the public comment period. Please respond to the following points which differ from the original draft permit.

First, on page 14, section II.D.4f, continuous monitoring of annular fluid pH was added. Ethyl currently monitors annular fluid pH on a twice daily basis and wishes to continue to do so. This matter was previously discussed at length with Department personnel during mid-1984 and the present sampling system was the result of those discussions.

Second, on page 15, section II.E.2, there are several references to injection fluid analysis. Please clarify what analytical the Department expects. Additionally, we currently submit a monthly report showing all the data requested in the quarterly report specified in the permit. Do we need to change to a quarterly reporting period or is the current system sufficient?

If there are any questions, please contact me at 501-547-2211.

Sincerely,

O. W. Mitchell
Technical Services Engineer

OWM/wl
(0053e)

ENVIRONMENTAL PROTECTION AGENCY PERMIT REGULATIONS FOR THE UNDERGROUND INJECTION CONTROL PROGRAM

(40 CFR 144; 48 FR 14153, April 1, 1983; Amended by 48 FR 39619, September 1, 1983)

PART 144—UNDERGROUND INJECTION CONTROL PROGRAM

Subpart A—General Provisions

Subpart B—General Program Requirements

Subpart C Authorization of Underground Injection by Rule

Subpart D—Authorization by Permit

Subpart E—Permit Conditions

Authority: Pub. L. 93–523, as amended by Pub. L. 95–190, Pub. L. 96–63 and Pub. L. 96–502; 42 USC 300f *et seq.*

Subpart A—General Provisions

§ 144.1 Purpose and scope of Part 144.

(a) *Contents of Part 144.* The regulations in this Part set forth requirements for the Underground Injection Control (UIC) Program promulgated under Part C of the Safe Drinking Water Act (SDWA) (Pub. L. 95–523, as amended by Pub. L. 95–190; 42 U.S.C. 300f et seq.) and, to the extent that they deal with hazardous waste, the Resource Conservation and Recovery Act (RCRA) (Pub. L. 94–580, as amended by Pub. L. 95–609, Pub. L. 96–510; 42 U.S.C. 6901 et seq.). They apply to EPA, and to approved States to the extent set forth in Part 145.

(b) *Authority.*

(1) Section 1421 of SDWA requires the Administrator to promulgate regulations establishing minimum requirements for effective UIC programs.

(2) Section 1422 of SDWA requires the Administrator to list in the Federal Register "each State for which in his judgment a State underground injection control program may be necessary to assure that underground injection will not endanger drinking water sources" and to establish by regulation a program for EPA administration of UIC programs in the absence of an approved State program in a listed State.

(3) Section 1423 of SDWA provides procedures for EPA enforcement of UIC requirements.

(4) Section 1431 authorizes the Administrator to take action to protect the health of persons when a contaminant which is present in or may enter a public water system may present an imminent and substantial endangerment to the health of persons.

(5) Section 1445 of SDWA authorizes the promulgation of regulations for such recordkeeping, reporting, and monitoring requirements "as the Administrator may reasonably require * * * to assist him in establishing regulations under this title" and a "right of entry and inspection to determine compliance with this title including for this purpose, inspection, at a reasonable time, of records, files, papers, processes, controls, and facilities * * *."

(6) Section 1450 of SDWA authorizes the Administrator "to prescribe such regulations as are necessary or

10-14-83 Published by THE BUREAU OF NATIONAL AFFAIRS, INC., Washington, D.C. 20037

appropriate to carry out his functions" under SDWA.

(c) *Overview of the UIC program.* An UIC program is necessary in any State listed by EPA under section 1422 of the SDWA. Because all States have been listed, the SDWA requires all States to submit an UIC program within 270 days after July 24, 1980, the effective date of 40 CFR Part 146, which was the final element of the UIC minimum requirements to be originally promulgated, unless the Administrator grants an extension, which can be for a period not to exceed an additional 270 days. If a State fails to submit an approvable program, EPA will establish a program for that State. Once a program is established, SDWA provides that all underground injections in listed States are unlawful and subject to penalties unless authorized by a permit or a rule. This Part sets forth the requirements governing all UIC programs, authorizations by permit or rule and prohibits certain types of injection. The technical regulations governing these authorizations appear in 40 CFR Part 146.

(d) *Structure of the UIC Program.*

(1) *Part 144.* This part sets forth the permitting and other program requirements that must be met by UIC Programs, whether run by a State or by EPA. It is divided into the following subparts:

(i) Subpart A describes general elements of the program, including definitions and classifications.

(ii) Subpart B sets forth the general program requirements, including the performance standards applicable to all injection activities, basic elements that all UIC programs must contain, and provisions for waiving permit of rule requirements under certain circumstances.

(iii) Subpart C sets forth requirements for wells authorized by rule.

(iv) Subpart D sets forth permitting procedures.

(v) Subpart E sets forth specific conditions or types of conditions, that must, at a minimum be included in all permits.

(2) *Part 145.* While Part 144 sets forth minimum requirements for all UIC Programs, these requirements are specifically indentified as elements of a State application for primacy to administer an UIC Program in Part 145. Part 145 also sets forth the necessary elements of a State submission and the procedural requirements for approval of State programs.

(3) *Part 124.* The public participation requirements that must be met by UIC Programs, whether administered by the State or by EPA, are set forth in Part 124. EPA must comply with all Part 124 requirements; State administered programs must comply with Part 124 as required by Part 145. These requirements carry out the purposes of the public participation requirement of 40 CFR Part 25 (Public Participation), and supersede the requirements of that Part as they apply to the UIC Program.

(4) *Part 146.* This part set forth the technical criteria and standards that must be met in permits and authorizations by rule as required by Part 144.

(e) *Scope of the Permit or Rule Requirement.*

The UIC Permit Program regulates underground injections by five classes of wells (see definition of "well injection," § 144.3). The five classes of wells are set forth in § 144.6. All owners or operators of these injection wells must be authorized either by permit or rule by the Director. In carrying out the mandate of the SDWA, this subpart provides that no injection shall be authorized by permit or rule if it results in the movement of fluid containing any contaminant into Underground Sources of Drinking Water (USDWs—see § 144.3 for definition), if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 142 or may adversely affect the health of persons (§ 144.12). Existing Class IV wells which inject hazardous waste directly into an underground source of drinking water are to be eliminated over a period of six months and new such Class IV wells are to be prohibited (§ 144.13). Class V wells will be inventoried and assessed and regulatory action will be established at a later date.

In the meantime, if remedial action appears necessary, an individual permit may be required (§ 144.25) or the Director must require remedial action or closure by order (§ 144.12(c)). During UIC program development, the Director may identify aquifers and portions of aquifers which are actual or potential sources of drinking water. This will provide an aid to the Director in carrying out his or her duty to protect all USDWs. An aquifer is a USDW if it fits the definition, even if it has not been "identified." The Director may also designate "exempted aquifers" using criteria in § 146.04. Such aquifers are those which would otherwise qualify as "underground sources of drinking water" to be protected, but which have no real potential to be used as drinking water sources. Therefore, they are not USDWs. No aquifer is an "exempted aquifer" until it has been affirmatively designated under the procedures in § 144.7. Aquifers which do not fit the definition of "underground sources of drinking water" are not "exempted aquifers." They are simply not subject to the special protection afforded USDWs.

(1) *Specific inclusions.* The following wells are included among those types by injection activities which are covered by the UIC regulations. (This list is not intended to be exclusive but is for clarification only.)

(i) Any injection well located on a drilling platform inside the State's territorial waters.

(ii) Any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is emplacement of fluids.

(iii) 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

(iv) Any septic tank, cesspool, or other well used by a multiple dwelling, community, or Regional system for the injection of wastes.

(2) Specific exclusions. The following are not covered by these regulations:

(i) Injection wells located on a drilling platform or other site that is beyond the State's territorial waters.

(ii) Individual or single family residential waste disposal systems such as domestic cesspools or septic systems.

(iii) Non-residential cesspools, septic systems or similar waste disposal systems if such systems (A) are used solely for the disposal of sanitary waste, and (B) have the capacity to serve fewer than 20 persons a day.

(iv) Injection wells used for injection of hydrocarbons which are of pipeline quality and are gases at standard temperature and pressure for the purpose of storage.

(v) Any dug hole which is not used for emplacement of fluids underground.

(3) The prohibition applicable to Class IV wells under § 144.13 does not apply to injections of hazardous wastes into aquifers or portions thereof which have been exempted pursuant to § 146.04.

§ 144.2 Promulgation of Class II Programs for Indian Lands.

Notwithstanding the requirements of this Part or Parts 124 and 146 of this chapter, the Administrator may promulgate an alternate UIC Program for Class II wells on any Indian reservation or Indian lands. In promulgating such a program the Administrator shall consider the following factors:

(a) The interest and preferences of the tribal government having responsibility for the given reservation or Indian lands;

(b) The consistency between the alternate program and any program in effect in an adjoining jurisdiction; and

(c) Such other factors as are necessary and appropriate to carry out the Safe Drinking Water Act.

§ 144.3 Definitions.

Terms not defined in this section have the meaning given by the appropriate Act. When a defined term appears in a definition, the defined term is sometimes placed within quotation marks as an aid to readers.

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions or modifications to the forms; or forms approved by EPA for use in approved States, including any approved modifications or revisions.

Appropriate Act and regulations means the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), or Safe Drinking Water Act (SDWA), whichever is applicable, and applicable regulations promulgated under those statutes.

Approved State Program means a State UIC program administered by the State that has been approved by EPA according to SDWA § 1422.

Aquifer means a geological "formation," group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

Area of Review means the area surrounding an injection well described according to the criteria set forth in § 146.06 or in the case of an area permit, the project area plus a circumscribing area the width of which is either ¼ of a mile or a number calculated according to the criteria set forth in § 146.06.

Contaminant means any physical, chemical, biological, or radiological substance or matter in water.

Director means the Regional Administrator, the Administrator of EPA, or the State Director, as the context requires, or an authorized representative. When there is no approved State program, and there is an EPA administered program, "Director" means the Regional Administrator. When there is an approved State program, "Director" normally means the State Director.

In some circumstances, however, EPA retains the authority to take certain actions even when there is an approved State program. In such cases, the term "Director" means the Regional Administrator and not the State Director.

Draft permit means a document prepared under § 124.6 indicating the Director's tentative decision to issue or deny, modify, revoke and reissue, terminate, or reissue a "permit." A notice of intent to terminate a permit, and a notice of intent to deny a permit, as discussed in § 124.5 are types of "draft permits." A denial of a request for modification, revocation and reissuance, or termination, as discussed in § 124.5 is not a "draft permit."

Drilling mud means a heavy suspension used in drilling an "injection well," introduced down the drill pipe and through the drill bit.

Emergency permit means a UIC "permit" issued in accordance with § 144.34.

Environmental Protection Agency ("EPA") means the United States Environmental Protection Agency.

EPA means the United States "Environmental Protection Agency."

Exempted aquifer means an "aquifer" or its portion that meets the criteria in the definition of "underground source of drinking water" but which has been exempted according to the procedures in § 144.7.

Existing injection well means an "injection well" other than a "new injection well."

Facility or activity means any UIC "injection well," or an other facility or activity that is subject to regulation under the UIC program.

Fluid means any material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.

Formation means a body of consolidated or unconsolidated rock characterized by a degree of lithologic homogeneity which is prevailingly, but not necessarily, tabular and is mappable on the earth's surface or traceable in the subsurface.

Formation fluid means "fluid" present in a "formation" under natural conditions as opposed to introduced fluids, such as "drilling mud."

Generator means any person, by site location, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261.

Ground water means water below the land surface in a zone of saturation.

Hazardous waste means a hazardous waste as defined in 40 CFR 261.3.

Hazardous Waste Management facility ("HWM facility") means all contiguous land, and structures, other appurtenances, and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (for example, one or more landfills, surface impoundments, or combinations of them).

HWM facility means "Hazardous Waste Management facility."

Injection well means a "well" into which "fluids" are being injected.

Injection zone means a geological "formation" group of formations, or part of a formation receiving fluids through a "well."

Interstate agency means an agency of two or more States established by or under an agreement or compact approved by the Congress, or any other agency of two or more States having substantial powers or duties pertaining to the control of pollution as determined and approved by the administrator under the "appropriate Act and regulations."

Major facility means any UIC "facility or activity" classified as such by the Regional Administrator, or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director.

Manifest means the shipping document originated and signed by the "generator" which contains the

information required by Subpart B of 40 CFR Part 262.

New injection wells means an "injection well" which began injection after a UIC program for the State applicable to the well is approved or prescribed.

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the UIC program.

Permit means an authorization, license, or equivalent control document issued by EPA or an approved State to implement the requirements of this Part. Parts 145, 146 and 124. "Permit" includes an area permit (§ 144.33) and an emergency permit (§ 144.34). Permit does not include UIC authorization by rule (§ 144.21), or any permit which has not yet been the subject of final agency action, such as a "draft permit."

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Plugging means the act or process of stopping the flow of water, oil or gas into or out of a formation through a borehole or well penetrating that formation.

Project means a group of wells in a single operation.

Radioactive Waste means any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR Part 20, Appendix B, Table II, Column 2.

RCRA means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Pub. L. 94–580, as amended by Pub. L. 95–609, Pub. L. 96–510, 42 U.S.C. 6901 et seq.).

Regional Administrator means the Regional Administrator of the appropriate Regional Office of the Environmental Protection Agency or the authorized representative of the Regional Administrator.

Schedule of compliance means a schedule of remedial measures included in a "permit," including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with the "appropriate Act and regulations."

SDWA means the Safe Drinking Water Act (Pub. L. 93–523, as amended by Pub. L. 96–502, 42 U.S.C. 300f et seq.).

Site means the land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands and the Commonwealth Northern Mariana Islands.

State Director means the chief administrative officer of any State or interstate agency operating an approved program, or delegated representative of the State Director. If responsibility is divided among two or more State or interstate agencies, "State Director" means the chief administrative officer of the State or interstate agency authorized to perform the particular procedure or function to which reference is made.

State/EPA Agreement means an agreement between the Regional Administrator and the State which coordinates EPA and State activities, responsibilities and programs.

Stratum (plural strata) means a single sedimentary bed or layer, regardless of thickness, that consists of generally the same kind of rock material.

Total dissolved solids means the total dissolved (filterable) solids as determined by use of the method specified in 40 CFR Part 136.

UIC means the Underground Injection Control program under Part C of the Safe Drinking Water Act, including an "approved State program."

Underground injection means a "well injection."

Underground source of drinking water (USDW) means an aquifer or its portion:

(a)(1) Which supplies any public water system; or

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

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

(ii) Contains fewer than 10,000 mg/l total dissolved solids; and

(b) Which is not an exempted aquifer.

USDW means "underground source of drinking water."

Well means a bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension.

Well injection means the subsurface emplacement of "fluids" through a bored, drilled, or driven "well;" or through a dug well, where the depth of the dug well is greater than the largest surface dimension.

§ 144.4 Considerations under Federal law.

[144.4 introductory paragraph revised by 48 FR 39619, September 1, 1983]

The following is a list of Federal laws that may apply to the issuance of permits under these rules. When any of these laws is applicable, its procedures must be followed. When the applicable law requires consideration or adoption of particular permit conditions or requires the denial of a permit, those requirements also must be followed.

(a) The *Wild and Scenic Rivers Act*, 16 U.S.C. 1273 et seq. Section 7 of the Act prohibits the Regional Administrator from assisting by license or otherwise the construction of any water resources project that would have a direct, adverse effect on the values for which a national wild and scenic river was established.

(b) *The National Historic Preservation Act of 1966*, 16 U.S.C. 470 et seq. Section 106 of the Act and implementing regulations (36 CFR Part 800) require the Regional Administrator, before issuing a license, to adopt measures when feasible to mitigate potential adverse effects of the licensed activity and properties listed or eligible for listing in the National Register of Historic Places. The Act's requirements are to be implemented in cooperation with State Historic Preservation Officers and upon notice to, and when appropriate, in consultation with the Advisory Council on Historic Preservation.

(c) The *Endangered Species Act*, 16 U.S.C. 1531 *et seq.* Section 7 of the Act and implementing regulations (50 CFR Part 402) require the Regional Administrator to ensure, in consultation with the Secretary of the Interior or Commerce, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

(d) *The Coastal Zone Management Act*, 16 U.S.C. 1451 *et seq.* Section 307(c) of the Act and implementing regulations (15 CFR Part 930) prohibit EPA from issuing a permit for an activity affecting land or water use in the coastal zone until the applicant certifies that the proposed activity complies with the State Coastal Zone Management program, and the State or its designated agency concurs with the certification (or the Secretary of Commerce overrides the State's nonconcurrence).

(e) *The Fish and Wildlife Coordination Act*, 16 U.S.C. 661 *et seq.*,

requires the Regional Administrator, before issuing a permit proposing or authorizing the impoundment (with certain exemptions), diversion, or other control or modification of any body of water, consult with the appropriate State agency exercising jurisdiction over wildlife resources to conserva these resources.

(f) *Executive orders* [Reserved.]

§ 144.5 Confidentiality of information.

(a) In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA mey make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

(b) Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;

(2) Information which deals with the existence, absence, or level of contaminants in drinking water.

§ 144.6 Classification of wells.

Injection wells are classified as follows:

(a) *Class I*

(1) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water.

(2) Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

(b) *Class II.* Wells which inject fluids:

(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integal part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

(2) For enhanced recovery of oil or natural gas; and

(3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

(c) *Class III.* Wells which inject for extraction of minerals including:

(1) Mining of sulfur by the Frasch process;

(2) In situ production of uranium or other metals; this category includes only in-situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included n Class V.

(3) Solution mining of salts or potash.

(d) *Class IV*

(1) Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste into e formation which within one-quarter (¼) mile of the well contains an underground source of drinking water.

(2) Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste above a formation which within one-quarter (¼) mile of the well contains an underground source of drinking water.

(3) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to dispose of hazardous waste, which cannot be classified under paragraphs (a)(1) or (d) (1) and (2) of this section (e.g., wells used to dispose of hazardous waste into or above a formation which contains an aquifer which has been exempted pursuant to § 146.04).

(e) *Class V.* Injection wells not included in Classes I, II, III, or IV.

§ 144.7 Identification of underground sources of drinking water and exempted aquifers.

(a) The Director may identify (by narrative description, illustrations, maps, or other means) and shall protect, except where exempted under paragraph (b) of this section, as an underground source of drinking water, all aquifers or parts of aquifers which meet the definition of an "underground source of drinking water" in § 144.3. Even if an aquifer has not been specifically identified by the Director, it is an underground source of drinking water if it meets the definition in § 144.3.

(b)(1) the Director may identify (by narrative description, illustrations, maps, or other means) and describe in geographic and/or geometric terms (such as vertical and lateral limits and gradient) which are clear end definite, all aquifers or parts thereof which the Director proposes to designate as exempted aquifers using the criteria in 40 CFR 146.04.

(2) No designation of an exempted aquifer submitted as part of a UIC Program shall be final until approved by the Administrator as part of a UIC program.

(3) Subsequent to program approval or promulgation, the Director may, after notice and opportunity for a public hearing, identify additional exempted aquifers. For approved State programs exemption of aquifers identifed (i) under § 146.04(b) shall be treated as a program revision under § 145.32; (ii) under § 146.04(c) shall become final if the State Director submits the exemption in writing to the Administrator and the Administrator has not disapproved the designation within 45 days. Any disapproval by the Administrator shall state the reasons and shall constitute final Agency action for purposes of judicial review.

(c)(1) For Class III wells, the Director shall require an applicant for a permit which necessitates an aquifer exemption under § 146.04(b)(1) to furnish the data necessary to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing. Information contained in the mining plan for the proposed project, such as a map and general description of the mining zone, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining method, and a time-table of planned development of the mining zone shall be considered by the Director in addition to the information required by § 144.31(g).

(2) For Class II wells, a demonstration of commercial producibility shall be made as follows:

(i) For a Class II well to be used for enhanced oil recovery processes in a field or project containing aquifers from which hydrocarbons were previously produced, commercial producibility shall be presumed by the Director upon a demonstration by the applicant of historical production having occurred in the project area or field.

(ii) For Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced, information such as logs, core data, formation description, formation depth, formation thickness and formation parameters such as permeability and porosity shall be considered by the Director, to the extent such information is available.

§ 144.8 Noncompliance and program reporting by the Director.

The Director shall prepare quarterly and annual reports as detailed below. When the State is the permit-issuing authority, the State Director shall submit any reports required under this section to the Regional Administrator. When EPA is the permit-issuing authority, the Regional Administrator shall submit any report required under this section to EPA Headquarters.

(a) *Quarterly reports.* The Director shall submit quarterly narrative reports for major facilities as follows:

(1) *Format.* The report shall use the following format:

(i) Provide an alphabetized list of permittees. When two or more permittees have the same name, the lowest permit number shall be entered first.

(ii) For each entry on the list, include the following information in the following order:

(A) Name, location, and permit number of the noncomplying permittees.

(B) A brief description and date of each instance of noncompliance for that permittee. Instances of noncompliance may include one or more the kinds set forth in paragraph (a)(2) of this section. When a permittee has noncompliance of more than one kind, combine the information into a single entry for each such permittee.

(C) The date(s) and a brief description of the action(s) taken by the Director to ensure compliance.

(D) Status of the instance(s) of noncompliance with the date of the review of the status or the date of resolution.

(E) Any details which tend to explain or mitigate the instance(s) of noncompliance.

(2) *Instances of noncompliance to be reported.* Any instances of noncompliance within the following categories shall be reported in successive reports until the noncompliance is reported as resolved. Once noncompliance is reported as resolved it need not appear in subsequent reports.

(i) *Failure to complete construction elements.* When the permittee has failed to complete, by the date specified in the permit, an element of a compliance schedule involving either planning for construction or a construction step (for example, begin construction, attain operation level); and the permittee has not returned to compliance by accomplishing the required elemente of the schedule within 30 deys from the date a compliance schedule report is due under the permit.

(ii) *Modifications to schedules of compliance.* When a schedule of compliance in the permit has been modified under §§ 144.39 or 144.41 because of the permittee's noncompliance.

(iii) *Failure to complete or provide compliance schedule or monitoring reports.* When the permittee has failed to complete or provide a report required in a permit compliance schedule (for example, progress report or notice of noncompliance or compliance) or a monitoring report; and the permittee has not submitted the complete report within 30 days from the date it is due under the permit for compliance schedules, or from the date specified in the permit for monitoring reports.

(iv) *Deficient reports.* When the required reports provided by the permittee are so deficient as to cause misunderstanding by the Director and thus impede the review of the status of compliance.

(v) *Noncompliance with other permit requirements.* Noncompliance shall be reported in the following circumstances:

(A) Whenever the permittee has violated a permit requirement (other than reported under paragraph (a)(2) (i) or (ii) of this section), and has not returned to compliance within 45 days from the date reporting of noncompliance was due under the permit; or

(B) When the Director determines that a pattern of noncompliance exists for a major facility permittee over the most recent four consecutive reporting periods. This pattern includes any violation of the same requirement in two consecutive reporing periods, and any violation of one or more requirements in each of four consecutive reporting periods; or

(C) When the Director determines significant permit noncompliance or other significant event has occurred, such as a migration of fluids into a USDW.

(vi) *All other.* Statistical information shall be reported quarterly on all other instances of noncompliance by major facilities with permit requirements not otherwise reported under paragraph (a) of this section.

(b) Annual reports. (1) *Annual noncompliance report.* Statistical reports shall be submitted by the Director on nonmajor UIC permittees indicating the total number reviewed, the number of noncomplying nonmajor permittees, the number of enforcement actions, and number of permit modifications extending compliance deadlines. The statistical information shall be organized to follow the types of noncompliance listed in paragraph (a) of this section.

(2) *For State-administered UIC Programs only.* In addition to the annual noncompliance report, the State Director shall:

(i) Submit each year a program report to the Administrator (in a manner and form prescribed by the Administrator) consisting of:

(A) A detailed description of the State's implementation of its program;

(B) Suggested changes, if any to the program description (see § 145.23(f)) which are necessary to reflect more accurately the State's progress in issuing permits;

(C) An updated inventory of active underground injection operations in the State.

(ii) In addition to complying with the requirements of paragraph (b)(2)(i) of this section, the Director shall provide the Administrator, on February 28th and August 31st of each of the first two years of program operation, the information required in 40 CFR 146.15, 146.25, and 146.35.

(c) *Schedule.* (1) For all quarterly reports. On the last working day of May, August, November, and February, the

State Director shall submit to the Regional Administrator information concerning noncompliance with permit requirements by major facilities in the State in accordance with the following schedule. The Regional Administrator shall prepare and submit information for EPA-issued permits to EPA Headquarters in accordance with the same schedule.

QUARTERS COVERED BY REPORTS ON NONCOMPLIANCE BY MAJOR FACILITIES

[Dates for completion of reports]	
January, February, and March	[1]May 31
April, May, and June	Aug. 31
July, August, and September	Nov. 30
October, November, and December	Feb. 28

[1]Reports must be made available to the public for inspection and copying on this date.

(2) *For all annual reports.* The period for annual reports shall be for the calendar year ending December 31, with reports completed and available to the public no more than 60 days later.

Subpart B—General Program Requirements

§ 144.11 Prohibition of unauthorized injection.

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

§ 144.12 Prohibition of movement of fluid into underground sources of drinking water.

(a) No owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 142 or may otherwise adversely affect the health of persons. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met.

(b) For Class I, II, and III wells, if any water quality monitoring of an underground source of drinking water indicates the movement of any contaminant into the underground source of drinking water, except as authorized under Part 146, the Director shall prescribe such additional requirements for construction, corrective action, operation, monitoring, or reporting (including closure of the injection well) as are necessary to prevent such movement. In the case of wells authorized by permit, these additional requirements shall be imposed by modifying the permit in accordance with § 144.39, or the permit may be terminated under § 144.40 if cause exists, or appropriate enforcement action may be taken if the permit has been violated. In the case of wells authorized by rule, see § § 144.21–.24.

(c) For Class V wells, if at any time the Director learns that a Class V well may cause a violation of primary drinking water regulations under 40 CFR Part 142, he or she shall:

(1) Require the injector to obtain an individual permit;

(2) Order the injector to take such actions (including where required closure of the injection well) as may be necessary to prevent the violation; or

(3) Take enforcement action.

(d) Whenever the Director learns that a Class V well may be otherwise adversely affecting the health of persons, he or she may prescribe such actions as may be necessary to prevent the adverse effect, including any action authorized under paragraph (c) of this section.

(e) Notwithstanding any other provision of this section, the Director may take emergency action upon receipt of information that a contaminant which is present in or is likely to enter a public water system may present an imminent and substantial endangerment to the health of persons.

§ 144.13 Elimination of certain Class IV wells.

(a) In addition to the requirement of § 144.14, the following are prohibited:

(1) The construction of any Class IV well for the injection of hazardous waste directly into an underground source of drinking water;

(2) The injection of hazardous waste directly into an underground source of drinking water through a Class IV well that was not in operation prior to July 26, 1980.

(3) Any increase in the amount of hazardous waste or change in the type of hazardous waste injected into a well injecting hazardous waste directly into a USDW.

(4) The operation of any Class IV well injecting hazardous waste directly into a USDW after 6 months following the approval or promulgation of a UIC program for the State.

(b) The prohibition applicable to Class IV wells does not apply to injections of hazardous wastes into aquifers or portions thereof which have been exempted pursuant to § 146.04.

§ 144.14 Requirements for wells injecting hazardous waste.

(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.)

(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 within 6 months after the approval or promulgation of the State UIC program.

(c) *Requirements.* In addition to complying with the applicable requirements of this Part and 40 CFR Part 146, the owner or operator of each facility meeting the requirements of paragraph (b) of this section, shall comply with the following:

(1) *Notification.* The owner or operator shall comply with the notification requirements of Section 3010 of Pub. L. 94-580.

(2) *Identification number.* The owner or operator shall comply with the requirements of 40 CFR 264.11.

(3) *Manifest system.* The owner or operator shall comply with the applicable recordkeeping and reporting requirements for manifested wastes in 40 CFR 264.71.

(4) *Manifest discrepancies.* The owner or operator shall comply with 40 CFR § 264.72.

(5) *Operating record.* The owner or operator shall comply with 40 CFR 264.73(a), (b)(1), and (b)(2).

(6) *Annual report.* The owner or operator shall comply with 40 CFR § 264.75.

(7) *Unmanifested waste report.* The owner or operator shall comply with 40 CFR § 264.76.

(8) *Personnel training.* The owner or operator shall comply with the applicable personnel training requirements of 40 CFR § 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 § 144.52(a)(6).

(d) *Additional requirements for Class IV wells.* [Reserved].

§ 144.15 Assessment of Class V wells.

Assessment of Class V Wells. The Director shall, within three years of the approval of the program in a State submit a report and recommendations to EPA in compliance with § 146.52(b).

§ 144.16 Waiver of requirement by Director.

(a) *When injection does not occur into, through or above an underground source of drinking water,* the Director may authorize a well or project with less stringent requirements for area of review, construction, mechanical integrity, operation, monitoring, and reporting than requird in 40 CFR Part 146 or § 144.52 to the extent that the reduction in requirements will not result in an increased risk of movement of fluids into an underground source of drinking water.

(b) When injection occurs through or above an underground source of drinking water, but the radius of endangering influence when computed under § 146.06(a) is smaller or equal to the radius of the well, the Director may authorize a well or project with less stringent requirements for operation, monitoring, and reporting than required in 40 CFR Part 146 or § 144.52 to the extent that the reduction in requirements will not result in an increased risk of movement of fluids into an underground source of drinking water.

(c) When reducing requirements under paragraph (a) or (b) of this section, the Director shall prepare a fact sheet under § 124.8 explaining the reasons for the action.

Subpart C—Authorization of Underground Injection by Rule

§ 144.21 Existing Class I, II (except enhanced recovery and hydrocarbon storage) and III wells.

Injection into existing Class I, II (except existing enhanced recovery and hydrocarbon storage), and III wells is authorized.

(a) *Duration.* The authorization under this section expires:

(1) Upon the effective date of the permit or permit denial, if a permit application has been filed in a timely manner as specified in § 144.31(c)(1);

(2) If a permit application has not been filed in a timely manner as specified in § 144.31(c)(1); or

(3) Five years after approval or promulgation of the UIC program unless a complete permit application is pending.

(b) *Class II and III wells in existing fields or projects.* Notwithstanding the prohibition in § 144.11, this section authorizes Class II and Class III wells or projects in existing fields or projects to continue normal operations until permitted, including construction, operation, and plugging and abandonment of wells as part of the operation, provided the owner or operator maintains compliance with all applicable requirements.

(c) *Requirements.* Owners or operators of wells authorized under this section shall comply with the following requirements no later than one year after authorization, except that where the referenced requirements apply to permittees, the terms "permit" and "permittee" shall be read to include rules and those authorized by rule:

(1) Section 144.51(a)—(exemption from rule where authorized by temporary permits);

(2) Section 144.51(j)(2)—(retention of records);

(3) 144.51(l)(6)—(reporting within 24 hours);

(4) Section 144.51(n)—(notice of abandonment);

(5) The owner or operator must prepare, maintain, and comply with a plan for plugging and abandonment that meets the requirements of § 146.10 and is acceptable to the Director (for purposes of this paragraph, temporary intermittent cessation of injection operations is not abandonment);

(6) The minimum operating, monitoring, and reporting requirements (except mechanical integrity) required to be specified by § 146.13 (Class I), § 146.23 (Class II) and § 146.33 (Class III);

(7) Section 144.52(a)(7)—(financial responsibility); and

(8) Section 144.14(c)—(requirements for wells injecting hazardous waste) applicable to Class I wells injecting hazardous waste only).

§ 144.22 Existing Class II enhanced recovery and hydrocarbon storage wells.

Injection into existing Class II enhanced recovery and hydrocarbon storage wells is authorized for the life of the well or project.

(a) Owners or operators of wells authorized under this section shall comply with the following requirements, except that where the referenced requirements apply to permittees the terms "permit" and "permittee" shall be read to include rule and those authorized by rule:

(1) Section 144.51(a)—(exemption from rule where authorized by temporary permit);

(2) Section 144.51(j)(2)—(retention of records);

(3) Section 144.51(l)(6)—(reporting within 24 hours);

(4) Section 144.52(a)—(notice of abandonment);

(5) The owner or operator must prepare, maintain, and comply with a plan for plugging and abandonment that meets the requirements of § 146.10 and is acceptable to the Director (for purposes of this paragraph, temporary intermittent cessation of injection operations is not abandonment);

(6) Section 144.52(a)(7)—(financial responsibility);

(7) Section 146.08—(mechanical integrity);

(8) Section 146.22—(casing and cementing requirements where appropriate); and

(9) The minimum operating, monitoring and reporting requirements required to be specified by § 146.23.

(b) Owners or operators of wells authorized under this section shall comply with the construction requirements no later than three years, and other requirements no later than one year after authorization.

§ 144.23 Class IV wells.

(a) Injection into existing Class IV wells as defined in § 144.6(d)(1) is authorized for up to six months after approval or promulgation of the UIC Program. Such wells are subject to the requirements of § 144.13 and § 144.14(c).

(b) Injection into existing Class IV wells as defined in § 144.6(d) (2) and (3) are authorized until six months after approval or promulgation of an UIC Program incorporating criteria and standards under Part 146, Subpart E applicable to Class IV injection wells. Such wells are subject to the requirements of § 144.14(c).

§ 144.24 Class V wells.

Injection into Class V wells is authorized until further requirements under future regulations become applicable.

§ 144.25 Requiring a permit.

(a) The Director may require any Class I, II, III, or V injection well authorized by a rule to apply for and obtain an individual or area UIC permit. Cases where individual or area UIC permits may be required include:

(1) The injection well is not in compliance with any requirement of the rule;

Note.—Any underground injection which violates any authorization by rule is subject to appropriate enforcement action.

(2) The injection well is not or no longer is within the category of wells and types of well operations authorized in the rule;

(3) The protection of USDWs requires that the injection operation be regulated by requirements, such as for corrective action, monitoring and reporting, or operation, which are not contained in the rule.

(b) For EPA administered programs, the Director may require the owner or operator authorized by a rule to apply for an individual or area UIC permit under this paragraph only if the owner or operator has been notified in writing that a permit application is required. The notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time for the owner or operator to file the application, and a statement that upon the effective date of the UIC permit the rule no longer applies to the activities regulated under the UIC Program.

(c) Any owner or operator authorized by a rule may request to be excluded from the coverage of the rules by applying for an individual or area UIC permit. The owner or operator shall submit an application under § 144.31 with reasons supporting the request, to the Director. The Director may grant any such requests.

§ 144.26 Inventory requirements.

Owners or operators of all injection wells authorized by rule shall submit inventory information to the Director. Any authorization under this subpart automatically terminates for any owner or operator who fails to comply within the time specified in paragraph (c) of this section.

(a) *Contents.* As part of the inventory, the Director shall require and the owner/operator shall provide at least the following information:

(1) Facility name and location;

(2) Name and address of legal contact;

(3) Ownership of facility;

(4) Nature and type of injection wells; and

(5) Operating status of injection wells.

Note.—This information is requested on national form "Inventory of Injection Wells." OMB No. 158–R0170

(b) *Notice.* Upon approval of the UIC Program in a State, the Director shall notify owners or operators of injection wells of their duty to submit inventory information. The method of notification selected by the Director must assure that the owners or operators will be made aware of the inventory requirement.

(c) *Deadlines.* Owners or operators of injection wells must submit inventory information no later than one year after the authorization by rule. The Director need not require inventory information from any facility with interim status under RCRA.

Subpart D—Authorization by Permit

§ 144.31 Application for a permit; authorization by permit.

(a) *Permit application.* Except for owners or operators authorized by rule, all underground injections wells are prohibited unless authorized by permit. Persons currently authorized by rule must still apply for a permit under this section unless authorization was for the life of the well or project. Rules authorizing well injections for which permit applications have been s[illegible] shall lapse for a particular well [illegible] or project upon the effective date permit or permit denial for that w[illegible] injection or project. Procedures for applications, issuance and administration of emergency permits [illegible] found exclusively in § 144.34.

(b) *Who applies?* When a facility or activity is owned by one person but is operated by another person, it is the operator's duty to obtain a permit.

(c) *Time to apply.* Any person who performs or proposes an underground injection for which a permit is or will be required shall submit an application to the Director in accordance with the UIC program as follows.

(1) For existing wells, as expeditiously as practicable but no later than 4 years from the approval or promulgation of the UIC program, or as required under § 144.14(b) for wells injecting hazardous waste.

(2) For new injection wells, except new wells in projects authorized under § 144.21(b) or covered by an existing area permit under § 144.33(c), a reasonable time before construction is expected to begin.

(d) *Completeness.* The Director shall not issue a permit before receiving a complete application for a permit except for emergency permits. An application for a permit is complete when the Director receives an application form and any supplemental information which are completed to his or her satisfaction. The completeness of any application for a permit shall be judged independently of the status of any other permit application or permit for the same facility or activity. For EPA-administered programs, an application which is reviewed under § 124.3 is complete when the Director receives either a complete application or the information listed in a notice of deficiency.

(e) *Information requirements.* All applicants for permits shall provide the following information to the Director, using the application form provided by the Director.

(1) The activities conducted by the applicant which require it to obtain permits under RCRA, UIC, the National Pollutant Discharge Elimination System (NPDES) program under the Clean Water Act, or the Prevention of

Significant Deterioration (PSD) program under the Clean Air Act.

(2) Name, mailing address, and location of the facility for which the application is submitted.

(3) Up to four SIC codes which best reflect the principal products or services provided by the facility.

(4) The operator's name, address, telephone number, ownership status, and status as Federal, State, private, public, or other entity.

(5) Whether the facility is located on Indian lands.

(6) A listing of all permits or construction approvals received or applied for under any of the following programs:

(i) Hazardous Waste Management program under RCRA.

(ii) UIC program under SDWA.

(iii) NPDES program under CWA.

(iv) Prevention of Significant Deterioration (PSD) program under the Clean Air Act.

(v) Nonattainment program under the Clean Air Act.

(vi) National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under the Clean Air Act.

(vii) Ocean dumping permits under the Marine Protection Research and Sanctuaries Act.

(viii) Dredge and fill permits under section 404 of CWA.

(ix) Other relevant environmental permits, including State permits.

(7) A topographic map (or other map if a topographic map is unavailable) extending one mile beyond the property boundaries of the source depicting the facility and each of its intake and discharge structures; each of its hazardous waste treatment, storage, or disposal facilities; each well where fluids from the facility are injected underground; and those wells, springs, and other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within a quarter mile of the facility property boundary.

(8) A brief description of the nature of the business.

(f) *Recordkeeping.* Applicants shall keep records of all data used to complete permit applications and any supplemental information submitted under § 144.31 for a period of at least 3 years from the date the application is signed.

(g) Contents of UIC application. [Reserved.]

§ 144.32 Signatories to permit applications and reports.

(a) *Applications.* All permit applications, except those submitted for Class II wells (see paragraph (b) of this section), shall be signed as follows:

(1) *For a corporation:* by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decisionmaking functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

Note.—EPA does not require specific assignments or delegations of authority to responsible corporate officers identified in § 144.32(a)(1)(i). The Agency will presume that these responsible corporate officers have the requisite authority to sign permit applications unless the corporation has notified the Director to the contrary. Corporate procedures governing authority to sign permit applications may provide for assignment or delegation to applicable corporate positions under § 144.32(a)(1)(ii) rather than to specific individuals.

[144.32(a)(1) revised by 48 FR 39619, September 1, 1983]

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) *For a municipality, State, Federal, or other public agency:* by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes: (i) The chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

[144.32(a)(3) revised by 48 FR 39619 September 1, 1983]

(b) *Reports.* All reports required by permits, other information requested by the Director, and all permit applications submitted for Class II wells under § 144.31 shall be signed by a person described in paragraph (a) of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in paragraph (a) of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(3) The written authorization is submitted to the Director.

(c) *Changes to authorization.* If an authorization under paragraph (b) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph (b) of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

(d) *Certification.* Any person signing a document under paragraph (a) or (b) of this section shall make the following certification:

I certify under the 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.

(d) *Certification.* Any person signing a document under paragraphs (a) or (b) of this section shall make the following certification:

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

information, including the possibility of fine and imprisonment for knowing violations.

[The second 144.32(d) was added by 48 F R 39619, September 1, 1983]

§ 144.33 Area permits.

(a) The Director may issue a permit on an area basis, rather than for each well individually, provided that the permit is for injection wells:

(1) Described and identified by location in permit application(s) if they are existing wells, except that the Director may accept a single description of wells with substantially the same characteristics;

(2) Within the same well field, facility site, reservoir, project, or similar unit in the same State;

(3) Operated by a single owner or operator; and

(4) Used to inject other than hazardous waste.

(b) Area permits shall specify:

(1) The area within which underground injections are authorized, and

(2) The requirements for construction, monitoring, reporting, operation, and abandonment for all wells authorized by the permit.

(c) The area permit may authorize the permittee to construct and operate, convert, or plug and abandon wells within the permit area provided:

(1) The permittee notifies the Director at such time as the permit requires,

(2) The additional well satisfies the criteria in paragraph (a) of this section and meets the requirements specified in the permit under paragraph (b) of this section, and

(3) The cumulative effects of drilling and operation of additional injection wells are considered by the Director during evaluation of the area permit application and are acceptable to the Director.

(d) If the Director determines that any well constructed pursuant to paragraph (c) of this section does not satisfy any of the requirements of paragraphs (c)(1) and (c)(2) of this section the Director may modify the permit under § 144.39, terminate under § 144.40, or take enforcement action. If the Director determines that cumulative effects are unacceptable, the permit may be modified under § 144.39.

§ 144.34 Emergency permits.

(a) *Coverage.* Notwithstanding any other provision of this Part or Part 124 the Director may temporarily permit a specific underground injection which has not otherwise been authorized by rule or permit if:

(1) An imminent and substantial endangerment to the health of persons will result unless a temporary emergency permit is granted; or

(2) A substantial and irretrievable loss of oil or gas resources will occur unless a temporary emergency permit is granted to a Class II well; and

(i) Timely application for a permit could not practicably have been made, and

(ii) The injection will not result in the movement of fluids into underground sources of drinking water, or

(3) A substantial delay in production of oil or gas resources will occur unless a temporary emergency permit is granted to a new Class II well and the temporary authorization will not result in the movement of fluids into an underground source of drinking water.

(b) *Requirements for issuance.*

(1) Any temporary permit under paragraph (a)(1) of this section shall be for no longer term than required to prevent the hazard.

(2) Any temporary permit under paragraph (a)(2) of this section shall be for no longer than 90 days, except that if a permit application has been submitted prior to the expiration of the 90-day period, the Director may extend the temporary permit until final action on the application.

(3) Any temporary permit under paragraph (a)(3) of this section shall be issued only after a complete permit application has been submitted and shall be effective until final action on the application.

(4) Notice of any temporary permit under this paragraph shall be published in accordance with § 124.11 within 10 days of the issuance of the permit.

(5) The temporary permit under this section may be either oral or written. If oral, it must be followed within 5 calendar days by a written temporary emergency permit.

(6) The Director shall condition the temporary permit in any manner he or she determines is necessary to ensure that the injection will not result in the movement of fluids into an underground source of drinking water.

§ 144.35 Effect of a permit.

(a) Except for Class II and III wells, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Part C of the SDWA. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in §§ 144.39 and 144.40.

(b) The issuance of a permit does not convey any property rights of any sort, or any exclusive privilege.

(c) The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

§ 144.36 Duration of permits.

(a) Permits for Class I and Class V wells shall be effective for a fixed term not to exceed 10 years. UIC permits for Class II and III wells shall be issued for a period up to the operating life of the facility. The Director shall review each issued Class II or III well UIC permit at least once every 5 years to determine whether it should be modified, revoked and reissued, terminated, or a minor modification made as provided in §§ 144.39, 144.40, and 144.41.

(b) Except as provided in § 144.37, the term of a permit shall not be extended by modification beyond the maximum duration specified in this section.

(c) The Director may issue any permit for a duration that is less than the full allowable term under this section.

§ 144.37 Continuation of expiring permits.

(a) *EPA permits.* When EPA is the permit-issuing authority, the conditions of an expired permit continue in force under 5 U.S.C. 558(c) until the effective date of a new permit if:

(1) The permittee has submitted a timely application which is a complete application for a new permit; and

(2) The Regional Administrator, through no fault of the permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit (for example, when issuance is impracticable due to time or resource constraints).

(b) *Effect.* Permits continued under this section remain fully effective and enforceable.

(c) *Enforcement.* When the permittee is not in compliance with the conditions of the expiring or expired permit the Regional Administrator may choose to do any or all of the following:

(1) Initiate enforcement action based upon the permit which has been continued;

(2) Issue a notice of intent to deny the new permit. If the permit is denied, the owner or operator would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operating without a permit;

(3) Issue a new permit under Part 124 with appropriate conditions; or

(4) Take other actions authorized by these regulations.

(d) *State continuation.* An EPA issued permit does not continue in force beyond its time expiration date under Federal law if at that time a State is the permitting authority. A State authorized to administer the UIC program may continue either EPA or State-issued permits until the effective date of the new permits, if State law allows. Otherwise, the facility or activity is operating without a permit from the time of expiration of the old permit to the effective date of the State-issued new permit.

§ 144.38 Transfer of permits.

(a) *Transfers by modification.* Except as provided in paragraph (b) of this section, a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued (under § 144.39(b)(2)), or a minor modification made (under § 144.41(d)), to identify the new permittee and incorporate such other requirements as may be necessary under the Safe Drinking Water Act.

(b) *Automatic transfers.* As an alternative to transfers under paragraph (a) of this section, any UIC permit for a well not injecting hazardous waste may be automatically transferred to a new permittee if:

(1) The current permittee notifies the Director at least 30 days in advance of the proposed transfer date referred to in paragraph (b)(2) of this section;

(2) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them, and the notice demonstrates that the financial responsibility requirements of § 144.52(a)(7) will be met by the new permittee; and

(3) The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify or revoke and reissue the permit. A modification under this paragraph may also be a minor modification under § 144.41. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph (b)(2) of this section.

§ 144.39 Modification or revocation and reissuance of permits.

When the Director receives any information (for example, inspects the facility, receives information submitted by the permittee as required in the permit (see § 144.51 of this chapter), receives a request for modification or revocation and reissuance under § 124.5, or conducts a review of the permit file) he or she may determine whether or not one or more of the causes listed in paragraphs (a) and (b) of this section for modification or revocation and reissuance or both exist. If cause exists, the Director may modify or revoke and reissue the permit accordingly, subject to the limitations of paragraph (c) of this section, and may request an updated application if necessary. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term. See § 124.5(c)(2) of this chapter. If cause does not exist under this section or § 144.41 of this chapter, the Director shall not modify or revoke and reissue the permit. If a permit modification satisfies the criteria in § 144.41 for "minor modifications" the permit may be modified without a draft permit or public review. Otherwise, a draft permit must be prepared and other procedures in Part 124 must be followed.

(a) *Causes for modification.* The following are causes for modification. For Class II or III wells the following may be causes for revocation and reissuance as well as modification, and for all other wells the following may be cause for revocation or reissuance as well as modification when the permittee requests or agrees.

(1) *Alterations.* There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit.

(2) *Information.* The Director has received information. Permits other than for Class II and III wells may be modified during their terms for this cause only if the information was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and would have justified the application of different permit conditions at the time of issuance. For UIC area permits (§ 144.33), this cause shall include any information indicating that cumulative effects on the environment are unacceptable.

(3) *New regulations.* The standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued. Permits other than for Class II or III wells may be modified during their terms for this cause only as follows:

(i) For promulgation of amended standards or regulations, when:

(A) The permit condition requested to be modified was based on a promulgated Part 146 regulation; and

(B) EPA has revised, withdrawn, or modified that portion of the regulation on which the permit condition was based, and

(C) A permittee requests modification in accordance with § 124.5 within ninety (90) days after Federal Register notice of the action on which the request is based.

(ii) For judicial decisions, a court of competent jurisdiction has remanded and stayed EPA promulgated regulations if the remand and stay concern that portion of the regulations on which the permit condition was based and a request is filed by the permittee in accordance with § 124.5 within ninety (90) days of judicial remand.

(4) *Compliance schedules.* The Director determines good cause exists for modification of a compliance schedule, such as an act of God, strike, flood, or materials shortage or other events over which the permittee has little or no control and for which there is no reasonably available remedy. See also § 144.41(c) (minor modifications).

(b) *Causes for modification or revocation and reissuance.* The following are causes to modify or, alternatively, revoke and reissue a permit:

(1) Cause exists for termination under § 144.40, and the Director determines that modification or revocation and reissuance is appropriate.

(2) The Director has received notification (as required in the permit, see § 144.41(d)) of a proposed transfer of the permit. A permit also may be modified to reflect a transfer after the effective date of an automatic transfer (§ 144.38(b)) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new permittee.

(c) *Facility siting.* Suitability of the facility location will not be considered at the time of permit modification or revocation and reissuance unless new information or standards indicate that a threat to human health or the environment exists which was unknown at the time of permit issuance.

§ 144.40 Termination of permits.

(a) The Director may terminate a permit during its term, or deny a permit renewal application for the following causes:

(1) Noncompliance by the permittee with any condition of the permit;

(2) The permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the permittee's misrepresentation of any relevant facts at any time; or

(3) A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.

(b) The Director shall follow the applicable procedures in Part 124 in terminating any permit under this section.

§ 144.41 Minor modifications of permits.

Upon the consent of the permittee, the Director may modify a permit to make the corrections or allowances for changes in the permitted activity listed in this section, without following the procedures of Part 124. Any permit modification not processed as a minor modification under this section must be made for cause and with Part 124 draft permit and public notice as required in § 144.39. Minor modifications may only:

(a) Correct typographical errors;

(b) Require more frequent monitoring or reporting by the permittee;

(c) Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement; or

(d) Allow for a change in ownership or operational control of a facility where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director.

(e) Change quantities or types of fluids injected which are within the capacity of the facility as permitted and, in the judgment of the Director, would not interfere with the operation of the facility or its ability to meet conditions described in the permit and would not change its classification.

(f) Change construction requirements approved by the Director pursuant to § 144.52(a)(1) (establishing UIC permit conditions), provided that any such alteration shall comply with the requirements of this Part and Part 146.

(g) Amend a plugging and abandonment plan which has been updated under § 144.52(a)(6).

Subpart E—Permit Conditions

§ 144.51 Conditions applicable to all permits.

The following conditions apply to all 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) 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 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.

(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.

(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) *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 SDWA, any substances or parameters at any location.

(j) *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). The Director may require the owner or operator to deliver the records to the Director at the conclusions of the retention period.

(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;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

(k) *Signatory requirement.* All applications, reports, or information submitted to the Administrator shall be signed and certified. (See § 144.32.)

(l) *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.)

(4) *Monitoring reports.* Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(5) *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) *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 a USDW; or

(ii) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between USDWs.

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

(7) *Other noncompliance.* The permittee shall report all instances of noncompliance not reported under paragraphs (l)(4), (5), and (6) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (l)(6) of this section.

(8) *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) *Requirements prior to commencing injection.* Except for all new wells authorized by an area permit under § 144.33(c), 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 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)(1) 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.

(n) 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.

§ 144.52 Establishing permit conditions.

(a) In addition to conditions required in § 144.51, the Director shall establish conditions, as required on a case-by-case basis under § 144.36 (duration of permits), § 144.53(a) (schedules of compliance), § 144.54 (monitoring), and for EPA permits only § 144.53(b) (alternate schedules of compliance) and § 144.4 (considerations under Federal law). In addition, each permit shall include conditions meeting the following requirements, when applicable:

(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 construction 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.

(2) *Corrective action* as set forth in § 144.55 and § 146.7.

(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.

(6) *Plugging and abandonment*. Any Class I, II or III permit shall include, and any Class V permit may include, conditions to ensure that plugging and abandonment of the well will not allow the movement of fluids either into an underground source of drinking water or from one underground source of drinking water to another. Applicants for a UIC permit shall submit a plan for plugging and abandonment. Where the plan meets the requirements of this paragraph, the Director shall incorporate it into the permit as a condition. Where the Director's review of an application indicates that the permittee's plan is inadequate, the Director shall require the applicant to revise the plan, prescribe conditions meeting the requirements of this paragraph, or deny the application. For purposes of this paragraph, temporary intermittent cessation of injection operations is not abandonment.

(7) *Financial responsibility*. The permittee is required to maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner prescribed by the Director. The permittee must show evidence of financial responsibility to the Director by the submission of surety bond, or other adequate assurance, such as financial statements or other materials acceptable to the Director.

(8) *Mechanical integrity*. A permit for any Class I, II or III 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 § 146.08 that the well has mechanical integrity.

(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.

(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 Parts 144, 145, 146 and 124.

(2) For a State issued permit, 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 (except as provided in § 124.86(c) for UIC permits being processed under Subparts E or F of Part 124). 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. For State and EPA administered programs, 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.

(3) New or reissued permits, and to the extent allowed under § 144.39 modified or revoked and reissued permits, shall incorporate each of the applicable requirements referenced in § 144.52.

(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.

§ 144.53 Schedule of compliance.

(a) *General*. The permit may, when appropriate, specify a schedule of compliance leading to compliance with the SDWA and Parts 144, 145, 146, and 124.

(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 paragraph (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 paragraph (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) *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 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 paragraph (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.

§ 144.54 Requirements 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 Part 146. Reporting shall be no less frequent than specified in the above regulations.

§ 144.55 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 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 USDW's, 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.

ENVIRONMENTAL PROTECTION AGENCY CRITERIA AND STANDARDS FOR THE UNDERGROUND INJECTION CONTROL PROGRAM

(40 CFR 146; 45 FR 42500, June 24, 1980, Effective July 24, 1980; Amended by 46 FR 43160, August 27, 1981; 47 FR 4998, February 3, 1982; 47 FR 32129, July 26, 1982; 48 FR 14153, April 1, 1983; 48 FR 31404, July 8, 1983)

PART 146—UNDERGROUND INJECTION CONTROL PROGRAM: CRITERIA AND STANDARDS

Subpart A—General Provisions

Authority: Secs. 1421, 1422, 1423, 1431, 1445, 1447, and 1450 of the Safe Drinking Water Act, as amended, 42 U.S.C. 300(f) et. seq.

Subpart A—General Provisions

§ 146.01 Applicability and scope.

(a) This Part sets forth technical criteria and standards for the Underground Injection Control Program. This part should be read in conjunction with 40 CFR Parts 144, 145, and 124 which also apply to UIC programs. 40 CFR Part 144 defines the regulatory framework of EPA administered permit programs, 40 CFR Part 145 describes the elements of an approvable State program and procedures for EPA approval of State participation in the permit programs. 40 CFR Part 124 describes the procedures the Agency will use for issuing permits under the covered programs. Certain of these procedures will also apply to State-administered programs as specified in 40 CFR Part 145.

[146.01(a) amended by 48 FR 14153, April 1, 1983]

(b) Upon the approval, partial approval or promulgation of a State UIC program by the Administrator, any underground injection which is not authorized by the Director by rule or by permit is unlawful.

§ 146.02 Law authorizing these regulations.

The laws authorizing these regulations and all other UIC program regulations are referenced in 40 CFR part 144. They include Sections 1421, 1422, 1423, 1431, 1445, 1447 and 1450 of the Public Health Service Act as amended by the Safe Drinking Water Act ("SDWA") (Pub. L. 93–523) and by the SDWA Amendments of 1977 (Pub. L. 95–190).

[146.02 amended by 48 FR 14153, April 1, 1983]

§146.03 Definitions.

The following definitions apply to the underground injection control program.

Abandoned well means a well whose use has been permanently discontinued or which is in a state of disrepair such that it cannot be used for its intended purpose or for observation purposes.

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions or modifications to the forms; or forms approved by EPA for use in approved States, including any approved modifications or revisions. For RCRA, application also includes the information required by the Director under § 122.25 (contents of Part B of the RCRA application).

Aquifer means a geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

Area of review means the area surrounding an injection well described according to the criteria set forth in §146.06 or in the case of an area permit, the project area plus a circumscribing area the width of which is either ¼ of a mile or a number calculated according to the criteria set forth in §146.06.

Casing means a pipe or tubing of appropriate material, or varying diameter and weight, lowered into a borehole during or after drilling in order to support the sides of the hole and thus prevent the walls from caving, to prevent loss of drilling mud into porous ground, or to prevent water, gas, or other fluid from entering or leaving the hole.

Catastrophic collapse means the sudden and utter failure of overlying "strata" caused by removal of underlying materials.

Cementing means the operation whereby a cement slurry is pumped into a drilled hole and/or forced behind the casing.

Confining bed means a body of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

Confining zone means a geological formation, group of formations, or part of a formation that is capable of limiting fluid movement above an injection zone.

Contaminant means any physical, chemical, biological, or radiological substance or matter in water.

Conventional mine means an open pit or underground excavation for the production of minerals.

[Added by 47 FR 4998, February 3, 1982]

Director means the Regional Administrator or the State Director, as the context requires, or an authorized representative. When there is no approved State program, and there is an EPA administered program, "Director" means the Regional Administrator. When there is an approved State program, "Director" normally means the State Director. In some circumstances, however, EPA retains the authority to take certain actions even where there is an approved State program. (For example, when EPA issued an NPDES permit prior to the approval of a State program, EPA may retain jurisdiction over that permit after program approval, see § 123.09.) In such cases, the term "Director" means the Regional Administrator and not the State Director.

Disposal well means a well used for the disposal of waste into a subsurface stratum.

Effective date of a UIC program means the date that a State UIC program is approved or established by the Administrator.

Environmental Protection Agency ("EPA") means the United States Environmental Protection Agency.

EPA means the United States "Environmental Protection Agency."

Exempted aquifer means an aquifer or its portion that meets the criteria in the definition of "underground source of drinking water" but which has been exempted according to the procedures of §144.8(b).

[Amended by 48 FR 14153, April 1, 1983]

Existing injection well means an "injection well" other than a "new injection well."

Experimental technology means a technology which has not been proven feasible under the conditions in which it is being tested.

[Added by 47 FR 4998, February 3, 1982]

Facility or activity means any "HWM facility," UIC "injection well," NPDES "point source," or State 404 dredge and fill activity, or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the RCRA, UIC, NPDES, or 404 programs.

Fault means a surface or zone of rock fracture along which there has been displacement.

Flow rate means the volume per time unit given to the flow of gases or other fluid substance which emerges from an orifice, pump, turbine or passes along a conduit or channel.

Fluid means material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.

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

Formation fluid means "fluid" present in a "formation" under natural conditions as opposed to introduced fluids, such as drilling mud.

Generator means any person, by site location, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261.

Ground water means water below the land surface in a zone of saturation.

Hazardous waste means a hazardous waste as defined in 40 CFR 261.3.

Hazardous Waste Management facility ("HWM facility") means all contiguous land, and structures, other appurtenances, and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (for example, one or more landfills, surface impoundments, or combination of them).

HWM facility means "Hazardous Waste Management facility."

Injection well means a "well" into which "fluids" are being injected.

Injection zone means a geological "formation", group of formations, or part of a formation receiving fluids through a well.

Lithology means the description of rocks on the basis of their physical and chemical characteristics.

Owner or operator means the owner or operator of any facility or activity subject to regulation under the RCRA, UIC, NPDES, or 404 programs.

Packer means a device lowered into a well to produce a fluid-tight seal.

[Revised by 47 FR 4998, February 3, 1982]

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved State" to implement the requirements of this part and Parts 144, 145 and 124. Permit does not include RCRA interim status (§ 122.23), UIC authorization by rule (§144.21—.26 and 144.15), or any permit which has not yet been the subject of final agency action, such as a "draft permit" or a "proposed permit."

Plugging means the act or process of stopping the flow of water, oil, or gas in "formations" penetrated by a borehole or "well."

Plugging means the act or process of stopping the flow of water, oil or gas into or out of a formation through a borehole or well penetrating that formation.

Pressure means the total load or force per unit area acting on a surface.

Project means a group of wells in a single operation.

[Added by 47 FR 4998, February 3, 1982]

Radioactive Waste means any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR Part 20, Appendix B, Table II column 2.

[Amended by 46 FR 43160, August 27, 1981]

RCRA means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Pub. L. 94–580, as amended by Pub. L. 95–609, 42 U.S.C. 6901 et seq.).

SDWA means the Safe Drinking Water Act (Pub. L. 93–523, as amended by Pub. L. 95–190, 42 U.S.C. 300(f) *et seq.).*

Site means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

Sole or principal source aquifer means an aquifer which has been designated by the Administrator pursuant to sections 1424 (a) or (e) of the SDWA.

State Director means the chief administrative officer of any State or interstate agency operating an approved program, or the delegated representative of the State Director. If responsibility is divided among two or more State or interstate agencies, "State Director" means the chief administrative officer of the State or interstate agency authorized to perform the particular procedure or function to which reference is made.

Stratum (plural *strata*) means a single sedimentary bed or layer, regardless of thickness, that consists of generally the same kind of rock material.

Subsidence means the lowering of the natural land surface in response to: Earth movements; lowering of fluid pressure; removal of underlying

supporting material by mining or solution of solids, either artificially or from natural causes; compaction due to wetting (Hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

Surface casing means the first string of well casing to be installed in the wall.

Total dissolved solids ("TDS") means the total dissolved (filterable) solids as determined by use of the method specified in 40 CFR Part 136.

UIC means the Underground Injection Control program under Part C of the Safe Drinking Water Act, including an "approved program."

Underground injection means a "well injection."

Underground source of drinking water (USDW) means an aquifer or its portion:

(1)(i) Which supplies any public water system; or

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

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

(B) Contains fewer than 10,000 mg/l total dissolved solids; and

(2) Which is not an exempted aquifer.

[Revised by 47 FR 4998, February 3, 1982]

USDW means "underground source of drinking water."

Well means a bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension.

Well injection means the subsurface emplacement of fluids through a bored, drilled or driven well; or through a dug well, where the depth of the dug well is greater than the largest surface dimension.

Well plug means a watertight and gastight seal installed in a borehole or well to prevent movement of fluids.

Well stimulation means several processes used to clean the well bore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for wastewater to move more readily into the formation, and includes (1) surging, (2) jetting, (3) blasting, (4) acidizing, (5) hydraulic fracturing.

Well monitoring means the measurement, by on-site instruments or laboratory methods, of the quality of water in a well.

§ 146.04 Criteria for exempted aquifers.

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.03 may be determined under 40 CFR 144.8 to be an "exempted aquifer" if it meets the following criteria:

[146.04 introductory paragraph amended by 48 FR 14153, April 1, 1983]

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

[146.04(b)(1) revised by 47 FR 4998, February 3, 1982]

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

[146.04(b)(4) amended by 47 FR 4998, February 3, 1982]

(c) The Total Dissolved Solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

[146.04(c) added by 47 FR 4998, February 3, 1982]

§ 146.05 Classification of injection wells.

Injection wells are classified as follows:

(a) *Class I.* (1) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within one quarter (1/4) mile of the well bore, an underground source of drinking water.

[146.05(a)(1) revised by 47 FR 4998, February 3, 1982]

(2) Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

(b) *Class II.* Wells which inject fluids:

(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

[146.05(b)(1) revised by 47 FR 4998, February 3, 1982]

(2) For enhanced recovery of oil or natural gas; and

(3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

(c) Class III. Wells which inject for extraction of minerals including:

[146.05(c) amended by 47 FR 4998, February 3, 1982]

(1) Mining of sulfur by the Frasch process;

(2) In situ production of uranium or other metals. This category includes only in-situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V.

[146.05(c)(2) revised by 46 FR 43160, August 27, 1981]

(3) Solution mining of salts or potash.

[New 146.05(c)(3) added and former (3), (4) redesignated as (4), (5) by 46 FR 43160, August 27, 1981]

(4) [Removed]

146.05(c)(4) removed by 47 FR 4998, February 3, 1982]

(5) [Removed]

[146.05(c)(5) removed by 47 FR 4998, February 3, 1982]

(d) Class IV

(1) Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste into a formation which within one quarter (¼) mile of the well contains an underground source of drinking water.

(2) Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste above a formation which within one quarter (¼) mile of the well contains an underground source of drinking water.

(3) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to dispose of hazardous waste, which cannot be classified under §§ 146.05(a)(1) or 146.05(d) (1) and (2) (e.g., wells used to dispose of hazardous wastes into or above a formation which contains an aquifer which has been exempted pursuant to § 146.04).

[146.05(d) revised by 47 FR 4998, February 3, 1982]

[Sec. 146.05(d)(3)]

(e) Class V—Injection wells not included in Class I, II, III, or IV. Class V wells include:

[146.05(e) amended by 47 FR 4998, February 3, 1982]

(1) Air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling in a heat pump;

(2) Cesspools including multiple dwelling, community or regional cesspools, or other devices that receive wastes which have an open bottom and sometimes have perforated sides. The UIC requirements do not apply to single family residential cesspools nor to non-residential cesspools which receive solely sanitary wastes and have the capacity to serve fewer than 20 persons a day.

[146.05(e)(2) revised by 47 FR 4998, February 3, 1982]

(3) Cooling water return flow wells used to inject water previously used for cooling;

(4) Drainage wells used to drain surface fluid, primarily storm runoff, into a subsurface formation;

(5) Dry wells used for the injection of wastes into a subsurface formation;

(6) Recharge wells used to replenish the water in an aquifer;

(7) Salt water intrusion barrier wells used to inject water into a fresh water aquifer to prevent the intrusion of salt water into the fresh water;

(8) Sand backfill and other backfill wells used to inject a mixture of water and sand, mill tailings or other solids into mined out portions of subsurface mines whether what is injected is a radioactive waste or not. [146.05(e)(8) amended by 46 FR 43160, August 27, 1981]

(9) Septic system wells used to inject the waste or effluent from a multiple dwelling, business establishment, community or regional business establishment septic tank. The UIC requirements do not apply to single family residential septic system wells, nor to non-residential septic system wells which are used solely for the disposal of sanitary waste and have the capacity to serve fewer than 20 persons a day.

[146.05(e)(9) revised by 47 FR 4998, February 3, 1982]

(10) Subsidence control wells (not used for the purpose 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;

(11) Radioactive waste disposal wells other than Class IV;

[146.05(e)(11) revised by 46 FR 43160, August 27, 1981]

(12) Injection wells associated with the recovery of geothermal energy for heating, aquaculture and production of electric power.

[146.05(e)(12) revised by 47 FR 4998, February 3, 1982]

(13) Wells used for solution mining of conventional mines such as stopes leaching;

[146.05(e)(14) and (15) added by 46 FR 43160, August 27, 1981]

(14) Wells used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts;

(15) Injection wells used in experimental technologies.

(16) Injection wells used for in situ recovery of lignite, coal, tar sands, and oil shale.

[146.05(e)(16) added by 47 FR 4998, February 3, 1982]

§ 146.06 Area of Review.

The area of review for each injection well or each field, project or area of the State shall be determined according to either paragraph (a) or (b) of this section. The Director may solicit input from the owners or operators of injection wells within the State as to which method is most appropriate for each geographic area or field.

[146.06(a) and (b) revised by 46 FR 43160, August 27, 1981]

(a) *Zone of endangering influence.* (1) The zone of endangering influence shall be:

(i) In the case of application(s) for well permit(s) under §122.38 that area the radius which is the lateral distance in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water; *or*

(ii) In the case of an application for an area permit under §122.39, the project area plus a circumscribing area the width of which is the lateral distance from the perimeter of the project area, in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water.

[146.06(a)(2) amended by 47 FR 4998, February 3, 1982]

(2) Computation of the zone of endangering influence may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the injection well or pattern. The following modified Theis equation illustrates one form which the mathematical model may take.

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

where

$$x = \frac{4\pi KH(h_w - h_{ow}S_oG_o)}{2.3Q}$$

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

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

H = Thickness of the injection zone (length)

t = Time of injection (time)

S = Storage coefficient (dimensionless)

Q = Injection rate (volume/time)

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

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

S_oG_o = Specific gravity of fluid in the injection zone (dimensionless)

π = 3.142 (dimensionless)

The above equation is based on the following assumptions:

(i) The injection zone is homogenous and isotropic;

(ii) The injection zone has infinite area extent;

(iii) The injection well penetrates the entire thickness of the injection zone;

(iv) The well diameter is infinitesimal compared to "r" when injection time is longer than a few minutes; and

(v) The emplacement of fluid into the injection zone creates instantaneous increase in pressure.

(b) *Fixed Radius.* (1) In the case of application(s) for well permit(s) under §122.38 a fixed radius around the well of not less than one-fourth (¼) mile may be used.

(2) In the case of an application for an area permit under §122.39 a fixed width of not less than one-fourth (¼) mile for the circumscribing area may be used.

In determining the fixed radius, the following factors shall be taken into consideration: Chemistry of injected and formation fluids; hydrogeology; population and ground-water use and dependence; and historical practices in the area.

(c) If the area of review is determined by a mathematical model pursuant to paragraph (a) of this section, the permissible radius is the result of such calculation even if it is less than one-fourth (¼) mile.

§ 146.07 Corrective Action.

[146.07 introductory paragraph amended by 48 FR 14153, April 1, 1983]

In determining the adequacy of corrective action proposed by the applicant under 40 CFR 144.55 and in determining the additional steps needed to prevent fluid movement into underground sources of drinking water, the following criteria and factors shall be considered by the Director:

[146.07(a) and (b) revised by 46 FR 43160, August 27, 1981]

(a) Nature and volume of injected fluid;

(b) Nature of native fluids or by-products of injection;

(c) Potentially affected population;
(d) Geology;
(e) Hydrology;
(f) History of the injection operation;
(g) Completion and plugging records;
(h) Abandonment procedures in effect at the time the well was abandoned; and
(i) Hydraulic connections with underground sources of drinking water.

§ 146.08 Mechanical integrity

(a) An injection well has mechanical integrity if:

(1) There is no significant leak in the casing, tubing or packer; and

(2) There is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore.

(b) One of the following methods must be used to evaluate the absence of significant leaks under paragraph (a)(1) of this section:

[146.08(b) amended by 47 FR 4998, February 3, 1982]

(1) Monitoring of annulus pressure; or

(2) Pressure test with liquid or gas; or

[146.08(b)(2) amended by 47 FR 4998, February 3, 1982]

(3) Records of monitoring showing the absence of significant changes in the relationship between injection pressure and injection flow rate for the following Class II enhanced recovery wells:

(i) Existing wells completed without a packer provided that a pressure test has been performed and the data is available and provided further that one pressure test shall be performed at a time when the well is shut down and if the running of such a test will not cause further loss of significant amounts of oil or gas; or

(ii) Existing wells constructed without a long string casing, but with surface casing which terminates at the base of fresh water provided that local geological and hydrological features allow such construction and provided further that the annular space shall be visually inspected. For these wells, the Director shall prescribe a monitoring program which will verify the absence of significant fluid movement from the injection zone into an USDW.

[146.08(b)(3) added by 47 FR 4998, February 3, 1982]

(c) One of the following methods must be used to determine the absence of significant fluid movement under paragraph (a)(2) of this section:

[146.08 (c)(1) and (2) revised by 46 FR 43160, August 27, 1981]

(1) The results of a temperature or noise log; or

(2) For Class II only, cementing records demonstrating the presence of adequate cement to prevent such migration; or

[146.08(c)(3) and (4) added by 47 FR 4998, February 3, 1982]

(3) For Class III wells where the nature of the casing precludes the use of the logging techniques prescribed at paragraph (c)(1) of this section, cementing records demonstrating the presence of adequate cement to prevent such migration;

(4) For Class III wells where the Director elects to rely on cementing records to demonstrate the absence of significant fluid movement, the monitoring program prescribed by § 146.33(b) shall be designed to verify the absence of significant fluid movement.

(d) The Director may allow the use of a test to demonstrate mechanical integrity other than those listed in paragraphs (b) and (c)(2) of this section with the written approval of the Administrator. To obtain approval, the Director shall submit a written request to the Administrator, which shall set forth the proposed test and all technical data supporting its use. The Administrator shall approve the request if it will reliably demonstrate the mechanical integrity of wells for which its use is proposed. Any alternate method approved by the Administrator shall be published in the Federal Register and may be used in all States unless its use is restricted at the time of approval by the Administrator.

(e) In conducting and evaluating the tests enumerated in this section or others to be allowed by the Director, the owner or operator and the Director shall apply methods and standards generally accepted in the industry. When the owner or operator reports the results of mechanical integrity tests to the Director, he shall include a description of the test(s) and the method(s) used. In making his/her evaluation, the Director shall review monitoring and other test data submitted since the previous evaluation.

§ 146.09 Criteria for Establishing Permitting Priorities.

In determining priorities for setting times for owners or operators to submit applications for authorization to inject under the procedures of §144.31(a),(c),(g) or §144.22(f), the Director shall base these priorities upon consideration of the following factors:

[146.09 introductory paragraph amended by 48 FR 14153, April 1, 1983]

(a) Injection wells known or suspected to be contaminating underground sources of drinking water;

(b) Injection wells known to be injecting fluids containing hazardous contaminants;

(c) Likelihood of contamination of underground sources of drinking water;

(d) Potentially affected population;

(e) Injection wells violating existing State requirements;

(f) Coordination with the issuance of permits required by other State or Federal permit programs;

(g) Age and depth of the injection well; and

(h) Expiration dates of existing State permits, if any.

§ 146.10 Plugging and abandoning Class I—III wells.

(a) Prior to abandoning Class I—III wells the well shall be plugged with cement in a manner which will not allow the movement of fluids either into or between underground sources of drinking water. The Director may allow Class III wells to use other plugging materials if he is satisfied that such materials will prevent movement of fluids into or between underground sources of drinking water.

[146.10(a) revised by 47 FR 4998, February 3, 1982]

(b) Placement of the cement plugs shall be accomplished by one of the following:

(1) The Balance Method;

[146.10(b)(2) and (3) amended by 47 FR 4998, February 3, 1982]

(2) The Dump Bailer Method;

(3) The Two-Plug Method; or

(4) An alternative method approved by the Director, which will reliably provide a comparable level of protection to underground sources of drinking water.

[146.10(b)(4) added by 47 FR 4998, February 3, 1982]

(c) The well to be abandoned shall be in a state of static equilibrium with the mud weight equalized top to bottom, either by circulating the mud in the well at least once or by a comparable method prescribed by the Director, prior to the placement of the cement plug(s).

(d) The plugging and abandonment plan required in 40 CFR §144.52(a)(6) and §144.51(n) shall, in the case of a Class III project which underlies or is in an aquifer which has been exempted under 40 CFR 146.04, also demonstrate adequate protection of USDWs. The Director shall prescribe aquifer cleanup and monitoring where he deems it necessary and feasible to insure adequate protection of USDWs.

[146.10(d) amended by 47 FR 4998, February 3, 1982; 48 FR 14153, April 1, 1983]

Subpart B—Criteria and Standards Applicable to Class I Wells

§ 146.11 Applicability.

This subpart establishes criteria and standards for underground injection control programs to regulate Class I wells.

§ 146.12 Construction Requirements.

(a) All Class I wells shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

(b) All Class I wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:

(1) Depth to the injection zone;

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

(3) Hole size;

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

(5) Corrosiveness of injected fluid, formation fluids, and temperatures;

(6) Lithology of injection and confining intervals; and

(7) Type or grade of cement.

(c) All Class I injection wells, except those municipal wells injecting non-corrosive wastes, shall inject fluids through tubing with a packer set immediately above the injection zone, or tubing with an approved fluid seal as an alternative. The tubing, packer, and fluid seal shall be designed for the expected service.

(1) The use of other alternatives to a packer may be allowed with the written approval of the Director. To obtain approval, the operator shall submit a written request to the Director, which shall set forth the proposed alternative and all technical data supporting its use. The Director shall approve the request if the alternative method will reliably provide a comparable level of protection to underground sources of drinking water. The Director may approve an alternative method solely for an individual well or for general use.

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

(i) Depth of setting;

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

(iii) Injection pressure;

(iv) Annular pressure;

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

(vi) Size of casing.

(d) Appropriate logs and other tests shall be conducted during the drilling and construction of new Class I wells. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the Director. At a minimum, such logs and tests shall include:

[146.12(d) amended by 46 FR 43160, August 27, 1981]

(1) Deviation checks on all holes constructed by first drilling a pilot hole, and then enlarging the pilot hole by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid migration in the form of diverging holes are not created during drilling.

(2) Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required, the following logs shall be considered for use in the following situations:

(i) For surface casing intended to protect underground sources of drinking water:

(A) Resistivity, spontaneous potential, and caliper logs before the casing is installed; and

(B) A cement bond, temperature, or density log after the casing is set and cemented.

(ii) For intermediate and long strings of casing intended to facilitate injection:

(A) Resistivity, spontaneous potential, porosity, and gamma ray logs before the casing is installed;

(B) Fracture finder logs; and

(C) A cement bond, temperature, or density log after the casing is set and cemented.

(e) At a minimum, the following information concerning the injection formation shall be determined or calculated for new Class I wells:

(1) Fluid pressure;

(2) Temperature;

(3) Fracture pressure;

(4) Other physical and chemical characteristics of the injection matrix; and

(5) Physical and chemical characteristics of the formation fluids.

§ 146.13 Operating, Monitoring and Reporting Requirements.

[Editor's note: EPA July 26, 1982 (47 FR 32129) amended §146.13 to add OMB control No. 2000–0456.]

(a) *Operating Requirements.* Operating requirements shall, at a minimum, specify that:

(1) Except during stimulation injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case shall injection pressure initiate fractures in the confining zone or cause the movement of injection or formation fluids into an underground source of drinking water.

[146.13(a)(1) amended by 46 FR 43160, August 27, 1981]

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

(3) Unless an alternative to a packer has been approved under § 146.12(c), the annulus between the tubing and the long string of casings shall be filled with a fluid approved by the Director and a pressure, also approved by the Director, shall be maintained on the annulus.

(b) *Monitoring Requirements.* Monitoring requirements shall, at a minimum, include:

(1) The analysis of the injected fluids with sufficient frequency to yield representative data of their characteristics;

(2) Installation and use of continuous recording devices to monitor injection pressure, flow rate and volume, and the pressure on the annulus between the tubing and the long string of casing;

(3) A demonstration of mechanical integrity pursuant to § 146.08 at least once every five years during the life of the well; and

(4) The type, number and location of wells within the area of review to be used to monitor any migration of fluids into and pressure in the underground sources of drinking water, the parameters to be measured and the frequency of monitoring.

(c) *Reporting Requirements.* Reporting requirements shall, at a minimum, include:

(1) Quarterly reports to the Director on:

(i) The physical, chemical and other relevant characteristics of injection fluids;

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

(iii) The results of monitoring prescribed under subparagraph (b)(4) of this section.

(2) Reporting the results, with the first quarterly report after the completion, of:

(i) Periodic tests of mechanical integrity;

(ii) Any other test of the injection well conducted by the permittee if required by the Director; and

(iii) Any well work over.

§ 146.14 Information to be Considered by the Director.

This section sets forth the information which must be considered by the Director in authorizing Class I wells. For an existing or converted new Class I well the Director may rely on the existing permit file for those items of information listed below which are current and accurate in the file. For a newly drilled Class I well, the Director shall require the submission of all the information listed below. For both existing and new Class I wells certain maps, cross-sections, tabulations of wells within the area of review and other data may be included in the application by reference provided they are current, readily available to the Director (for example, in the permitting agency's files) and sufficiently identified to be retrieved. In cases where EPA issues the permit all the information in this Section must be submitted to the Administrator.

(a) Prior to the issuance of a permit for an existing Class I well to operate or the construction or conversion of a new Class I well the Director shall consider the following:

(1) Information required in 40 CFR 144.31 and 144.31(g);

[146.14(a)(1) amended by 48 FR 14153, April 1, 1983]

(2) A map showing the injection well(s) for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number, or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (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. Only information of public record is required to be included on this map;

(3) A tabulation of data on all wells within the area of review which penetrate into the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require;

(4) Maps and cross sections indicating the general vertical and lateral limits of all underground sources of drinking water within the area of review, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection;

(5) Maps and cross sections detailing the geologic structure of the local area;

(6) Generalized maps and cross sections illustrating the regional geologic setting;

(7) Proposed operating data;

(i) Average and maximum daily rate and volume of the fluid to be injected;

(ii) Average and maximum injection pressure; and

(iii) Source and an analysis of the chemical, physical, radiological and biological characteristics of injection fluids;

(8) Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the receiving formation;

(9) Proposed stimulation program;

(10) Proposed injection procedure;

(11) Schematic or other appropriate drawings of the surface and subsurface construction details of the well.

[146.14(a)(11) amended by 46 FR 43160, August 27, 1981]

(12) Contingency plans to cope with all shut-ins or well failures so as to prevent migration of fluids into any underground source of drinking water;

(13) Plans (including maps) for meeting the monitoring requirements in § 146.13(b);

(14) For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under 40 CFR 144.55;

[146.14(a)(14) amended by 48 FR 14153, April 1, 1983]

(15) Construction procedures including a cementing and casing program, logging procedures, deviation checks, and a drilling, testing, and coring program; and

(16) A certificate that the applicant has assured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by 40 CFR 144.52(a)(1).

[146.14(a)(16) amended by 46 FR 43160, August 27, 1981; 48 FR 14153, April 1, 1983]

(b) Prior to granting approval for the operation of a Class I well the Director shall consider the following information:

(1) All available logging and testing program data on the well;

(2) A demonstration of mechanical integrity pursuant to §146.08;

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

[146.14(b)(3) revised by 46 FR 43160, August 27, 1981]

(4) The results of the formation testing program;

(5) The actual injection procedure;

(6) The compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone; and

(7) The status of corrective action on defective wells in the area of review.

(c) Prior to granting approval for the plugging and abandonment of a Class I well the Director shall consider the following information:

(1) The type and number of plugs to be used;

(2) The placement of each plug including the elevation of the top and bottom;

(3) The type and grade and quantity of cement to be used;

(4) The method for placement of the plugs; and

(5) The procedure to be used to meet the requirements of § 146.10(c).

§ 146.15 Mid-course evaluation requirements.

In compliance with 40 CFR 144.9(b)(2) the data to be submitted on each Class I permit at six month intervals during the first two years of operation of the State program shall at a minimum include the following:

[146.15 introductory paragraph amended by 48 FR 14153, April 1, 1983]

(a) The data required in § 146.14(a)(1);

(b) The data required in § 146.14(a)(3) including, under location, the distance and direction from the injection well;

(c) The depth to the top and bottom of any USDW;

(d) The distance to the nearest down-gradient water supply well;

(e) A description of the geology and hydrology of the area;

(f) The construction characteristics of the well;

(g) The corrective action proposed as well as that performed;

(h) The type and results of all mechanical integrity tests reported to the Director; and

(i) Any reporting to the Director under §144.51(l)(6).

[146.15(i) amended by 48 FR 14153, April 1, 1983]

Subpart C—Criteria and Standards Applicable to Class II Wells

§ 146.21 Applicability.

This subpart establishes criteria and standards for underground injection control programs to regulate Class II wells.

§ 146.22 Construction requirements.

(a) All new Class II wells shall be sited in such a fashion that they inject into a formation which is separated from any USDW by a confining zone that is free

of known open faults or fractures within the area of review.

[146.22(a) amended by 46 FR 43160, August 27, 1981]

[Former 146.22(b) redesignated as (b)(1) by 47 FR 4998, February 3, 1982]

(b) (1) All Class II injection wells shall be cased and cemented to prevent movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered.

[Former 146.22(b)(1)—(3) redesignated as (b)(1)(i)—(iii) by 47 FR 4998, February 3, 1982]

(i) Depth to the injection zone;

(ii) Depth to the bottom of all USDWs; and

(iii) Estimated maximum and average injection pressures;

(b)(2) In addition the Director may consider information on:

(i) Nature of formation fluids;

(ii) Lithology of injection and confining zones;

(iii) External pressure, internal pressure, and axial loading;

(iv) Hole size;

(v) Size and grade of all casing strings; and

(vi) Class of cement.

[New 146.22(b)(2) added by 47 FR 4998, February 3, 1982]

(c) The requirements in paragraph (b) of this section need not apply to existing or newly converted Class II wells located in existing fields if:

(1) Regulatory controls for casing and cementing existed for those wells at the time of drilling and those wells are in compliance with those controls; and

(2) Well injection will not result in the movement of fluids into an underground source of drinking water so as to create a significant risk to the health of persons.

(d) The requirements in paragraph (b) of this section need not apply to newly drilled wells in existing fields if:

(1) They meet the requirements of the State for casing and cementing applicable to that field at the time of submission of the State program to the Administrator; and

(2) Well injection will not result in the movement of fluids into an underground source of drinking water so as to create a significant risk to the health of persons.

(e) Where a State did not have regulatory controls for casing and cementing prior to the time of the submission of the State program to the Administrator, the Director need not apply the casing and cementing requirements in paragraph (b) of this section if he submits as a part of his application for primacy, an appropriate plan for casing and cementing of existing, newly converted, and newly drilled wells in existing fields, and the Administrator approves the plan.

(f) Appropriate logs and other tests shall be conducted during the drilling and construction of new Class II wells. A descriptive report interpreting the results of that portion of those logs and tests which specifically relate to (1) an USDW and the confining zone adjacent to it, and (2) the injection and adjacent formations shall be prepared by a knowledgeable log analyst and submitted to the Director. At a minimum, these logs and tests shall include:

[146.22(f) amended by 46 FR 43160, August 27, 1981]

(1) Deviation checks on all holes constructed by first drilling a pilot hole and then enlarging the pilot hole, by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling.

(2) Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required the following shall be considered by the Director in setting logging and testing requirements:

[146.22(f)(2)(i) and (i)(A) revised by 47 FR 4998, February 3, 1982]

(i) For surface casing intended to protect underground sources of drinking water in areas where the lithology has not been determined:

(A) Electric and caliper logs before casing is installed; and

(B) A cement bond, temperature, or density log after the casing is set and cemented.

(ii) For intermediate and long strings of casing intended to facilitate injection:

(A) Electric, porosity and gamma ray logs before the casing is installed;

[146.22 (f)(2)(ii)(A) revised by 47 FR 4998, February 3, 1982]

(B) Fracture finder logs; and

(C) A cement bond, temperature, or density log after the casing is set and cemented.

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

(1) Fluid pressure;

(2) Estimated fracture pressure;

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

[146.22(g) revised by 47 FR 4998, February 3, 1982]

§ 146.23 Operating, monitoring, and reporting requirements.

[Editor's note: EPA July 26, 1982 (47 FR 32129) amended §146.23 to add OMB control No. 2000–0456.]

(a) *Operating Requirements.* Operating requirements shall, at a minimum, specify that:

(1) Injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In no case shall injection pressure cause the movement of injection or formation fluids into an underground source of drinking water.

[146.23(a)(1) amended by 46 FR 43160, August 27, 1981]

(2) Injection between the outermost casing protecting underground sources of drinking water and the well bore shall be prohibited.

(b) *Monitoring Requirements.* Monitoring requirements shall, at a minimum, include:

(1) Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics;

(2) Observation of injection pressure, flow rate, and cumulative volume at least with the following frequencies:

(i) Weekly for produced fluid disposal operations;

(ii) Monthly for enhanced recovery operations;

(iii) Daily during the injection of liquid hydrocarbons and injection for withdrawal of stored hydrocarbons; and

(iv) Daily during the injection phase of cyclic steam operations;

And recording of one observation of injection pressure, flow rate and cumulative volume at reasonable intervals no greater than 30 days.

[146.23(b)(2) revised by 47 FR 4998, February 3, 1982]

(3) A demonstration of mechanical integrity pursuant to § 146.08 at least once every five years during the life of the injection well;

(4) Maintenance of the results of all monitoring until the next permit review (see 40 CFR 144.52(a)(5)); and

[146.23(b)(4) amended by 48 FR 14153, April 1, 1983]

(5) Hydrocarbon storage and enhanced recovery may be monitored on a field or project basis rather than on an individual well basis by manifold monitoring. Manifold monitoring may be used in cases of facilities consisting of more than one injection well, operating with a common manifold. Separate monitoring systems for each well are not

required provided the owner/operator demonstrates that manifold monitoring is comparable to individual well monitoring.

(c) *Reporting Requirements.*

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

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

(Approved by the Office of Management and Budget under control number 2000-0456).

[146.23 amended by 48 FR 31404, July 8, 1983]

§ 146.24 Information to be considered by the director.

This section sets forth the information which must be considered by the Director in authorizing Class II wells. Certain maps, cross-sections, tabulations of wells within the area of review, and other data may be included in the application by reference provided they are current, readily available to the Director (for example, in the permitting agency's files) and sufficiently identified to be retrieved. In cases where EPA issues the permit, all the information in this Section is to be submitted to the Administrator.

(a) Prior to the issuance of a permit for an existing Class II well to operate or the construction or conversion of a new Class II well the Director shall consider the following:

(1) Information required in 40 CFR 144.31 and 144.31(g);

[146.24(a)(1) amended by 48 FR 14153, April 1, 1983]

(2) A map showing the injection well or project area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, and water wells. The map may also show surface bodies of waters, mines (surface and subsurface), quarries and other pertinent surface features including residences and roads, and faults if known or suspended. Only information of public record and pertinent information known to the applicant is required to be included on this map. This requirement does not apply to existing Class II wells; and

(3) A tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review included on the map required under paragraph (a)(2) of this section which penetrate the proposed injection zone or, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Director may require. In cases where the information would be repetitive and the wells are of similar age, type, and construction the Director may elect to only require data on a representative number of wells. This requirement does not apply to existing Class II wells.

(4) Proposed operating data:

(i) Average and maximum daily rate and volume of fluids to be injected;

(ii) Average and maximum injection pressure; and

[146.24(a)(4)(iii)—(6) amended by 47 FR 4998, February 3, 1982]

(iii) Source and an appropriate analysis of the chemical and physical characteristics of the injection fluid.

(5) Appropriate geological data on the injection zone and confining zone including lithologic description, geological name, thickness and depth;

(6) Geologic name and depth to bottom of all underground sources of drinking water which may be affected by the injection;

(7) Schematic or other appropriate drawings of the surface and subsurface construction details of the well;

[146.24(a)(8)—(12) removed and (13) and (14) redesignated as (8) and (9) by 47 FR 4998, February 3, 1982; amended by 48 FR 14153, April 1, 1983]

(8) In the case of new injection wells the corrective action proposed to be taken by the applicant under 40 CFR 144.55;

(9) A certificate that the applicant has assured through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by 40 CFR 144.52(a)(7);

(b) In addition the Director may consider the following:

(1) Proposed formation testing program to obtain the information required by §146.22 (g);

(2) Proposed stimulation program;

(3) Proposed injection procedure;

(4) Proposed contingency plans, if any, to cope with well failures so as to prevent migration of contaminating fluids into an underground source of drinking water.

(5) Plans for meeting the monitoring requirements of § 146.23(b).

[New 146.24(b) added and former (b) redesignated as (c) by 47 FR 4998, February 3, 1982]

(c) Prior to granting approval for the operation of a Class II well the Director shall consider the following information:

(1) All available logging and testing program data on the well;

(2) A demonstration of mechanical integrity pursuant to § 146.08;

(3) The anticipated maximum pressure and flow rate at which the permittee will operate.

(4) The results of the formation testing program;

(5) The actual injection procedure; and

(6) For new wells the status of corrective action on defective wells in the area of review.

[146.24(c) redesignated as (d) by 47 FR 4998, February 3, 1982]

(d) Prior to granting approval for the plugging and abandonment of a Class II well the Director shall consider the following information:

(1) The type, and number of plugs to be used;

(2) The placement of each plug including the elevation of top and bottom;

(3) The type, grade, and quantity of cement to be used;

(4) The method of placement of the plugs; and

(5) The procedure to be used to meet the requirements of § 146.10(c).

§ 146.25 Mid-course evaluation requirements.

(a) In compliance with 40 CFR 144.9(b)(2) the data to be submitted on each new Class II permit at six months intervals during the first two years of operation of the State program shall at a minimum include the following:

[146.25(a) introductory paragraph amended by 48 FR 14153, April 1, 1983]

(1) The data required in § 146.24(a)(1);

(2) The data required in § 146.24(a)(3) including, under location, the distance and direction from the injection well;

(3) The depth to the top and bottom of any USDW;

(4) The distance to the nearest down-gradient water supply well;

(5) A description of the geology and hydrology of the area;

(6) The construction characteristics of the well;

(7) The corrective action proposed as well as that performed; and

(8) Any reporting to the Director under §144.51(l)(6)

[146.25(a)(8) amended by 48 FR 14153, April 1, 1983]

(b) The Director shall also submit the type and results of all Mechanical Integrity tests reported on existing wells and new (conversion only) wells during the first two years of operation.

(c) The Director shall require a temperature log or noise log, on a sample of Class II wells in cases where operators submitted cementing records to meet the requirement of § 146.08(c). The wells to be tested shall be chosen by a formal random selection procedure. The sampling shall be done on a field or pool basis and be statistically representative of the wells in that field or pool. At a minimum, the sample size for each State shall be 100 wells or 5 percent of the number of Class II injection wells in the State whichever is smaller. At least half of the wells tested must be existing wells.

Subpart D—Criteria and Standards Applicable to Class III Wells

§ 146.31 Applicability.

This subpart establishes criteria and standards for underground injection control programs to regulate Class III wells.

§ 146.32 Construction requirements.

(a) All new Class III wells shall be cased and cemented to prevent the migration of fluids into or between underground sources of drinking water. The Director may waive the cementing requirement for new wells in existing projects or portions of existing projects where he has substantial evidence that no contamination of underground sources of drinking water would result. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:

[146.32(a) revised by 47 FR 4998, February 3, 1982]

(1) Depth to the injection zone;

(2) Injection pressure, external pressure, internal pressure, axial loading, etc.;

(3) Hole size;

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

(5) Corrosiveness of injected fluids and formation fluids;

(6) Lithology of injection and confining zones; and

(7) Type and grade of cement.

(b) Appropriate logs and other tests shall be conducted during the drilling and construction of new Class III wells. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the Director. The logs and tests appropriate to each type of Class III well shall be determined based on the intended function, depth, construction and other characteristics of the well, availability of similar data in the area of the drilling site and the need for additional information that may arise from time to time as the construction of the well progresses. Deviation checks shall be conducted on all holes where pilot holes and reaming are used, unless the hole will be cased and cemented by circulating cement to the surface. Where deviation checks are necessary they shall be conducted at sufficiently frequent intervals to assure that vertical avenues for fluid migration in the form of diverging holes are not created during drilling.

[146.32(b) amended by 46 FR 43160, August 27, 1981; 47 FR 4998, February 3, 1982]

(c) Where the injection zone is a formation which is naturally water-bearing the following information concerning the injection zone shall be determined or calculated for new Class III wells or projects:

(1) Fluid pressure;

(2) Fracture pressure; and

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

[146.32(c) amended by 47 FR 4998, February 3, 1982]

(d) Where the injection formation is not a water-bearing formation, the information in paragraph (c)(2) of this section must be submitted.

[146.32(d) amended by 47 FR 4998, February 3, 1982]

(e) Where injection is into a formation which contains water with less than 10,000 mg/l TDS monitoring wells shall be completed into the injection zone and into any underground sources of drinking water above the injection zone which could be affected by the mining operation. These wells shall be located in such a fashion as to detect any excursion of injection fluids, process by-products, or formation fluids outside the mining area or zone. If the operation may be affected by subsidence or catastrophic collapse the monitoring wells shall be located so that they will not be physically affected.

(f) Where injection is into a formation which does not contain water with less than 10,000 mg/l TDS, no monitoring wells are necessary in the injection stratum.

(g) Where the injection wells penetrate an USDW in an area subject to subsidence or catastrophic collapse an adequate number of monitoring wells shall be completed into the USDW to detect any movement of injected fluids, process by-products or formation fluids into the USDW. The monitoring wells shall be located outside the physical influence of the subsidence or catastrophic collapse.

(h) In determining the number, location, construction and frequency of monitoring of the monitoring wells the following criteria shall be considered:

(1) The population relying on the USDW affected or potentially affected by the injection operation;

(2) The proximity of the injection operation to points of withdrawal of drinking water;

(3) The local geology and hydrology;

(4) The operating pressures and whether a negative pressure gradient is being maintained;

(5) The nature and volume of the injected fluid, the formation water, and the process by-products; and

[146.32(h)(5) revised by 46 FR 43160, August 27, 1981]

(6) The injection well density.

§ 146.33 Operating, monitoring, and reporting requirements.

[*Editor's note:* EPA July 26, 1982 (47 FR 32129) amended §146.33 to add OMB control No. 2000–0456.]

(a) *Operating Requirements.* Operating requirements prescribed shall, at a minimum, specify that:

(1) Except during well stimulation injection pressure at the wellhead shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case, shall injection pressure initiate fractures in the confining zone or cause the migration of injection or formation fluids into an underground source of drinking water.

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

(b) *Monitoring Requirements.* Monitoring requirements shall, at a minimum, specify:

[146.33(b)(1)—(4) amended by 47 FR 4998, February 3, 1982]

(1) Monitoring of the nature of injected fluids with sufficient frequency to yield representative data on its characteristics. Whenever the injection fluid is modified to the extent that the analysis required by §146.34(a)(7)(iii) is incorrect or incomplete, a new analysis as required by §146.34(a)(7)(iii) shall be provided to the Director.

(2) Monitoring of injection pressure and either flow rate or volume semi-monthly,

or metering and daily recording of injected and produced fluid volumes as appropriate.

(3) Demonstration of machanical integrity pursuant to § 146.08 at least once every five years during the life of the well for salt solution mining.

(4) Monitoring of the fluid level in the injection zone semi-monthly, where appropriate and monitoring of the parameters chosen to measure water quality in the monitoring wells required by § 146.32(e), semi-monthly.

(5) Quarterly monitoring of wells required by 146.32(g).

(6) All Class III wells may be monitored on a field or project basis rather than an individual well basis by manifold monitoring. Manifold monitoring may be used in cases of facilities consisting of more than one injection well, operating with a common manifold. Separate monitoring systems for each well are not required provided the owner/operator demonstrates that manifold monitoring is comparable to individual well monitoring.

(c) *Reporting Requirements.* Reporting requirements shall, at a minimum, include:

(1) Quarterly reporting to the Director on required monitoring;

(2) Results of mechanical integrity and any other periodic test required by the Director reported with the first regular quarterly report after the completion of the test; and

(3) Monitoring may be reported on a project or field basis rather than individual well basis where manifold monitoring is used.

(Approved by the Office of Management and Budget under control number 2000-0456).

[146.33 amended by 48 FR 31404, July 8, 1983]

§ 146.34 Information to be considered by the Director.

This section sets forth the information which must be considered by the Director in authorizing Class III wells. Certain maps, cross sections, tabulations of wells within the area of review, and other data may be included in the application by reference provided they are current, readily available to the Director (for example, in the permitting agency's files) and sufficiently identified to be retrieved. In cases where EPA issues the permit, all the information in

(a) Prior to the issuance of a permit for an existing Class III well or area to operate or the construction of a new Class III well the Director shall consider the following:

(1) Information required in 40 CFR 144.31 and 144.31(g).

[146.34(a)(1) amended by 48 FR 14153, April 1, 1983]

(2) A map showing the injection well or project area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name and location of all existing producing wells, injection wells, abandoned wells, dry holes, public water systems and water wells. The map may also show surface bodies of waters, mines (surface an subsurface) quarries and other pertinent surface features including residences and roads, and faults if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.

(3) A tabulation of data reasonably available from public records or otherwise known to the applicant on wells within the area of review included on the map required under paragraph (a)(2) of this section which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and completion, and any additional information the Director may require. In cases where the information would be repetitive and the wells are of similar age, type, and construction the Director may elect to only require data on a representative number of wells.

(4) Maps and cross sections indicating the vertical limits of all underground sources of drinking water within the area of review, their position relative to the injection formation, and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection;

[146.34(a)(4) amended by 47 FR 4998, February 3, 1982]

(5) Maps and cross sections detailing the geologic structure of the local area;

(6) Generalized map and cross sections illustrating the regional geologic setting;

(7) Proposed operating data:

(i) Average and maximum daily rate and volume of fluid to be injected;

(ii) Average and maximum injection pressure; and

(iii) Qualitative analysis and ranges in concentrations of all constituents of injected fluids. The applicant may request Federal confidentiality as specified in 40 CFR Part 2. If the information is proprietary an applicant may, in lieu of the ranges in concentrations, choose to submit maximum concentrations which shall not be exceeded. In such a case the applicant shall retain records of the undisclosed concentrations and provide them upon request to the Director as part of any enforcement investigation.

[146.34 (a)(7)(iii) revised by 47 FR 4998, February 3, 1982]

(8) Proposed formation testing program to obtain the information required by § 146.32(c).

[146.34(a)(8) revised by 47 FR 4998, February 3, 1982]

(9) Proposed stimulation program;

(10) Proposed injection procedure;

(11) Schematic or other appropriate drawings of the surface and subsurface construction details of the well;

(12) Plans (including maps) for meeting the monitoring requirements of § 146.33(b);

(13) Expected changes in pressure, native fluid displacement, direction of movement of injection fluid;

(14) Contingency plans to cope with all shut-ins or well failures so as to prevent the migration of contaminating fluids into underground sources of drinking water;

(15) A certificate that the applicant has assured, through a performance bond, or other appropriate means, the resources necessary to close, plug, or abandon the well as required by 40 CFR 144.52(a)(7) and

[146.34(a)(15) amended by 46 FR 43160, August 27, 1981; 48 FR 14153, April 1, 1983]

(16) The corrective action proposed to be taken under 40 CFR 144.55.

[146.34(a)(16) amended by 48 FR 14153, April 1, 1983]

(b) Prior to granting approval for the operation of a Class III well the Director shall consider the following information:

(1) All available logging and testing data on the well;

(2) A satisfactory demonstration of mechanical integrity for all new wells and for all existing salt solution wells pursuant to §146.08;

[146.34(b)(2) amended by 47 FR 4998, February 3, 1982]

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

(4) The results of the formation testing program;

(5) The actual injection procedures; and

(6) The status of corrective action on defective wells in the area of review.

(c) Prior to granting approval for the plugging and abandonment of a Class III well the Director shall consider the following information:

(1) The type and number of plugs to be used;

[Sec. 146.34(c)(1)]

(2) The placement of each plug including the elevation of the top and bottom;

(3) The type, grade and quantity of cement to be used;

(4) The method of placement of the plugs, and

(5) The procedure to be used to meet the requirements of § 146.10(c).

§ 146.35 Mid-course evaluation requirements.

In compliance with 40 CFR 144.9(b)(2) the data to be submitted on each Class III permit at six month intervals during the first two years of operation of the State program shall at a minimum include the following:

[146.35 introductory paragraph amended by 48 FR 14153, April 1, 1983]

(a) The data required in § 146.14(a)(1);

(b) The data required in § 146.34(a)(3) including, under location, the distance and direction from the injection well;

(c) The depth to the top and bottom of any USDW;

(d) The distance to the nearest down-gradient water supply well;

(e) A description of the geology and hydrology of the area;

(f) The construction characteristics of the well;

(g) The type and results of all mechanical integrity tests reported to the Director during the first two years of the program; and

(h) Any reporting to the Director under §144.51(l)(6)

[146.35(h) amended by 48 FR 14153, April 1, 1983]

Subpart E—Criteria and Standards Applicable to Class IV Injection Wells [Reserved]

Subpart F—Criteria and Standards Applicable to Class V Injection Wells

§ 146.51 Applicability.

This subpart sets forth Criteria and Standards for underground injection control programs to regulate all injection not regulated in Subparts B, C, D, and E.

(a) Generally, wells covered by this Subpart inject non-hazardous fluids into or above formations that contain underground sources of drinking water. It includes all wells listed in § 146.05(e) but is not limited to those types of injection wells.

(b) It also includes wells not covered in Class IV that inject radioactive material listed in 10 CFR Part 20, Appendix B, Table II, Column 2.

[146.51(b) revised by 47 FR 4998, February 3, 1982]

§ 146.52 Inventory and Assessment.

(a) The owner or operator of any Class V well shall, within one year of the effective date of an underground injection control program, notify the Director of the existence of any well meeting the definitions of Class V under his control, and submit the inventory information required in 40 CFR 144.26(a).

[146.52(a) amended by 48 FR 14153, April 1, 1983]

(b) Within three (3) years of approval of the State program the Director shall complete and submit to EPA a report containing:

(1) The information on the construction features of Class V wells, and the nature and volume of the injected fluids;

(2) An assessment of the contamination potential of the Class V wells using hydrogeological data available to the State;

(3) An assessment of the available corrective alternatives where appropriate and their environmental and economic consequences; and

(4) Recommendations both for the most appropriate regulatory approaches and for remedial actions where appropriate.

STATE OF ARKANSAS

DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

ARKANSAS UNDERGROUND INJECTION CONTROL CODE

Section 1. TITLE AND PURPOSE

(a) The following rules and regulations of the Department of Pollution Control and Ecology of the State of Arkansas, adopted pursuant to the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended; Ark.Stat.Ann. §82-1901et seq.), shall be known as the ARKANSAS UNDERGROUND INJECTION CONTROL CODE, hereinafter called the UIC.

(b) It is the purpose of this Code to adopt underground injection control regulations necessary to qualify the State of Arkansas to receive authorization for its Underground Injection Control Program pursuant to the Safe Drinking Water Act of 1974, as amended (PL 93-523 as amended by PL 95-190 and PL 96-63; 42 USC 300f et seq.). In order to receive such authorization, it is necessary for the Department of Pollution Control and Ecology to have regulations as stringent as the federal program administered by the United States Environmental Protection Agency.

Section 2. DEFINITIONS

When used in this Code:

(a) Abandoned well means a well whose use has been permanently discontinued or which is in a state of disrepair such that it cannot be used for its intended purpose or for observation purposes.

(b) Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

(c) Application means the EPA standard national forms for applying for a permit, including any additions, revisions or modifications to the forms; or forms approved by EPA for use in approved States, including any approved modifications or revisions. For RCRA, application also includes the information required by the Director under §122.25 (contents of Part B of RCRA application).

(d) Aquifer means a geological formation,group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

(e) Area of review means the area surrounding an "injection well" described according to the criteria set forth in s146.06.

(f) Casing means a pipe or tubing of varying diameter and weight, lowered into a borehole during or after drilling in order to support the sides of the hole and thus prevent the walls from caving, to prevent loss of drilling mud into porous ground, or to prevent water, gas, or other fluid from entering or leaving the hole. (Amended by 46 FR 43150, August 27, 1981.)

(g) Catastrophic collapse means the sudden and utter failure of overlying "strata" caused by removal of underlying materials.

(h) Cementing means the operation whereby a cement slurry is pumped into a drilled hole and/or forced behind the casing.

(i) CFR means Code of Federal Regulations.

(j) Confining bed means a body of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

(k) Confining zone means a geological formation, group of formation, or part of a formation that is capable of limiting fluid movement above and below the injection zone.

(l) Contaminant means any physical, chemical, biological, or radiological substance or matter in water.

(m) Department means the Arkansas Department of Pollution Control and Ecology.

(n) Director means the Director of the Arkansas Department of Pollution Control and Ecology.

(o) Disposal well means a well used for the disposal of waste into a subsurface stratum.

(p) Effective date of a UIC program means the date that a State UIC program is approved or established by the Administrator.

(q) EPA means the United States Environmental Protection Agency.

(r) Exempted aquifer means an aquifer or its portion that meets the criteria in the definition of "underground source of drinking water" but which has been exempted according to the procedures of s122.35(b).

(s) Existing injection well means an "injection well" other than a "new injection well."

(t) Facility or activity means any "HWM facility," UIC "injection well," NPDES "point source," or State 404 dredge and fill activity, or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under RCRA, UIC, NPDES, or 404 programs.

(u) Fault means a surface or zone of rock fracture along which there has been displacement.

(v) Flow rate means the volume per time unit given to the flow of gases or other fluid substance which emerges from an orifice, pump, turbine, or passes along a conduit or channel.

(w) Fluid means material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.

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

(y) Formation fluid means "fluid" present in a "formation" under natural conditions as opposed to introduced fluids, such as drilling mud.

(z) Generator means any person, by site location, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261.

(zz) Groundwater means water below the land surface in a zone of saturation.

(aa) Hazardous waste means a hazardous waste as defined in 40 CFR 261.3.

(bb) Hazardous Waste Management facility ("HWM facility") means all contiguous land, and structures, other appurtenances, and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (for example, one or more landfills, surface impoundments, or combination of them).

(cc) Industrial waste means any liquid, gaseous or solid waste substance resulting from any process of industry, mining, manufacturing, trade or business or from the development of any natural resources.

(dd) Injection well means a "well" into which "fluids" are being injected.

(ee) Injection zone means a geological "formation", group of formations, or part of a formation receiving fluids through a well.

(ff) Lithology means the description of rocks on the basis of their physical and chemical characteristic.

(gg) Major facility means any RCRA, UIC, NPDES, or 404 "facility or activity" classified as such by the Regional Administrator, or, in the case of "approved State programs," the Regional Administrator in conjunction with the State Director.

(hh) Other wastes means garbage, municipal refuse, decayed wood, sawdust, shavings, bark, lime, sand, ashes, offal, oil tar chemicals, and all other substances organic or inorganic not sewage or industrial waste which may be discharged into the waters of the State. Any wastes and "pollutants" includes sewage, industrial waste, or other wastes.

(ii) Owner or operator means the owner or operator of any facility or activity subject to regulation under the RCRA, UIC, NPDES, or 404 program.

(jj) Packer means a device lowered into a well which can be expanded to produce a fluid-tight seal.

(kk) Permit means an authorization, license, or equivalent control document issued to implement the requirements of Parts 122, 123, 124 and 146 of the 40 CFR. "Permit" does not include RCRA interim status (§122.23), UIC authorization by rule (§122.37), or any permit which has not yet been the subject of final agency action, such as a "draft permit" or a "proposed permit."

(ll) Person means the State agency, any municipality, governmental subdivision of the State or the United States, public or private corporation, individual, partnership, association or other entity.

(mm) Plugging means the act or process of stopping the flow of water, oil, or gas in "formations" penetrated by a borehole or "well."

(nn) Plugging record means a systematic listing of permanent or temporary abandonment of water, oil, gas, test, exploration and waste injection wells, and may contain a well log, description of amounts and types of plugging material used, the method employed for plugging, a description of formations which are sealed and a graphic log of the well showing formation location, formation thickness, and location of plugging structures.

(oo) Pollution means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the State, or such discharge of any liquid, gaseous or solid substance in any waters of the State as will or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

(pp) Pressure means the total load or force per unit area acting on a surface.

(qq) Radioactive Waste means any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR Part 20, Appendix B. Table II, Column 2, or exceed the "Criteria for Identifying and Applying Characteristics of Hazardous Waste and for Listing Hazardous Waste" in 40 CFR Part 261, whichever is applicable.

(rr) RCRA means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Pub. L. 94-580, as amended by Pub. L. 95-609, 42 U.S.C. 300 (f) et seq.

(ss) Site means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

(tt) Sole or principal source aquifer means an aquifer which has been designated by the Administrator pursuant to sections 1424(a) or (e) of the SDWA.

(uu) State Director means the chief administrative officer of any State or interstate agency operating an approved program, or the delegated representative of the State Director. If responsibility is divided among two or more State or interstate agencies, "State Director" means the chief administrative officer of the State or interstate agency authorized to perform the particular procedure or function to which reference is made.

(vv) Stratum (plural strata) means a single sedimentary bed or layer, regardless of thickness, that consists of generally the same kind of rock material.

(ww) Subsidence means the lowering of the natural land surface in response to Earth movements; lowering of fluid pressure; removal of underlying supporting material by mining or solution of solids, either artificially or from natural causes; compaction due to wetting (Hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

(xx) Surface casing means the first string of well casing to be installed in the well.

(yy) Total dissolved solids ("TDS") means the total dissolved (filterable) solids as determined by use of the method specified in 40 CFR Part 136.

(zz) UIC means the Underground Injection Control program under part C of the Safe Drinking Water Act., including an "approved program."

(zzz) Underground injection means a "well injection."

(aaa) Underground source of drinking water (USDW, RCRA and UIC) means an aquifer or its portion:

(1) (i) Which supplies any public water system; or
(ii) Which contains a sufficient quantity of ground water to supply a public water system; and
(A) Currently supplies drinking water for human consumption; or
(B) Contains fewer than 10,000 mg/l total dissolved solids; and
(2) Which is not an "exempted aquifer."

(bbb) USDW means "underground source of drinking water."

(ccc) Well means a bored, drilled or driven shaft, or a dug hole whose depth is greater than the largest surface dimension.

(ddd) Well injection means the subsurface emplacement of fluids through a bored, drilled, or driven well; or dug well, where the depth of the dug well is greater than the largest surface dimensions.

(eee) Well plug means a watertight and gastight seal installed in a borehole or well to prevent movement of fluids.

(fff) Well stimulation means several processes used to clean the well bore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for wastewater to move more readily into the formation and includes (1) surging, (2) jetting, (3) blasting, (4) acidizing, (5) hydraulic fracturing.

(ggg) Well monitoring means the measurement, by on-site instruments or laboratory methods, of the quality of water in a well.

(hhh) New injection well (UIC) means a well which began injection after a UIC program for the State applicable to the well is approved.

Section 3. ADOPTION OF FEDERAL REGULATIONS

(a) Except where manifestly inconsistent with the provisions of the Safe Drinking Water Act, as amended, or with federal regulations adopted pursuant thereto, or with the provisions of this Code,

the Department shall have the responsibilities and that authority, with reference to the State of Arkansas, and granted to the Administrator of the United States Environmental Protection Agency under the provision of the following regulations, which regulations are hereby adopted and made part of this Code as though set forth herein word for word, and which shall also apply to all persons subject to regulations under the provisions of the Safe Drinking Water Act and/or the Arkansas Water and Air Pollution Control Act relating to underground injection control, within the State of Arkansas:

40 CFR Part 122, Subparts A, and C (except Section 122.36); 45 FR 33418 et seq., May 19, 1980; as amended 46 FR 43610 et seq., August 27, 1981; as amended April 8, 1982; and as amended to the date hereof;

40 CFR Part 123, Subparts A and C, 45 FR 33377 et seq. May 19, 1980; as amended April 8, 1982; and as amended to the date hereof; and

40 CFR Part 124, Subpart A, 45 FR 3345, et seq. May 19, 1980; as amended April 8, 1982; and as amended to the date hereof; and

40 CFR Part 146, Subparts A, B, D, E, and F. 45 FR 42500, et seq., June 24, 1980; as amended 46 FR 43161, et seq., August 27, 1981; as amended February 3, 1982; and as amended to the date hereof.

Whenever the effect of any of the aforecited regulations is modified by a formal action of the United States Environmental Protection Agency, as evidenced by publication in the Federal Register, the effect of such action, upon its effective date, shall be extended in full force and effect as Interim Provisions of this Code and shall be enforceable as such, provided that the effect of said action does not conflict with the provisions of the Arkansas Water and Air Pollution Control Act. No Interim Provision of this Code shall remain in effect for more than six months, unless the Commission grants an extention after opportunity for public comment as provided in subsection (e) below.

(b) (Reserved for future federal regulation reference.)

(c) (Reserved for future federal regulation reference.)

(d) In all instances wherein the federal regulations of 40 CFR 122, 123, 124 and 146 refer to the administrator of the United States Environmental Protection Agency, the reference, for purposes of this Code, shall be deemed to mean the Department, unless the context plainly dictates otherwise. Nothing herein contained shall be construed as eliminating any approval required from the EPA Administrator under the SDWA for Department action such as aquifer exemption and alternative testing of mechanical integrity.

(e) The Director, within a reasonable time after the effective date of the Interim Provisions of this Code, shall cause a public notice to be published in a newspaper of statewide circulation stating the existence of such Interim Provisions and giving notice of the public's opportunity to comment on the Interim Provisions. Whenever the Director finds that a public hearing should be held to consider the continued application of Interim Provisions or proposed modifications to such Provisions, a notice of public hearing and formal action of the Commission shall follow in the manner described in subsection (f) below.

(f) Whenever the federal regulations referenced in subsection (a) of this section are amended, modified, revoked, expanded, supplemented, or otherwise changes, such revocation, expansion, supplement or other change shall become part of this Code when:

(1) a 30 day notice of public hearing upon the proposed change is published by the Department, and

(2) such amendment, modification, revocation, expansion, supplement or other change is adopted by the Commission after public hearing; where a time exceeding 35 days exists between the promulgation of the federal regulation and the next regularly scheduled Commission meeting, the Director, finding sufficient cause for earlier consideration may request the chairman of the Commission to call a special meeting of the Commission to consider the matter.

(3) such amendement, modification, revocation, expansion, supplement or other change shall become effective upon adoption by the Commission unless otherwise set out in the resolution adopting such change.

Section 4. VIOLATIONS

(a) No person shall construct, install, alter, modify, or operate any underground injection facility without a permit from the Department or, as to Class II and Class V bromine related brine disposal wells, from the Arkansas Oil and Gas Commission.

(b) No person shall construct, install, or operate a Class IV well as defined in Section 5(d) hereof, and no permit for a Class IV well shall be issued by the Department.

(c) No person shall construct, install, alter, modify or operate any underground injection facility contrary to the terms and conditions of a permit or of any provision of this Code or the Arkansas Water and Air Pollution Control Act, as amended (the Act).

(d) No person shall violate any other provision of this Code or of the Act.

(e) Any person who violates any provision of this Code or the Act shall be subject to the penalties as provided in Section 9 (a), (b), and (c), Part I, of this Act (Sec. 82-1909 (a), (b), and (c), Ark.Stats.Ann.)

Section 5. CLASSIFICATION OF INJECTION WELLS

(a) Class I. (1) Wells used by generators of hazardous wastes or owners or operators of hazardous waste management facilities to inject hazardous waste, other than Class IV wells.

(2) Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

(b) Class II. Wells which inject fluids:

(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

(2) For enchanced recovery of oil or natural gas; and

(3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

(c) Class III. Wells which inject for extraction of minerals including:

(1) Mining of sulfur by the Frasch process:

(2) In situ production of uranium or other metals. This category includes only in-situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V. (146.05 (c)(2) revised by 46 FR 43160, August 27, 1981)

(3) Solution mining of salts or potash.

(New 146.05(c)(3) added and former (3), (4) redesignated as (4), (5) by 46 FR 43160, August 27, 1981)

(4) In situ combustion of fossil fuel.

Note. - Fossil fuels includes coal, tar sands, oil shale and any other fossil fuel which can be mined by this process.

(5) Recovery of geothermal energy to produce electric power.

Note. - Class III wells include the recovery of geothermal energy to produce electric power but do not include wells used in heating or aquaculture which fall under Class V.

(d) Class IV. Wells used by generators of hazardous wastes or of radioactive wastes, by owners or operators of hazardous waste management facilities, or by owner or operators of radioactive waste disposal sites to dispose of hazardous wastes or radioactive into or above a formation which within one quarter mile of the well contains an underground source of drinking water.

(e) Class V. Injection wells not included in Class I, II, III, or IV.

Note. - Class V wells includes:

(1) Air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling in a heat pump;

(2) Cesspools or other devices that receive wastes, which have an open bottom and sometimes have perforated sides. The UIC requirements do not apply to single family residential cesspools;

(3) Cooling water return flow wells used to inject water previously used for cooling;

(4) Drainage wells used to drain surface fluid, primarily storm runoff, into a subsurface formation;

(5) Dry wells used for the injection of wastes into a subsurface formation;

(6) Recharge wells used to replenish the water in an aquifer;

(7) Salt water intrusion barrier wells used to inject water into a fresh water aquifer to prevent the intrusion of salt water into the fresh water;

(8) Sand backfill and other backfill wells used to inject a mixture of water and sand, mill tailings or other solids into mined out portions of subsurface mines whether what is injected is a radioactive waste or not. (146.05(e)(8) amended by 46 FR 43160, August, 27, 1981)

(9) Septic system wells used:

(i) To inject the waste or effluent from a multiple dwelling, business establishment, community or regional business establishment septic tank; or

(ii) For a multiple dwelling, community or regional cesspool. The UIC requirements do not apply to single family residential waste disposal systems;

(10) Subsidence control wells (not used for the purpose of oil or natural gas production) used to inject fluids into a non-oil or gas producing zone to reduce or eleminate subsidence associated with the overdraft of fresh water;

(11) Radioactive waste disposal wells other than Class IV: (146.05(e)(11) revised by 46 FR 43160, August 27, 1981);

(12) Geothermal wells used in heating and aquaculture;

(13) Wells used for solution mining of conventional mines such as stopes leaching; (146.05(e)(14) and (15) added by 46 FR 43160 August 27, 1981)

(14) Wells used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts;

(15) Injection wells used in experimental technologies.

(f) Well classes currently operating in Arkansas include Class I wells used by owners of industrial facilities to inject non-hazardous waste in disposal wells which inject beneath the lowermost formation containing, within one quarter mile of the well bore, an USDW.

Class II wells which inject fluids: which are brought to the surface in connection with conventional oil or natural gas production; for enhanced recovery of oil or natural gas and for the storage of hydrocarbons which are liquid at standard temperature and pressure.

Class V wells that are used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts.

Section 6. SEVERABILITY

If any provision of this Code or the application thereof to any person or circumstance is held valid, such invalidity shall not affect other provisions or applications of this Code which can be given effect without the invalid provision or application, and to this end provisions of this Code are declared to be severable.

Section 7. EFFECTIVE DATE

This Code shall be in full force and effect as of the date of its promulgation.

Promulgated the 22 day of January, 1982.
By ORDER OF THE COMMISSION ON POLLUTION CONTROL AND ECOLOGY

John P. Gaitten
Chairman

Attest:

Director

Approved:

Frank White
Frank White, Governor
State of Arkansas

AMENDMENTS TO
ARKANSAS UNDERGROUND INJECTION CODE

AMENDMENTS TO
ARKANSAS UNDERGROUND INJECTION CODE

The Arkansas Underground Injection Code as promulgated on the 22nd day of January, 1982 is hereby amended as follows:

1. The enumeration of Federal regulations adopted by reference in Subsection (a) of Section 3 of the Code, entitled "Adoption of Federal Regulations", is hereby amended to read as follows:

40 CFR Part 122, Subparts A, and C (except Section 122.36); 45 FR 33418 et seq., May 19, 1980; as amended 46 FR 43610 et seq., August 27, 1981; as amended April 8, 1982; and as amended to the date hereof;

40 CFR Part 123, Subparts A and C, 45 FR 33377 et seq. May 19, 1980; as amended April 8, 1982; and as amended to the date hereof; and

40 CFR Part 124, Subpart A, 45 FR 3345, et seq. May 19, 1980; as amended April 8, 1982; and as amended to the date hereof; and

40 CFR Part 146, Subparts A, B, D, E, and F. 45 FR 42500, et seq., June 24, 1980; as amended 46 FR 43161, et seq., August 27, 1981; as amended February 3, 1982; and as amended to the date hereof.

2. Section 4 of the Code, entitled "Violations", is hereby amended by redesignating the present Subsections (b), (c), and (d) as (c), (d), and (e) and adding a new Subsection (b) to read as follows:

"(b) No person shall construct, install, or operate a Class IV well as defined in Section 5(d) hereof, and no permit for a Class IV well shall be issued by the Department."

Promulgated this 15th day of October, 1982.

BY ORDER OF THE COMMISSION ON POLLUTION CONTROL AND ECOLOGY.

John P. Lasater
Chairman

Attest:
Jarrell E. Goodhead
Director

APPROVED:
Frank White
FRANK WHITE, Governor
State of Arkansas

AMENDMENTS TO
ARKANSAS UNDERGROUND INJECTION CONTROL CODE

The Arkansas Underground Injection Control Code as promulgated on the 22nd day of January, 1982 is hereby amended as follows:

The enumeration of Federal regulations adopted by reference in Subsection (a) Section 3 of the Code, entitled "Adoption of Federal Regulations", is hereby amended as follows.

Delete reference to 40 CFR, Part 122 Subparts A and C (except Section 122.36); and change to read Part 144; dated April 1, 1983.

Delete reference to 40 CFR Part 123 Subparts A and C and change to read 40 CFR Part 145; dated April 1, 1983.

Promulgated this 6th day of October, 1983.

BY ORDER OF THE COMMISSION ON POLLUTION CONTROL AND ECOLOGY

Chairman

Attest:

Director

Approved:

BILL CLINTON, Governor
State of Arkansas

ATTACHMENT 2

WASTE STREAM ANALYSIS

TABLE 2.0-1

ANALYSIS OF DECTP WASTEWATER

WDW-1 and WDW-2 (proposed)

Analysis	Aqueous Waste (ppm)
Na	126,800
P	12,600
S	82,000
Cl	11,100
[1] NaOH	56,000
[2] As	20
[3] Total heavy metals, ppm as lead	<20
[4] As	18
[4] Cu	0.6
[4] Pb	Not Detected
[4] Ag	Not Detected

Notes:
1. NaOH - acid titration after H_2O_2 oxidation.
2. As-wet ash method
3. Total heavy metals - heavy metals test in food chemicals Codex, p. 763.
4. Metals - atomic emission, DC plasma

Miscellaneous Waste Streams

TABLE 2.0-3
WASTESTREAMS TO WDW-13 AND WDW-2

Wastestream	Flow gpm (BBL/day)	Composition Component	PPM
Bromine Purification	0.3 (10)	H_2SO_4	980,000
		H_2O	20,000
		Organics	Trace
EDB (Vent Scrubber)	3 (100)	H_2O	1,000,000
		EDB	Trace
VB_r	5 (170)	H_2O	1,000,000
		Ethylene Glycol	Trace
$CaBr_2$ (Caustic Vent Scrubber)	0.5 (20)	H_2O	857,000
		NaBr	83,000
		$NaBrO_3$	24,000
		$NaHCO_3$	8,000
		NaOH	2,000
ADMA Mand re 1/17/83 request	80 gpm	H_2O	998,900
		NaBr	1,000
		Organics	100
DBBPO	5 gpm	NaCl	7,000
		NaBr	11,000
		NaOBr	6,000
		Na_2SO_4	2,000
		$Al(OH)_3$	3,000
		H_2O	Balance
Neutralization	A. 8 (270)	H_2O	842,000
		$Ca(OH)_2$	150,000
		Grit & Inerts	8,000
	B. 7 (240)	H_2O	500,000
		NH_4OH	500,000
Cooling Towers	15 (500)	H_2O	998,985
		Various Salts (Na, Mg, Ca)	1,000
		CrO_4	15
Boiler House	50 (1700)	H_2O	999,000
		Various Salts (Sulfates, Phosphates)	1,000
Surface Run-Off	20	H_2O	1,000,000
		Traces of every compound present on plant site.	
Flare Seal Pots	20 (680)	H_2O	1,000,000
		H_2S	Trace

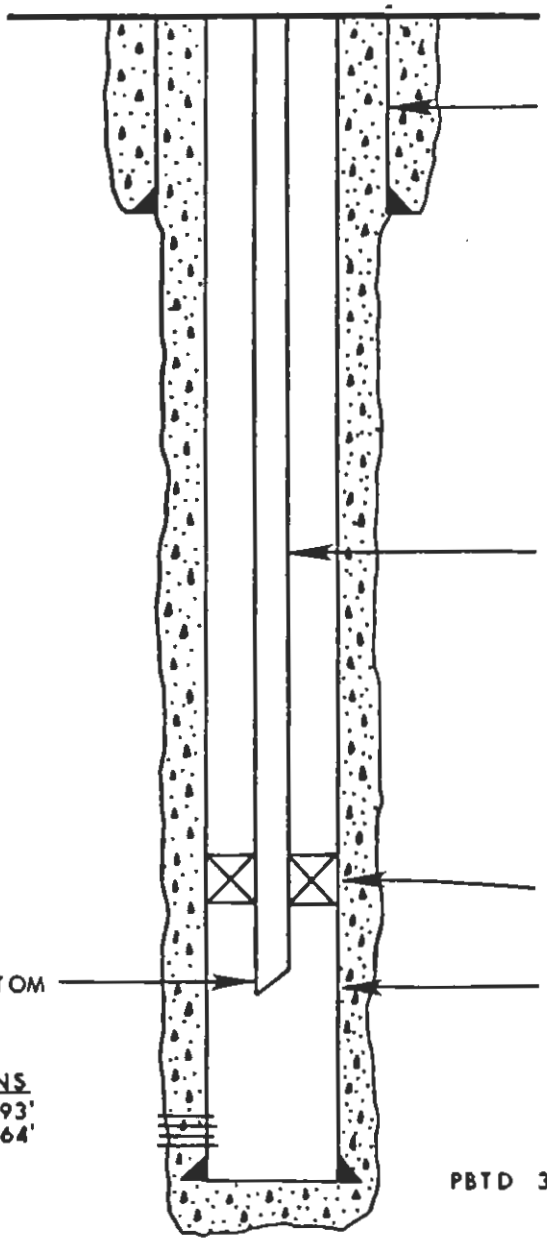
ATTACHMENT 3

WELL DESCRIPTION

8.0 WELL CONSTRUCTION AND COMPLETION

8.1 DISPOSAL WELL NO. 1

Disposal well No. 1 was drilled to a total depth of 3180'. 13 3/8" casing was set at 169' with 250 sacks of cement. 8 5/8" casing was set at 3198' with 1600 sacks of cement. The 8 5/8" casing was perforated from 3048' - 3093' and 3139' - 3164'. 5 1/2" injection tubing was hung off at 2991'. Pertinent construction details are illustrated in Figure 8.0-1 and are listed in Table 8.0-1.



ALL MEASUREMENTS ARE TAKEN FROM KELLY BUSHING (KB)
KB = 11.0' ABOVE GROUND LEVEL

ETHYL CORPORATION
MAGNOLIA, ARKANSAS

FIGURE 8.0-1

DISPOSAL WELL NO.1

SCALE: NONE DATE 9/83

TABLE 8.0-1

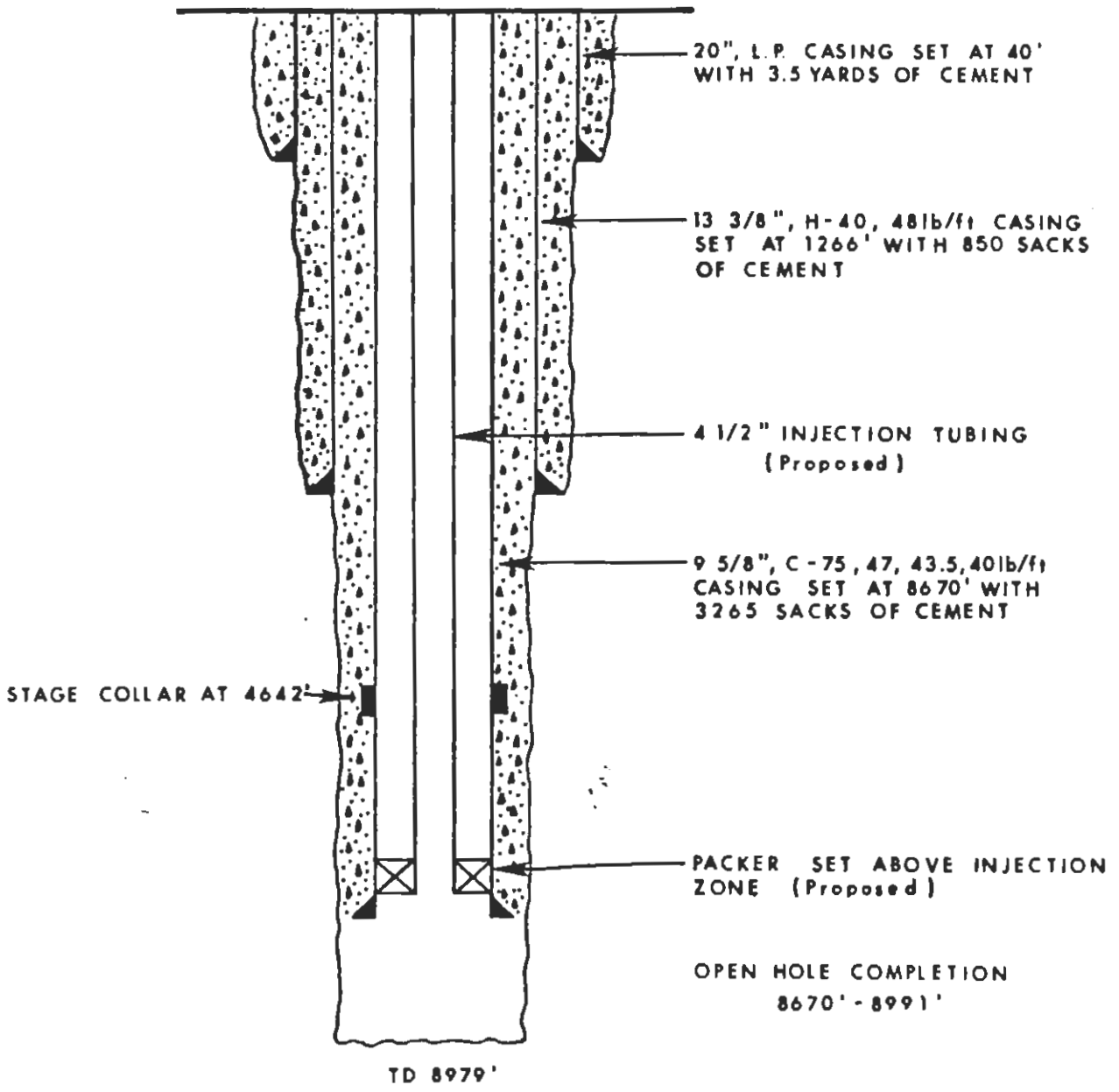
CONSTRUCTION DETAILS DISPOSAL WELL NO. 1

Total Depth	*3180'*
Completion	*Perforated*
Injection Interval(s)	*3048' - 3093'* *3139' - 3164'*
Tubing	*5 1/2", 17 lb/ft., K-55 set at 2991'*
Packer	*TIW packer, top set at 2991'*
Tubulars	
Surface	*13 3/8", 48 lb/ft., H-40 set at 169'*
Long String	*8 5/8", 32 lb/ft., K-55 set at 3198'*
Centralizers	*Yes, depths unknown*
Cement	
Surface	*250 sacks Class "A" plus 2% $CaCl_2$*
Long String	*1300 sacks Halliburton Light* *300 sacks Class "H"*
Cement Equipment	*Unknown*
Annular Fluid	*Inhibited Brine*

All measurements are taken from kelly bushing (KB), KB = 11.0' above ground level.

8.3 DISPOSAL WELL NO. 13

Disposal well No. 13 was drilled to a total depth of 8979'. 20" casing was set at 40' with 3.5 yards of cement. 13 3/8" casing was set at 1266' with 850 sacks of cement. 9 5/8" casing was set at 8670' with 3265 sacks of cement. This well has open hole completion from 8670' - 8979'. Pertinent construction details are illustrated in Figure 8.0-3 and are listed in Table 8.0-3. Please note that well No. 13 currently does not have tubing and packer installed. Once the well has been permitted, 4 1/2" injection tubing will be installed and set with a packer immediately above the injection zone. Figure 8.0-3 illustrates the proposed recompletion.



ALL MEASUREMENTS ARE TAKEN FROM KELLY BUSHING (KB)
KB = 16' ABOVE GROUND LEVEL

ETHYL CORPORATION
MAGNOLIA, ARKANSAS

FIGURE 8.0-3

DISPOSAL WELL NO.13

SCALE NONE DATE: 9/83

TABLE 8.0-3

CONSTRUCTION DETAILS DISPOSAL WELL NO. 13

Total Depth	8979'
Completion	Open hole
Injection Interval(s)	8670' - 8979'
Tubing	4 1/2" (proposed)
Packer	4 1/2" x 9 5/8" (proposed)
Tubulars	20", LP, set at 40' 13 3/8", 48 lb/ft., H-40 set at 1266' 9 5/8", 47 lb/ft., 43.5 lb/ft., 40 lb/ft., C-75 set at 8670'
Centralizers	Halco, located at 118', 1066', 4394', 4517', 4600', 4684', 4767', 8166' 8250', 8334', 8417', 8511', 8594', 8660'
Cement	
Conductor	3.5 yards of Readi - Mix
Surface	850 sacks Lite
Long String	1st Stage: 700 sacks 50/50 Pozmix 625 sacks Lite 2nd Stage: 1640 sacks Lite 300 50/50 Pozmix
Cement Equipment	Stage Collar at 4642'

All measurements are taken from kelly bushing (KB), KB - 16' above ground level.

#10
OCT 3 1984

Ethyl Corporation

CHEMICALS GROUP
BROMINE CHEMICALS DIVISION

October 2, 1984

P. O. BOX 728
MAGNOLIA, ARKANSAS 71753
TELEPHONE 501-547-2211
501-234-2088

Mr. David Thomas
Arkansas Dept. of Pollution Control & Ecology
P. O. Box 9583
Little Rock, Arkansas 72219

Dear Mr. Thomas:

Re: Ethyl Corporation UIC Permit Application

Please find attached interpretations of cement bond logs for our WDW #1 and WDW #13. Also, find an interpretation of the casing caliper for WDW #13.

Respectfully,

Darrell W. Bias

Darrell W. Bias
Sr. Tech Service Engineer

DWB/wl

Attachment

David Thomas 10/3/84
CBL analysis WDW #10
Top of Midway - 1374', collar is at 1446' - good bond up to collar & from collar to 175' a surface - poor bond.

Squeeze job needed.

CBL Analysis WOW #13
?able analysis; everything is good, fair a excellent. Poor CBL, - only from 4600 - 6750

Complete Cement Bond Caliper Logs needed for WOW #13 & #6.

Schlumberger

SCHLUMBERGER WELL SERVICES
5000 GULF FREEWAY, P.O. BOX 2175
HOUSTON, TEXAS 77001, (713) 928-2511

PLEASE REPLY TO
P.O. BOX 808
MAGNOLIA, ARKANSAS 71753

September 10, 1984

Ethyl Corporation
P. O. Box 729
Magnolia, Arkansas 71753

Subject: Analysis of Cement Bond Log
Ethyl Corporation
Waste Disposal Well No. 1
Kerlin Field
Columbia County, Arkansas

Comments.....

Interval	Quality of Bond
3035 - 3021	Excellent
3021 - 3010	Fair
3010 - 2948	Good - Zone Isolation
2948 - 2854	Excellent
2854 - 2841	Fair
2841 - 2725	Excellent
2725 - 2712	Good - Zone Isolation
2712 - 2657	Excellent
2657 - 2607	Good - Fair - Some Zone Isolation
2607 - 2417	Excellent
2417 - 2382	Good - Fair - Some Zone Isolation
2382 - 2280	Excellent
2280 - 2238	Fair - Poor - Some Zone Isolation
2238 - 2132	Excellent
2132 - 2058	Poor - Fair - Little Zone Isolation
2058 - 1984	Fair - Good - Some Zone Isolation
1984 - 1930	Excellent
1930 - 1895	Poor
1895 - 1880	Good - Zone Isolation
1880 - 1802	Excellent
1802 - 1686	Poor
1686 - 1478	Poor - Fair - Little Zone Isolation
1478 - 1452	Good - Zone Isolation
1452 - 1420	Fair - Poor - Little Zone Isolation
1420 - 173	Poor

Sincerely,

Greg Van Belois

Greg Van Belois
General Field Engineer

GVB:jg

McCullough

TO: ETHYL CORPORATION

FROM: BOB MOORE, SSE.

SUBJECT: ANALYSIS OF CEMENT BOND LOG
ETHYL CORPORATION
SWD # 13
KERLIN FIELD
COLUMBIA, ARKANSAS

VALUES:

EXCELLENT BOND	100-90% SIGNAL ATTENUATION
GOOD BOND	90-70% SIGNAL ATTENUATION
FAIR BOND	70-30% SIGNAL ATTENUATION
POOR BOND	30-0% SIGNAL ATTENUATION

ZONE DEPTH(FT)	QUALITY OF BOND
8650-8600	GOOD
8600-8550	EXCELLENT
8550-8530	GOOD
8530-8110	EXCELLENT
8110-8080	GOOD
8080-7546	EXCELLENT
7546-7470	GOOD
7470-7000	EXCELLENT
7000-6932	GOOD
6932-6920	EXCELLENT
6920-6616	FAIR
6616-6595	EXCELLENT
6595-6520	GOOD
6520-6440	EXCELLENT
6440-6412	GOOD
6412-6398	EXCELLENT
6398-6250	GOOD
6250-6085	EXCELLENT
6085-5600	GOOD
5600-5050	GOOD TO FAIR LITTLE ZONE ISOLATION
5050-4880	FAIR TO POOR NO ZONE ISOLATION
4880-4654	FAIR
4654-4630	EXCELLENT
4630-4606	GOOD TO FAIR
4606-4433	EXCELLENT
4433-4310	GOOD TO EXCELLENT
4310-4250	EXCELLENT
4250-4238	GOOD

PHONE (501) 234-4202 • P. O. BOX 276 • MAGNOLIA, ARKANSAS 71753

McCullough

ZONE DEPTH (FT)	QUALITY OF BOND
4238-3550	EXCELLENT TO GOOD
3550-3460	GOOD TO FAIR
3460-3448	EXCELLENT
3448-3368	GOOD TO FAIR
3368-2900	EXCELLENT TO GOOD
2900-2600	GOOD TO FAIR VERY FEW ZONE ISOLATIONS
2600-2500	EXCELLENT
2500-1928	EXCELLENT TO GOOD GOOD ZONE ISOLATION
1928-1370	FAIR
1370-1210	GOOD TO FAIR
1210-1175	EXCELLENT
1175-1070	FAIR
1070-954	GOOD
954-915	EXCELLENT
915-825	FAIR
825-565	EXCELLENT
565-460	GOOD
460-410	EXCELLENT
410-340	GOOD TO FAIR
340-322	EXCELLENT
322-170	FAIR
170-110	EXCELLENT TO GOOD
110-SURFACE	FAIR

COMMENTS:
OVERALL BOND JOB IS EXCELLENT WITH GOOD ZONE ISOLATION OVER MOST OF THE WELL.

SINCERELY,

BOB MOORE, SSE.

PHONE (501) 234-4202 • P. O. BOX 276 • MAGNOLIA, ARKANSAS 71753

McCullough

COMMENTS:

THERE APPEARS TO BE A SMALL AMOUNT OF CORROSION TAKING PLACE AROUND 420'. THE CASING APPEARS TO BE IN EXCELLENT SHAPE FROM 420' TO 5970'. CORROSION PROBLEMS EXIST FROM 5970' TO TD.

SINCERELY,

Bob Moore

BOB MOORE, SSE.

PHONE (501) 234-4202 • P. O. BOX 276 • MAGNOLIA, ARKANSAS 71753

McCullough

TO: ETHYL CORPORATION

FROM: BOB MOORE, SSE.

SUBJECT: ANALYSIS OF CASING
ETHYL CORPORATION
SWD #13
KERLIN FIELD
COLUMBIA, ARKANSAS

VALUES:

EXCELLENT	CASING WITHIN API TOLERANCE
GOOD	FROM API TOLERANCE TO 75% METAL REMAINING
FAIR	75% TO 50% METAL REMAINING
POOR	LESS THAN 50% METAL REMAINING

ZONE DEPTH (FT)	QUALITY OF CASING
8650-8585	GOOD
8585-8563	GOOD TO EXCELLENT
8563-8512	GOOD
8512-8454	EXCELLENT
8454-8444	GOOD
8444-8408	EXCELLENT
8408-7872	GOOD TO EXCELLENT
7872-7806	EXCELLENT
7806-7780	GOOD
7780-7630	EXCELLENT
7630-6850	GOOD TO EXCELLENT
6850-6783	GOOD
6783-6740	GOOD
6740-6698	EXCELLENT
6698-6640	GOOD TO EXCELLENT
6640-6614	EXCELLENT
6614-6370	GOOD
6370-6310	GOOD TO EXCELLENT
6310-6150	GOOD
6150-6070	EXCELLENT
6070-5950	GOOD TO EXCELLENT
5950-5920	GOOD
5920-5248	EXCELLENT
5248-5035	EXCELLENT
5035-4691	GOOD TO EXCELLENT
4691-420	EXCELLENT
420-SURFACE	GOOD

PHONE (501) 234-4202 • P. O. BOX 276 • MAGNOLIA, ARKANSAS 71753

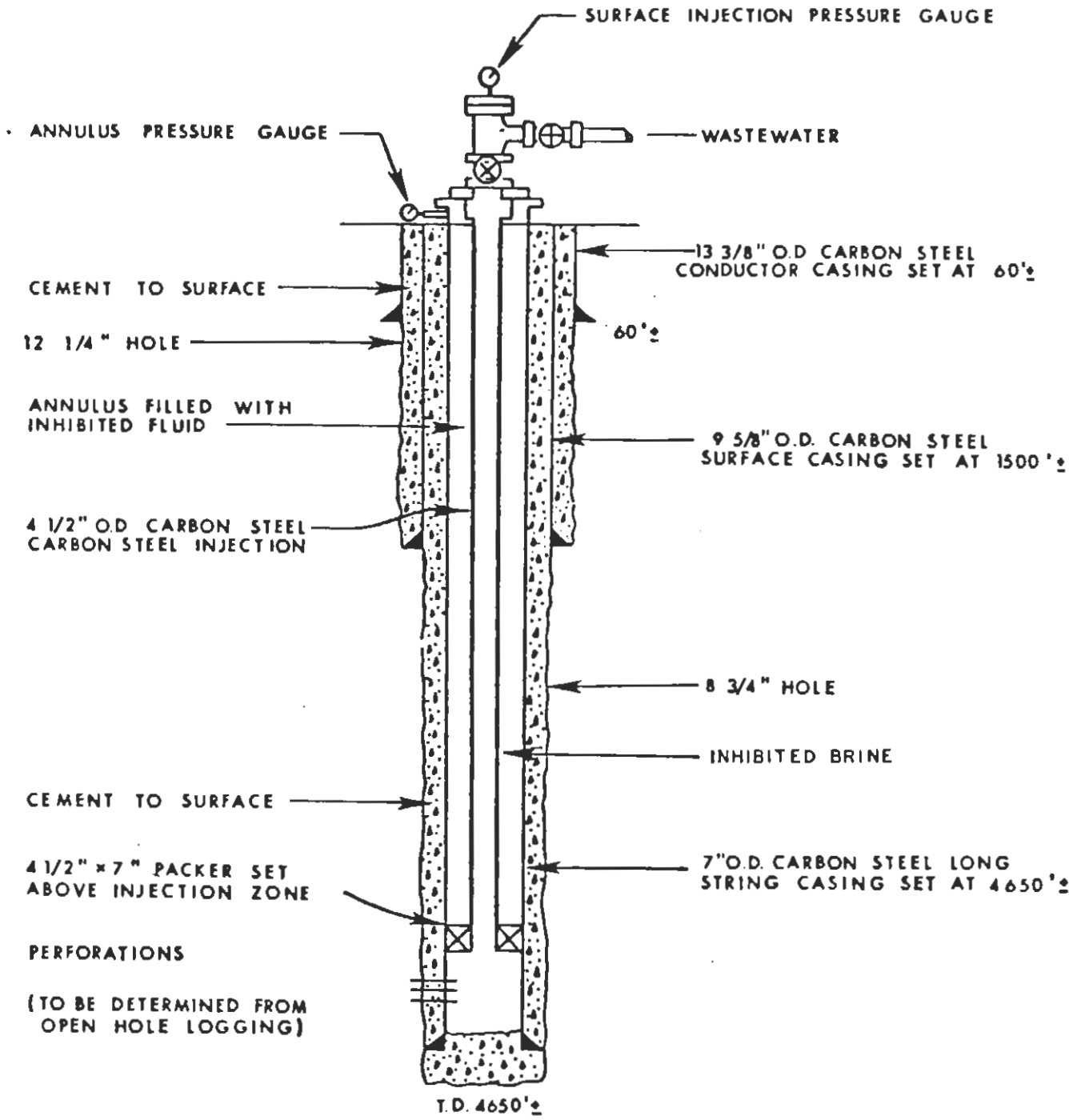
9.0 NEW WELL CONSTRUCTION

9.1 PROPOSED WASTE DISPOSAL WELL NO. 2

One waste disposal well (WDW-2) is proposed to be drilled and completed into the James Limestone with an alternate recompletion into the Tokio Formation. The specific location and spacing of the proposed well is shown in Figure 1.0-1.

9.2 WELL DESIGN

The proposed injection well will have three "strings" of steel casing plus injection tubing. Conductor casing will be set to a depth of 60'± to prevent soil collapse while drilling. Surface casing will be set below the deepest fresh water zones (1500'±) and cemented to the surface. The surface casing will protect fresh water zones from contamination by waste fluids. The long string casing will be set below the bottom of the James Limestone and extend to the surface. It maintains well integrity and provides a second protective casing through fresh water zones. The long string casing will be cemented to the surface providing additional isolation of fresh groundwater. To prevent corrosion of the casing, wastewater is pumped down injection tubing. The tubing is separated from the long string casing by a fluid - filled annulus. Waste fluids cannot move up this annulus because of a mechanical "packer" set above the injection zone. Figure 9.0-1 is a well and wellhead schematic illustrating the proposed design for the waste disposal well WDW-2. Table 9.0-1 summarizes construction details for the proposed disposal well.



ETHYL CORPORATION
MAGNOLIA, ARKANSAS

FIGURE 9.0-1

WDW – 2

SCALE NONE DATE OCT. 83

TABLE 9.0-1

CONSTRUCTION DETAILS PROPOSED DISPOSAL WELL NO. 2

Total Depth	*4650'±*
Type of Completion	*Perforated*
Injection Interval(s)	*James Limestone (primary)* *Tokio Formation (secondary)*
Tubing	*4 1/2", carbon steel at 4500'±*
Packer	*4 1/2" x 7" packer set at 4500'±*
Tubulars	
Conductor	*13 3/8" set at 60'±*
Surface	*9 5/8" set at 1500'±*
Long String	*7" set at 4650'±*
Centralizer	*10 will be installed from 3000'± to 4600'±*
Cement	*Light weight and Class H*
Annular Fluid	*Inhibited brine*

9.2.1 Conductor Casing - *Conductor casing will be set through the surface alluvium and into the top of the bedrock units. Approximately 60'± of 13 3/8" O.D. carbon steel casing will be needed. The conductor casing serves several functions. It provides protection from collapse of the unconsolidated alluvium sediments and seals potential shallow lost circulation zones. The conductor casing can also serve as a support foundation for other surface equipment necessary during drilling operations.*

9.2.2 Surface Casing - *Surface casing will be set through the fresh ground water zones to provide protection from wastewater contamination. 9 5/8" O.D. carbon steel casing set to a depth of 1500'± and cemented to the surface will be more than adequate for protection of potable ground water.*

9.2.3 Long String Casing - *The long string or protection casing is set through the bottom of the James Limestone injection zone and cemented to the surface. Approximately 4650'± of 7" O.D. carbon steel casing will be required. Since the long string casing provides the primary protection against vertical migration of waste fluids, tests will be made to assure a good cement bond.*

9.2.4 Injection Tubing - *The injection tubing should be selected to minimize friction loss at high flowrates so that pumping costs are*

reduced and permit limitations are maintained. An estimated 4500'± of 4 1/2" O.D. carbon steel injection tubing will be required. It will be set on a packer above the James Limestone injection zone. The packer will seal the annular space between the long string casing and injection tubing. The annular space can then be pressurized and monitored as required to detect leaks or mechanical failures.

9.3 DRILLING PROGRAM

Set 13 3/8" conductor casing to 60'±. Drill a 12 1/4" hole to surface casing depth with a deviation not exceeding 1° (degree) per hundred foot interval. Run deviation surveys as required. Condition open hole and run spontaneous potential - resistivity and open hole caliper logs. After logging condition hole and run 9 5/8" casing as per attached casing program. The surface casing will have a cement float shoe and float collar. After running 9 5/8" casing, circulate hole prior to cement job. Exact cement volumes will be determined from open hole caliper logs. A sufficient amount of excess cement will be pumped to insure cement returns to the surface. Allow approximately 12 hours setting time before slacking off tension on casing. Cut off conductor and surface casing and install casing head. Nipple up and test blowout preventors, choke manifold and pressure test surface casing as required by the Arkansas State Department of Pollution Control and Ecology.

Pick up 8 3/4" bit and drill out float equipment and 5' of new formation.

Continue to drill ahead with a vertical deviation of not more than 1° per 100' or 4° at total depth. Run deviation surveys as required. Mud properties should be maintained in accordance with the mud program unless otherwise indicated by hole conditions. Upon reaching total depth. condition hole and log well as specified under logging program.

After logging, condition hole and run 7" long string casing as per attached casing program. Use two casing centralizers on shoe joint spaced 10' from bottom and 10' from top of joint. Place casing centralizer on collars as required. The 7" casing will have a cementing float shoe and float collar. After running 7" casing circulate hole. The 7" casing will be cemented back to the surface in one stage. Exact cement volumes will be determined from open hole caliper logs.

Cut casing and nipple down blowout preventors. Install a casing spool. This will conclude the drilling portion of the well. All remaining operations will proceed under the completion prognosis.

9.4 MUD PROGRAM

DEPTH	MUD WEIGHT	VISCOSITY	FLUID LOSS
0 - surface casing depth	8.5 - 9.6	30 - 55	N.C.
Base of surface casing - Top of injection zone	9.0 - 9.8	30 - 45	N.C. - 20
Top of injection zone - Total depth	9.0 - 9.8	30 - 45	10 or less

The mud recommendations listed are to be used as a guide only. Actual mud properties will be determined by hole conditions; however, the fluid loss shown through the injection zone will be maintained within the specified values.

9.5 LOGGING PROGRAM

	TOOL	INTERVAL
12 1/4" hole	Spontaneous Potential - Resistivity - Caliper	From TD of surface hole to base of conductor
8 3/4" hole	Spontaneous Potential - Resistivity	TD to base of surface casing.
	Formation density with Gamma Ray Caliper	Note: Gamma Ray will be continued to surface.
	Sidewall Cores	As required.
Cased Hole Logs	Gamma Ray/Cement Bond/Collar Log	Inside 7" casing
	Radioactive Tracer Log	Through injection zone

9.6 CASING PROGRAM

Conductor	60'± of 13 3/8" O.D.
Surface	1500'± of 9 5/8" O.D.
Long String	4650'± of 7" O.D.

9.7 CEMENTING PROGRAM

All cement values will be calculated after running open hole caliper logs to determine excess volumes needed to insure cement returns to the surface. The various cement and additives recommended will be lab tested by a cementing company prior to use to insure correct performance.

9.7.1 Surface Casing

9 5/8" in a 12 1/4" hole

Excess to be calculated from caliper log.

Lead Cement: Light weight

Tail Cement: Class "H"

9.7.2 Long String Casing

7" in a 8 3/4" hole.

Excess to be calculated from Caliper Log.

Tail Slurry: Light Weight

Lead Slurry: Class "H"

9.8 COMPLETION PROGNOSIS

Move in and rig up completion rig. Pick up work string and scraper. Circulate hole clean to top of float collar. Displace mud in casing with fresh water. Pressure test casing as required.

Rig up cased hole logging unit and run: (1) Gamma Ray - Collar Locator and Cement Bond Logs from bottom of 7" casing to surface. Pick up perforating gun and perforate. Intervals will be selected from open hole logs.

Pickup a 4 1/2" x 7" packer and run in 4 1/2" injection tubing. The packer will be set at 4500'±. Circulate treated packer fluid down annulus side. Hang off tubing and set packer. Install wellhead. Pressure test annulus as required. Rig down and move out completion rig.

Should a waste/formation water buffer be required, it will be furnished and injected at such time. Acidize as required.

Rig up wireline and suspend bottom hole pressure recorder in well for static reservoir pressure determination. Rig up pump truck and inject the formation fluid or brine at various rates while recording pressure and volumes. Retrieve bottom hole recorder.

9.9 MONITORING

The proposed injection well will be furnished with a well monitoring system. All samples and measurements taken for the purpose of monitoring will be representative of the monitored activity. Injection fluids will be sampled and analyzed with a frequency sufficient to yield data representative of their characteristics. Wellhead monitoring will include the following:

9.9.1 Pressure gauges shall be installed and properly maintained on the injection tubing and on the annulus at the wellhead.

9.9.2 Continuous recording devices shall be installed and maintained in proper operating condition at all times to monitor and record injection tubing pressures, injection flowrates, injection volumes, tubing - long string casing annulus pressure, and any other specified data. The instruments will be housed in water proof enclosures.

Mechanical integrity shall be demonstrated and reported in accordance with the Arkansas State Department of Pollution Control and Ecology.

ATTACHMENT 4

PLUGGING AND ABANDONMENT

11.0 PLUGGING AND ABANDONMENT PLAN

11.1 PLUGGING PROCEDURES

In the event that a major well failure occurs or upon reaching the effective end of the wells useful life, the disposal well will be plugged in accordance with the prevailing Arkansas Department of Pollution Control and Ecology injection well closure guidelines. The following proposed steps for plugging operations are designed to permanently seal the injection wellbore and thus prevent communication between the disposal reservoir and upper strata containing fresh water.

The injection tubing will be removed from the wellbore, properly decontaminated and disposed of in an acceptable manner. The long string protection casing will be filled with cement from bottom to surface. The cement used for plugging will be selected to provide maximum resistance to the wastewater in the well. Cement will be placed in the injection zone using a cement retainer and the remaining casing filled in multiple stages using a displacement method. The casings will be cut 3' below grade level and a steel plate welded across the top. Pertinent well identification information will be included on the plate.

After the plugging has been completed a detailed report and plug and abandon form will be submitted to the Arkansas Department of Pollution Control and Ecology UIC Division. Table 11.0-1 lists a general step by step procedure to properly close a disposal well.

TABLE 11.1

CLOSURE PLAN

PLUG AND ABANDONMENT PROCEDURE FOR EXISTING AND PROPOSED WASTE DISPOSAL WELLS

1. *Move in and rig up.*
2. *Pump 100 bbls of 10 lb/gal. brine.*
3. *Dismantle wellhead and mount blowout preventors.*
4. *Remove the injection tubing. If packer will not unseat, cut the tubing with a tubing charge immediately above the packer. Remove and decontaminate the tubing as required.*
5. *Set cement retainer at top of injection zone.*
6. *Squeeze cement with Class "H" from top of injection zone to total depth. Cement volume to be open hole volume plus 25% excess.*
7. *Wait on cement four hours.*
8. *Pressure test retainer and cement to 500 psi for 30 minutes and tag top of retainer to verify depth.*
9. *Balance Class "H" in two stages from top of injection zone to surface.*
10. *Rig down and move out.*
11. *Wait on cement eight hours.*
12. *Cut off wellhead and casings 3' below ground level and weld steel plate on top of the casing. Steel plate should be inscribed with Serial No. and date of plugging. State representative will witness the plugging and will sign the plug and abandonment form.*

ATTACHMENT 5

CASING TESTING PROCEDURES

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

MEMORANDUM

TO: Bob Blanz, Deputy Director, Program Operations
A. L. Sparks, UIC Coordinator, Water Division

FROM: Lynnette Gandl, Geologist, Permits Branch

DATE: March 15, 1984

SUBJECT: Update - Pressure test requirements on Class I injection wells

The following guidelines represent slight modifications of those proposed in a March 1 memo as the policy of the ADPC&E regarding casing pressure testing for mechanical integrity of Class I injection wells. The modifications are partially the result of an E.P.A. Region 6 UIC program meeting on April 7 & 8, 1984.

1. If a well is pressured up to greater than 1000 psi, then the pressure must hold for a minimum of 30 minutes.

2. If a well is pressured up to more than 500 psi but less than or equal to 1000 psi, the pressure must hold for a minimum of 1 hour.

3. If a well is pressured up to 500 psi or less, the pressure must hold for 3 hours.

4. A well must be pressured up to at least 100 psi over maximum expected injection pressures.

5. If more than one pressure gage is used for any reason, as when removing the pressure truck and installing an in-line pressure gage, the pressure reading for the lowest reading gage will be utilized in applying guidelines 1 to 4 above.

6. Pressure during the test may not be allowed to exceed 75% of calculated fracture pressure.

7. Maximum pump capacity must not exceed 75% of calculated fracture pressure.

It is suggested that these criteria become a part of the UIC permit guidelines for Class I wells. Slightly different standards may apply when wells are retested at five year intervals since re-tests will generally be performed with injection tubing in place.

These guidelines are subject to change and additional criteria may be developed.

LAG:cjh

cc: Phyllis Garnett, Director
Jim Shell, Chief, Water Division
Mark Witherspoon, Supervisor - Land Disposal Section
Gary Eddy, ADPC&E District Field Inspector